SPECIFICATIONS

CITY OF TORONTO

Mount Dennis Childcare Centre

1234 Weston Road
Toronto, Ontario

Volume 3

Reports

ISSUED FOR TENDER

January 17th, 2020

Coolearth Architecture Inc.
& CS&P Architects Inc.
Project No. 17026

Design Discipline

Documents prepared by the respective Consultants are designated by the following discipline symbols:

- Owner (O)
- Architect (A)
- Civil Consultant (C)
- Commissioning Consultant (COMM)
- Electrical Consultant (E)
- Landscape Consultant (L)
- Mechanical Consultant (M)
- Structural Consultant (S)
- Shoring Consultant (SH)

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1 REPORTS, DRAWINGS AND INFORMATION

1.1 A copy of the below reports, drawings and information as specified herein are appended to this Document.

1.2 **UTILITY AND HYDRANT FLOW CURVE INFORMATION**

.1 **Site Servicing and Stormwater Management Report**
Mount Dennis Childcare
1234 Weston Road,
Toronto, Ontario
Prepared by: Masongsong Associates Engineering Limited
Report No.: MAEL Project 17-904
Dated: July 2018
58 pages

.2 **Existing As-Built Utility Drawings**
4 pages

.3 **Hydrant Flow Curve**
Prepared by: GTA Waterworks
1 page

1.3 **GEOTECHNICAL INFORMATION**

.1 **Geotechnical Investigation**
Proposed Mount Dennis Childcare Centre
1234 Weston Road,
Toronto, Ontario
Prepared by: GeoPro Consulting Limited
Report No.: 17-2118GH
Dated: July 9, 2018
51 pages

.2 **Environmental Site Assessment Report**
Supplemental Phase II
Environmental Site Assessment
1230 and 1234 Weston Road,
Toronto, Ontario
Prepared by: WSP Canada Group Limited
Report No.: 15M-00656-01
Dated: November 2018
89 pages

.3 **Risk Assessment Report**
Modified Generic Risk Assessment Report
1230 and 1234 Weston Road,
Toronto, Ontario
Prepared by: WSP Canada Group Limited
Report No.: 15M-00656-02
Dated: November 2018
52 pages

.4 **Remedial Options Analysis**
Modified Generic Risk Assessment Report
1230 and 1234 Weston Road,
Toronto, Ontario
Prepared by: WSP Canada Group Limited
Report No.: 15M-00656-00
Dated: October 23, 2017
7 pages

.5 **Soil Vapour Investigation**
Mount Dennis Childcare
1230 and 1234 Weston Road,
Toronto, Ontario
Prepared by: WSP Canada Group Limited
Report No.: 17M-02431-00
Dated: November 9, 2018
44 pages

.6 **Hydrogeological Evaluation**
Proposed Childcare Centre
1234 Weston Road,
Toronto, Ontario
Prepared by: GeoPro Consulting Limited
Report No.: 17-2118H04
Dated: November 30, 2018
70 pages

.7 **Hydrological Review Summary**
Prepared by: GeoPro Consulting Limited
Dated: August 2018
13 pages

.8 **Response to Peer Review Comments**
1234 Weston Road,
Toronto, Ontario
Prepared by: WSP Canada Group Limited
Report No.: 17M-01905-32
Dated: November 9, 2018
7 pages

.9 **Thermal Conductivity Test Report**
Analysis of TC Test Data for
Mount Dennis Childcare Centre
1234 Weston Road,
Toronto, Ontario
Prepared by: GEOptimize Inc.
Dated: 2018-11-07
10 pages

1.4 CITY OF TORONTO CABLING AND SECURITY INFORMATION

.1 **Cabling Standard**
City of Toronto, Corporate Services
Information & Technology
Standards and Procedures
Cabling Standard
Issued by: IT Network Services
Version 4.4 - July 4, 2018
22 pages

.2 **Security System Information**

.1 **City of Toronto Corporate Security; Security Schedules, Drawing Typicals (Revision 1.6)**
Dated: 12/21/2009
38 pages
- Additional notes:
  - Telephone system will be VOip for the most part, which is running off the network equipment, but some analog phones require some space on a plywood backboard, not in the rack.
  - Refer to page 4: Typical for server rack for CCTV equipment and includes Patch panel, Cisco PoE Network Switch, KVM, Milestone Husky NVR and UPS
  - Refer to page 13: Typical for Access Control Panel wall (iStar Panel), complete with wall sizing required for fire rated plywood where all panels will be installed (disregard the iStar Expansion Panel and Camera Power Supply, as these items will be irrelevant for the size and IP-CCTV systems).
  - Hubroom must accommodate the iStar Panel and the IPCCTV rack and have sufficient room for systems maintenance to work on and be properly ventilated (recommended temp is 20 to 22 degrees Celsius).

.2 **Security Cut Sheets:**

.1 **Network security cameras:** AXIS ‘P3225-LVE’ for exterior cameras and AXIS ‘P3225-LV’ for interior cameras (3 pages).

.2 **Interruptible power systems (UPS):** APC ‘Smart-UPS On-Line’ (4 pages).

.3 **Gangable enclosure cabinet:** Middle Atlantic Products ‘WRK-24-32 Series Rack’, (2 pages).

.4 **Network video recorder (NVR):** Milestone ‘Husky M20’ (2 pages).

.5 **IT rack drawing** (1 page with JPEG).

1.5 **BUILDING AUTOMATION SYSTEM (BAS) INFORMATION**

.1 **City of Toronto Standard Specifications**
Section 23 09 23 - Building Automation System (BAS)
Dated: September 2018
40 pages

1.6 **ARBORIST REPORT**

.1 **Arborist Report**
Tree Inventory & Preservation Plan for
1234 Weston Road
Prepared by: Whiteside Tree & Garden Inc.
Dated: 2017-11-20
9 pages

END OF DOCUMENT

Utility & Hydrant Flow Curve Information

Site Servicing and Stormwater Management Report

Mount Denis Childcare
1234 WESTON ROAD,
City of Toronto
Coolearth Architecture

SITE SERVICING AND STORMWATER MANAGEMENT REPORT

July 2018

MAEL Project 17-904

MASONGSONG ASSOCIATES ENGINEERING LIMITED
ENGINEERING SUSTAINABLE FUTURES

SITE SERVICING AND
STORMWATER MANAGEMENT REPORT

Mount Dennis Childcare
1234 WESTON ROAD,
City of Toronto

For

Coolearth Architecture Inc.

JULY 2018

Prepared by:

MASONGSONG ASSOCIATES ENGINEERING LIMITED
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1.0 INTRODUCTION

1.1 Study Objectives and Location

Masongsong Associates Engineering Limited has been retained by Coolearth Architecture Inc. to provide a site servicing and stormwater management report in support of a proposed 2-storey childcare building - Mount Dennis Childcare located at 1234 Weston Road, in the City of Toronto.

The objective of this report is to identify the requirements for site servicing and stormwater management as it relates to current City of Toronto criteria, and to demonstrate how this proposed site will function within the framework of existing infrastructure.

1.2 Existing Site Description & Background

The subject site is legally described as Part of Lots 1, 2 and 3 Registered Plan 2017, in the City of Toronto. The subject land is currently occupied by a two-storey detached house which previously served as childcare. Driveway entrance is situated off Weston Road,

The subject site has an area of approximately 0.1595 ha. (0.39 acres) and is bounded to the north by Weston Road, to the east by Glenvalley Drive, to the south by an existing two storey detached home, and to the west by an existing 3-storey residential building.

Figure 1 below illustrates the location of the proposed development.

Figure 1 *Site Location Key Plan*

1.3 Proposed Development Plan

The development proposal is to demolish the existing two storey dwelling and construct a new 2-storey childcare building with a basement level, a driveway entrance and associated parking spaces off Glenvalley Drive. The proposed development site statistics is attached in Appendix A.

1.4 Existing Municipal Services

There are existing municipal sewers and watermain surrounding the subject site. A schematic of the existing services in the vicinity of the site is included in Appendix A as Figure 2. A discussion of the available existing infrastructure follows.

2.0 WATER SERVICING

2.1 Existing Watermain

The existing watermains surrounding the subject site are as follows:

- A 300Ø mm diameter watermain on Weston Road (far side)
- A 150Ø mm diameter watermain on Glenvalley Drive (near side)

The existing watermains within the proposed site are illustrated on Figure 2 in Appendix A.

2.2 Proposed Water Servicing

The architect has confirmed that the class of building requires a sprinkler system, and therefore a 150mm waterline is proposed to be tapped off the existing 150mm municipal main on Glenvalley Drive. Refer to Drawing SGR-1 in the Appendix drawing for watermain connection details.

The proposed 150 mm diameter connection will serve as the fire line, with a 100 mm diameter domestic cold-water supply branched off the main service in accordance with City standards. Both fire and domestic lines will be provided with shut-off valves at the streetline and water meters in accordance with City standards. In accordance with Municipal Code, new fire supply lines are to be metered. The fire-line meter will be installed inside the building on the basement level.

All work within the Grenvalley Drive right-of-way will be completed by City forces but paid by the developer/applicant.

2.3 Proposed Water Demands

Based on the architectural plan, the proposal building will have a total gross floor area of 1,841 m^2. Using the City of Toronto Design Criteria for Sewers and Watermains, the total future population forecast can be quantified as 47 persons (1,841 m^2 x 0.0258 persons/m^2). The 0.0258 person/m^2 is based on population equivalents based on land use as per City of Toronto Design Criteria for Sewers and Watermains, Nov. 2009. However, the building was approved with an occupancy of 120 person (98 children and about 20 staffs); therefore, our calculation will be based on a maximum 120 person.

The residential per capita demand is estimated based on the City criteria of 191 L/c/d. With a maximum of 120 persons, the average-day domestic demand is 0.265 L/s. The maximum day demand is factored up by 1.10, therefore yielding a max-day domestic consumption rate of **0.292 L/s**, or 17.51 L/min.

However, the fire flow is much more critical. Based on the Fire Underwriters Survey (FUS), the required fire flow is 4,000 L/min. See Tables F2-F3 (Appendix B).

Hydrant flow test along Glenvalley Drive was carried out by GTA WATERWORKS; the result is attached in Appendix A.

Detailed hydrant flow is calculated in Table F1, confirming that the existing watermain on Glenvalley Drive is capable of delivering a fire flow of over 4264 L/min, which satisfied both FUS and ISO fire flows superimposed on the maximum-day domestic consumptions.

Based on the hydrant testing results, the existing main has adequate supply and pressures to meet the critical high-demand flow for fire-fighting plus the maximum day domestic consumption rate. Therefore, the existing municipal watermain is sufficient to support the proposed development.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Servicing

The subject site is bounded by existing sanitary sewers along Weston Road and Glenvalley Drive, specifically:

- A 1500mmØ sanitary trunk sewer within Weston Road flowing northwest to southeast towards Eglinton Avenue West;
- A 375mmØ sanitary sewer within Weston Road flowing north to east and eventually to a 1500mmØ sanitary trunk sewer at the intersection of Oxford Drive and Weston Road;
- A 300mmØ combined sewer within Glenvalley Drive flowing south to north and connect into the ex. 1500mmØ sanitary trunk sewer on Weston Road.
- A 1050mmØ overflow sewer within Glenvalley Drive flowing north to south.

The existing sanitary sewers within the proposed site are illustrated on Figure 2 in Appendix A.

3.2 Proposed Sanitary Servicing

It is proposed to provide a new 250mm diameter sanitary service connection at the southeast property boundary and connect into the existing 300mm diameter combined sewer on Glenvalley Drive. The connection will be provided with a control maintenance hole at the property line and a maintenance hole at the existing 300mm diameter sewer in accordance with City standards. Refer to Drawing SGR-1 in the Appendix drawing for sanitary connection details.

It is noted that all work within the municipal right-of-way is to be performed by City forces, but paid for by the developer/applicant, unless otherwise directed by the City at the time of construction.

3.3 Sanitary Sewage Flow Estimates

As per the watermain in Section 2.3, the development site will generate approximately 120 people. In accordance with City requirements, the sanitary sewage flow estimates are calculated based on the population forecasts plus extraneous ground water infiltration. Using the above population estimates, the future sanitary sewerage rate from the subject site is calculated as follow:

Proposed Site Design Flow:

Peak Flow Design Parameters

Total Population = 120 p
Residential Avg. Flow = 450 L/p/d
Peaking Factors = 1 + {14/(4+(P/1000)$^{0.50}$)} = 4.00 max.
Site Area = 0.1595 ha
Infiltration rate = 0.26 L/s/ha = 0.041 L/s

Calculation of Peak Design Flows

Design flow, $Q_{SANITARY}$ *= average daily flow * peaking factor + infiltration flow*
={(120 p x 450 L/p/d / 86400 s/d) x 4.00 + 0.041 L/s
=2.50 L/s + 0.041 L/s
= **2.54 L/s**

Therefore, the peak sanitary flow from the development site is been calculated to be **2.54 L/s.**

Existing Peak Flow:

The former Childcare which was closed in 2014, was licensed for a maximum of 109 person (95 children and 14 staffs). Utilizing the same calculation methodology, the peak flow from the former building is 2.31 L/s. Therefore, the additional flow to the system would be **0.23 L/s** (2.54-2.31).

The post development site generates an increase flow rate of only 0.23 L/s which represents less than 0.12% of the receiving sewer capacity which can be considered as negligible flow. The receiving sewer is a 300mm diameter pipe @ 3.7% with a full flow capacity of 186.01 L/s; therefore, an increase of 0.39% (0.23/186.01). When considered in the context of a receiving sewer, which yields a much lower Harmon Peaking Factor (due to increased population) the estimated sewerage discharge is even lower. In addition, this re-development site is not a rezoning and not a subdivision; therefore, a downstream sanitary capacity analysis is not required.

- **Therefore, it is concluded that the subject development will be adequately accommodated by the existing 300mm combined sewer on Glenvalley Drive with no requirement for systemic upgrades or further analysis.**

4.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The stormwater management plan for the subject site will be designed in accordance with the City of Toronto's Wet Weather Flow Management Guideline (WWFMG, November 2006) in conjunction with the Best Management Practice guidelines in the MOE SWMPP Manual. Specific criteria to be applied in the stormwater management design are as follows:

- Water quality control – Level 1 or Enhanced Protection
- Water Balance – a minimum 10mm event detained for infiltration as per the Toronto Green Standard v3 (TGS)
- 100-year post development to 2 yr predevelopment quantity control

The following sections will detail the pre and post-development conditions and describe how the WWFMG targets can be achieved on site.

4.1 Existing Storm Sewers and Drainage

The subject site is bounded by existing storm sewers along Weston Road and Glenvalley Drive, specifically:

- A 900mmØ storm sewer within Weston Road flowing west to east towards Eglinton Avenue West;
- A 450mmØ storm sewer within Glenvalley Drive flowing south to north towards Weston Road where it connects into an existing 900mmØ storm.

The existing storm sewers within the proposed site are illustrated on Figure 2 in Appendix A.

4.2 Quantity Controls

4.2.1 Allowable Peak Flow – Pre Development

The quantity control target for this development is to attenuate the runoff from all storm events (2- through and including 100-year storm) to the 2-year pre-development level. Stormwater detention and/or retention is to be provided where necessary to achieve the specified release rate.

Storm drainage from the site under the existing conditions is as illustrated on Figure 2 in Appendix A. Based on the topographical survey and field observation, there is no on-site stormwater management quantity control for the subject site. The site in general drains from west to east and north to south into the existing Glenvalley Drive storm sewer systems. As shown on the plan, the subject site has a pre-development composite runoff coefficient of R=0.61.

Considering the relatively small size of the site (0.1595 ha), the pre and post-development storm flows have been quantified using the Modified Rational Method, as specified in the WWFMG. The City of Toronto Rainfall intensity equations used for calculating pre and post-development flows is as follows:

2-year storm rainfall intensity:

$$i_2 = 21.8 * (t_c)^{-0.78}$$

100-year storm rainfall intensity:

$$i_{100} = 59.7 * (t_c)^{-0.80}$$

Where:

i = rainfall intensity (mm/hr)
t_c= time of concentration (hr) = 0.166hr*

*An initial time of concentration of 0.1666 hours (10 minutes) was used for determining peak pre and post-development flows.

$$\therefore i_2 = 88.19 mm/hr$$

$$\therefore i_{100} = 250.32 mm/hr$$

In accordance with WWFMG policy, a runoff coefficient of no more than R=0.50 is to be used for computing pre-development peak flows.

Therefore, the site will be limited to the maximum allowable coefficient of R=0.50. The 2-year pre-development peak flow rate shall be the allowable release rate for the site as follows:

$$Q_{allow} = \frac{A_t R i_2}{360} (m^3/s)$$

Where:

Q_{allow} = Peak Stormwater Flow (m^3/s)
R = Runoff coefficient = 0.50
i_2 = Rainfall intensity (mm/hr) = 88.19mm/hr
A_t = Total site Area (ha) = 0.1595 ha

Q_{2year} = (0.50 * 88.19 * 0.1595) / (360*1000) = 19.54 L/s

Therefore, the maximum allowable release rate from the subject site into the municipal road storm sewer systems is **19.54 L/s**.

4.2.2 Post-development Catchments and Detention

In order to meet City criteria controls for stormwater management, the 100-year stormwater peak run-off shall be controlled to the 2-year storm pre-development condition.

Due to the small size of the subject site area, it is proposed to achieve both quality and quantity controls with a treatment-train comprising of:

- A Jellyfish Filter **(model JF4-2-1 or equivalent)** device as a pre-treatment settling chamber, removing larger solids, bitumous runoff, and the initial TSS settling. The Jellyfish modeling output is included in Appendix C.

  An OGS device has been specified for the site to accommodate the at-grade impervious areas to improve upon the overall weighted TSS removal rate. It is known that the City of Toronto only approved standard OGS devices (Stormceptor, CDS, etc.) to provide a maximum 50% TSS removal efficiency. Newer media-filter based technology such as the Imbrium Jellyfish Filter are recognized by the City as providing a much higher removal rate of TSS and Total Phosphorus (TP) down to the 2-micron particulates. It is proposed to incorporate a media-based filtration system as a controlled-flow treatment train Best Management Practice (BMP) to improve the overall TSS removal rate.

- The full 10mm storm run-off discharged from the OGS device will be routed into below-grade **Infiltration Tanks (Brentwood Stormtank, or equivalent)**; the full 10mm volume will be passed through a crushed stone bottom and be allowed to dissipate back to the in-situ soils over at least 24-48 hours period to maximize on-site recharge. Most infiltration galleries are prone to clogging. With the implementation of a pre-treatment OGS device, the discharge into the Storm tanks will already have been cleansed of a large proportion of TSS and larger floatables, thus significantly prolonging the effectiveness of the infiltration tanks.

  The specified Brentwood system has a large void-ratio and high contact area with in-situ soils to promote at-source recharge in both vertical and horizontal directions.

- The Brentwood tanks will also provide quantity attenuation of the 100-year to 2-year post development flows.

The proposed BMP treatment train of routing post-development flows through a Jellyfish Filter to an Infiltration Gallery for infiltration will provide an exceptionally high-level of LID treatment. More specific device sizing and performance is presented in the following sections.

4.2.3 10mm Retention for Water Balance (as per TGS v3)

The volume to be stored for the 10mm water balance for infiltration is estimated in the following table as follows:

Table 2.0 10mm water balance requirement

Surface Area Component	Area	Initial Abstraction		Target Water Retention	Deficit Storage Required to meet Water Balance Target	
	(m^2)	(mm)	(m^3)	(mm)	(mm)	(m^3)
Rooftops	737	1	0.737	10	9	6.63
Impervious	356	1	0.356	10	9	3.20
Pervious	502	5	2.51	10	0	0.0
Total Water Balance Storage Required						**9.83**

The required water balance volume of 9.83 m^3 will be storage under the infiltration tank; this volume will pass through a crushed stone bottom and be allowed to dissipate back to the in-situ soils over at least 24-48 hours period to maximize on-site discharge. As the entire 10 mm volume is being stored and retained for in-situ infiltration, there are no proposed piped outlets for the 10 mm storm event other than the controlled pipe for the allowable 2-year storm discharge which is set above the 10 mm storage volume.

Based on the Geotechnical Investigation prepared by GEOPro Consulting, the native soils explored at the Site are comparably consistent, which are mainly comprised on sand with infiltration rates ranged from 40 mm/hour to 150mm/hour which are suitable for infiltration type LID. An excerpt of Geotechnical report indicating the infiltration rates is attached in Appendix D.

Given the proposed tank dimensions, this yields a maximum outflow of:

Discharge Rate = Infiltration Area x Infiltration Rate (native soils, lowest value)
= (10.0 m^2 x 40 mm/hr x (1 m/1000 mm)
= 0.40 m^3/hr

Therefore, solving for holding time:

Holding Time = Total Storage Provided / Discharge Rate
= 11.8 m^3 / 0.40 m^3/hr
= 29.2 hours

Based on the above storage requirement a suitable configuration of the Brentwood Storm tank will provide 11.8 m^3 of storage in the infiltration tanks. As the entire 10mm volume is being stored and retained for in-situ infiltration, there are no proposed piped outlets for the frequent storm event. Tank configuration and section are showing in drawing No. SGR-1 and DET-1.

4.2.4 Quantity Control (100-Year)

Drainage of the site under proposed conditions is as illustrated on the Post-Development Storm Drainage Plan as Figure 3 in Appendix A. Under the proposed conditions, the expected runoffs from the site have been calculated and are presented below.

- **Area U - Uncontrolled**

Runoffs in front of the building fronting Weston Road will drain uncontrolled into the existing Weston Road storm sewer system. This area is not feasible to capture the runoff due to the building geometry and that this area is anticipated to be future widening.

Based on the City criteria for the 100-year IDF curve, the uncontrolled runoff from area A.1 is calculated as follow:

Q=C I A/360 where $C = 0.73$
$I_{100\text{-yr}} = 250.32$ mm/hr (10 min time of concentration)
$A = 0.0186$ha

$\therefore$ $\mathbf{Q_{100}} = 0.73 \times 250.32 \times 0.0186 / 360 * 1000$
$= 9.44$ L/s

This 9.44 L/s of uncontrolled will be deducted from the total allowable site discharge into the municipal storm sewer systems.

- **Area C - Controlled**

The maximum allowable release rate from Area C to the existing municipal storm sewers is 10.1 L/s (19.54-9.44) as per the pre-development calculation. In order to meet this allowable discharge rate, a 75 mm diameter orifice control tube will be installed at the control storm maintenance hole. The maximum release rate from the orifice tube is 9.70 L/s (See Table C1 in Appendix C for orifice calculation).

Based on the above release rate, the required 100-year on-site storage is calculated to be approximately 41.1 m^3. Refer to the attached storage calculator sheet in Appendix C as Table C2 which uses the Mass Rational Method to calculate the 100-year storage requirements.

Total underground volume provided for the 100-year storm event is approximately **48.5m^3** (47.23m^3 in the Brentwood tanks and 1.27m^3 in the u/g MHs and sewers, see Table C3 in Appendix C for detail).

Total post-development discharge is controlled to pre-developments levels for all storms up to the 100-year events; therefore, the existing storm sewers can accommodate the site without any adverse effects on downstream systems.

4.2.5 Emergency/Major Overland Flow

The proposed grade within the site have been designed such that for storms greater than the 100-yr events or in the case of emergency overflow due to clogging in the storm system, safe overland flow route exists are established to convey flow away from the site and into the Municipal Streets with a maximum ponding of 0.10m.

5.0 GROUNDWATER CONSIDERATION

Based on the geotechnical investigation prepared by GeoPro Consulting, the subject site does not require any groundwater discharge as the proposed basement elevation and the anticipated excavation depth is much higher than the ground water table. Therefore, a hydrogeological report is <u>not required.</u>

A letter from GeoPro confirming the above is attached in Appendix D.

6.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control should be implemented for all construction activities within the subject site, and for each consecutive phase and stage of construction, including earthworks, servicing and building activities. The basic principles considered for minimizing erosion, sedimentation, and resultant negative environmental impacts include:

- Minimize local disturbance activities (e.g. grading);
- Expose the smallest possible land area to erosion for the shortest possible time;
- Implement erosion and sediment control measures before the outset of construction activities; and,
- Carry out regular inspections of erosion and sediment control measures and repair or maintain as necessary.
- Erection of silt fences around all site perimeters;
- Provide sediment traps (e.g. rock check dams, straw bales, scour basins) along interceptor swales at the site boundaries (most notably the southerly and easterly limits of the site);
- Inlet controls at catchbasins, comprising filter cloth overlain with rip-rap;
- Implement a weekly street sweeping and cleaning program for any mudtracking onto the adjacent municipal roadways;
- Provide gravel “mud mats” at construction vehicle access points to minimize off-site tracking of sediments; and,
- Confine refueling/servicing equipment to areas well away from inlets to the minor system or major system elements.
- All waste and unused building materials (including garbage, cleaning wastes, wastewater, toxic materials, or hazardous materials) shall be properly disposed of and not allowed to be mixed with and carried off by runoff from the site into a receiving watercourse or storm sewer.

Removal of the erosion and sediment controls should be done once construction is completed and sediment run-off from the construction activities has stabilized.
An Erosion and Sediment Plan (ESC) is attached in the Appendix Drawings.

7.0 CONCLUSIONS AND SUMMARY RECOMMENDATIONS

This functional servicing and stormwater management report demonstrates that the proposed development at 1234 Weston can be accommodated by the existing local infrastructure. Specifically:

- **Water Service** will be provided by the existing 150 mm diameter municipal watermain located on Glenvalley Drive. A 150 mm service line will be tapped off the main to provide fire service with a 100 mm domestic branch at the streetline. Based on the hydrant testing results and analysis, there is adequate supply and pressures to meet the critical high-demand flow for fire-fighting plus the maximum-day domestic consumption rate.
- **Sanitary Service** is provided by the existing 300 mm diameter municipal combined sanitary sewer located on Glenvalley Drive. A 250 mm service lateral is proposed, with maintenance holes at the property line and at the sewer connection point. Based on the City guideline, a downstream sanitary capacity analysis is <u>not required</u> as the site is not a rezoning and not a subdivision development.
- **Storm Drainage** will be collected on site and attenuated from the 100-year event down to the 2-year pre-development level. Volumetric storages will be achieved in the proposed underground stormwater tanks incorporated below the parking area.
- **Water Balance** will be achieved by utilizing portion of the underground storage volume for infiltration for the first 10mm rainfall event events.
- **TSS Removal** will be achieved by installing a Jellyfish Filter unit to provide a primary settling function in the treatment train, with the discharge further enhanced by a downstream infiltration tank.
- **Groundwater Discharge** is not required for the site as the proposed basement elevation and the anticipated excavation depth is much higher than the ground water table.
- **Erosion and Sediment Controls** will need to be implemented during development until the site has been stabilized with groundcover.

We trust you will find this submission is complete and in order. Should you have any questions or require additional information, please contact the undersigned.

Respectfully Submitted,

MASONGSONG ASSOCIATES ENGINEERING LIMITED

Professional Engineers Ontario
Limited Licensee
Name: K. K. LO
Number: 100209166
Category: CIVIL
Limitations:
This licence is subject to the limitations as detailed on the certificate.
Association of Professional Engineers of Ontario

LICENSED PROFESSIONAL ENGINEER
W. C. IP
PROVINCE OF ONTARIO

Ken Lo, LEL
Project Manager

Andrew Ip, P. Eng.
Principal

Appendix A

Figures

Ansel Cai

From: Ken Lo
Sent: Thursday, July 26, 2018 9:38 AM
To: Ansel Cai
Subject: FW: FW: City of Toronto Mount Dennis Childcare; 1234 Weston

Categories: Yellow category

Regards,

Ken Lo, LEL | Project Manager
(905) 944-0162 ext. 232

Masongsong Associates Engineering Limited
7800 Kennedy Road, Suite 201 . Markham, Ontario . L3R 2C7
T: (905) 944-0162 F:(905) 944-0165 www.maeng.ca

-----Original Message-----
From: Sharp@coolearth.ca <sharp@coolearth.ca>
Sent: January 30, 2018 10:43 AM
To: Ken Lo <KenL@maeng.ca>
Cc: Susan Lewin <slewin@csparch.com>
Subject: Fwd: FW: City of Toronto Mount Dennis Childcare; 1234 Weston

Hi Ken,

Just got this from the city.
It looks pretty clear to me.
Is it good?
If not, can you email Serge, copy to me and Susan?

Thanks.

s/

------- Forwarded message -------

From: "Serge Petit" <Serge.Petit@toronto.ca>
To: "'Sharp@coolearth.ca'" <Sharp@coolearth.ca>
Cc: "Ashraf Hanna" <Ashraf.Hanna@toronto.ca>, "Elisabeth Silva Stewart" <Elisabeth.SilvaStewart@toronto.ca>
Subject: FW: City of Toronto Mount Dennis Childcare; 1234 Weston
Date: Tue, 30 Jan 2018 10:10:45 -0500

Hi Sheena,

Good morning,

Please see below some comments in respect of your queries about Development Engineering requirements for the Mount Denis Childcare Site Plan Application.

(a) The Sanitary Study as per the attached guideline in your e-mail, is not required. (As you rightly mentioned, this is for rezoning applications).
(b) The flow monitoring is also not required.

For the Site Plan Control Application, Development Engineering would require the following:

- A Site Servicing report and a Stormwater Management report for the proposed development
- A Site Grading Plan for the Development Site and a Site Servicing Plan to service the development site; both plans to be prepared by a Professional Engineer
- A Geological Study, (hydrogeological review to be included), prepared by a Geotechnical Engineer or Geoscientist

The Site Servicing Report must determine the adequacy of the existing municipal infrastructure fronting or in close proximity of the proposed development site, to service the proposed development in terms of water, sanitary and storm sewer services. The design of the water, sanitary and storm services must be based on the City of Toronto "Design Criteria for Sewers and Watermains Manual".

The capacity of the receiving sanitary and storm sewers identified to service the development site must also be established by the Applicant's Engineer.

Design calculations are required to show that the water demand flow and pressure, (per hydrant test), is adequate to service the proposed development.

The Stormwater Management Report must determine suitable methods for management and attenuation of stormwater at the development site as per the requirements of the City's Wet weather Flow Management Guidelines (WWFMG).
Existing external drainage from adjacent properties that traverse the development site, and how such drainage will be accommodated, must be addressed.

The volume of groundwater, if any, to be discharged to the municipal sewers, must also be established; based on the hydrogeological report, and in consultation with Toronto Water (Environmental Monitoring & Protection).

If you have any questions or wish to discuss any of the above, please call.

Regards,

Serge

Serge Petit, P. Eng., PMP

Engineer
Development Engineering, Etobicoke York District Engineering Review Engineering & Construction Services City of Toronto 4th Floor, 2 Civic Centre Court Etobicoke - Toronto, Ontario M9C 5A3
P: 416.394.2519
E: spetit@toronto.ca

-----Original Message-----
From: Ashraf Hanna
Sent: January-29-18 2:12 PM
To: Serge Petit <Serge.Petit@toronto.ca>
Subject: FW: City of Toronto Mount Dennis Childcare; 1234 Weston

Hi Serge,

Per our conversation, please reply.

Thanks,
Ashraf

-----Original Message-----
From: Sharp@coolearth.ca [mailto:sharp@coolearth.ca]
Sent: January-26-18 5:21 PM
To: Ashraf Hanna <Ashraf.Hanna@toronto.ca>
Cc: Frank Molinari <Frank.Molinari@toronto.ca>; Susan Lewin <slewin@csparch.com>; Ken Lo <KenL@maeng.ca>; Elisabeth Silva Stewart <Elisabeth.SilvaStewart@toronto.ca>
Subject: City of Toronto Mount Dennis Childcare; 1234 Weston

Hi Ashraf,

We are working on a stand alone childcare for Toronto Children's Services. Our SPA checklist from our pre-application meeting is attached.

Elisabeth Silva Stewart, our coordinating planner, old us that you were either the person who could anser the question below, or you could tell us who to ask.

Could you confirm if a sanitary study is required? Based on the guideline (attached, second paragraph When to Apply), "The guideline is applicable to rezoning and subdivision applications. It does not apply to stand alone site plan applications."

If we are not rezoning and we are not a subdivision (non-residential), then are we exempt from the lengthy flow-monitoring studies?

thanks.

Sheena.

--
Sheena Sharp, Principal
Coolearth Architecture inc.
386 Pacific Ave.,
Toronto, ON M6P 2R1
@coolearth_arch

wk: 416-868-9774
cl: 416-575-5928

This email has been checked for viruses by AVG.
http://www.avg.com

--
Sheena Sharp, Principal
Coolearth Architecture inc.
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Toronto, ON M6P 2R1
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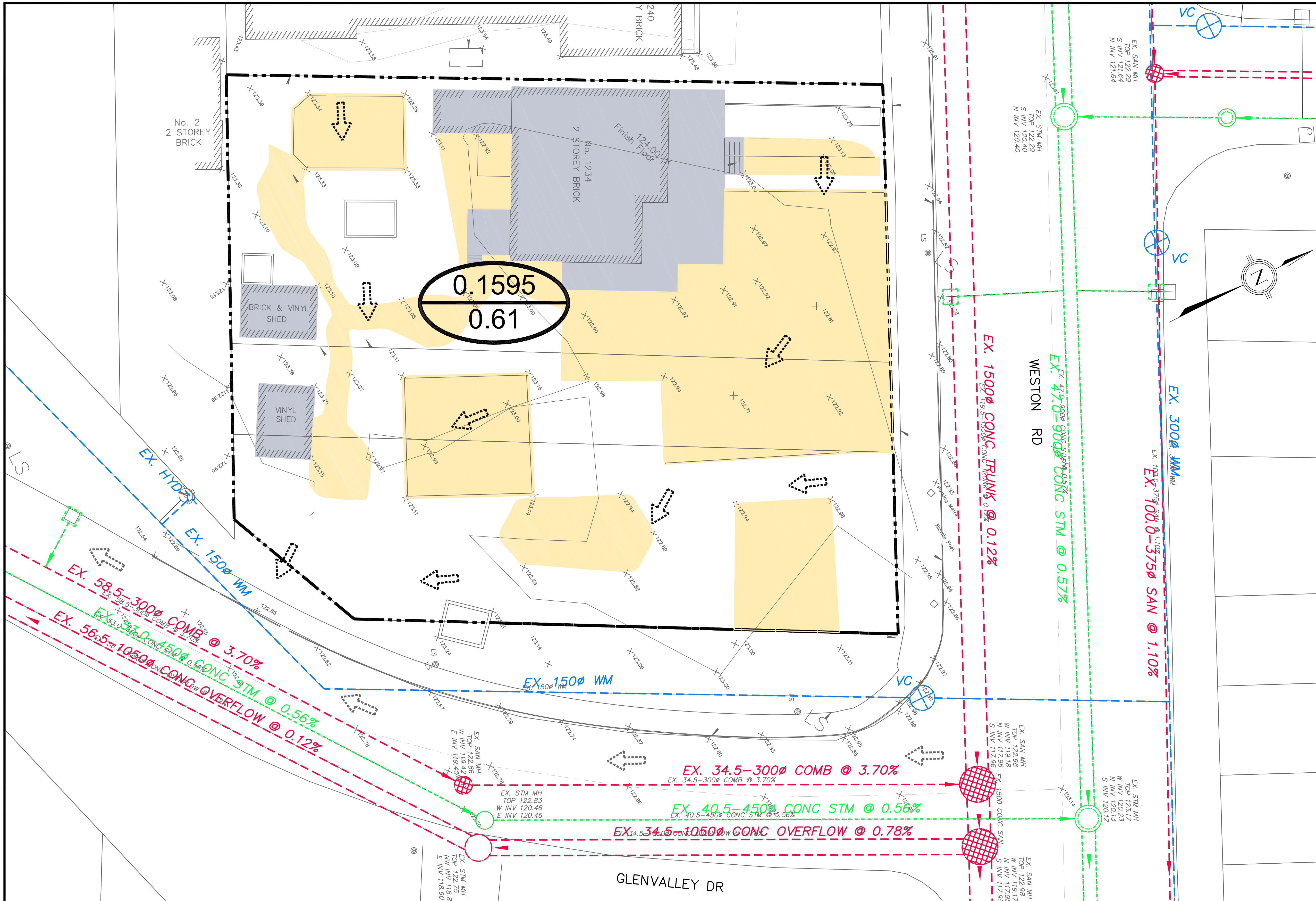
wk: 416-868-9774
cl: 416-575-5928

SITE STATISTICS

*FOR TGS STATS SEE "A0.20 - OBC MATRIX"

LOT AREA	1594 m²
GROSS FLOOR AREA	1841 m²
BUILDING AREA	731 m²
BASEMENT FLOOR AREA	650 m²
GROUND FLOOR AREA	666 m²
SECOND FLOOR AREA	525 m²
FLOOR SPACE INDEX (CURRENT)	1.155
ACCESSORY BUILDINGS	19.8 m²
SOFT LANDSCAPING	113 m²
SOFT LANDSCAPING - CITY PROPERTY	48 m²
NON-ROOF HARDSCAPING	795 m²
PARKING	168 m²
PARKING SPOTS	4 SPACES
PARKING SUPPLIED WITH EVSE	1 - PARKING SPOT #4
FRONT SETBACK	4.4 m
REAR SETBACK	16.3 m
WEST SETBACK (MIN.)	2.4 m
EAST SETBACK (MIN.)	0.1 m
BUILDING HEIGHT TO PARAPET	8.977 m
BUILDING HEIGHT TO TOP OF SOLAR PANELS	12.062 m
NUMBER OF BICYCLE PARKING SPACES	21 SHORT & 4 LONG TERM



LEGEND

DRAINAGE BOUNDARY

0.1595 TOTAL AREA (Ha.)

0.61 COMPOSITE RUNOFF COEFFICIENT

OVERLAND FLOW ROUTE

STORM SEWER

SAN/COMBINED SEWER

WATERMAIN

BUILDING AREA

IMPERVIOUS AREA

TOTAL SITE AREA (EXISTING)		
DESCRIPTION	AREA (Ha.)	RUNOFF COEFF.
BUILDING AREAS	0.0248	0.90
IMPERVIOUS AREAS	0.0640	0.90
PERVIOUS AREAS	0.0707	0.25
	0.1595	0.61

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PROJECT: PROPOSED BUILDING (1234 WESTON ROAD, CITY OF TORONTO)

DWG. TITLE: PRE - DEVELOPMENT PLAN (EXISTING CONDITIONS)

DWG. No:	DATE:	PROJECT No.	SCALE:
FIG. 2	JANUARY 2018	17-904	NTS

Appendix B

Water Analysis

Main Size	300 mm
Static Pressure (psi)	80
Elevation Difference (m)	0 m
Location	1234 Weston Rd
Municipality	Toronto
Operators	Bill
Tested By	M.Larocca
Date	25-Jun-18
Time	13:00
Remarks	

Flow Test Measurements

# of Ports	Nozzle Size (in)	Pressure Flow Gauge (psi)	Flow (U.S.G.P.M)	Flow (L/s)	Residual Pressure (psi)
1	2	5	348	22.0	51
2	2	2	221	13.9	43
	2	2	221	13.9	43
1	2	6	382	24.1	52

Test Results

Flow at 20 psi (140 kPa) **550** U.S.G.P.M

$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Qr = fire flow at residual pressure P (gpm, l/s)
Qt = hydrant discharge during test (gpm, l/s)
Ps = static pressure (psi, kPa)
Pr = desired residual pressure (psi, kPa)
Pt = residual pressure during test (psi, kPa)

Hydrant Classification as per NFPA 291	
Class	Colour
B	Orange

Hydrant Flow Curve

1234 Weston Rd, Toronto ON

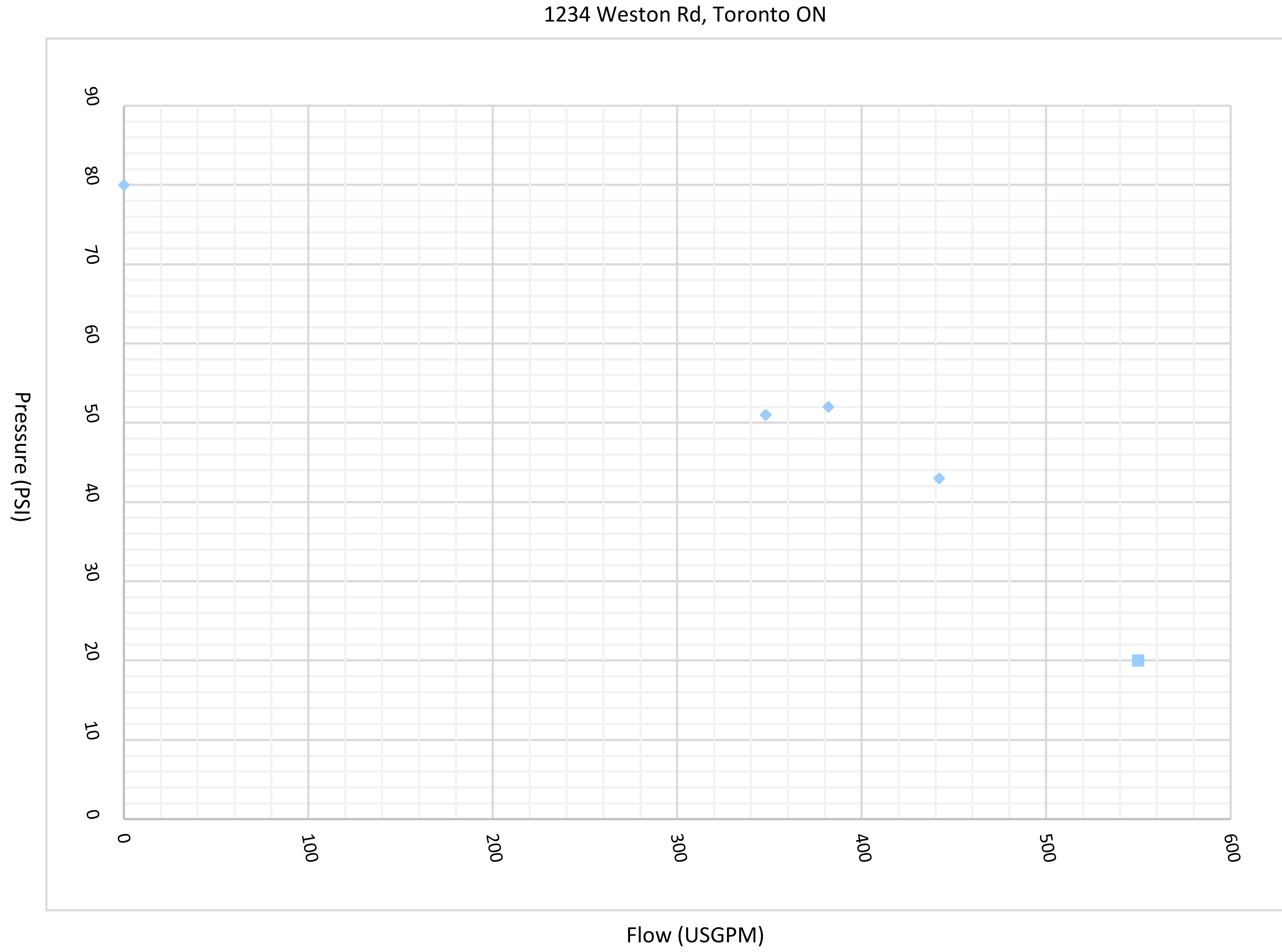

Table F1 Available Fire Flow Calculations

Project:	**1234 Weston Road**
Client:	**Coolearth Architecture**

Outlet diameter:	**2**	in, one port	Location:	**Glenvalley Drive**
Static pressure:	**80**	psi	Date of Test:	**25-Jun-18**
Resid. pressure:	**51**	psi, one port	Operator:	**GTA Waterworks**

• Observed Flow $Q_F = 29.83 \times C \times (d^2) \times (p^{0.5})$

where	C =	**0.90**	Coefficient
	d =	**2.00**	in, Outlet diameter
	p =	**52.00**	psi, Pitot Pressure
⇨	Q_F =	**761**	USGPM
		2,879	L/min

• Available Flow $Q_R = Q_F \times (h_R^{0.54}) / (h_F^{0.54})$

where	h_F =	29.00	psi, Pressure difference, static to measured residual
	h_R =	60.00	psi, Pressure difference, static to required residual
	Required =	**20.00**	psi
⇨	Q_F =	**1,126**	USGPM
		4,264	L/min

Table F2 Required Fire Flow Calculations

Project:	**1234 Weston Road**
Client:	**Coolearth Architecture**

• Base Flow $F_B = 220 \times C_C \times A^{0.5}$

where	$C_C =$	0.60		from Table F3
	$A =$	797.25	m^2	from Table F3
⇨	$F_B =$	3,727	L/min	
		4,000	L/min	rounded to nearest 1,000 L/min

• Occupancy Factor

$C_O =$	**-15%**		from Table F3
$F_O =$	$F_B + (F_B \times C_O)$		
=	3,400	L/min	

• Sprinkler Factor

$C_S =$	**-30%**		from Table F3
$f_S =$	$F_O \times C_S$		
=	-1,020	L/min	

• Exposure Factor

$C_E =$	**55%**		from Table F3
$f_E =$	$F_O \times C_E$		
=	1,870	L/min	

• Total Required Flow

$F =$	$F_O + f_S + f_E$		
=	4,250	L/min	
=	**4,000**	L/min	rounded to nearest 1,000 L/min

Table F3 Building Area and Coefficients

Project:	**1234 Weston Road**
Client:	**Coolearth Architecture**

• **Area of Building** — **797** m^2

The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected.

✓ ***If the vertical openings and exterior vertical communications are property protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.***

• **Construction Coefficient** — floors. **0.60** ⇔

1.50	Wood Frame
1.00	Ordinary Construction
0.80	Non-Combustible
0.70	Fire Resistive (<2 hrs)
0.60	**Fire Resistive (>2 hrs)**

• **Occupancy Coefficient** — C_O = **-15%** ⇔

-25%	Non-Combustible
-15%	**Limited Combustible**
0%	Combustible
15%	Free Burning
25%	Rapid Burning

• **Sprinkler Coefficient** — C_S = **-30%** ⇔

-30%	**NFPA 13 standard**
-40%	+ fully supervised
-50%	+ std water supply

• **Exposure Coefficient** — C_E = **55%** ⇔

N	26.3m	10%
S	20.0m	15%
E	22.2m	10%
W	4.7m	20%

25%	0 - 3m separation
20%	3.1- 10m separation
15%	10.1- 20m separation
10%	20.1- 30m separation
5%	> 30m separation
	percentages counted per side, max 75%

Appendix C

Stormwater Management Calculations

LEGEND

DRAINAGE BOUNDARY

AREA ID

C | 0.77 — COMPOSITE RUNOFF COEFFICIENT

0.1595 — TOTAL AREA (Ha.)

ROOFTOP AREA R=0.90

IMPERVIOUS AREA R=0.90

PERVIOUS AREAS R=0.50

UNCONTROLLED AREA

OVERLAND FLOW ROUTE

TOTAL SITE AREA (PROPOSED)		
DESCRIPTION	AREA (Ha.)	RUNOFF COEFF.
BUILDING AREA	0.0746	0.90
IMPERVIOUS AREA	0.0311	0.90
PERVIOUS AREA	0.0391	0.50
UNCONTROLLED AREA	0.0186	0.73
	0.1595	0.78

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T: (905) 944-0162
www.maeng.ca

PROJECT:
MOUNT DENNIS CHILDCARE CENTER
(1234 WESTON ROAD, CITY OF TORONTO)

DWG. TITLE:
POST - DEVELOPMENT PLAN
(PROPOSED CONDITIONS)

DWG. No: **FIG. 3**

DATE: **MARCH 2018**

PROJECT No. **17-904**

SCALE: **NTS**

Orifice Flow Calculations

$$Q = CA(2 \times g \times h)^{0.5}$$

d=	0.075	m	Restrictor Diameter
h=	0.3625	m	Water Surface Height
a=	0.0044	m2	Pipe Cross-section Area
q=	0.0097	9.66	Total Flow
	m3/s	L/S	
Invert Elev	121.25	m	Pipe Outlet - Control
HWL Eleva	121.65	m	

where C = 0.82
A = π d2 /4
g = 9.81 m/s2

and h = Ponding Elevation-(invert elevation orifice+d/2)

Centre of orifice = d/2

Table C2

On-Site Storage Calculator

Toronto 100-Year

Project: 1234 Weston Rd
Project No.: 17-904
By: A.S.C
Date: 05-Apr-16

Location: 1234 Weston Rd

$$i_{100} = 59.7 \times T^{(-0.80)}$$

A =	0.1409	ha
Composite C =	0.78	
i-2y *(Allowable)* =	88.19	mm/hr
$Q_{Allowable}$ =	0.0097	m^3/s
Q_{Actual} =	0.0097	m^3/s

t_c (min)	i_{100} (mm/hr)	Q_{100} (m^3/s)	Q_{stored} (m^3/s)	Peak Volume (m^3)	
5	435.832	0.1331	0.123	37.018	
6	376.682	0.1150	0.105	37.920	
7	332.979	0.1017	0.092	38.637	
8	299.243	0.0914	0.082	39.213	
9	272.334	0.0831	0.073	39.679	
10	250.320	0.0764	0.067	40.055	
11	231.943	0.0708	0.061	40.358	
12	216.347	0.0660	0.056	40.599	
13	202.927	0.0620	0.052	40.786	
14	191.246	0.0584	0.049	40.928	
15	180.977	0.0552	0.046	41.030	
16	171.870	0.0525	0.043	41.097	
17	163.733	0.0500	0.040	41.131	
18	156.415	0.0478	0.038	41.138	***
19	149.793	0.0457	0.036	41.119	

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Monday, July 09, 2018
Project Name	1234 Weston Rd.
Project Number	
Location	Toronto

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.

Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF4-1-1 is recommended to meet the water quality objective by treating a flow of 7.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 85 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	7.6	85

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Jellyfish® Filter

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

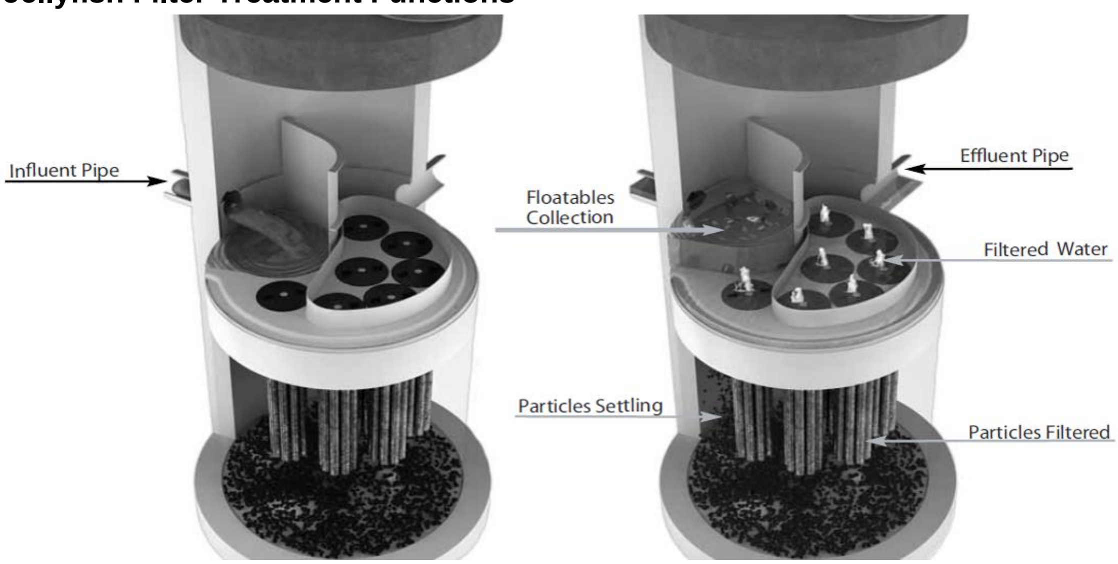
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 59% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TARP qualifying rain events and field monitored according to the TARP field test protocol, demonstrating:

- A median TSS removal efficiency of 89%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 59%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Monday, July 09, 2018
Project Name:	1234 Weston Rd.
Project Number:	
Location:	Toronto

Designer Information

Company:	Masongsong Associates Engineering Ltd.
Contact:	Ken Lo
Phone #:	

Notes

Rainfall

Name:	TORONTO CENTRAL
State:	ON
ID:	100
Record:	1982 to 1999
Co-ords:	45°30'N, 90°30'W

Drainage Area

Total Area:	0.1595 ha
Imperviousness:	78%

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 18 years of TORONTO CENTRAL rainfall data:	**3.9 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 753 m³, with a suspended sediment concentration of 60 mg/L.	**45 kg**

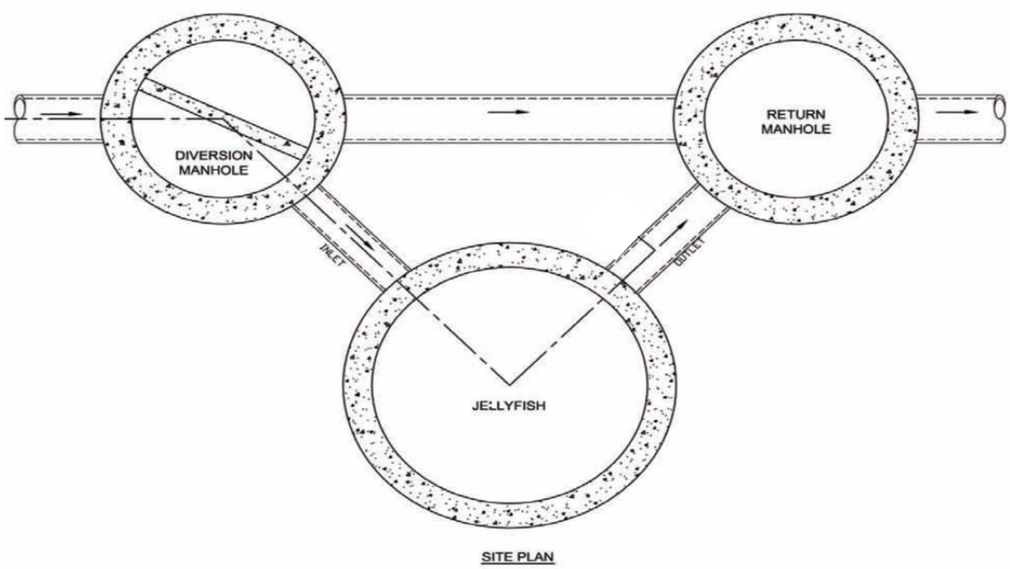
Recommendation

The Jellyfish Filter model JF4-1-1 is recommended to meet the water quality objective by treating a flow of 7.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 85 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	**1**	**1**	**1.2**	**2313**	**0.34**	**379**	**7.6**	**85**
JF4-2-1	2	1	1.2	2313	0.34	379	12.6	142
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	5	1	1.8	5205	0.79	848	27.8	313
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	12	3	3.0	14456	2.21	2302	68.2	768
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	**62º**	**150**	**200**
1.8	59º	200	250
2.4	52º	250	300
3.0	48º	300	450
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft^2 (0.142 lps/m^2).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL

In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

DESIGN GUIDE

STORMTANK® Module

BRENTWOOD®

Contents

1.0 Introduction
2.0 Product Information
3.0 Manufacturing Standards
4.0 Structural Response
5.0 Foundation
6.0 System Materials
7.0 Connections
8.0 Pretreatment
9.0 Additional Considerations
10.0 Inspection & Maintenance
11.0 System Sizing
12.0 Detail Drawings
13.0 Specifications
14.0 Appendix – Bearing Capacity Tables

General Notes

1. Brentwood recommends that the installing contractor contact either Brentwood or the local distributor prior to installation of the system to schedule a pre-construction meeting. This meeting will ensure that the installing contractor has a firm understanding of the installation instructions.
2. All systems must be designed and installed to meet or exceed Brentwood's minimum requirements. Although Brentwood offers support during the design, review, and construction phases of the Module system, it is the ultimate responsibility of the Engineer of Record to design the system in full compliance with all applicable engineering practices, laws, and regulations.
3. Brentwood requires a minimum cover of 24" (610 mm) and/or a maximum Module invert of 11' (3.35 m). Additionally, a minimum 6" (152 mm) leveling bed, 12" (305 mm) side backfill, and 12" (305 mm) top backfill are required on every system.
4. Brentwood recommends a minimum bearing capacity and subgrade compaction for all installations. If site conditions are found not to meet any design requirements during installation, the Engineer of Record must be contacted immediately.
5. All installations require a minimum two layers of geotextile fabric. One layer is to be installed around the Modules, and another layer is to be installed between the stone/soil interfaces.
6. Stone backfilling is to follow all requirements of the most current installation instructions.
7. The installing contractor must apply all protective measures to prevent sediment from entering the system during and after installation per local, state, and federal regulations.
8. The StormTank® Module carries a Limited Warranty, which can be accessed at www.brentwoodindustries.com.

1.0 Introduction

About Brentwood

Brentwood is a global manufacturer of custom and proprietary products and systems for the construction, consumer, medical, power, transportation, and water industries. A focus on plastics innovation, coupled with diverse production capabilities and engineering expertise, has allowed Brentwood to build a strong reputation for thermoplastic molding and solutions development.

Brentwood's product and service offerings continue to grow with an ever-increasing manufacturing presence. By emphasizing customer service and working closely with clients throughout the design, engineering, and manufacturing phases of each project, Brentwood develops forward-thinking strategies to create targeted, tailored solutions.

StormTank® Module

The StormTank Module is a strong, yet lightweight, alternative to other subsurface systems and offers the largest void space (up to 97%) of any subsurface stormwater storage unit on the market. The Modules are simple to assemble on site, limiting shipping costs, installation time, and labor. Their structural PVC columns pressure fit into the polypropylene top/bottom platens, with side panels inserted around the perimeter of the system. This open design and lack of internal walls make the Module system easy to clean compared to other subsurface box structures. When properly designed, applied, installed, and maintained, the Module system has been engineered to achieve a 50-year lifespan.

Technical Support

Brentwood's knowledgeable distributor network and in-house associates emphasize customer service and support by parterning with customers to extend the process beyond physical material supply. These trained specialists are available to assist in the review of proposed systems, conversions of alternatively designed systems, or to resolve any potential concerns before, during, and after the design process. To provide the best assistance, it is recommended that associates be provided with a site plan and cross-sections that include grading, drainage structures, dimensions, etc.

2.0 Product Information

Applications

The Module system can be utilized for detention, infiltration, capture and reuse, and specialty applications across a wide range of industries, including the commercial, residential, and recreational segments. The product's modular design allows the system to be configured in almost any shape (even around utilities) and to be located under almost any pervious or impervious surface.

Module Selection

Brentwood manufactures the Module in five different heights (Table 1) that can be stacked uniformly up to two Modules high. This allows for numerous height configurations up to 6' (1.83 m) tall. The Modules can be buried up to a maximum invert of 11' (3.35 m) and require a minimum cover of 24" (610 mm) for load rating. When selecting the proper Module, it is important to consider the minimum required cover, any groundwater or limiting zone restrictions, footprint requirements, and all local, state, and federal regulations.

Table 1: Nominal StormTank® Module Specificiations

	ST-18	ST-24	ST-30	ST-33	ST-36
Height	18" (457 mm)	24" (610 mm)	30" (762 mm)	33" (838 mm)	36" (914 mm)
Void Space	95.5%	96.0%	96.5%	96.9%	97.0%
Module Storage Capacity	6.54 ft^3 (0.18 m^3)	8.64 ft^3 (0.24 m^3)	10.86 ft^3 (0.31 m^3)	11.99 ft^3 (0.34 m^3)	13.10 ft^3 (0.37 m^3)
Min. Installed Capacity*	9.15 ft^3 (0.26 m^3)	11.34 ft^3 (0.32 m^3)	13.56 ft^3 (0.38 m^3)	14.69 ft^3 (0.42 m^3)	15.80 ft^3 (0.45 m^3)
Weight	22.70 lbs (10.30 kg)	26.30 lbs (11.93 kg)	29.50 lbs (13.38 kg)	31.3 lbs (14.20 kg)	33.10 lbs (15.01 kg)

Min. Installed Capacity includes the leveling bed, Module, and top backfill storage capacity for one Module. Stone storage capacity is based on 40% void space.* ***Side backfill storage is not included.*

3.0 Manufacturing Standards

Brentwood selects material based on long-term performance needs. To ensure long-term performance and limit component deflection over time (creep), Brentwood selected polyvinyl chloride (PVC) for the Module's structural columns and a virgin polypropylene (PP) blend for the top/bottom and side panels. PVC provides the largest creep resistance of commonly available plastics, and therefore, provides the best performance under loading conditions. Materials like polyethylene (HDPE) and recycled PP have lower creep resistance and are not recommended for load-bearing products and applications.

Materials:

Brentwood's proprietary PVC and PP copolymer resins have been chosen specifically for utilization in the StormTank® Module. The PVC is blended in house by experts and is a 100% blend of post-manuacturing/pre-consumer recycled material. Both materials exhibit structural resilience and naturally resist the chemicals typically found in stormwater runoff.

Methods:

Injection Molding

The Module's top/bottom platens and side panels are injection molded, using proprietary molds and materials. This allows Brentwood to manufacture a product that meets structural requirements while maintaining dimensional control, molded-in traceability, and quality control.

Extrusion

Brentwood's expertise in PVC extrusion allows the structural columns to be manufactured in house. The column extrusion includes the internal structural ribs required for lateral support.

Quality Control

Brentwood maintains strict quality control in order to ensure that materials and the final product meet design requirments. This quality assurance program includes full material property testing in accordance with American Society for Testing and Materials (ASTM) standards, full-part testing, and process testing in order to quantify product performance during manufacturing. Additionally, Brentwood conducts secondary finshed-part testing to verify that design requirements continue to be met post-manufacturing.

All Module parts are marked with traceability information that allows for tracking of manufacturing. Brentwood maintains equipment at all manufacturing locations, as well as at its corporate testing lab, to ensure all materials and products meet all requirements.

4.0 Structural Response

Structural Design

The Module has been designed to resist loads calculated in accordance with the American Association of State Highway and Transportation Official's (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design manual. This fully factored load includes a multiple presence factor, dynamic load allowance, and live load factor to account for real-world situations. This loading was considered when Brentwood developed both the product and installation requirements. The developed minimum cover ensures the system maintains an adequate resistance factor for the design truck (HS-20) and HS-25 loads.

Full-Scale Product Testing

Engineers at Brentwood's in-house testing facility have completed full-scale vertical and lateral tests on the Module to evaluate product response. To date, Brentwood continues in-house testing in order to evaluate long-term creep effects.

Fully Installed System Testing

Brentwood's dedication to providing a premier product extends to fully installed testing. Through a partnership with Queen's University's GeoEngineering Centre in Kingston, Ontario, Brentwood has conducted full-scale installation tests of single- and double-stacked Module systems to analyze short- and long-term performance. Testing includes short-term ultimate limit state testing under fully factored AASHTO loads and minimum installation cover, lateral load testing, long-term performance and lifecycle testing utilizing time-temperature superposition, and load resistance development. Side backfill material tests were also performed to compare the usage of sand, compacted stone, and uncompacted stone.

5.0 Foundation

The foundation (subgrade) of the subsurface storage structure may be the most important part of the Module system installation as this is the location where the system applies the load generated at the surface. If the subgrade lacks adequate support or encounters potential settlement, the entire system could be adversely affected. Therefore, when implementing an underground storage solution, it is imperative that a geotechnical investigation be performed to ensure a strong foundation.

Considerations & Requirements:

Bearing Capacity

The bearing capacity is the ability of the soil to resist settlement. In other words, it is the amount of weight the soil can support. This is important versus the native condition because the system is replacing earth, and even though the system weighs less than the earth, the additional load displacement of the earth is not offset by the difference in weight.

Using the Loading and Resistance Factor Design (LRFD) calculation for bearing capacity, Brentwood has developed a conservative minimum bearing capacity table (see Appendix). The Engineer of Record shall reference this table to assess actual cover versus the soil bearing required for each unit system.

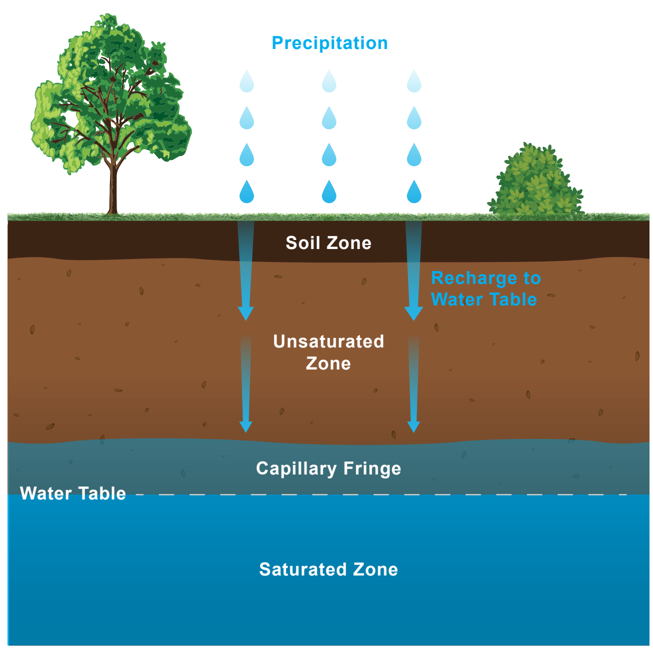
Soil Profile

Limiting Zones

Limiting zones are conditions in the underlying soils that can affect the maximum available depth for installation and can reduce the strength and stability of the underlying subgrade. The three main forms of limiting zones are water tables, bedrock, and karst topography. It is recommended that a system be offset a minimum of 12" (305 mm) from any limiting zones.

Compaction

Soil compaction occurs as the soil particles are pressed together and pore space is eliminated. By compacting the soils to 95% (as recommended by Brentwood), the subgrade strength will increase, in turn limiting both the potential for the soil to move once installed and for differential settlement to occur throughout the system. If designing the specific compaction requirement, settlement should be limited to less than 1" (25 mm) through the entire subgrade and should not exceed a 1/2" (13 mm) of differential settlement between any two adjacent units within the system over time.



Water Table Zones

Mitigation

If a minimum subgrade bearing capacity cannot be achieved because of weak soil, a suitable design will need to be completed by a Geotechnical Engineer. This design may include the over-excavation of the subgrade and an engineered fill or slurry being placed. Additional material such as geogrid or other products may also be required. Please contact a Geotechnical Engineer prior to selecting products or designing the subgrade.

6.0 System Materials

Geotextile Fabric

The 6-ounce geotextile fabric is recommended to be installed between the soil and stone interfaces around the Modules to prevent soil migration.

Leveling Bed

The leveling bed is constructed of 6”-thick (152 mm) angular stone (Table 2). The bed has not been designed as a structural element but is utilized to provide a level surface for the installation of the system and provide an even distribution of load to the subgrade.

Stone Backfill

The stone backfill is designed to limit the strain on the product through displacement of load and ensure the product’s longevity. Therefore, a minimum of 12”-wide (305 mm) angular stone must be placed around all sides of the system. In addition, a minimum layer of 12” (305 mm) angular stone is required on top of the system. All material is to be placed evenly in 12” (305 mm) lifts around and on top of the system and aligned with a vibratory plate compactor.

Table 2: Approved Backfill Material

Material Location	Description	AASHTO M43 Designation	ASTM D2321 Class	Compaction/Density
Finished Surface	Topsoil, hardscape, stone, concrete, or asphalt per Engineer of Record	N/A	N/A	Prepare per engineered plans
Suitable Compactable Fill	Well-graded granular soil/aggregate, typically road base or earthen fill (maximum 4" particle size)	56, 57, 6, 67, 68	I & II III (Earth Only)	Place in maximum 12" lifts to a minimum 90% standard proctor density
Top Backfill	Crushed angular stone placed between Modules and road base or earthen fill	56, 57, 6, 67, 68	I & II	Plate vibrate to provide evenly distributed layers
Side Backfill	Crushed angular stone placed between earthen wall and Modules	56, 57, 6, 67, 68	I & II	Place and plate vibrate in uniform 12" lifts around the system
Leveling Bed	Crushed angular stone placed to provide level surface for installation of Modules	56, 57, 6, 67, 68	I & II	Plate vibrate to achieve level surface

Impermeable Liner

In designs that prevent runoff from infiltrating into the surrounding soil (detention or reuse applications) or groundwater from entering the system, an impermeable liner is required. When incorporating a liner as part of the system, Brentwood recommends using a manufactured product such as a PVC liner. This can be installed around the Modules themselves or installed around the excavation (to gain the benefit of the void space in the stone) and should include an underdrain system to ensure the basin fully drains. This liner is installed with a layer of geotextile fabric on both sides to prevent puncture, in accordance with manufacturer recommendations.

7.0 Connections

Stormwater runoff must be able to move readily in and out of the StormTank® Module system. Brentwood has developed numerous means of connecting to the system, including inlet/outlet ports and direct abutment to a catch basin or endwall. All methods of connection should be evaluated as each one may offer a different solution. Brentwood has developed drawings to assist with specific installation methods, and these are available at www.brentwoodindustries.com.

Inlet/Outlet and Pipe Connections

To facilitate easy connection to the system, Brentwood manufactures two inlet/outlet ports. They are 12" (305 mm) and 14" (356 mm), respectfully, and utilize a flexible coupling connection to the adjoining pipe.

Another common installation method is to directly connect the pipe to the system. In order to do this, an opening is cut into the side panels, the pipe is inserted, and then the system is wrapped in geotextile fabric. When utilizing this connection method, the pipe must be located a minimum of 3" (76 mm) from the bottom of the system. This provides adequate clearance for the bottom platen and the required strength in the remaining side panel. To maintain the required clearances or reduce pipe size, it may be necessary to connect utilizing a manifold system.

Direct Abutment

The system can also be connected by directly abutting Modules to a concrete catch basin or endwall. This allows for a seamless connection of structures in close proximity to the system and eliminates the need for numerous pipe connections. When directly abutting one of these structures, remove any side panels that fully abut the structure, and make sure it is flush with the system to prevent material migration into the structure.

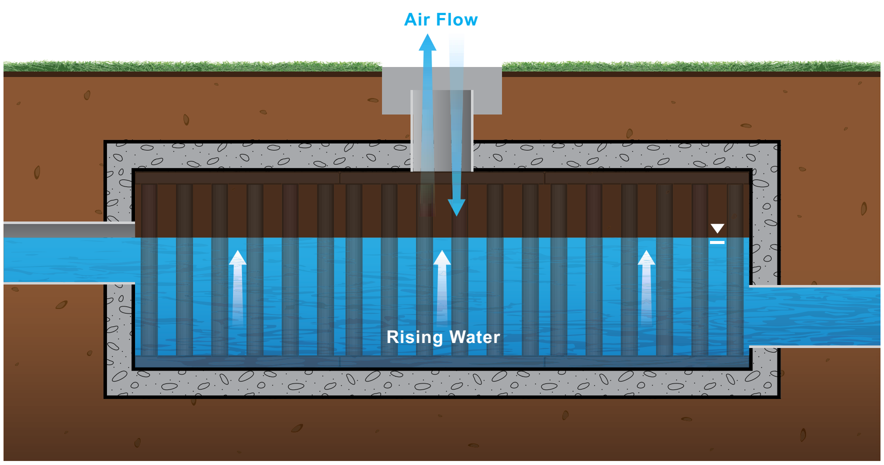
Underdrain

Underdrains are typically utilized in detention applications to ensure the system fully drains since infiltration is limited or prohibited. The incorporation of an underdrain in a detention application will require an impermeable liner between the stone-soil interface.

Cleanout Ports

Brentwood understands the necessity to inspect and clean a subsurface system and has designed the Module without any walls to allow full access. Brentwood offers three different cleanout/observation ports for utilization with the system. The ports are made from PVC, provide an easy means of connection, and are available in 6" (152 mm), 8" (203 mm) and 10" (254 mm) diameters. The 10" (254 mm) port is sized to allow access to the system by a vacuum truck suction hose for easy debris removal.

It is recommended that ports be located a maximum of 30' (9.14 m) on center to provide adequate access, ensure proper airflow, and allow the system to completely fill.



Ventilation and Air Flow

8.0 Pretreatment

Removing pollutants from stormwater runoff is an important component of any stormwater management plan. Pretreatment works to prevent water quality deterioration and also plays an integral part in allowing the system to maintain performance over time and increase longevity. Treatment products vary in complexity, design, and effectiveness, and therefore, should be selected based on specific project requirements.

Typical Stormwater System

Catch Basin → **Inlet Piping** → **Pretreatment** → **Storage Basin** → **Outlet Structure**

Pretreatment: STORMTANK® *Shield*

Storage Basin: STORMTANK® *Module*, STORMTANK® *Pack*

StormTank® Shield

Brentwood's StormTank Shield provides a low-cost solution for stormwater pretreatment. Designed to improve sumped inlet treatment, the Shield reduces pollutant discharge through gross sediment removal and oil/water separation. For more information, please visit www.brentwoodindustries.com.

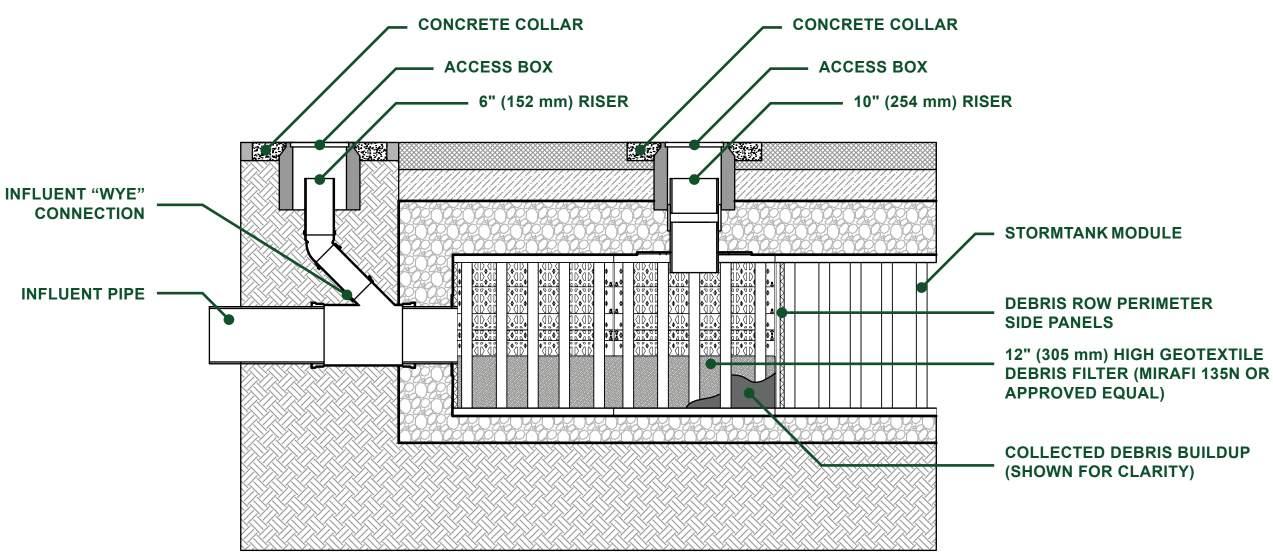
Debris Row (Easy Cleanout)

An essential step of designing, installing, and maintaining a subsurface system is preventing debris from entering the storage. This can be done by incorporating debris rows (or bays) at the inlets of the system to prevent debris from entering the rest of the system.

The debris row is built into the system utilizing side panels with a 12" (305 mm) segment of geotextile fabric. This allows for the full basin capacity to be utilized while storing any debris in an easy-to-remove location. To calculate the number of side panels required to prevent backing up, the opening area of the side panels on the area above the geotextile fabric has been calculated and compared to the inflow pipe diameter.

Debris row cleanout is made easy by including 10" (254 mm) suction ports, based on the length of the row, and a 6" (152 mm) saddle connection to the inflow pipe. If the system is directly abutting a catch basin, the saddle connection is not required, and the flush hose can be inserted through the catch basin. Debris is then flushed from the inlet toward the suction ports and removed.

Brentwood has developed drawings and specifications that are available at www.brentwoodindustries.com to illustrate the debris row configuration and layouts.



Debris Row Section Detail

Appendix D

Excerpts from Geotechnical Report

GeoPro Project 17-2118G July 24, 2018

Masongsong Associates Engineering Limited

Attention: Mr. Ansel Sheng Cai E-mail: AnselC@maeng.ca

RE: Explanation on the Absence of the Hydrogeological Report
For the Proposed Mount Dennis Childcare Centre
1234 Weston Road, Toronto, Ontario

GeoPro Consulting Limited ("GeoPro") was retained by Coolearth Architecture Inc. (the "Client") to conduct a geotechnical investigation for the proposed Mount Dennis Childcare Centre at 1234 Weston Road, in the City of Toronto (the "City"), Ontario (the "Site").

It is understood that the proposed building will consist of a two-storey building with one level basement.

During the geotechnical investigation, a total of two (2) boreholes (BH1 and BH2) were drilled to the depths ranging from 6.1 m below the existing ground surface ("mBGS") to 6.7 mBGS, and installation of one (1) monitoring well in the advanced borehole BH1.

Based on the results of the geotechnical investigation, the slag and existing fill materials are unsuitable to support the proposed structure. The proposed building may be founded on conventional shallow spread and/or continuous strip footings bearing in the native, undisturbed competent sand below the fills, which is approximately 4.0 m below the ground surface ("mBGS").

Based on the groundwater monitoring, the groundwater level was dry at the bottom of monitoring well BH1.

Considering that the groundwater level is anticipated to be below the anticipated excavation depth, no groundwater control would be anticipated for the anticipated excavation depth for the proposed development. Therefore, no Hydrogeological report would consider to be necessary for the proposed development.

We trust that the above information meets the requirements at this moment. Should you need any clarifications, please feel free to contact our office.

Sincerely,

GeoPro Consulting Limited

Geotechnical - Hydrogeology - Environmental - Materials Testing – Inspection

Kaiying Qiu, B.Sc, M.Sc.

Assistant Project Manager

LICENSED PROFESSIONAL ENGINEER
D. B. LIU
100107874
PROVINCE OF ONTARIO

David B. Liu, P.Eng., Principal

Appendix Drawings

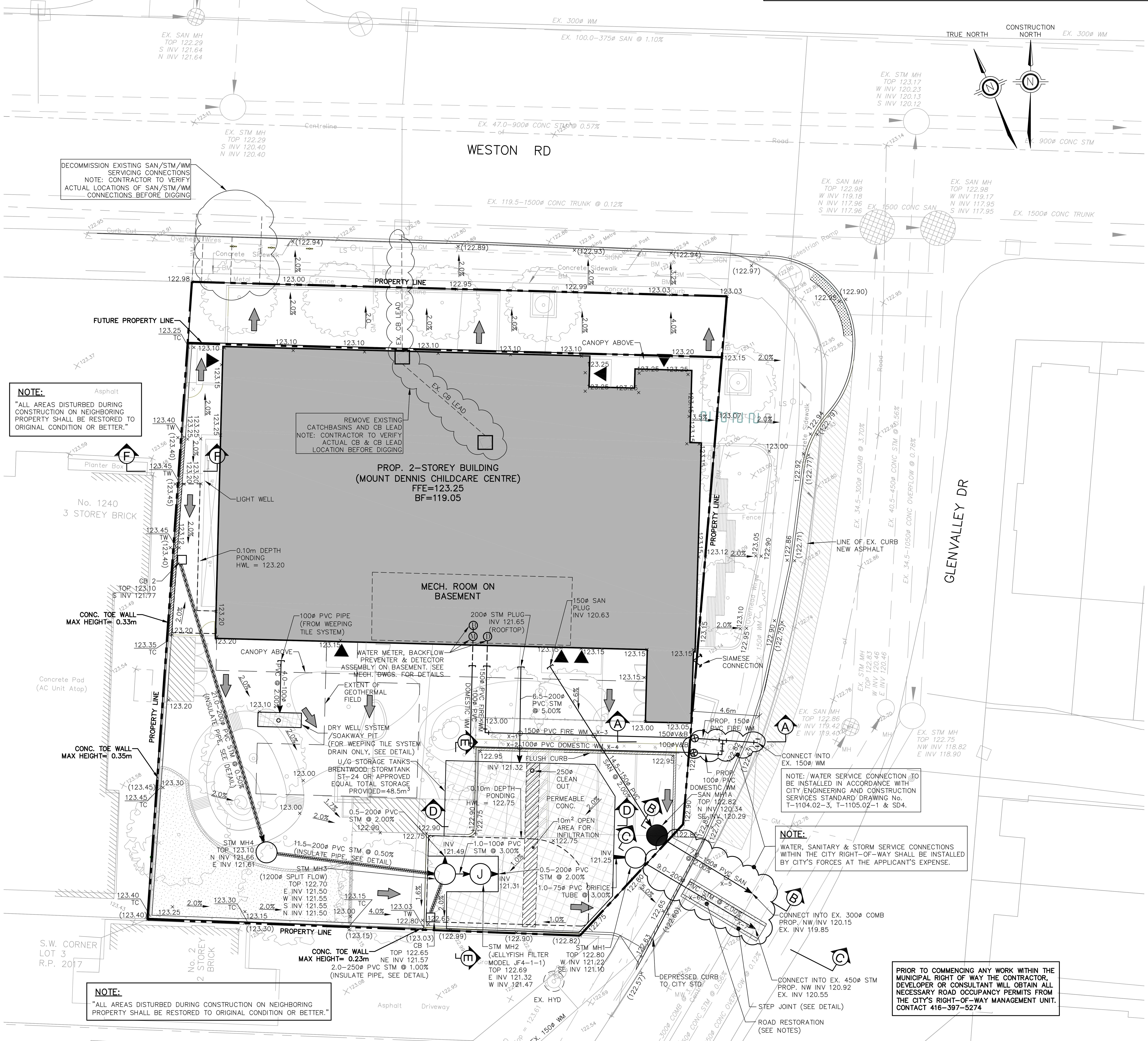
Site Servicing and Grading Plan
Detailed Plan

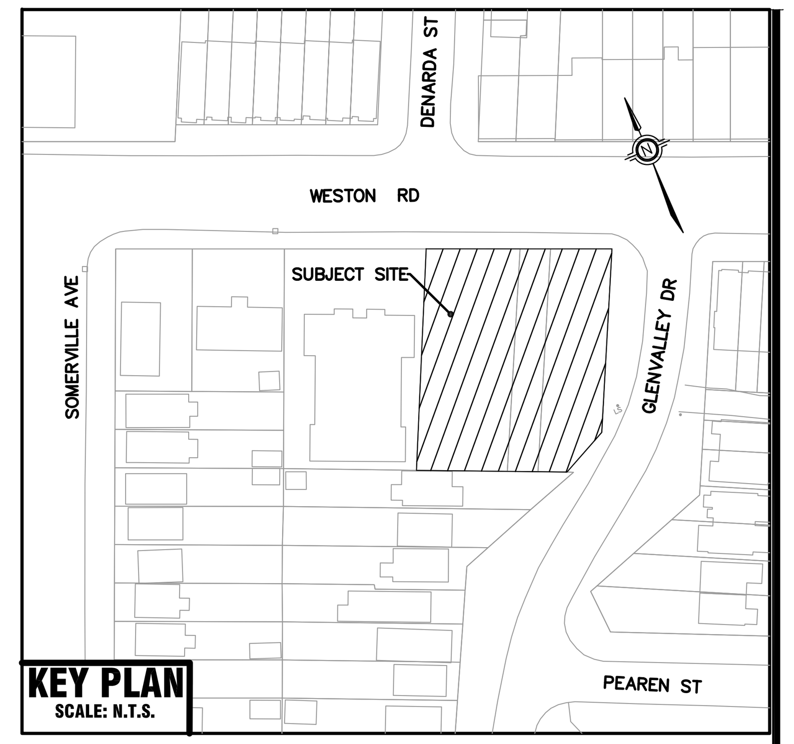
NOTES:

BUILDING PERMIT ISSUANCE SHALL BE SUBJECT TO THE BUILDING PERMIT DRAWINGS NOT BEING IN CONTRAVENTION WITH THESE APPROVED PLANS AND DRAWINGS INCLUDING, BUT NOT LIMITED TO, THE EXTERIOR DESIGN OF THE BUILDING AND EXTERIOR BUILDING MATERIALS.

NOTES:

- IT IS THE RESPONSIBILITY OF THE APPLICANT TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER – ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF GROUNDWATER INTO THE MUNICIPAL SEWER SYSTEMS AND WATERCOURSES;
- THE APPLICANT IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING THE NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT & CLIMATE CHANGE WITH REGARD TO ANY PROPOSED DEWATERING;
- PRIOR TO COMMENCING ANY WORK WITHIN THE RIGHT OF WAY, THE CONTRACTOR, DEVELOPER, OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT OF WAY MANAGEMENT UNIT;
- STAFF HAVE REVIEWED THIS APPLICATION ON THE UNDERSTANDING THAT IT WILL COMPRISE A SINGLE PARCEL OF LAND, UNDER ONE OWNER, UPON COMPLETION. IF ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, SUBMITS AN APPLICATION FOR SEVERANCE, PART – LOT CONTROL, SUBDIVISION, CONDOMINIUM APPROVAL OR ANY OTHER FORM OF LAND DIVISION FOR THIS DEVELOPMENT NOT IN ACCORDANCE WITH THIS ASSUMPTION, DIFFERENT SERVICING CONNECTIONS, INCLUDING ALL ASSOCIATED STORMWATER MANAGEMENT FACILITIES AND ANY NECESSARY REVISED PLANS AND STUDIES, MAY BE REQUIRED BY THE CITY AT THE SOLE COST TO THAT APPLICANT;
- REFER TO THE ACCEPTED ENGINEERING DRAWINGS FOR THIS SUBJECT SITE, PREPARED BY MASONGSONG ASSOCIATES ENGINEERING LTD. FOR ALL SITE SERVICING AND ABOVE GROUND CONNECTIONS INFORMATION.





LEGEND:

	LIMIT OF REDEVELOPMENT
132.60	EXISTING ELEVATION
132.60	PROPOSED ELEVATION
(132.60)	EXISTING ELEVATION TO REMAIN
132.60 TW	PROPOSED TOP OF WALL ELEVATION
	PROPOSED SANITARY MANHOLE
	PROPOSED STORM MANHOLE
	PROPOSED CATCHBASIN
	DRAINAGE FLOW
	OVERLAND FLOW DIRECTION
M	WATER METER LOCATION
	PROPOSED WATER VALVE AND BOX
	EXISTING CATCHBASIN
	EXISTING SANITARY MANHOLE
	EXISTING STORM MANHOLE
	EXISTING HYDRANT
	EXISTING VALVE & CHAMBER

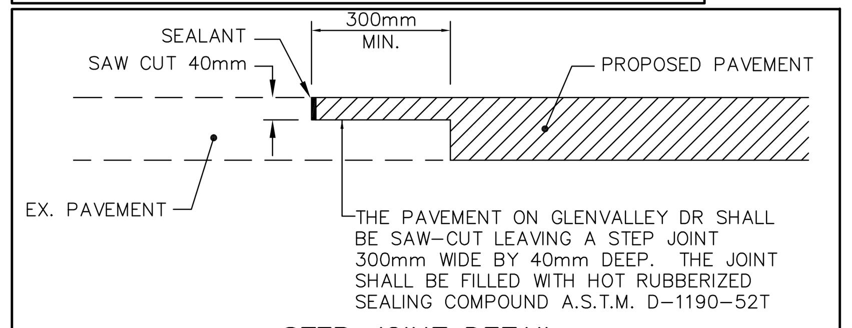
SERVICING CROSSING CHART

X-1	STM INV. WM OBV.	= 121.26 = 120.76	0.50
X-2	STM INV. WM OBV.	= 121.25 = 120.75	0.50
X-3	SAN INV. WM OBV.	= 120.52 = 120.02	0.50
X-4	WM INV. SAN OBV.	= 121.16 = 120.64	0.52
X-5	WM INV. SAN OBV.	= 120.85 = 120.35	0.50
X-6	STM INV. WM OBV.	= 121.00 = 120.50	0.50
X-7	STM INV. SAN OBV.	= 120.92 = 120.22	0.70

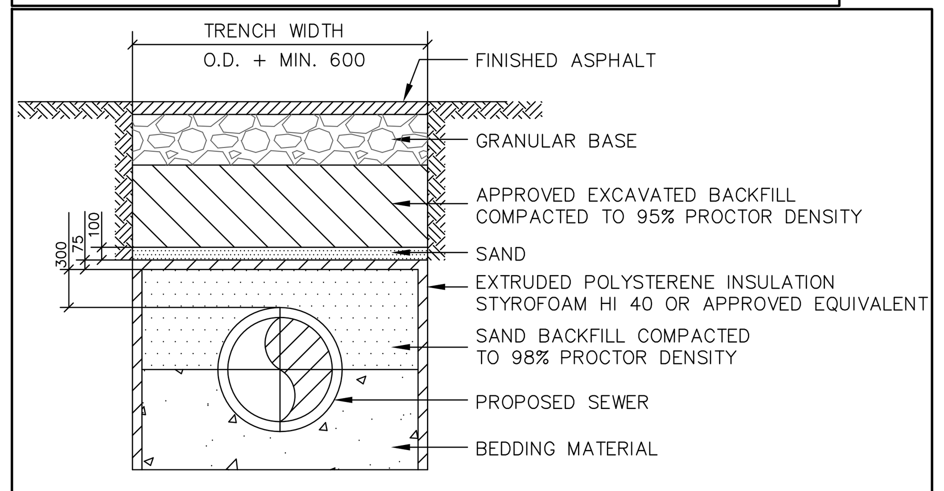
DENOTE FOR W/M UNDER STM/SAN PROVIDE A MIN. OF 0.50m VERTICAL SEPARATION

ROAD RESTORATION NOTES:

1. CONTRACTOR TO OBTAIN ROAD OCCUPANCY PERMIT AND MAINTAIN MINIMUM 1-LANE OF TRAFFIC OPEN AT ALL TIMES.
2. ALL TRENCHES WITHIN MUNICIPAL RIGHT OF WAY, TO BE RESTORED WITH NON-SHRINK BACKFILL.
3. EXISTING ASPHALT TO BE MATCHED WITH A 40mm DEPTH STEP JOINT, AND ALL CRACKS TO BE SEALED WITH HOT RUBBERIZED SEALANT.
4. ALL MUNICIPAL BOULEVARDS TO BE RESTORED WITH 200mm TOPSOIL AND No.1 GRADE NURSERY SOD.



STEP JOINT DETAIL
N.T.S



INSULATE PIPE DETAIL
N.T.S.

UTILITY NOTES:

POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWING, AND WHERE SHOWN. THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

BENCHMARK:

SHOWN ON THIS PLAN ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL ELEVATIONS DATUM (1928) AND ARE DERIVED FROM THE VERTICAL CONTROL MONUMENTS LISTED IN THE FOLLOWING TABLE:

MONUMENT	ELEVATION
VCM 12619690203	125.857
VCM 12019630225	125.018

TORONTO TECHNICAL SERVICE DIVISION

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS.

THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

Accepted as to form in reliance upon the professional skill and ability of Masongsong Associates Engineering Limited, Consulting Engineers, as to design and specification.

ASHRAF HANNA, P.ENG., MANAGER OF DEVELOPMENT ENGINEERING – ETOBICOKE YORK DISTRICT

Date

Key to Detail Location

NO. Detail Number
NO. Drawing Number

If this sheet is not 33 1/8" x 23 3/8" (841 x 594 mm) It is a reduced print - Read dwg. accordingly.

Contractors must check and verify all dimensions on the job and report any discrepancies to the Architect before proceeding with the work.

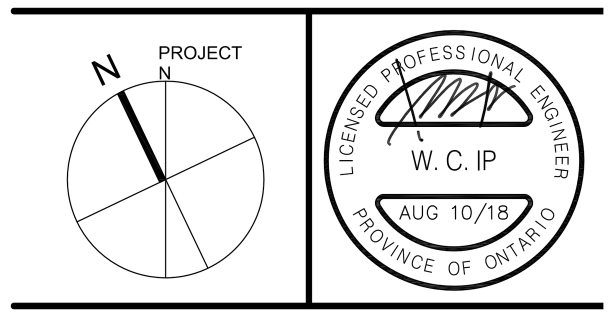
All prints and specifications are the property of the Architect and must be returned at the completion of the work.

Drawings should not be scaled.

No	Date	Revision/Issued
1	APR 13, 2018	ISSUED FOR SPA
2	MAY 11, 2018	ISSUED FOR DESIGN DEVELOPMENT
3	AUG 10, 2018	ISSUED FOR SPA-RESUBMISSION

CONSULTANTS LIST

ARCHITECT	Coolearth Architecture Inc. 386 Pacific Ave. Toronto, ON, M6P 2R1 Phone: 416-868-9774
	CS&P Architects 2345 Yonge St., Suite 200 Toronto, ON, M4P 2E5 Phone: 416-482-5002
STRUCTURAL ENGINEER	Stephenson Engineering 2550 Victoria Park Ave Suite 602 Toronto, ON M2J 5A9 Phone: 416-635-9970
MECHANICAL & ELECTRICAL ENGINEER	R Mancini and Associates 30 Martha St Suite 203 Bolton, ON L7E 5V1 Phone: 905-951-6292
LANDSCAPE ARCHITECT	PMA Landscape Architects Ltd. 359 Keele Street Toronto, ON, M6P 2K6 Phone: 416-239-9818
CIVIL ENGINEER	Masongsong Associates Engineering Ltd. 7800 Kennedy Road, S. 201 Markham, ON, L3R 2C7 Phone: 905-944-0162



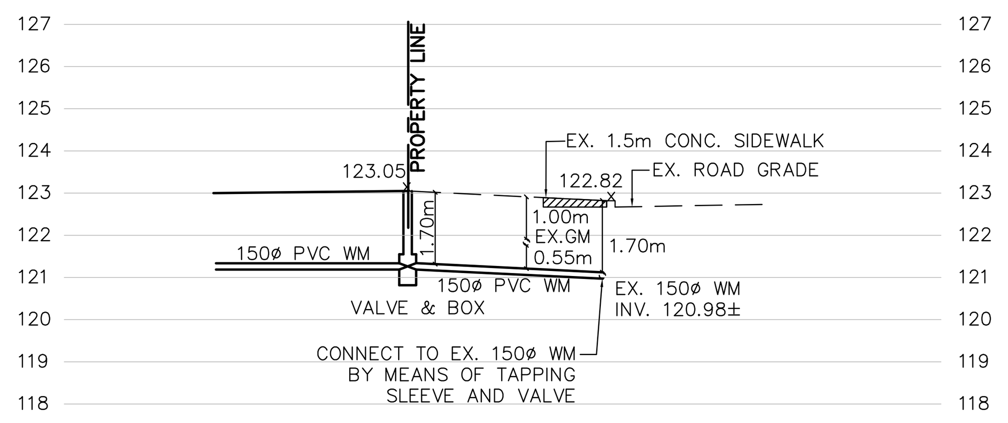
MASONGSONG ASSOCIATES
7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

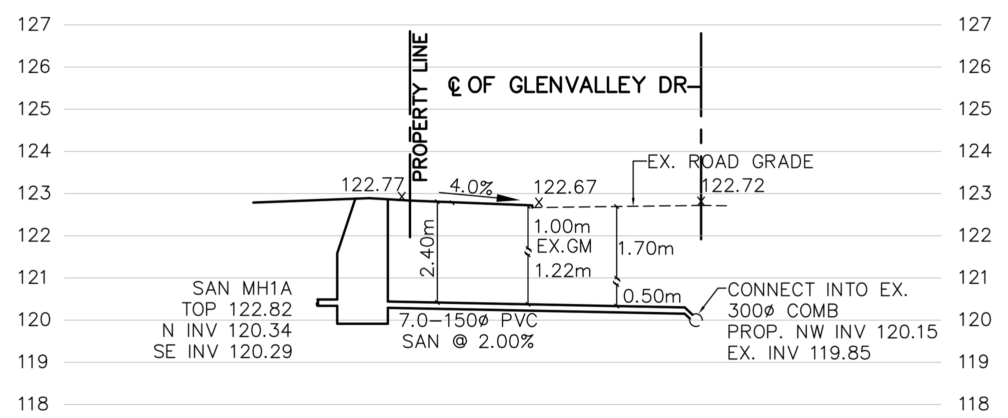
SITE SERVICING & GRADING PLAN

scale:	1:150
date:	04/06/18
drawn:	A.S.C
checked by:	K.L
project number:	17-904
drawing number:	SGR-1

Revision: 1



SECTION A-A (WATERMAIN CONNECTION)
1:150



SECTION B-B (SANITARY CONNECTION)
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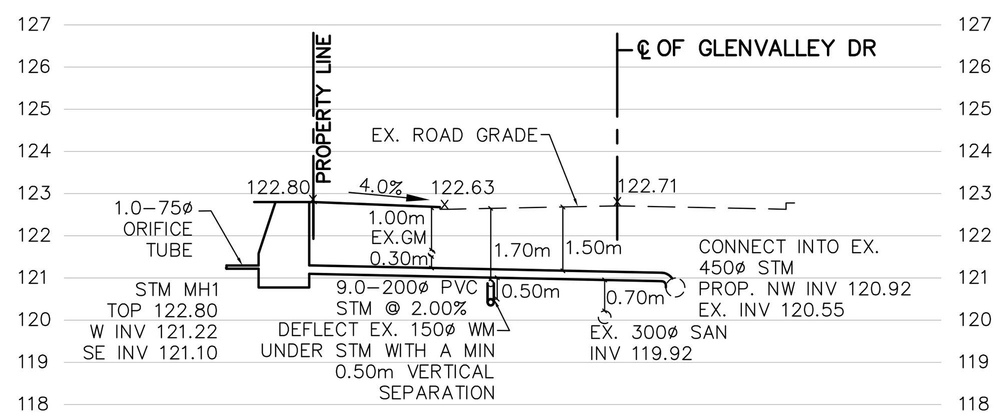
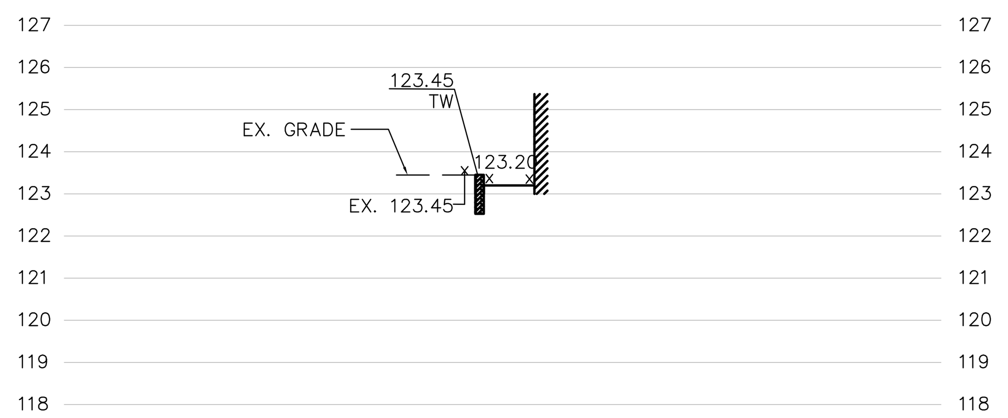
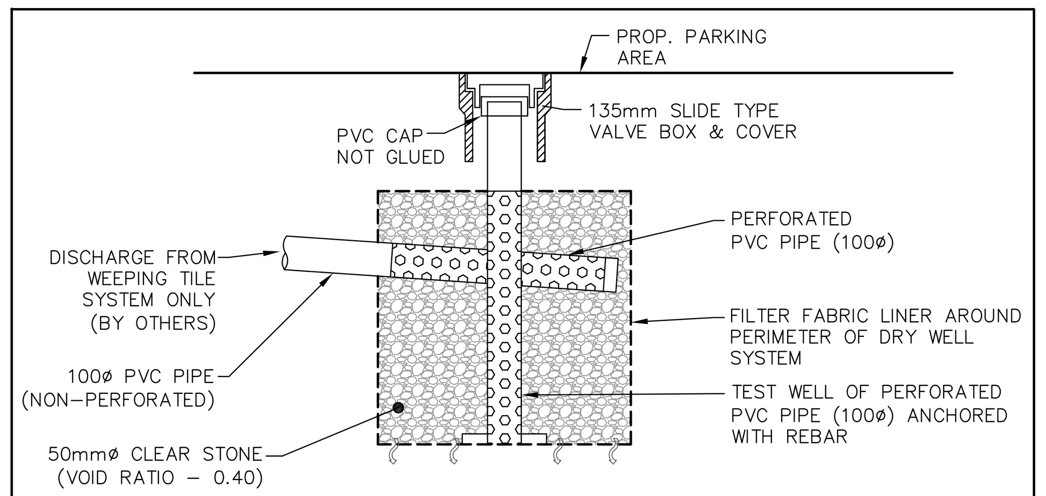


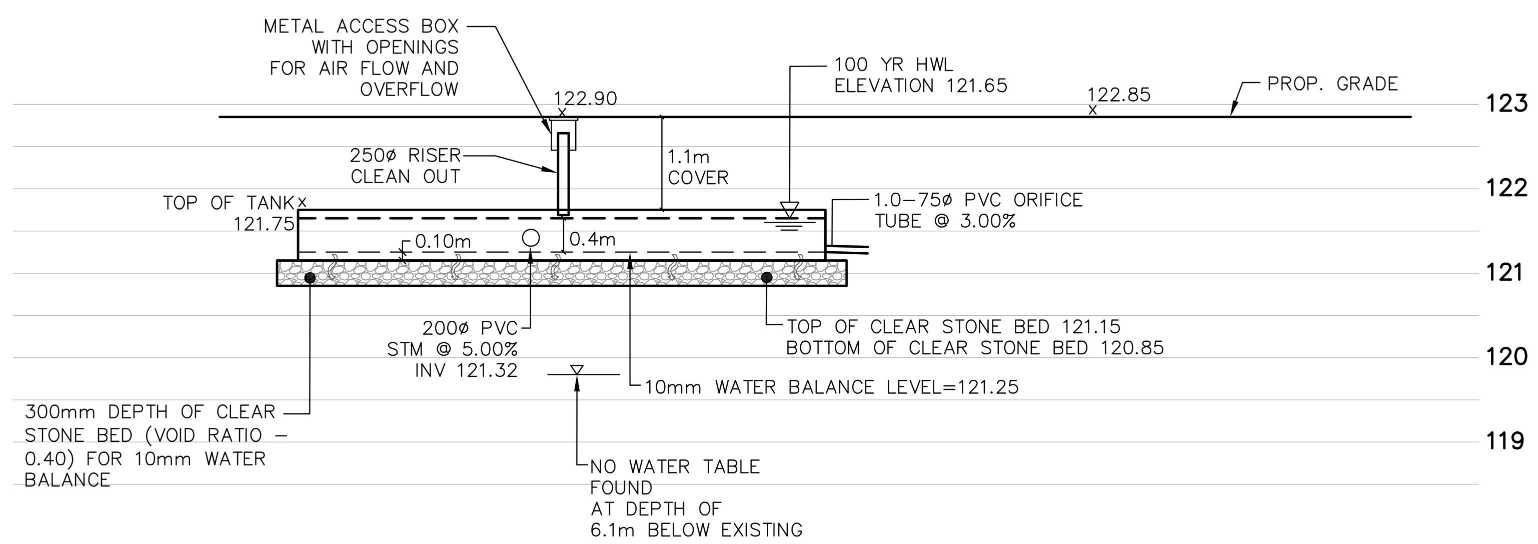
SECTION C-C (STORM CONNECTION)
1:150



SECTION F-F
1:150



DRY WELL SYSTEM/SOAKAWAY PIT
N.T.S.



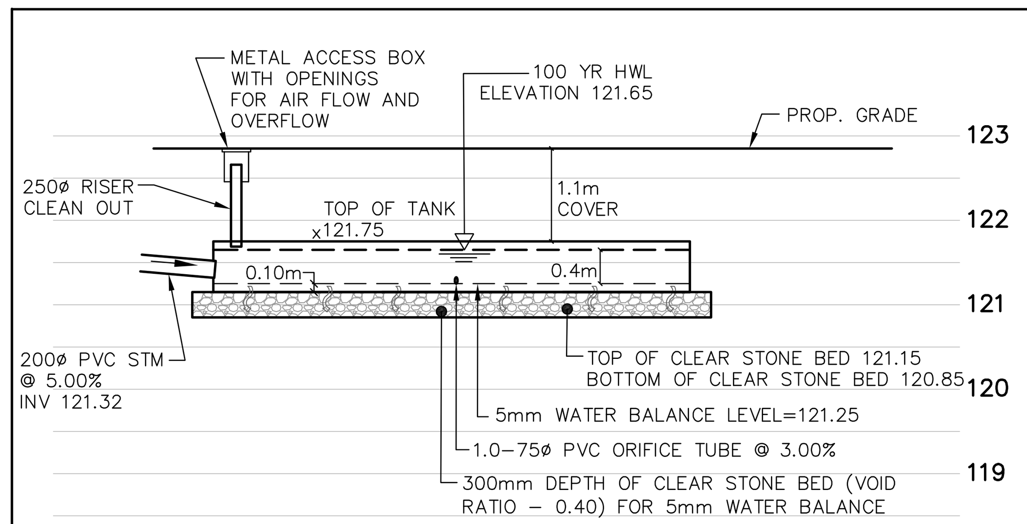
WATER BALANCE

=AREA x HEIGHT (BELOW OUTLET)
$=123.0m^2 \times 0.10m \times 96.0\%$
$=11.8m^3 > 9.83m^3$ (REQUIRED, REFER TO FSR REPORT)

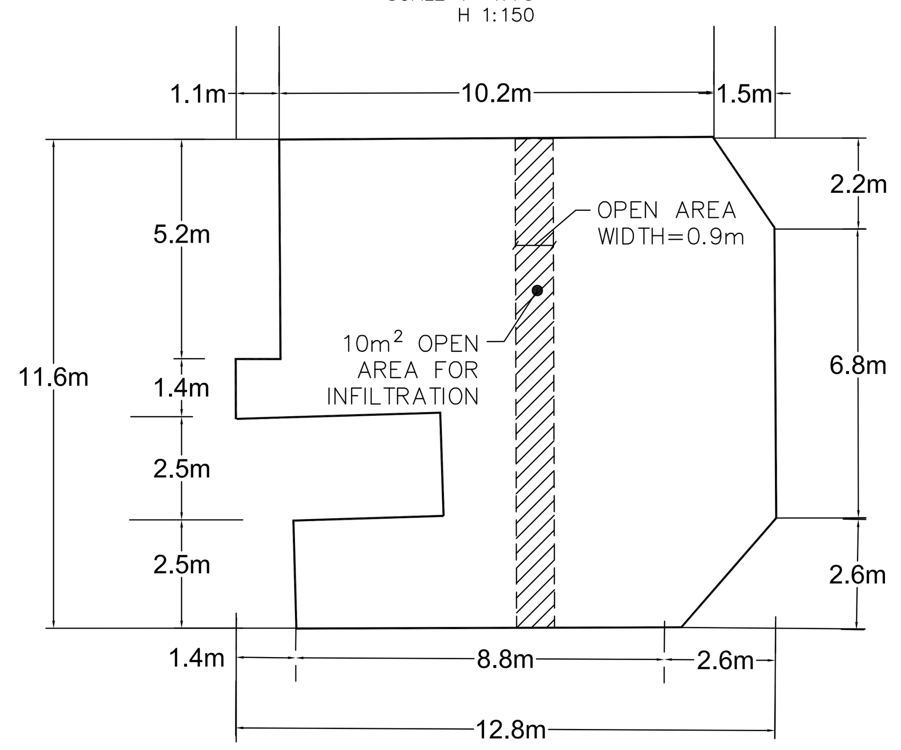
100-YR STORAGE

=AREA x TANK HEIGHT ABOVE WATER BALANCE x VOID SPACE + STORAGE IN U/G SEWERS AND MH
$=123.0m^2 \times 0.40m \times 96.0\% + 1.27m^3$
$=49.2m^3 \times 96.0\% + 1.27m^3$
$=48.5m^3 > 41.1m^3$ (REQUIRED, REFER TO FSR REPORT)

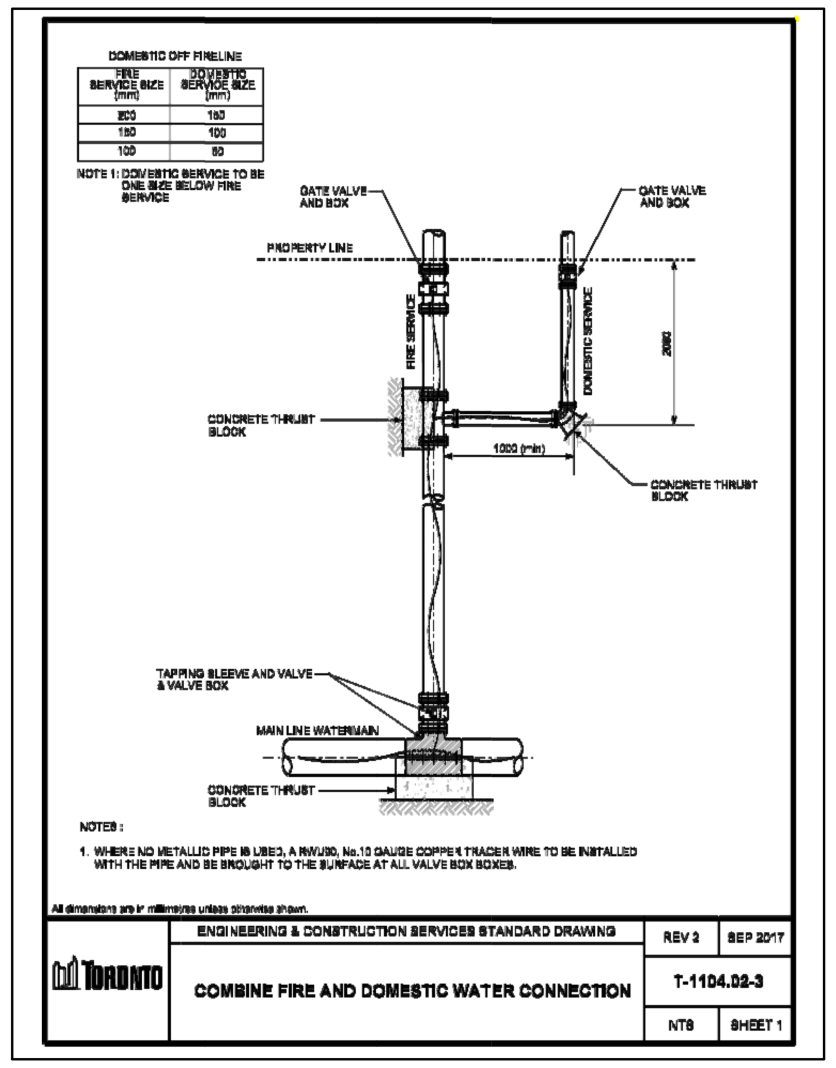
SECTION D-D (STORMTANK-BRENTWOOD ST-24)
SCALE V 1:75
H 1:150

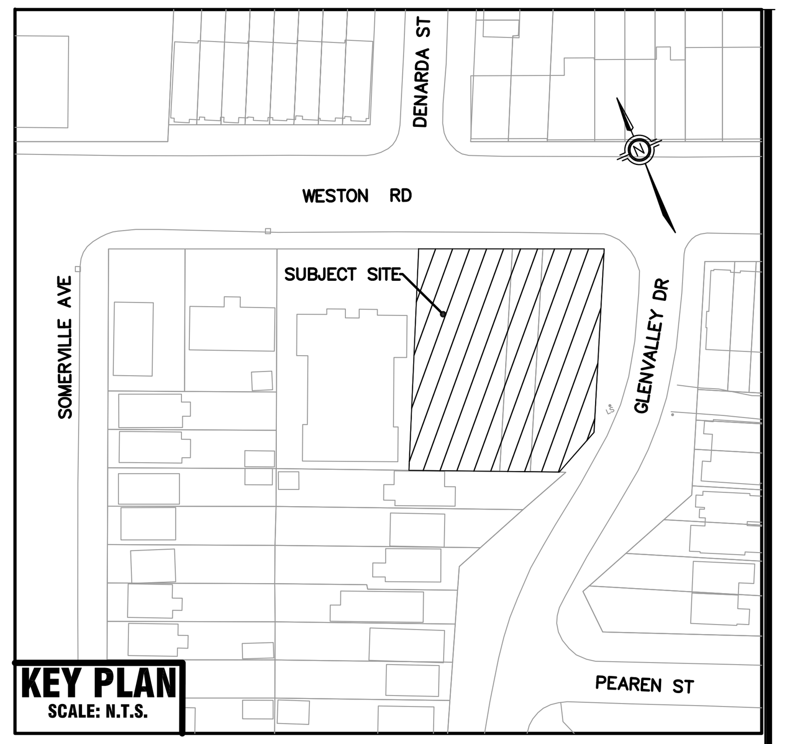


SECTION E-E
SCALE V 1:75
H 1:150

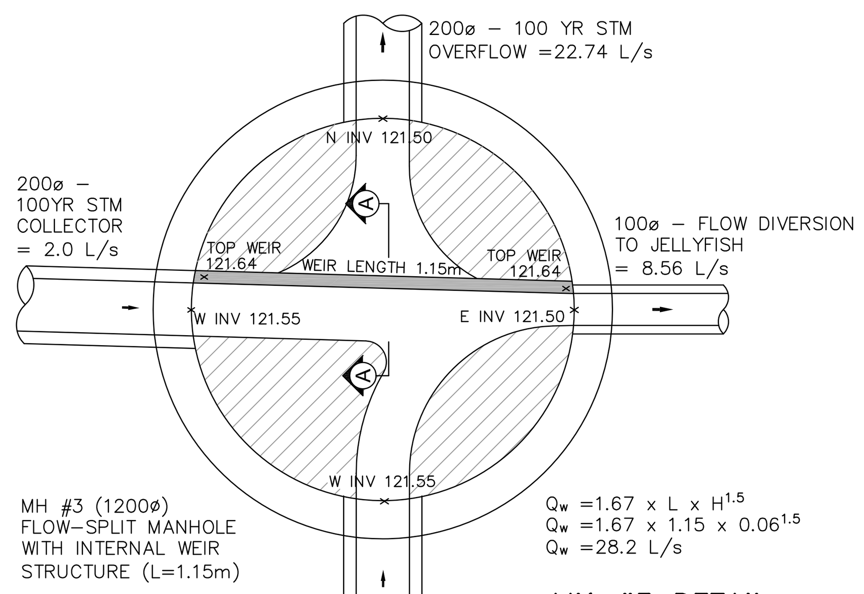


PLAN VIEW
SCALE 1:150

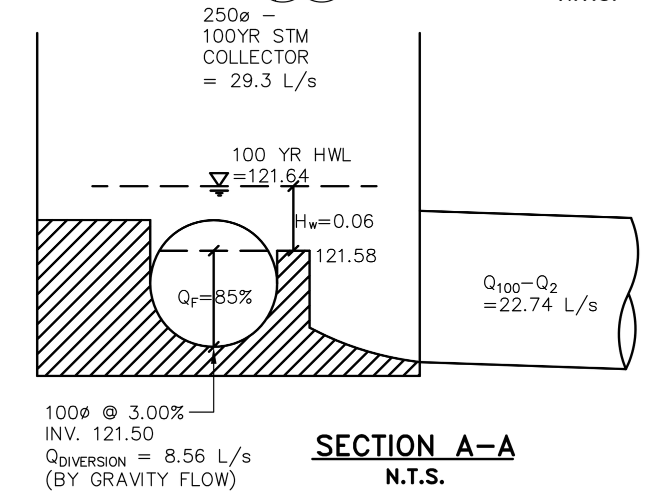




KEY PLAN
SCALE: N.T.S.

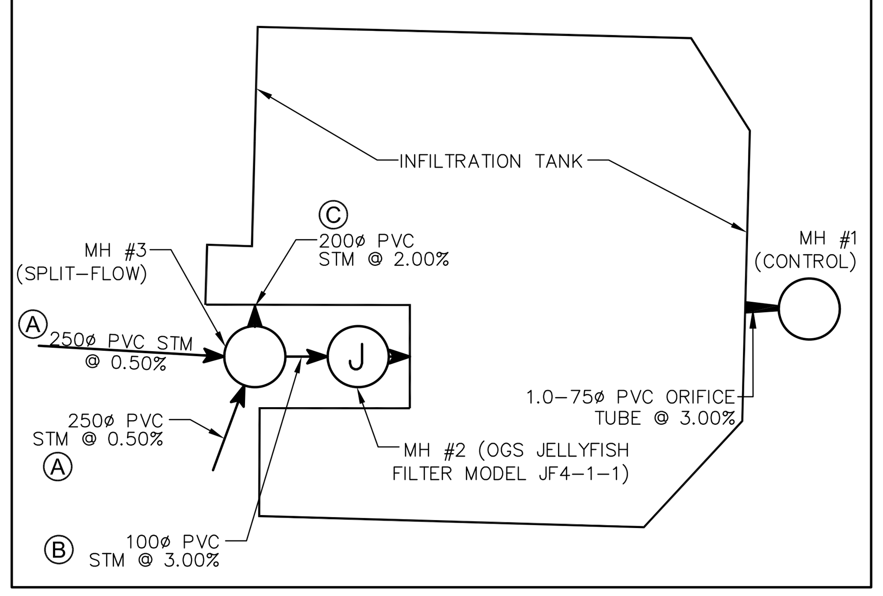


MH #3 DETAIL
N.T.S.



SECTION A-A
N.T.S.

FLOW POINT	DESCRIPTION	PEAK FLOW (L/S)
A	COLLECTION PIPES (100-YR DISCHARGE)	31.3 L/s
B	DIVERSION TO JELLYFISH (BY GRAVITY FLOW)	8.56 L/s
C=A-B	OVERFLOW	22.74 L/s



TORONTO TECHNICAL SERVICE DIVISION

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS.
THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

Accepted as to form in reliance upon the professional skill and ability of Masongsong Associates Engineering Limited, Consulting Engineers, as to design and specification.

ASHRAF HANNA, P.ENG., MANAGER OF DEVELOPMENT ENGINEERING - ETOBICOKE YORK DISTRICT
Date

Key to Detail Location
NO. Detail Number
NO. Drawing Number

If this sheet is not 33 1/8" x 23 3/8" (841 x 594 mm) It is a reduced print - Read dwg. accordingly.

Contractors must check and verify all dimensions on the job and report any discrepancies to the Architect before proceeding with the work.

All prints and specifications are the property of the Architect and must be returned at the completion of the work.

Drawings should not be scaled.

No	Date	Revision/Issued
1	APR 13, 2018	ISSUED FOR SPA
2	MAY 11, 2018	ISSUED FOR DESIGN DEVELOPMENT
3	AUG 10, 2018	ISSUED FOR SPA-RESUBMISSION

CONSULTANTS LIST

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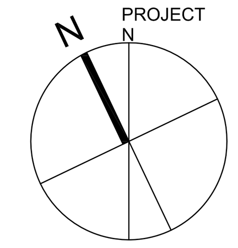
	CS&P Architects 2345 Yonge St., Suite 200 Toronto, ON, M4P 2E5 Phone: 416-482-5002
STRUCTURAL ENGINEER	Stephenson Engineering 2550 Victoria Park Ave Suite 602 Toronto, ON M2J 5A9 Phone: 416-635-9970
MECHANICAL & ELECTRICAL ENGINEER	R Mancini and Associates 30 Martha St Suite 203 Bolton, ON L7E 5V1 Phone: 905-951-6292
LANDSCAPE ARCHITECT	PMA Landscape Architects Ltd. 359 Keele Street Toronto, ON, M6P 2K6 Phone: 416-239-9818
CIVIL ENGINEER	Masongsong Associates Engineering Ltd. 7800 Kennedy Road, S. 201 Markham, ON, L3R 2C7 Phone: 905-944-0162



PROJECT
N

LICENSED PROFESSIONAL ENGINEER
W. C. IP
AUG 10/18
PROVINCE OF ONTARIO

MASONGSONG ASSOCIATES
7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

DETAILS PLAN

scale:	1:150
date:	04/06/18
drawn:	A.S.C
checked by:	K.L
project number:	17-904
drawing number:	DET-1

Revision: 1

As-Built Utility Drawings

BOROUGH OF YORK
Department of Works
PLAN AND PROFILE
OF
WESTON ROAD
SEWER

Deputy Commissioner   Commissioner of Works

ROLL SEW. 648

GENERAL NOTE:

1. UNITS ARE IN METRES EXCEPT AS NOTED
2. When new sewer is completed existing combined sewer will carry sanitary flow only.

NO.	REVISIONS	DATE	BY	APPROVED	DATE
2	Revised as constr. Contract Nº 79-10-621-1	Jan., 1980	A.L.		
1	Revised as constr. Contract Nº 79-1-246	Jan., 1980	A.L.		

SURVEYED BY A. WHALEN
DRAWN BY D. Mason
DESIGNED BY R. STANDISH
CHECKED BY C. H. Ng
DATE 6/6/78

REGISTERED PROFESSIONAL ENGINEER C. H. NG PROVINCE OF ONTARIO

BOROUGH OF YORK • DEPARTMENT OF WORKS

APPROVED
COMMISSIONER OF WORKS
DEPUTY COMMISSIONER

SCALES
1: 100 VERTICAL
1: 250 HORIZONTAL

Glenvalley Drive Storm Sewer

DRAWING NUMBER SEW. 246-1
REV. 2

TRANSLAR 100-12-77

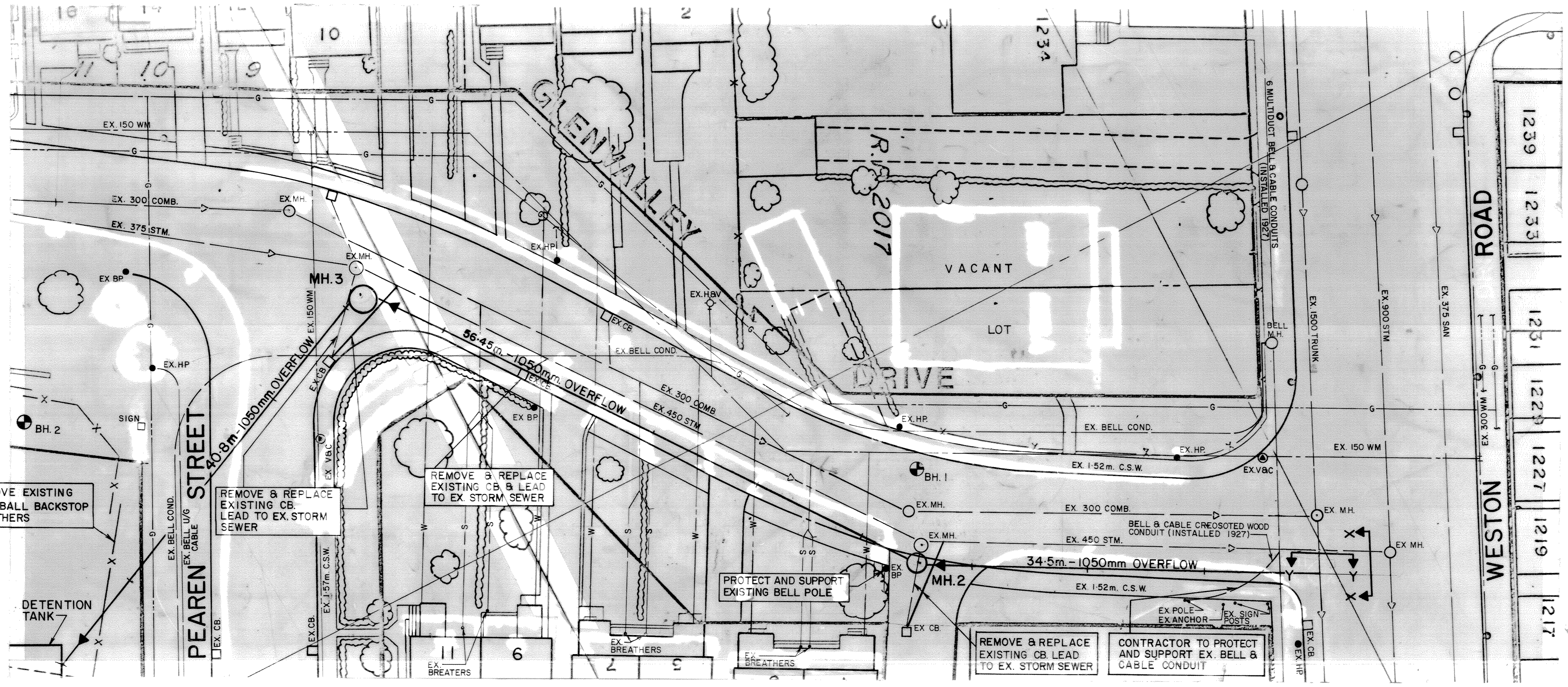
#23

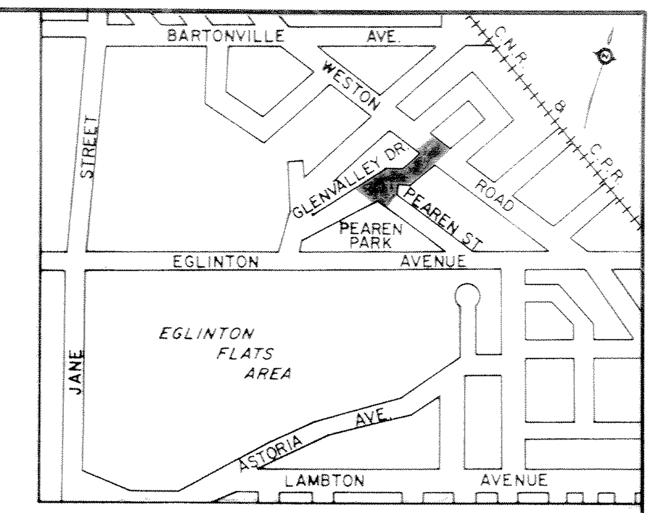
NOTES:

EXISTING COMBINED SEWER SERVICES FOR HOUSES ALONG GLENVALLEY DRIVE TO BE RECONNECTED TO EXISTING 300mm. COMB. SEWER (SEE DETAIL 8697-A-8)

EXISTING WATER SERVICES FOR HOUSES 1,3,5,7,9 & 11 ALONG GLENVALLEY DR. TO BE RECONNECTED TO EXISTING 150mm. WATERMAIN.

MAXIMUM TRENCH WIDTH FOR 1050mm. DIAMETER PIPE NOT TO EXCEED 2·0m. BELOW PIPE CROWN.



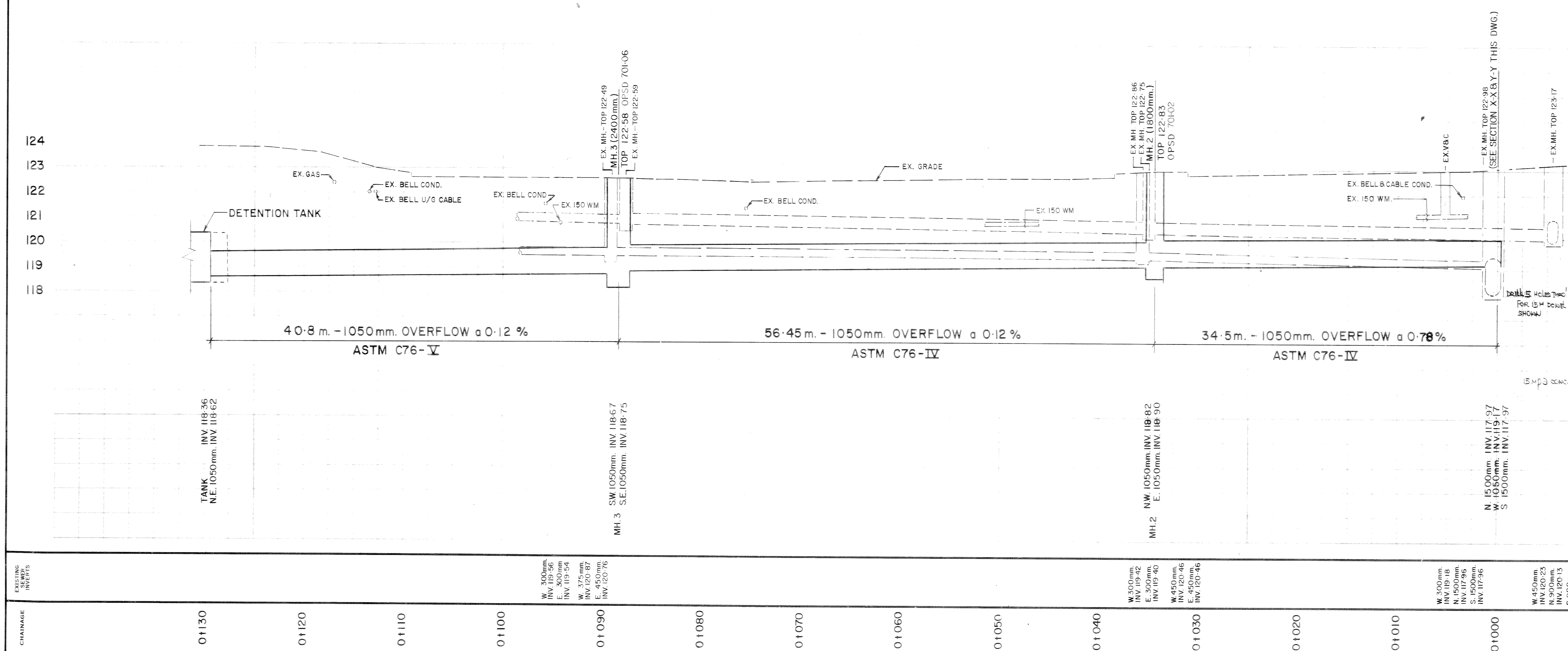


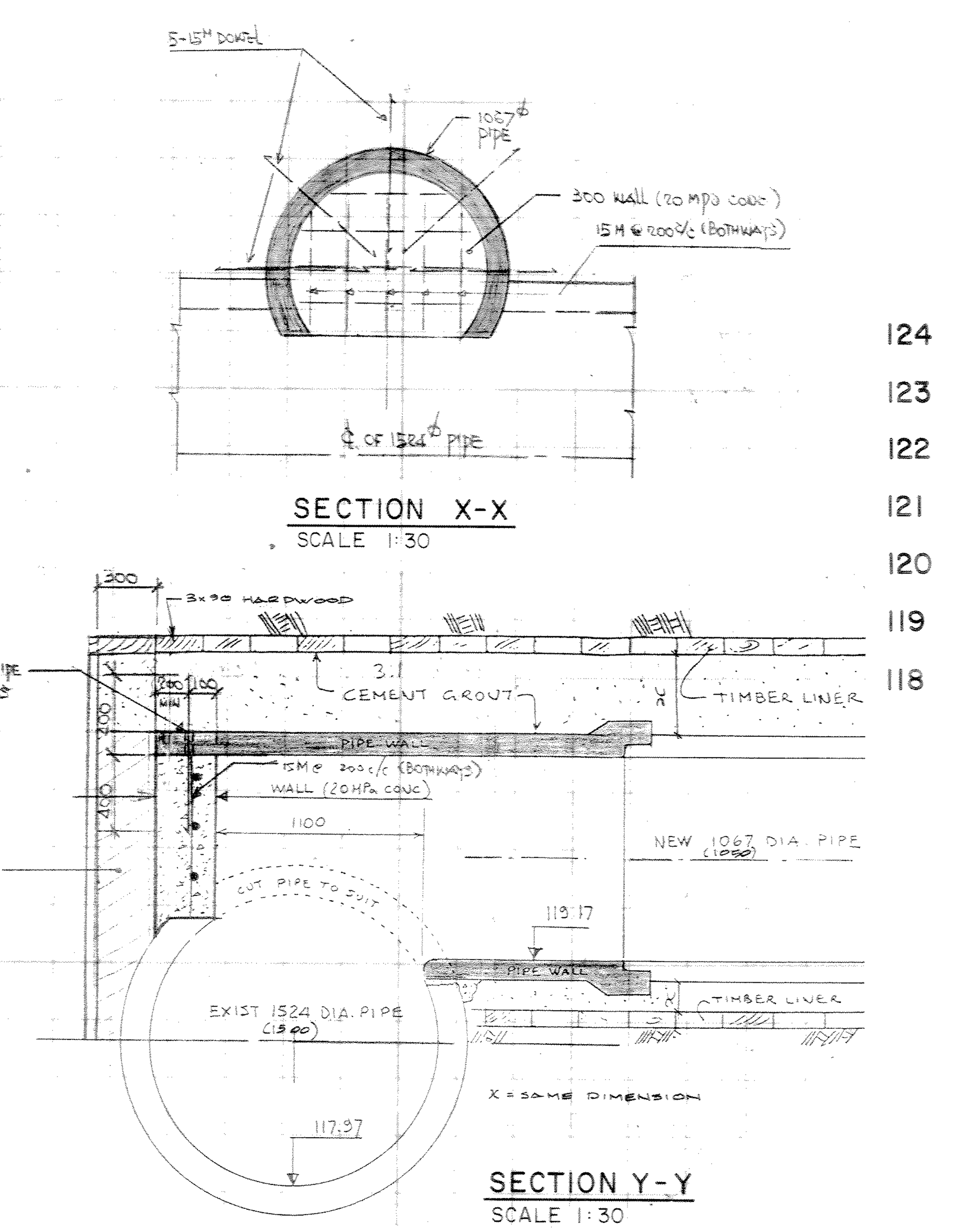
CONSTRUCTION NORTH

GENERAL NOTES

1. All trenches to be backfilled with Granular 'C' compacted to 100% Proctor Density
2. All corrugated galvanized steel pipe to have coating weight of not less than 0.061 grams (total both sides) per cm², as per manufacturer's specifications.
3. All concrete sewers to have rubber gasket joints.
4. All locations of services are approximate and should be confirmed by the Contractor.
5. Contractor to support existing services, as per City of York specifications.
6. All sewers to have bedding as shown on drawing #8697-A-8

AS CONSTRUCTED
APRIL, 1989





GENERAL NOTE:

SURVEYED BY	
DRAWN BY	P.E.
DESIGNED BY	D.E.M.
CHECKED BY	
DATE	JAN., 1987

NO.	REVISIONS	DATE	BY	APPROVED	DATE

P. E. MAUNDER — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

CITY OF YORK • DEPARTMENT OF WORKS

APPROVED

COMMISSIONER OF WORKS — DEPUTY COMMISSIONER

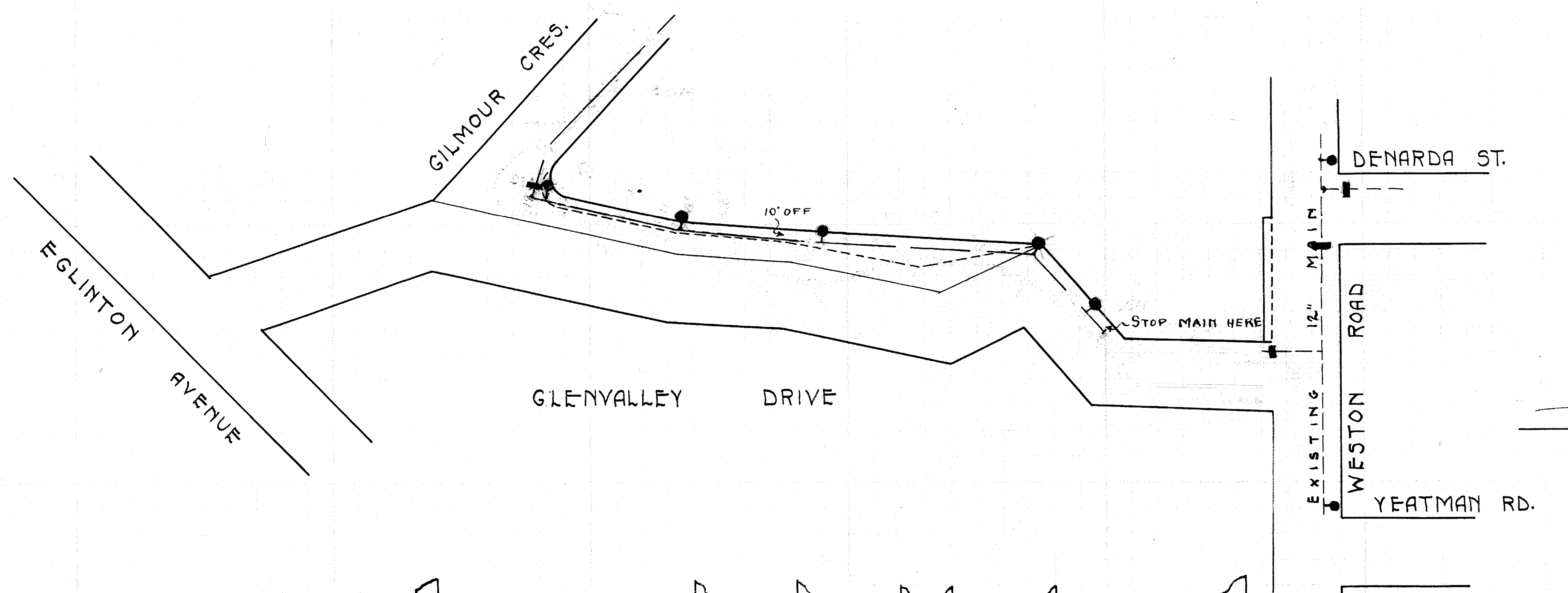
SCALES: 1:100 VERTICAL, 1:250 HORIZONTAL

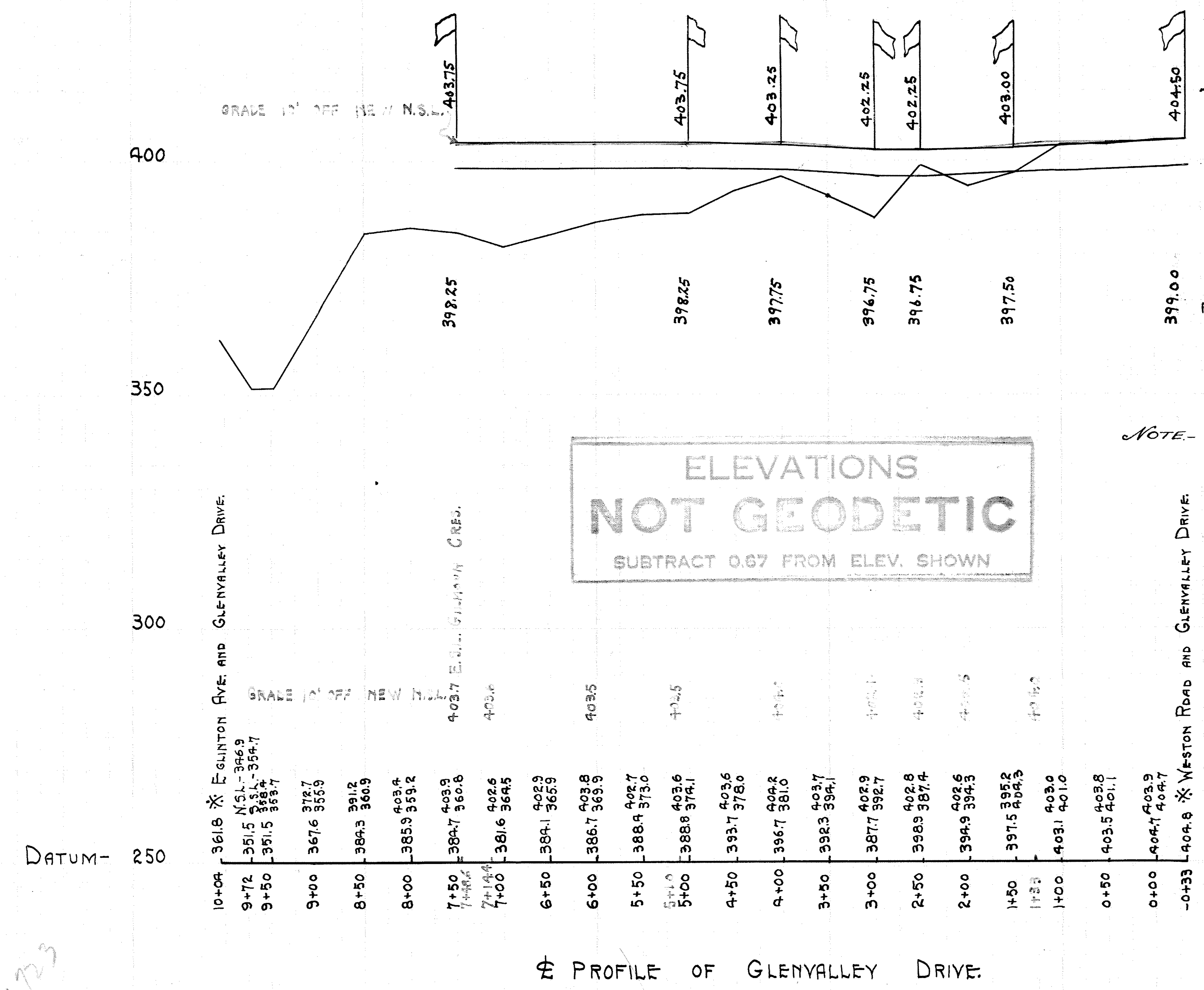
GLENVALLEY DRIVE

DRAWING NUMBER SEW. 246-2 — 8697-A-1

CONTRACT Nº 87-6-485-1

1





ELEVATIONS
NOT GEODETIC
SUBTRACT 0.67 FROM ELEV. SHOWN

REVISIONS

REMARKS	MADE BY	DATE

Commissioner of Works.

Deputy City Engineer

Asst. Engineer Roadway Section.

Asst. Engineer Water Main Extension Section.

TOWNSHIP OF YORK

PLAN AND PROFILE OF

GLENVALLEY DRIVE

PROPOSED 6" WATERMAIN.

SCALES: 20' = 1" Vertical
100' = 1" Horizontal

NOTE.- Grade approved by City of Toronto, 4-8-21.

FRANK BARBER
Township Engineer

PER R. O. Wynne-Roberts
ENGINEER.

Surveyed by	A.P.B	Date	29 MAR. 21.
Drawn by	F.C.R	Date	11 MAY. 21.
Checked by		Date	25 JULY. 21.
Approved by	J.McA.	Date	
Work Order	815	Ass'm't Sheet	23
B. M. Elevation:			
Location:			

SIDEWALK	Plan No.	W.O.
PAVEMENT	Plan No.	W.O.
WATER MAIN	Plan No. 9757	W.O. 815
SEWER	Plan No.	W.O.
MISCELL.	Plan No.	W.O.

246

9757

W-723.

Hydrant Flow Curve

GTA WATERWORKS

Main Size	300 mm
Static Pressure (psi)	80
Elevation Difference (m)	0 m
Location	1234 Weston Rd
Municipality	Toronto
Operators	Bill
Tested By	M.Larocca
Date	25-Jun-18
Time	13:00
Remarks	

Flow Test Measurements

# of Ports	Nozzle Size (in)	Pressure Flow Gauge (psi)	Flow (U.S.G.P.M)	Flow (L/s)	Residual Pressure (psi)
1	2	5	348	22.0	51
2	2	2	221	13.9	43
	2	2	221	13.9	43
1	2	6	382	24.1	52

Test Results

Flow at 20 psi (140 kPa) **550** U.S.G.P.M

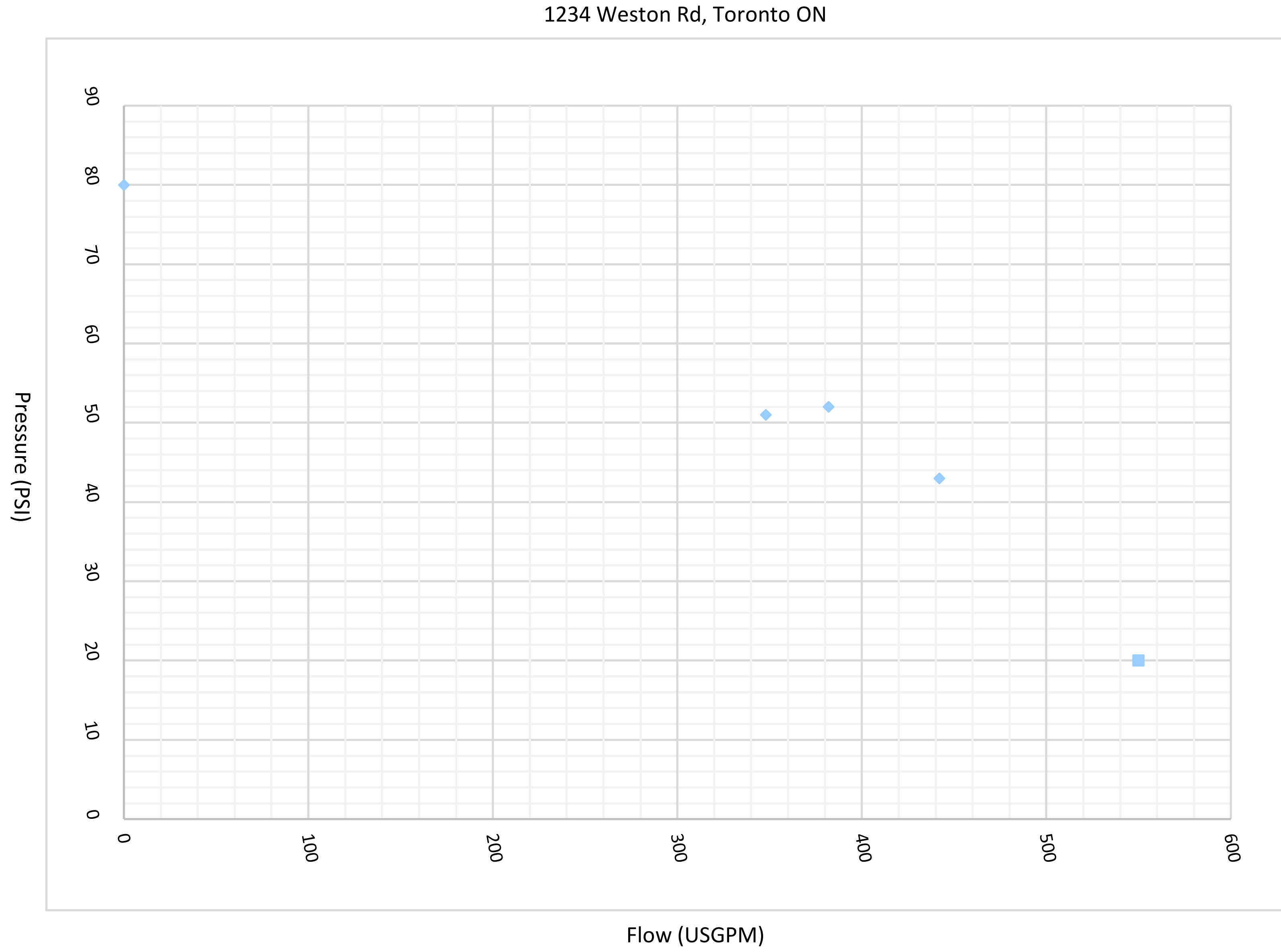
$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Qr = fire flow at residual pressure P (gpm, l/s)
Qt = hydrant discharge during test (gpm, l/s)
Ps = static pressure (psi, kPa)
Pr = desired residual pressure (psi, kPa)
Pt = residual pressure during test (psi, kPa)

Hydrant Classification as per NFPA 291	
Class	Colour
B	Orange

Hydrant Flow Curve

1234 Weston Rd, Toronto ON



Geotechnical Information

Geotechnical Investigation

GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Geotechnical Investigation

Proposed Mount Dennis Childcare Centre

1234 Weston Road, Toronto, Ontario

Prepared For:

Coolearth Architecture Inc.

GeoPro Project No.: 17-2118GH Revised

Report Date: July 9, 2018

Professional, Proficient, Proactive

T: (905) 237-8336 E: office@geoproconsulting.ca

Units 57, 40 Vogell Road, Richmond Hill, Ontario L4B 3N6

GeoPro
CONSULTING LIMITED

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Slug Test Results

Appendix B
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Appendix C
Laboratory Certificate of Analysis

Limitations to the Report

1 INTRODUCTION

GeoPro Consulting Limited (GeoPro) was retained by Coolearth Architecture Inc (the Client) to conduct a geotechnical investigation for the proposed Mount Dennis Childcare Centre at 1234 Weston Road, Toronto, Ontario.

The purpose of this geotechnical investigation was to obtain information on the existing subsurface conditions by means of a limited number of boreholes, in-situ tests and laboratory tests of soil samples to provide required geotechnical design information. Based on GeoPro's interpretation of the obtained data, geotechnical comments and recommendations related to the project designs are provided.

This report is prepared with the condition that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Furthermore, the recommendations and opinions in this report are applicable only to the proposed project as described above. On-going liaison and communication with GeoPro during the design stage and construction phase of the project is strongly recommended to confirm that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project shall be directed to GeoPro for further elaboration and/or clarification.

This report is provided on the basis of the terms of reference presented in our approved proposal prepared based on our understanding of the project. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this report can be relied upon.

This report deals with geotechnical issues only. The geo-environmental (chemical) aspects of the subsurface conditions, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources were not investigated and were beyond the scope of this assignment. However, a limited chemical testing was carried out on selected soil samples for assessment of soil quality for excess soil disposal purposes.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. Laboratory testing, for most part, follows ASTM or CSA Standards or modifications of these standards that have become standard practice in Ontario.

This report has been prepared for the Client only. Third party use of this report without GeoPro's consent is prohibited. The limitations to the report presented above form an integral part of the report and they must be considered in conjunction with this report.

2 FIELD AND LABORATORY WORK

Field work for the geotechnical investigation was carried out during December 7, 2017, during which time two (2) boreholes (Boreholes BH1 and BH2) were advanced to depths between about 6.1 m to 6.7 m below the existing ground surface (mBGS). The borehole locations are shown on Borehole Location Plan, Drawing 1.

The boreholes were advanced using continuous split spoon equipment supplied by a drilling specialist subcontracted to GeoPro. Soil samples were recovered from augered boreholes at regular intervals of depth using a 50 mm O.D. split-spoon sampler driven into the soil in accordance with the Standard Penetration Test (SPT) procedure described in ASTM D1586 - 11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.

Groundwater condition observations were made in the open boreholes during drilling and upon completion of drilling. The borehole was backfilled and sealed upon completion of drilling. Monitoring well (51 mm O.D.) was installed in Borehole BH1 to monitor long-term groundwater conditions as well as to facilitate the hydrogeological testing.

A proposed borehole location plan prepared by GeoPro was provided to Client for review prior to the filed investigation work. The approved borehole locations were staked in the field by GeoPro according to the drill rig accessibility and the underground utility conditions. The field work for this investigation was monitored by a member of our engineering staff who logged the boreholes and cared for the recovered samples.

All soil samples obtained during this investigation were brought to our laboratory for further examination. These soil samples will be stored for a period of three (3) months after the day of issuing draft report, after which time they will be discarded unless we are advised otherwise in writing. Geotechnical classification testing (including water content, grain size distribution and Atterberg Limits, when applicable) were carried out on selected soil samples.

To assess the soil infiltration properties, Guelph Permeameter tests were carried out at three (3) locations (G1, G2 and G3) as shown on Drawing 1. In addition, slug test was conducted in the monitoring well at Borehole BH1.

The approximate elevations at the as-drilled borehole locations were surveyed using a DGPS unit. The elevations at the as-drilled borehole locations were not provided by a professional surveyor and should be considered to be approximate. Contractors performing the work should confirm the elevations prior to construction. The borehole locations plotted on the Borehole Location Plan, Drawing 1 were based on the measurement of the site features and should be considered to be approximate.

3 SUBSURFACE CONDITIONS

Notes on sample descriptions are presented in Enclosure 1A. Explanations of terms used in the borehole logs are presented in Enclosure 1B. The subsurface conditions in the boreholes

(Boreholes BH1 and BH2) are presented in the individual borehole logs (Enclosures 2 and 3 inclusive). Detailed descriptions of the major soil strata encountered in the boreholes drilled at the site are provided as follows.

Asphalt

Asphalt with a thickness of about 55 mm was encountered surficially in Borehole BH1.

Granular Base/Subbase

Granular base/subbase materials with a thickness of about 105 mm were encountered in Borehole BH1.

Topsoil

Topsoil with a thickness of 70 mm was encountered surficially in Borehole BH2.

Fill Materials

Fill materials consisting of sandy silt, (organic) sand and silt, silty sand, sand, gravelly sand, slag, and clayey silt were encountered below the topsoil and granular base/subbase materials in all boreholes, and extended to depths ranging from about 2.7 m to 4.9 m below the existing ground surface. For the cohesive fill materials, an SPT N value of 9 blows per 300 mm penetration indicated a stiff consistency. For the cohesionless fill materials, SPT N values ranging from 2 to 23 blows per 300 mm penetration indicated very loose to compact compactness. The in-situ moisture content measured in the soil samples ranged from approximately 3% to 26%.

Sand and Silty Fine Sand

Sand and silty fine sand deposits were encountered in all boreholes below the fill materials, and extended to depths ranging from about 6.1m to 6.7 m below the existing ground surface. All boreholes were terminated in these deposits. SPT N values ranging from 14 to 50 blows per 300 mm penetration indicated a compact to dense compactness. The natural moisture content measured in the soil samples ranged from approximately 3% to 11%.

3.1 Groundwater Conditions

The groundwater condition observations made in the boreholes during and immediately upon completion of drilling are shown in the borehole logs and also summarized in the following table.

BH No.	BH Depths (m)	Depth of Water Encountered during Drilling (mBGS)	Water Level upon Completion of Drilling (mBGS)	Cave-in Depth upon Completion of Drilling (mBGS)
BH1	6.7	-	-	6.6
BH2	6.1	-	-	5.1

Note: mBGS = meters below ground surface

Monitoring wells construction details and the measured groundwater level are shown in the borehole logs and also summarized in the following table.

Monitoring Well ID	Screen Interval (mBGS)	Water Level (mBGS)
		December 19, 2017
BH1	5.0 – 6.6	dry

Note: mBGS = meters below ground surface

It should be noted that groundwater levels can vary and are subject to seasonal fluctuations in response to weather events.

3.2 Estimated Hydraulic Conductivity

The hydraulic conductivity (K-value) was estimated based on the results obtained from the particle size analyses of selected soil samples and from in-situ single well response test (slug test).

In addition, the field saturated hydraulic conductivity (K_{fs}) values were estimated based on the results obtained from the Guelph Permeameter Infiltration tests.

3.2.1 Particle Size Distribution Method

Particle size analyses (sieve and hydrometer) of two (2) soil samples collected at the Site were conducted, and the results of particle size distribution are presented on Figure 1.

The hydraulic conductivity of the soils was estimated using applicable empirical equations based on the details of particle size gradation. As shown in the following table, the estimated K values ranged from 7.4×10^{-4} cm/s to 2.1×10^{-2} cm/s for deposits of sand, and the maximum geometric mean value was about 1.9×10^{-2} cm/s.

Sample ID	Soil sample Depth (mBGS)	Soil Type	K value (cm/s)			
			Hazen	Breyer	Kozeny Carman	Geometric Mean
BH1 SS7B	4.9 ~ 5.3	Sand	1.3×10^{-3}	1.6×10^{-3}	7.4×10^{-4}	1.2×10^{-3}
BH2 SS5	3.1 ~ 3.8	Sand	2.0×10^{-2}	2.1×10^{-2}	1.6×10^{-2}	1.9×10^{-2}

3.2.2 Single Well Response Test (Slug Test) Method

Single well response test (slug test) was conducted in one (1) monitoring well BH1.

Hydraulic conductivity for the screened soil was estimated using the Hvorslev method based on the result of the slug test. The result of slug test is presented in Appendix A, and the estimated K value is presented in the following table.

Monitoring Well	Screen Depth (mBGS)	Screened Soil	K Value (cm/s)
BH1	5.1 ~ 6.6	Sand	3.5×10^{-3}

As shown above, the estimated K values for the soil screened between 5.1 mBGS to 6.6 mBGS was estimated to be 3.5×10^{-3} cm/s.

3.2.3 Guelph Permeameter Infiltration Test Method

Guelph Permeameter infiltration testing is one of the recommended infiltration test methods discussed in Stormwater Management Criteria (SWMC), Version 1.0, dated August 2012, issued by the Toronto and Region Conservation Authority ("TRCA").

Guelph Permeameter Infiltration Testing was carried out at three (3) locations (G1 to G3) as shown on Drawing No. 1 at depth ranging from 0.75 mBGS to 0.95 mBGS. Based on the results obtained from Guelph Permeameter infiltration tests, the field saturated hydraulic conductivity (K_{fs}) values were estimated. The results of Guelph Permeameter tests and data processing are presented in Appendix B, and are summarized in the following table.

Test Location	Soil Depth (mBGS)	Primary Soil	Hydraulic Conductivity (cm/s)
G1	0.75	Silty Sand (Fill)	3.1×10^{-4}
G2	0.75	Silty Sand (Fill)	2.2×10^{-3}
G3	0.95	Silty Sand (Fill)	1.8×10^{-3}

Due to the presence of fill materials at the site, variation of hydraulic conductivity may be anticipated at different locations.

4 DISCUSSION AND RECOMMENDATIONS

This report contains the findings of GeoPro's geotechnical investigation, together with the geotechnical engineering recommendations and comments. These recommendations and comments are based on factual information and are intended only for use by the design engineers. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The anticipated construction conditions are also discussed, but only to the extent that they may influence design decisions. Construction methods discussed, however, express GeoPro's opinion only and are not intended to direct the contractors on how to carry out the construction. Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all the factors that may have an effect upon the construction.

The design drawings of the project are not available at the time of preparing this report. Once the design drawings and detail site plan are available, this report should be reviewed by GeoPro and further recommendations be provided as appropriate.

4.1 Proposed Building Foundation Design Considerations

It is understood that the proposed building will consist of a two-storey building with one level basement. Based on the results of this investigation, the slag and existing fill materials are unsuitable to support the proposed structure. The proposed building may be founded on conventional shallow spread and/or continuous strip footings bearing in the native, undisturbed competent sand below the fills. The soil bearing resistance at Serviceability Limit States (SLS) and a factored bearing resistance at Ultimate Limit States (ULS) together with the corresponding founding depths at the borehole locations are provided in the following table:

BH No.	Bearing Resistance at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Anticipated Bearing Soil
BH1	200	300	5.0	Compact Sand
BH2	200	300	3.0	Compact to Dense Sand

All foundation bases must be inspected by GeoPro prior to pouring concrete to confirm the design bearing resistance values.

Foundations designed to the specified bearing resistances at Serviceability Limit States (SLS) are expected to settle less than 25 mm total and 19 mm differential.

All footings exposed to seasonal freezing conditions must have at least 1.2 m of soil cover for frost protection.

In the vicinity of the existing buried utilities or the foundation of the existing building, all footings must be lowered to undisturbed native soils, or alternatively the services must be structurally bridged.

Where it is necessary to place footings at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

It is suggested that finalized basement floor elevations should be set at least 1.0 m above the local water table. Underfloor drains and upgraded level of water-proofing would be necessary in areas of the site if basements are proposed to be located below the local groundwater table and in potentially water bearing soils. Under-floor-slab drainage may be required for basements under such conditions and these conditions should be identified in the field by GeoPro. The drainage tiles consisting of 100 mm diameter perforated pipes with filter fabric, should discharge into a positive frost-free outlet, as shown on Drainage and Backfill Recommendations, Drawing 2. Exterior basement walls should be damp-proofed above the water table and water-proofed below the water table. The backfill against the footing and foundation walls should consist of free-draining, non-frost-susceptible granular or equivalent. The on-site materials such as sandy silt to silt have adfreezing potential; if these soils are used to backfill against the perimeter foundation walls, a polyethylene slip-membrane should be placed below ground surface on the perimeter foundations walls. Vertical drains should be installed at the window wells and connected to the perimeter drains to reduce basement dampness. GeoPro recommends that 'dimple board' be used on all below ground surfaces.

Based on the anticipated basement floor depths (i.e. approximately 4.0 m below existing ground surface), the under-slab drainage system may not be required, subject to the inspection during construction; additional groundwater level measurement may be considered to evaluate the potential groundwater table fluctuations.

It should be noted that the recommended foundation type, founding depths, and bearing resistances were based on the borehole information only. The geotechnical recommendations and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to the subsurface conditions between and beyond the boreholes when foundation construction is underway. The interpretation between and beyond the boreholes and the recommendations of this report must therefore be checked through field inspections provided by a qualified geotechnical engineer from GeoPro to validate the information for use during the construction stage. Due to the anticipated variation of the subsurface conditions at this specific site, the geotechnical engineer who carried out the geotechnical investigation shall be retained during the construction stage to avoid the potential misinterpretation of the soil information presented in the report.

4.2 Lateral Earth Pressure on Walls

The lateral earth pressure acting at any depth on foundation walls can be calculated as follows:

$$p = K (\gamma h + q)$$

Where	p	=	lateral earth pressure in kPa acting at depth of h
	K	=	lateral earth pressure coefficient equal to 0.45 for overburden soil assuming planar overburden/ backfill surface against walls
	γ	=	unit weight of overburden soil, a value of 20 kN/m^3 may be assumed
	h	=	depth of the wall below the finished grade
	q	=	value of surcharge adjacent to foundation walls in kPa

The above expression assumes that a permanent free drainage system will be provided to prevent the build-up of any hydrostatic pressure behind the walls.

Should the hydrostatic pressures be built up behind the walls, they must be included in calculating the lateral earth pressures.

4.3 Floor Slab

The slag and existing fill materials are considered unsuitable to support the proposed structure and should be completely removed from the building footprint and be replaced with engineered fill. The existing fill materials should be wasted or used for landscaping purposes subject to the environmental quality. The excavated natural soils, which are free of organics and other deleterious materials, may be reused as engineered fill for supporting the floor slab, subject to the environmental acceptability and geotechnical inspection during construction.

Prior to placing engineered fill, the exposed subgrade should be proofrolled in conjunction with an inspection by qualified geotechnical personnel, to confirm that the exposed soils are native, undisturbed and competent, and have been adequately cleaned of existing fills, ponded water and all disturbed, loosened, softened, organic and other deleterious materials.

Approved materials should be placed in loose lifts not exceeding 200 mm in thickness and compacted to at least 98% of materials' Standard Proctor Maximum Dry Density (SPMDD). Imported granular fill (i.e. Granular B), which can be compacted with small compact equipment, should be used in confined areas.

In consideration of the anticipated thick engineered fill, granular materials (i.e. such as Granular B) should be considered for the engineered fill within the proposed building footprint. Removal of the existing fills and placement of compacted fills must be carried out under full time monitoring by the geotechnical engineer from GeoPro.

As noted above, in case of shortage of the engineered fill materials, imported sandy materials which conform to Granular 'B' may be used. The final lift directly beneath the floor slabs should consist of a minimum of 150 mm of OPSS Granular A material, uniformly compacted to at least 100 percent of standard Proctor maximum dry density. This should provide a modulus of subgrade reaction, for a 1 foot square plate, k_1, of approximately 40 MPa/m.

Special care should be taken to ensure compaction adjacent to foundation walls. The floor slabs should be structurally separated from the foundation wall. Sawcut control joints should be provided at regular intervals and along column lines to minimize shrinkage cracking and to allow for differential settlement of the floor slabs.

Where the backfill against the exterior walls is to support settlement sensitive structures, such as concrete slabs, pavements or walkways, it should be uniformly compacted to at least 98 percent of standard Proctor maximum dry density.

4.4 Excavations and Backfill

It is anticipated that the foundation excavation will be up to 5.0 m below existing ground surface. All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the existing fill materials and sandy deposits can be classified as Type 3 soil above groundwater table and Type 4 soil below groundwater table.

It is anticipated that foundation excavations at the site will consist of temporary open cuts with side slopes not steeper than 1.5 horizontal to 1 vertical (1.5H:1V). However, depending on the construction procedures adopted by the contractor and weather conditions at the time of construction, some local flattening of the slopes may be required.

No major problems with groundwater are anticipated for the installation of foundations at the above noted excavation depths. It is expected that any seepage, which occurs during wet periods, can be removed by pumping from sumps.

Possible obstructions may also be anticipated in the fill material. Provisions must be made in the excavation contract for the removal of possible boulders in the native soils or obstructions in the fill material.

The selected inorganic fill and native soils free of topsoil and organics can be used as general construction backfill where it can be compacted by sheep foot roller with loose lifts of soil not exceeding 300 mm. Imported granular fill, which can be compacted with small compacting equipment, should be used in confined areas.

The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should be compacted at the surface or be covered with tarpaulins to minimize moisture uptake.

4.5 Seismic Consideration

The 2012 Ontario Building Code (OBC 2012) came into effect on January 1, 2014 and contains updated seismic analysis and design methodology. The seismic site classification methodology outlined in the new code is based on the subsurface conditions within the upper 30 m below grade. Two methods of defining the site class are presented in the following sections for the proposed development: a conservative approach based on shallow boreholes (i.e. boreholes less than 30 m in depth) with using local geological/physiographical experience; and a method based on geophysical testing in accordance with the Section 4.1.8.4A of OBC 2012.

The conservative site classification is based on physical borehole information obtained at depths of less than 30 m and based on general knowledge of the local geology and physiography. In this regard, the current drilling program included boreholes drilled to depths up to 6.7 m below the existing ground surface. Based on the borehole information and our local experience, a Site Class D may be used for the building design.

4.6 Pavement Design

Based on the subsurface soil conditions encountered at the site and the assumed traffic usage for the parking lots, access road and the driveway areas within the public right of way, the pavement designs have been provided in the following table.

Pavement Designs for Private Parking Lot

Material		Thickness of Pavement Elements (mm)	
		Light Duty Parking Lot for Cars	Heavy Duty Access Road and Truck Parking
Hot-Mix Asphalt (OPSS 1150)	HL 3 Surface Course	40	50
	HL 8 Binder Course	50	100 (two lifts)
Granular Materials (OPSS 1010)	Granular A	150	150
	Granular B	300	450

Pavement Designs for Public Right of Way

Material		Thickness of Pavement Elements (mm)
Hot-Mix Asphalt (TS 1151)	SP12.5 FC1 C Surface Course	40
	SP19.0 D Binder Course	135
Granular Materials (TS 1010)	Granular A Base	150
	Granular B Type II Subbase	150
Prepared and Approved Subgrade		

The recommended pavement structures should be considered for preliminary design purposes only. A functional design life of ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific traffic data input from the Client.

Subject to the subgrade conditions (i.e. backfill materials wet of optimum water contents being placed) and weather conditions (i.e. during wet weather), the placement of thicker granular base/sub-base layer in order to facilitate the construction may be required. The need for filter fabric/geo-grid can be evaluated during construction. Furthermore, heavy construction equipment/vehicles may cause the disturbance to the subgrade and granular base/subbase before the placement of asphalt, especially during wet weather which should be considered during construction.

The long term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

Additional comments on the construction of parking areas and access roadways are as follows:

1. As part of the subgrade preparation, proposed parking areas and access roadways should be removed of existing fills and other obvious objectionable material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report. The subgrade should be properly shaped, crowned then proofrolled in the full time presence of a representative of this office. Soft or spongy subgrade areas should be excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD.

2. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed lot grading. Assuming that satisfactory crossfalls in the order of 2% have been provided, subdrains extending from and between catch basins may be satisfactory. In the event that shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by GeoPro Consulting Limited.

3. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavorable weather.

It is recommended that GeoPro Consulting Limited be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

4.7 Soil Infiltration Assessment

4.7.1 Summarized Soil Stratigraphy

The soil stratigraphy at the subject site as revealed in the boreholes generally consist of fill materials beneath the topsoil and/or asphalt concrete, underlain by native silty fine sand, and sand. The fill materials consisted of sandy silt, (organic) sand and silt, silty sand, sand, gravelly sand, slag, and clayey silt, and extended to the depths ranging from about 2.7 m to 4.9 mBGS.

4.7.3 Soil Percolation Time and Infiltration Rate

The values of percolation time and the values of soil infiltration rate for the shallow fill material (0.0 mBGS ~ 0.6 mBGS at depth) and for the native soils (3.1 mBGS ~ 6.6 mBGS at depth) were evaluated using the obtained hydraulic conductivity values as per the methods described in Supplementary Standards SB-6, issued by Ministry of Municipal Affairs and Housing (2006), and in TRCA's Stormwater Management Criteria ("SWMC"), Version 1.0, dated August 2012, and modified based on our experience.

The estimated values of soil percolation time and the values of infiltration rate are presented in the following table.

Primary Soil (Tested)		Tested Soil Depth (mBGS)	Test Location	Hydraulic Conductivity (cm/s)	Percolation Time or T-time, (min/cm)	Infiltration Rate 1/T, (mm/hr)
Shallow Fill Materials	Silty Sand	0.75	G1	3.1×10^{-4}	21	29
	Silty Sand	0.75	G2	2.2×10^{-3}	12	50
	Silty Sand	0.95	G3	1.8×10^{-3}	13	46
Native Soils	Sand	3.1 ~ 3.8	BH2 SS5	1.9×10^{-2}	4	150
	Sand	4.9 ~ 5.3	BH1 SS7B	1.2×10^{-3}	15	40
	Sand	5.1 ~ 6.6	BH1 (slug test)	3.5×10^{-3}	10	60

As shown in the above table, the estimated values of percolation time for the shallow fill materials at the Site range from 12 min/cm to 21 min/cm, while the values of infiltration rate range from 29 mm/hr to 50 mm/hr. The estimated values of percolation time for the native soils at the depths between 3.1 mBGS and 6.6 mBGS at the Site range from 4 min/cm to 15 min/cm, while the values of infiltration rate range from 40 mm/hour to 150 mm/hour.

As per SWMC, the infiltration rate used to design an infiltration facility should incorporate a safety correction factor that compensates for the potential reduction in soil permeability due to compaction or smearing during construction, the gradual accumulation of fine sediments over the lifespan of the infiltration facility, and the uncertainty in measured values when less permeable soil horizons exist within 1.5 metres below the proposed bottom elevation of the infiltration facility.

5 ENVIRONMENTAL SOIL ANALYTICAL RESULTS

5.1 Soil Sample Submission

In order to provide information on the chemical quality of the subsurface soils, selected soil samples were submitted to AGAT Laboratories in Mississauga, Ontario ("AGAT") for chemical analyses. Descriptions of the selected soil samples and analytical parameters are presented in the following table:

Sample ID	Soil Depth (mBGS)	Primary Soil	Analytical Parameters
BH1 SS2B	1.2 – 1.5	Fill: Slag	Metals/Inorganics
BH2 SS1B	0.1 – 0.8	Fill: Silty Sand	Metals/Inorganics
BH1 SS3 – SS6	1.5 – 4.6	Fill: Sandy Silt, Sand and Silt, Silty Sand and Sand	PHCs, VOCs, PAHs & PCBs

Note: PHCs = Petroleum Hydrocarbons Fractions F1-F4
VOCs = Volatile Organic Compounds
PAHs = Polycyclic Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls

It should be noted that at the time of the sampling, no obvious visual or olfactory evidence of environmental impact (i.e. staining or odours) was observed at the sampling locations.

5.2 Soil Analytical Results

A total of three (3) soil samples were analysed for the parameters including metals and inorganics, PHCs, VOCs, PAHs and PCBs under Ontario Regulation 153/04 ("O. Reg. 153/04") as amended. A copy of the soil analytical results is provided in the Laboratory Certificates of Analysis, attached in Appendix C.

The soil analytical results were compared with the Ontario Ministry of the Environment and Climate Change ("MOECC") "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011, Table 1: Full Depth Background Site Condition Standards for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Uses ("2011 MOECC Table 1 Standards"); Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition ("2011 MOECC Table 2 Standards"), and Table 3: Full Depth Generic Site Condition Standards in a non-potable Ground Water Condition ("2011 MOECC Table 3 Standards").

Based on the comparison, exceedances of MOECC Table 1, Table 2 or Table 3 standards were noted for SAR, metals and/or PAHs in the tested soil samples in the Borehole BH1. The exceedance values detected in the soil samples are summarized in the following table.

Soil Sample ID	Parameter	Detected Value	MOECC Table 1 Standards Guideline Value	MOECC Table 2 and 3 Standards (R/P/I) Guideline Value	MOECC Table 2 and 3 Standards (I/C/C) Guideline Value
BH1 SS2B	Arsenic	55 ug/g	**18** ug/g	**18** ug/g	**18** ug/g
	Cadmium	4.6 ug/g	**1.2** ug/g	**1.2** ug/g	**1.9** ug/g
	Copper	105 ug/g	**92** ug/g	140 ug/g	230 ug/g
	Lead	238 ug/g	**120** ug/g	**120** ug/g	**120** ug/g
	Molybdenum	5.2 ug/g	**2** ug/g	6.9 ug/g	40 ug/g
	Selenium	2.3 ug/g	**1.5** ug/g	2.4 ug/g	5.5 ug/g
	SAR	7.15	**2.4**	**5**	12
	Zinc	1610 ug/g	**290** ug/g	**340** ug/g	**340** ug/g
BH1 SS3 – SS6	Acenaphthylene	0.30 ug/g	**0.093** ug/g	**0.15** ug/g	**0.15** ug/g
	Anthracene	0.17 ug/g	**0.16** ug/g	0.67 ug/g	0.67 ug/g
	Benz(a)anthracene	1.1 ug/g	**0.36** ug/g	**0.5** ug/g	**0.96** ug/g
	Benzo(a)pyrene	1.2 ug/g	**0.3** ug/g	**0.3** ug/g	**0.3** ug/g
	Benzo(b)fluoranthene	2.0 ug/g	**0.47** ug/g	**0.78** ug/g	**0.96** ug/g
	Benzo(g,h,i)perylene	0.97 ug/g	**0.68** ug/g	6.6 ug/g	9.6 ug/g
	Benzo(k)fluoranthene	0.59 ug/g	**0.48** ug/g	0.78 ug/g	0.96 ug/g
	Dibenz(a,h)anthracene	0.17 ug/g	**0.1** ug/g	**0.1** ug/g	**0.1** ug/g
	Fluoranthene	1.1 ug/g	**0.56** ug/g	**0.69** ug/g	9.6 ug/g
	Indeno(1,2,3-cd)pyrene	0.70 ug/g	**0.23** ug/g	**0.38** ug/g	0.76 ug/g
	Pyrene	1.2 ug/g	**1** ug/g	78 ug/g	96 ug/g

Note: R/P/I = Residential, Parkland and Institutional Property Use
I/C/C = Industrial, Commercial and Community property Use
2.4 = standard value exceeded by the analytical result

5.3 Discussion of Analytical Results

Based on the analytical results, exceedances of MOECC Table 1, Table 2 or Table 3 Standards were noted for SAR, metals and/or PAHs in the tested soil sample taken from BH1. It should be noted that the sample tested with exceedances was taken from the fill materials which were noted to contain slag and brick fragments.

Based on the results of soil sample analysis, GeoPro would recommend the following disposal options:

1) The soils (i.e., fill materials) generated at the Site at the same tested sample depths from Borehole BH1 may be disposed at a licensed landfill site; however, additional chemical testing under O. Reg. 347/90 may be required by the landfill site.

It should be noted that the results of the chemical analysis refer only to the soil samples analyzed, which were obtained from specific sampling locations and sampling depths, and that the soil chemistry may vary between and beyond the location and depth of the samples taken. Therefore, soil materials to be used on site or transported to other sites must be inspected during excavation for indication of variance in composition or any chemical/environmental constraints. If conditions indicate significant variations, further chemical analyses should be carried out.

Please note that the level of testing outlined herein is meant to provide a broad indication of soil quality based on the limited soil samples tested. The analytical results contained in this report should not be considered a warranty with respect to the soil quality or the use of the soil for any specific purpose. Furthermore, it must be noted that our scope of work was only limited to the review of the analytical results of the limited number of samples. The scope of work did not include any environmental evaluation or assessment of the subject site (such as a Phase One or Phase Two Environmental Site Assessment).

Sites accepting fill may have requirements relating to its aesthetic or engineering properties in addition to its chemical quality. Some receiving sites may have specific chemical testing protocols, which may require additional tests to meet the requirements. The requirements for accepting the fill at an off-site location must be confirmed in advance. GeoPro would be pleased to assist once the receiving sites are determined and the requirements of the receiving sites are available.

6 MONITORING AND TESTING

The geotechnical aspects of the final design drawings and specifications should be reviewed by GeoPro prior to tendering and construction, to confirm that the intent of this report has been met. During construction, full-time engineered fill monitoring and sufficient foundation inspections, subgrade inspections, in-situ density tests and materials testing should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specifications.

7 CLOSURE

We appreciate the opportunity to be of service to you and trust that this report provides sufficient geotechnical engineering information to facilitate the detail design of this project. We look forward to providing you with continuing service during the construction stage. Please do not hesitate to contact our office should you wish to discuss, in further detail, any aspects of this project.

Yours very truly,

GEOPRO CONSULTING LIMITED

LICENSED PROFESSIONAL ENGINEER
D. B. LIU
100107874
PROVINCE OF ONTARIO

Dylan Q. Xiao, M.A.Sc., P.Eng.
Geotechnical Group

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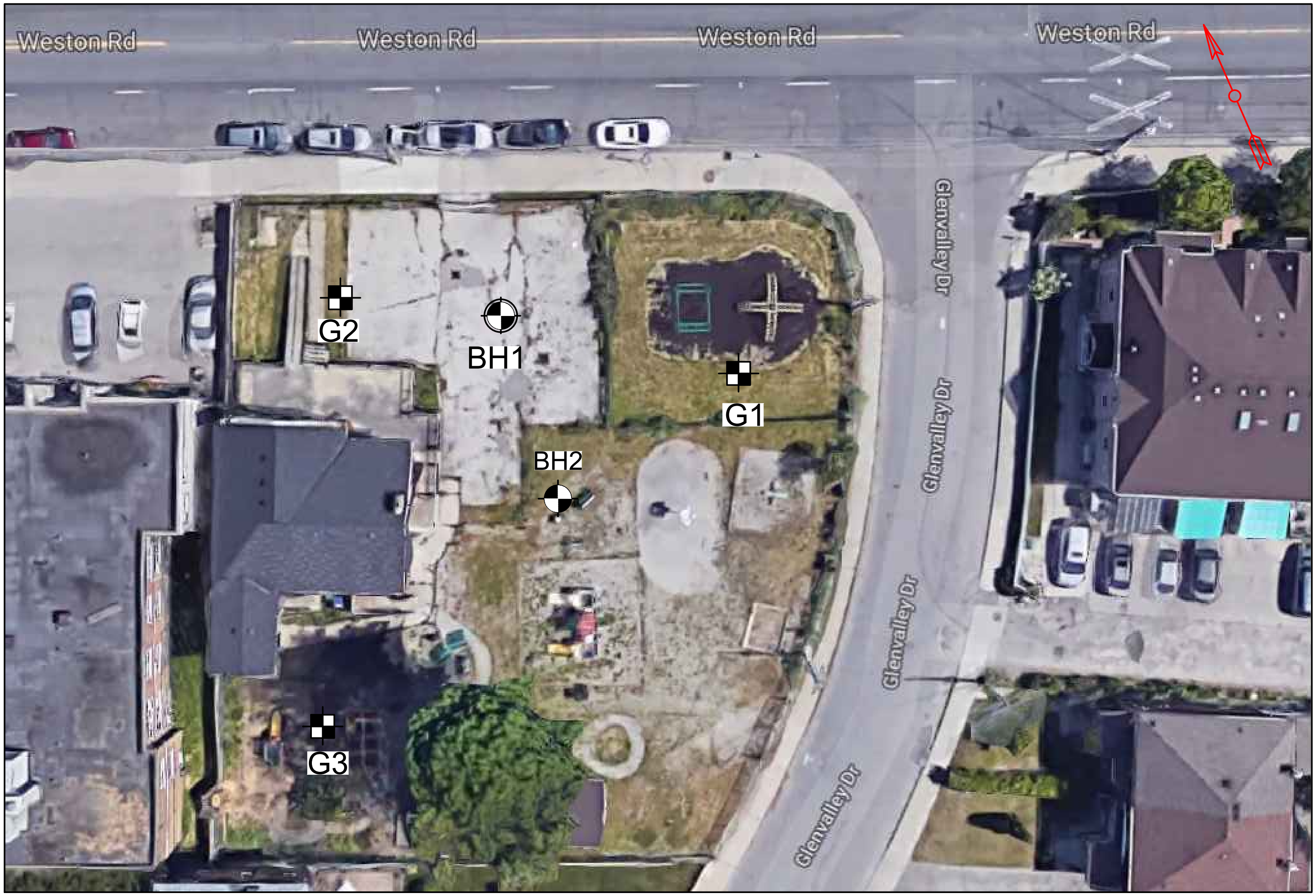
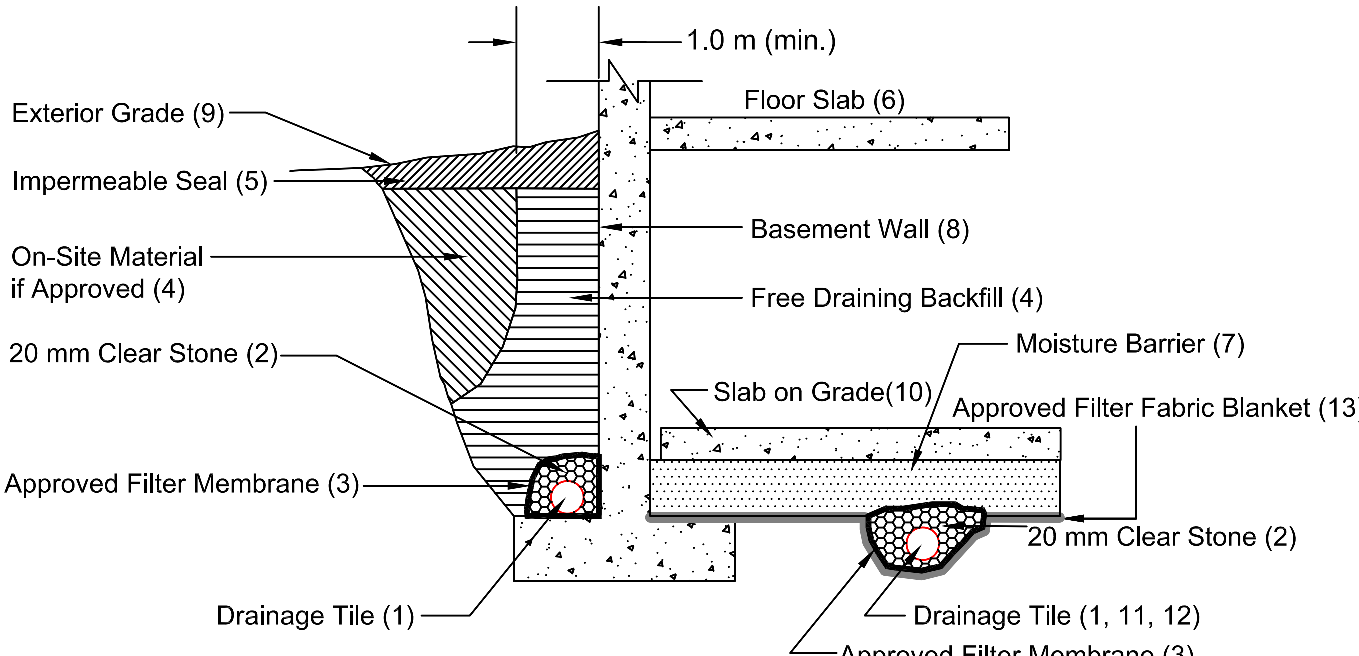
DRAWINGS



Legend:

- Borehole Location
- Monitoring Well Location
- Guelph Permeameter Infiltration Test Location

Client: **Coolearth Architechure Inc.**		Project No.: **17-2118GH**	Drawing No.: **1**
Drawn: **SP**	Approved: **DL**	Title: **Borehole/Monitoring Well/Infiltration Testing Location Plan**	
Date: **January, 2018**	Scale: **N.T.S**	Project: **Geotechnical Investigation Mount Dennis Childcare Centre 1234 Weston Road, Toronto, Ontario**	
Original Size: **Letter**	Rev: **SD**	GeoPro Consulting Limited	



EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be damp proofed /water proofed.
9. Exterior grade to slope away from building.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Basement with Underfloor Drainage
(not to scale)

ENCLOSURES

Enclosure 1A: Notes on Sample Descriptions

1. Each soil stratum is described according to the *Modified Unified Soil Classification System*. The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined according to Canadian Foundation Engineering Manual, 4^{th} Edition. Different soil classification systems may be used by others. Please note that a description of the soil stratums is based on visual and tactile examination of the samples augmented with field and laboratory test results, such as a grain size analysis and/or Atterberg Limits testing. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Enclosure 1B: Explanation of Terms Used in the Record of Boreholes

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube Sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

PM – Samples advanced by manual pressure
WR – Samples advanced by weight of sampler and rod
WH – Samples advanced by static weight of hammer

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Piezo-Cone Penetration Test (CPT):

An electronic cone penetrometer with a 60 degree conical tip and a projected end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurement of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

Textural Classification of Soils (ASTM D2487)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils(*)

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT "N" value
5. Pocket penetrometer

b) Cohesionless Soils

Compactness Condition (Formerly Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

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LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation for Proposed Mount Dennis Childcare Centre
CLIENT: Coolearth Architecture Inc.
PROJECT LOCATION: 1234 Weston Road, Toronto,ON
DATUM: Geodetic
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Split Spoon
FIELD ENGINEER: ED
SAMPLE REVIEW: DX
CHECKED: DL
DIAMETER: 51 mm
DATE: 2017-12-07
REF. NO.: 17-2118GH
ENCL. NO.: 2

SOIL PROFILE

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT
122.8	Ground surface	
122.7 / 0.1	**ASPHALT CONCRETE:** (55 mm)	
122.6 / 0.2	**GRANULAR BASE/SUBBASE:** (105 mm)	
122.5 / 0.3	**FILL:** organic sand and silt, trace clay, trace rootlets, dark brown, moist, very loose	
	FILL: silty sand, some organics, trace rootlets, dark brown, moist, very loose	
121.6 / 1.2	**FILL:** slag, trace to some sand, containing coal fragments, black to grey, moist, very loose	
121.3 / 1.5	**FILL:** sand and silt to silty sand, trace organics, trace rootlets, containing red bricks fragments, dark brown, moist, loose	
120.5 / 2.3	**FILL:** sandy silt, some clay, trace gravel, some organics, trace rootlets, dark brown, wet, loose	
120.3 / 2.5	**FILL:** sand and silt to silty sand, trace clay, trace gravel, trace to some organics, containing slag fragments, containing red bricks fragments, dark brown to brown, moist to wet, loose	
118.5 / 4.3	**FILL:** sand, trace to some silt, trace gravel, brown, moist, loose to compact	
117.9 / 4.9	**SAND:** trace to some silt, some gravel, brown, moist, compact to dense	
116.1 / 6.7	**END OF BOREHOLE**	

SAMPLES

NUMBER	TYPE	"N" BLOWS/0.3m
1A	SS	
1B	SS	
1C	SS	3
2A	SS	2
2B	SS	
3	SS	5
4A	SS	6
4B	SS	
5	SS	9
6A	SS	5
6B	SS	
7A	SS	14
7B	SS	
8	SS	36
9	SS	50

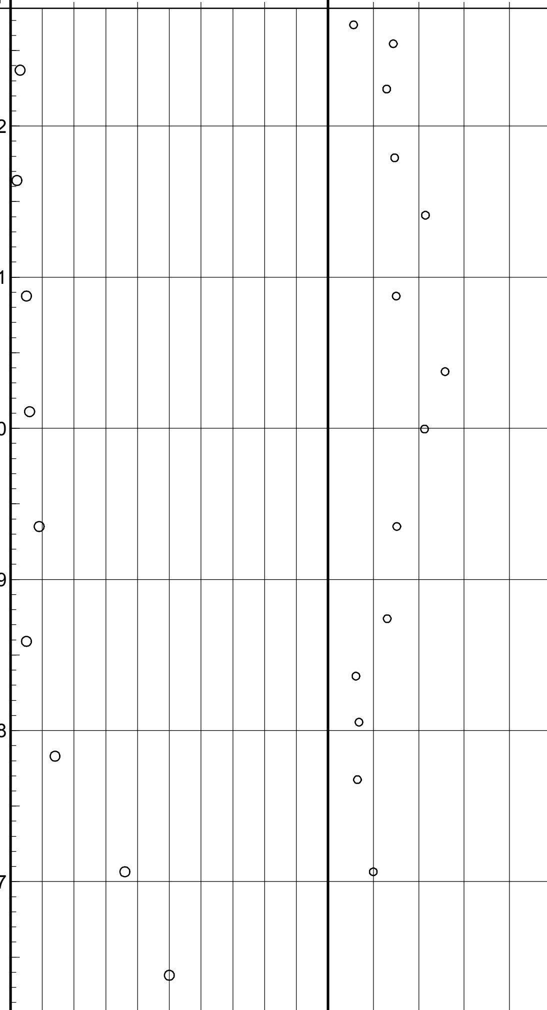
GROUND WATER: Concrete, Bentonite, Sand, Screen, Bentonite

REMARKS AND GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL: 13 70 18 (sample 7B)

DYNAMIC PENETRATION TEST (○ SPT, Cone, blows/0.3m: 20 40 60 80); SHEAR STRENGTH (kPa) (● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane: 20 40 60 80); ELEVATION: 122, 121, 120, 119, 118, 117

Plastic Limit w_P — Natural Moisture Content w — Liquid Limit w_L; WATER CONTENT (%): 10 20 30 40

UNIT WT (kN/m^3)



NoteS:
1) Borehole caved at a depth of 6.6 m below ground surface (mBGS) upon completion of drilling.
2) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.

Water Level Readings

Date	W. L. Depth (mBGS)
Dec. 19, 2017	dry

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

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LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation for Proposed Mount Dennis Childcare Centre	**DRILLING DATA**	
CLIENT: Coolearth Architecture Inc.	METHOD: Continuous Split Spoon	DIAMETER: 51 mm
PROJECT LOCATION: 1234 Weston Road, Toronto,ON	FIELD ENGINEER: ED	DATE: 2017-12-07
DATUM: Geodetic	SAMPLE REVIEW: DX	REF. NO.: 17-2118GH
BH LOCATION: See Borehole Locatiion Plan	CHECKED: DL	ENCL. NO.: 3

SOIL PROFILE

ELEV / DEPTH (m)	DESCRIPTION
122.9	
122.8 / 0.0 / 0.1	**TOPSOIL:** (70 mm)
	FILL: silty sand, trace clay, some to trace organics, trace rootlets, layers of clayey silt, containing slag fragments, dark brown to brown, moist, loose
121.8 / 1.1	**FILL:** sand, trace to some silt, trace gravel, pockets of clayey silt, brown, moist, loose
121.4 / 1.5	**FILL:** clayey silt, some sand to sandy, trace gravel, seams of sandy silt, brown, moist, stiff
121.2 / 1.7	**FILL:** sand, trace to some silt, trace to some gravel, pockets of sandy silt, brown, moist, loose to compact
120.3	---layers of silty fine sand
120.3 / 2.6	**FILL:** gravelly sand, trace to some silt, brown, moist, compact
120.2 / 2.7	
120.0 / 2.9	**SILTY FINE SAND:** brown, moist, compact
	SAND: trace to some silt, trace to some gravel, containing cobbles and boulders, brown, moist, compact to dense
116.8 / 6.1	**END OF BOREHOLE**

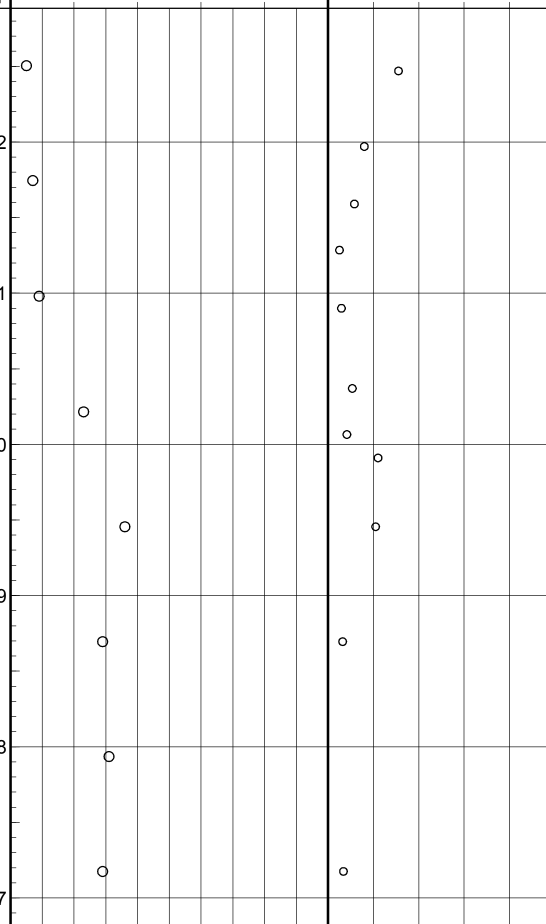
Note:
1) Borehole caved at a depth of 5.1 m below ground surface (mBGS) upon completion of drilling.

SAMPLES

NUMBER	TYPE	"N" BLOWS/0.3m
1A	SS	
1B	SS	5
2A	SS	7
2B	SS	
3A	SS	9
3B	SS	
4A	SS	23
4B	SS	
4C	SS	
5	SS	36
6	SS	29
7	SS	31
8	SS	29

GROUND WATER

ELEVATION: 122, 121, 120, 119, 118, 117



DYNAMIC PENETRATION TEST: O SPT, Cone, blows/0.3m: 20, 40, 60, 80

SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane: 20, 40, 60, 80

Plastic Limit w_P, Natural Moisture Content w, Liquid Limit w_L

WATER CONTENT (%): 10, 20, 30, 40

UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
10	83	7	

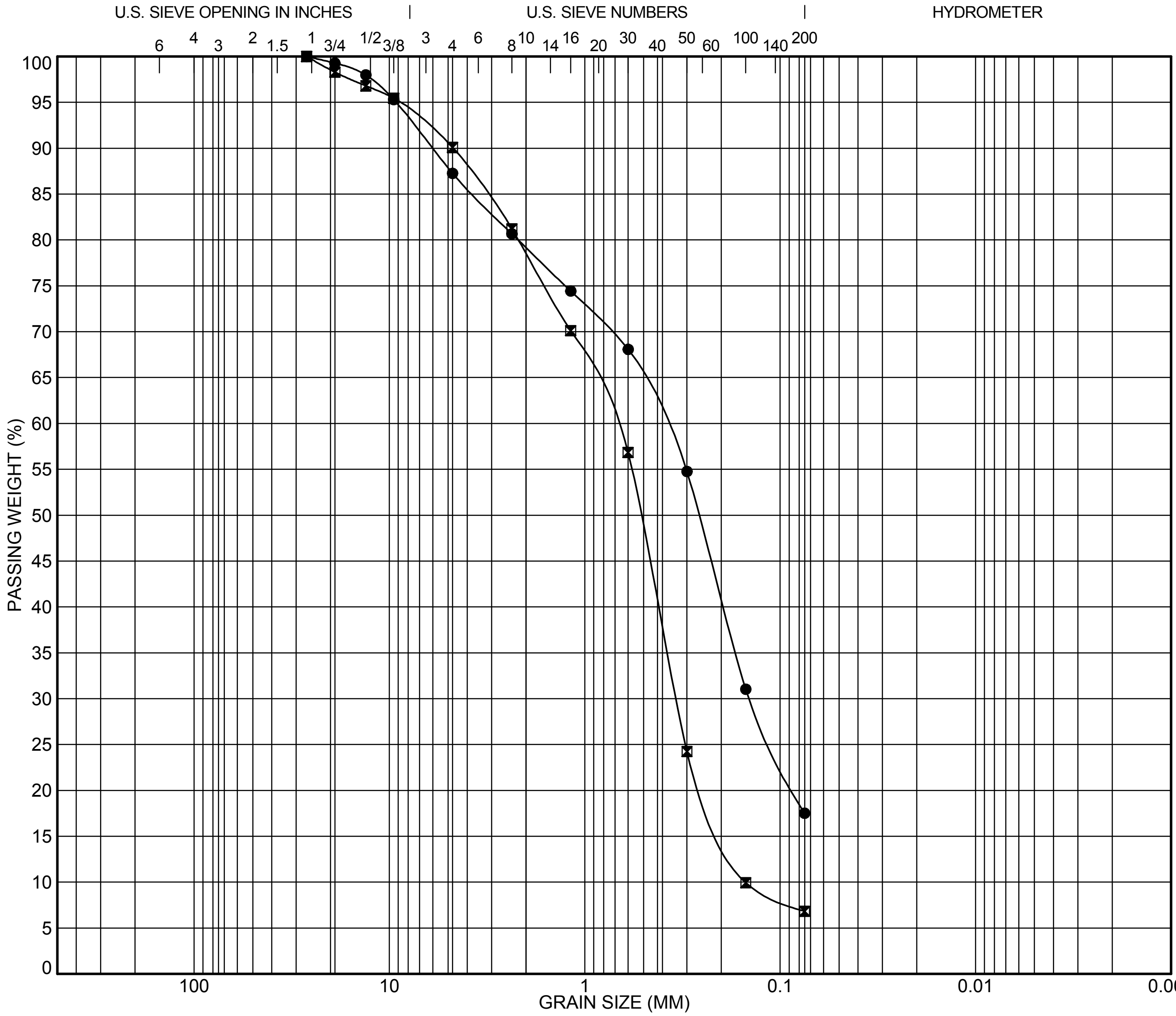
(Sample 5)

GROUNDWATER ELEVATIONS

Measurement: 1st, 2nd, 3rd, 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

FIGURES



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**BH1 SS7B 4.88**						
⊠	**BH2 SS5 3.05**					**1.08**	**4.69**

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH1 SS7B 4.88**	**26.5**	**0.394**	**0.142**		**12.7**	**69.8**	**17.5**	
⊠	**BH2 SS5 3.05**	**26.5**	**0.705**	**0.339**	**0.15**	**9.9**	**83.3**	**6.8**	

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office@geoproconsulting.ca www.geoproconsulting.ca

GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical Investigation for Proposed Residential	
LOCATION: 1234 Weston Road, Toronto,ON	
PROJECT NO.: 17-2118G	SAMPLED ON: 2017-12-07
FIGURE NO.: 1	TESTED ON: 2017-12-18

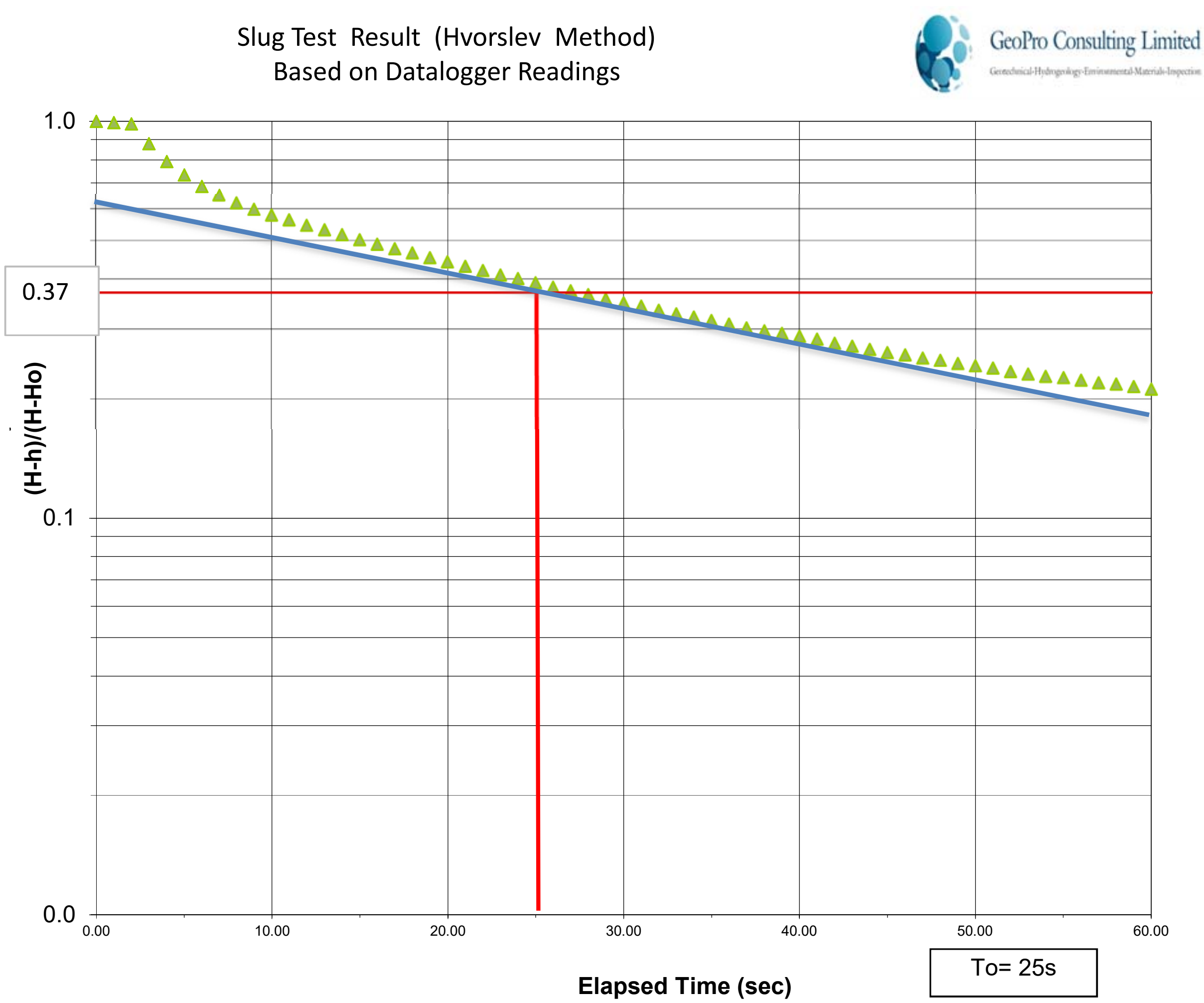
APPENDIX A

Slug Test: BH1

(Based on data from Datalogger - Falling Head Method -December 19, 2017)

Project Location: 1234 Weston Road, Toronto, Ontario

Project No. : 17-2118H		H =	Assumed Initial Water Head	
Conducted by:	Will Sun	Ho =	Water Head at time = 0	
Interpretted by:	Kaiying Qiu	h =	Water Head/Level at time t	
Well Number:	BH1			
Screen Depth (mBGS):	5.1 ~ 6.6			
Well Elevation (mASL):	122.78	L =	150	cm
Well Diameter:	2.0" ID	R =	2.55	cm
Static Water Level (mBGS):	Dry	r =	2.55	cm
Finish Reading (H)	10.086	To =	25	sec
Start Reading (h_0)	11.955	$K = r^2 \ln(L/R)/(2LTo)$ =	**3.5E-03**	cm/s



APPENDIX B

Constant Head Permeameter Test Report	Appendix C
G1	Page 1 of 3

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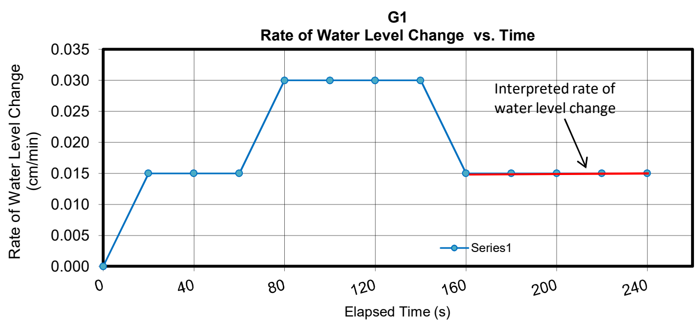
Geotechnical-Hydrogeology-Environmental-Materials-Inspection



Elapsed Time (s)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	10.0	-	-
20.0	10.1	0.1	0.01
40.0	10.2	0.1	0.01
60.0	10.3	0.1	0.02
80.0	10.5	0.2	0.03
100.0	10.7	0.2	0.03
120.0	10.9	0.2	0.03
140.0	11.1	0.2	0.03
160.0	11.2	0.1	0.01
180.0	11.3	0.1	0.02
200.0	11.4	0.1	0.01
220.0	11.5	0.1	0.01
240.0	11.6	0.1	0.01

Combined Reservoir Surface Area =	**35.22**	cm^2
Borehole Depth =	75	cm
Interpreted Rate of Water Level Change (R1) =	**2.5E-04**	**cm/s**
Steady Intake Water Rate (Q_1) =	**5.4E-04**	**cm^3/s**
hole radius (a) =	3	cm
Water column height in hole (H_1) =	5	cm

H1	**5 cm**	**water column height in borehole, first test**
a	3 cm	well radius
α	0.04	slope fitting parameter (estimated based on soil structure)
R1	**2.50E-04 cm/s**	
X	**35.22 cm^2**	**surface area for combined reservior used**
Y	2.170 cm^2	surface area for inner reservoir used
Q1=X1*R1	**0.009 cm^3/s**	**Flow rate based on combined reservoir area and average rate of infiltration**
Q1=Y1*R1	0.001 cm^3/s	Flow rate based on inner reservoir area and average rate of infiltration
	2	**Shape Factor, where:** 1: compacted, structure-less clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc 2: Soils which are both fine-textured (clayey or silty) and unstructured; may also include some fine sands 3: Structured soils from clays to loams; also incudes unstructured medium and fine sands 4: Coarse and/or gravelly sands; may also include some highly structured soils with large/numerous
C1	**0.84205855**	**Shape factor coefficient**

K_{fs} = 7.67E-06 cm/s

= 4.60E-04 cm/min

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $K_{fs} = G_2 Q_2 - G_1 Q_1$ $G_3 = \frac{(2H_2^2 + a^2 C_2) C_1}{2\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $G_4 = \frac{(2H_1^2 + a^2 C_1) C_2}{2\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $\Phi_m = G_3 Q_1 - G_4 Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

DATE:	2017/12/19	prepared by:	KY
PROJECT:	17-2118H	checked by:	BG

Constant Head Permeameter Test Report

G2

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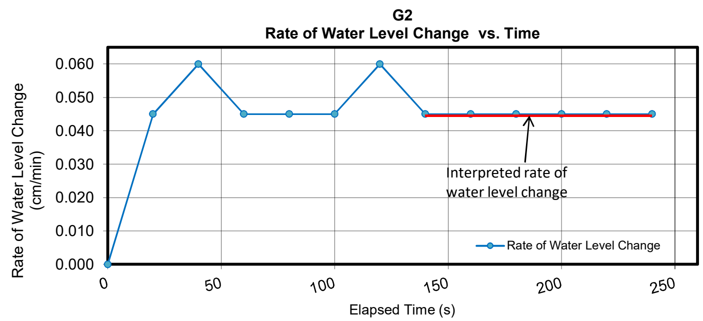
Geotechnical-Hydrogeology-Environmental-Materials-Inspection



Elapsed Time (s)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	22.0	-	-
20.0	22.3	0.3	0.05
40.0	22.7	0.4	0.06
60.0	23.0	0.3	0.05
80.0	23.3	0.3	0.05
100.0	23.6	0.3	0.05
120.0	24.0	0.4	0.06
140.0	24.3	0.3	0.05
160.0	24.6	0.3	0.05
180.0	24.9	0.3	0.04
200.0	25.2	0.3	0.05
220.0	25.5	0.3	0.05
240.0	25.8	0.3	0.05

Combined Reservoir Surface Area =	**35.22**	cm^2
Borehole Depth =	75	cm
Interpreted Rate of Water Level Change (R1) =	**7.5E-04**	**cm/s**
Steady Intake Water Rate (Q_1) =	**1.6E-03**	**cm^3/s**
hole radius (a) =	3	cm
Water column height in hole (H_1) =	10	cm

H1	**10 cm**	**water column height in borehole, first test**
a	3 cm	well radius
α	0.04	slope fitting parameter (estimated based on soil structure)
R1	**7.50E-04 cm/s**	
X	**35.22 cm^2**	**surface area for combined reservoir used**
Y	2.170 cm^2	surface area for inner reservoir used
Q1=X1*R1	**0.026 cm^3/s**	**Flow rate based on combined reservoir area and average rate of infiltration**
Q1=Y1*R1	0.002 cm^3/s	Flow rate based on inner reservoir area and average rate of infiltration
	2	**Shape Factor, where:** 1: compacted, structure-less clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc 2: Soils which are both fine-textured (clayey or silty) and unstructured; may also include some fine sands 3: Structured soils from clays to loams; also incudes unstructured medium and fine sands 4: Coarse and/or gravelly sands; may also include some highly structured soils with large/numerous
C1	**1.29023413**	**Shape factor coefficient**

K_{fs} = 1.52E-05 cm/s

= 9.15E-04 cm/min

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

DATE:	2017/12/19	prepared by:	KY
PROJECT:	17-2118H	checked by:	BG

Constant Head Permeameter Test Report	Appendix C
G3	Page 3 of 3

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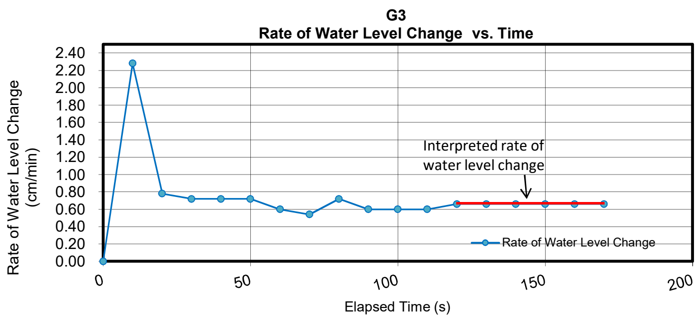
Geotechnical-Hydrogeology-Environmental-Materials-Inspection



Elapsed Time (s)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	34.0	-	-
10.0	37.8	3.8	2.28
20.0	39.1	1.3	0.78
30.0	40.3	1.2	0.72
40.0	41.5	1.2	0.72
50.0	42.7	1.2	0.72
60.0	43.7	1.0	0.60
70.0	44.6	0.9	0.54
80.0	45.8	1.2	0.72
90.0	46.8	1.0	0.60
100.0	47.8	1.0	0.60
110.0	48.8	1.0	0.60
120.0	49.9	1.1	0.66
130.0	51.0	1.1	0.66
140.0	52.1	1.1	0.66
150.0	53.2	1.1	0.66
160.0	54.3	1.1	0.66
170.0	55.4	1.1	0.66

Combined Reservoir Surface Area =	**35.22**	cm^2
Borehole Depth =	95	cm
Interpreted Rate of Water Level Change (R1) =	**1.1E-02**	**cm/s**
Steady Intake Water Rate (Q_1) =	**2.4E-02**	**cm^3/s**
hole radius (a) =	3	cm
Water column height in hole (H_1) =	2	cm

H1	**2 cm**	**water column height in borehole, first test**
a	3 cm	well radius
α	0.04	slope fitting parameter (estimated based on soil structure)
R1	**1.10E-02 cm/s**	
X	**35.22 cm^2**	**surface area for combined reservior used**
Y	2.170 cm^2	surface area for inner reservoir used
Q1=X1*R1	**0.387 cm^3/s**	**Flow rate based on combined reservoir area and average rate of infiltration**
Q1=Y1*R1	0.024 cm^3/s	Flow rate based on inner reservoir area and average rate of infiltration
	2	**Shape Factor, where:** 1: compacted, structure-less clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc 2: Soils which are both fine-textured (clayey or silty) and unstructured; may also include some fine sands 3: Structured soils from clays to loams; also incudes unstructured medium and fine sands 4: Coarse and/or gravelly sands; may also include some highly structured soils with large/numerous
C1	**0.46389125**	**Shape factor coefficient**

K_{fs} = 5.10E-04 cm/s

= 3.06E-02 cm/min

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

DATE:	2017/12/19	prepared by:	KY
PROJECT:	17-2118H	checked by:	BG

APPENDIX C

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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CLIENT NAME: GEOPRO CONSULTING LTD
UNIT 57, 40 VOGELL ROAD
RICHMOND HILL, ON L4B3N6
(905) 237-8336

ATTENTION TO: Bujing Guan

PROJECT: 17-2118G

AGAT WORK ORDER: 17T295914

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Dec 22, 2017

PAGES (INCLUDING COVER): 15

VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

VERSION 2: Revised report with requested sample ID change - issued on January 16, 2018.

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 17T295914
PROJECT: 17-2118G

CLIENT NAME: GEOPRO CONSULTING LTD
SAMPLING SITE:

ATTENTION TO: Bujing Guan
SAMPLED BY:Jim Wei

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-12-15

DATE REPORTED: 2017-12-22

			SAMPLE DESCRIPTION:	BH1 SS2B	BH2 SS1B
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2017-12-07	2017-12-07
Parameter	Unit	G / S	RDL	8981533	8981535
Antimony	µg/g	1.3	0.8	0.9	<0.8
Arsenic	µg/g	18	1	55	4
Barium	µg/g	220	2	130	48
Beryllium	µg/g	2.5	0.5	0.8	<0.5
Boron	µg/g	36	5	5	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.93	0.35
Cadmium	µg/g	1.2	0.5	4.6	<0.5
Chromium	µg/g	70	2	14	27
Cobalt	µg/g	21	0.5	8.8	5.2
Copper	µg/g	92	1	105	20
Lead	µg/g	120	1	238	62
Molybdenum	µg/g	2	0.5	5.2	<0.5
Nickel	µg/g	82	1	18	14
Selenium	µg/g	1.5	0.4	2.3	0.5
Silver	µg/g	0.5	0.2	0.4	0.5
Thallium	µg/g	1	0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.6	<0.5
Vanadium	µg/g	86	1	39	18
Zinc	µg/g	290	5	1610	77
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.402	0.142
Sodium Adsorption Ratio	NA	2.4	NA	7.15	0.102
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.45	7.43

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8981533-8981535 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

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AGAT WORK ORDER: 17T295914
PROJECT: 17-2118G

CLIENT NAME: GEOPRO CONSULTING LTD
ATTENTION TO: Bujing Guan
SAMPLING SITE:
SAMPLED BY:Jim Wei

O. Reg. 153(511) - PAHs (Soil)

DATE RECEIVED: 2017-12-15
DATE REPORTED: 2017-12-22

			SAMPLE DESCRIPTION:	BH1 SS3 – SS6
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8981537
Naphthalene	µg/g	0.09	0.05	<0.05
Acenaphthylene	µg/g	0.093	0.05	0.30
Acenaphthene	µg/g	0.072	0.05	<0.05
Fluorene	µg/g	0.12	0.05	<0.05
Phenanthrene	µg/g	0.69	0.05	0.23
Anthracene	µg/g	0.16	0.05	0.17
Fluoranthene	µg/g	0.56	0.05	1.1
Pyrene	µg/g	1	0.05	1.2
Benz(a)anthracene	µg/g	0.36	0.05	1.1
Chrysene	µg/g	2.8	0.05	1.2
Benzo(b)fluoranthene	µg/g	0.47	0.05	2.0
Benzo(k)fluoranthene	µg/g	0.48	0.05	0.59
Benzo(a)pyrene	µg/g	0.3	0.05	1.2
Indeno(1,2,3-cd)pyrene	µg/g	0.23	0.05	0.70
Dibenz(a,h)anthracene	µg/g	0.1	0.05	0.17
Benzo(g,h,i)perylene	µg/g	0.68	0.05	0.97
2-and 1-methyl Naphthalene	µg/g	0.59	0.05	<0.05
Moisture Content	%		0.1	15.6
Surrogate	Unit	Acceptable Limits		
Chrysene-d12	%	50-140		79

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8981537 Results are based on the dry weight of the soil.
Note: The result for Benzo(b)Fluoranthene is the total of the Benzo(b)&(j)Fluoranthene isomers because the isomers co-elute on the GC column.

Certified By:

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AGAT WORK ORDER: 17T295914

PROJECT: 17-2118G

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:Jim Wei

O. Reg. 153(511) - PCBs (Soil)

DATE RECEIVED: 2017-12-15

DATE REPORTED: 2017-12-22

			SAMPLE DESCRIPTION:	BH1 SS3 – SS6
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8981537
Polychlorinated Biphenyls	µg/g	0.3	0.1	<0.1
Surrogate	Unit	Acceptable Limits		
Decachlorobiphenyl	%	60-140		107

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8981537 Results are based on the dry weight of soil extracted.

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Certificate of Analysis

AGAT WORK ORDER: 17T295914
PROJECT: 17-2118G

CLIENT NAME: GEOPRO CONSULTING LTD
SAMPLING SITE:

ATTENTION TO: Bujing Guan
SAMPLED BY:Jim Wei

O. Reg. 153(511) - PHCs F1 - F4 (with PAHs) (Soil)

DATE RECEIVED: 2017-12-15

DATE REPORTED: 2017-12-22

			SAMPLE DESCRIPTION:	BH1 SS3 – SS6
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8981537
F1 (C6 to C10)	µg/g	25	5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5
F2 (C10 to C16)	µg/g	10	10	<10
F2 (C10 to C16) minus Naphthalene	µg/g		10	<10
F3 (C16 to C34)	µg/g	240	50	110
F3 (C16 to C34) minus PAHs	µg/g		50	100
F4 (C34 to C50)	µg/g	120	50	<50
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA
Moisture Content	%		0.1	15.6
Surrogate	Unit	Acceptable Limits		
Terphenyl	%	60-140		94

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8981537 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX and PAH contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

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AGAT WORK ORDER: 17T295914

PROJECT: 17-2118G

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:Jim Wei

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2017-12-15

DATE REPORTED: 2017-12-22

			SAMPLE DESCRIPTION:	BH1 SS3 – SS6
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8981537
Dichlorodifluoromethane	µg/g	0.05	0.05	<0.05
Vinyl Chloride	ug/g	0.02	0.02	<0.02
Bromomethane	ug/g	0.05	0.05	<0.05
Trichlorofluoromethane	ug/g	0.25	0.05	<0.05
Acetone	ug/g	0.5	0.50	<0.50
1,1-Dichloroethylene	ug/g	0.05	0.05	<0.05
Methylene Chloride	ug/g	0.05	0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g	0.05	0.05	<0.05
Methyl tert-butyl Ether	ug/g	0.05	0.05	<0.05
1,1-Dichloroethane	ug/g	0.05	0.02	<0.02
Methyl Ethyl Ketone	ug/g	0.5	0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g	0.05	0.02	<0.02
Chloroform	ug/g	0.05	0.04	<0.04
1,2-Dichloroethane	ug/g	0.05	0.03	<0.03
1,1,1-Trichloroethane	ug/g	0.05	0.05	<0.05
Carbon Tetrachloride	ug/g	0.05	0.05	<0.05
Benzene	ug/g	0.02	0.02	<0.02
1,2-Dichloropropane	ug/g	0.05	0.03	<0.03
Trichloroethylene	ug/g	0.05	0.03	<0.03
Bromodichloromethane	ug/g	0.05	0.05	<0.05
Methyl Isobutyl Ketone	ug/g	0.5	0.50	<0.50
1,1,2-Trichloroethane	ug/g	0.05	0.04	<0.04
Toluene	ug/g	0.2	0.02	<0.02
Dibromochloromethane	ug/g	0.05	0.05	<0.05
Ethylene Dibromide	ug/g	0.05	0.04	<0.04
Tetrachloroethylene	ug/g	0.05	0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.05	0.04	<0.04
Chlorobenzene	ug/g	0.05	0.05	<0.05
Ethylbenzene	ug/g	0.05	0.05	<0.05
m & p-Xylene	ug/g		0.05	<0.05

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 17T295914
PROJECT: 17-2118G

CLIENT NAME: GEOPRO CONSULTING LTD
SAMPLING SITE:

ATTENTION TO: Bujing Guan
SAMPLED BY:Jim Wei

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2017-12-15

DATE REPORTED: 2017-12-22

			SAMPLE DESCRIPTION:	BH1 SS3 – SS6
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8981537
Bromoform	ug/g	0.05	0.05	<0.05
Styrene	ug/g	0.05	0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	<0.05
o-Xylene	ug/g		0.05	<0.05
1,3-Dichlorobenzene	ug/g	0.05	0.05	<0.05
1,4-Dichlorobenzene	ug/g	0.05	0.05	<0.05
1,2-Dichlorobenzene	ug/g	0.05	0.05	<0.05
Xylene Mixture	ug/g	0.05	0.05	<0.05
1,3-Dichloropropene	µg/g	0.05	0.04	<0.04
n-Hexane	µg/g	0.05	0.05	<0.05
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		94
4-Bromofluorobenzene	% Recovery	50-140		83

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8981537 The sample was analysed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.

Certified By:

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CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Arsenic	µg/g	18	55
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Cadmium	µg/g	1.2	4.6
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Copper	µg/g	92	105
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Lead	µg/g	120	238
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Molybdenum	µg/g	2	5.2
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Selenium	µg/g	1.5	2.3
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	2.4	7.15
8981533	BH1 SS2B	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Zinc	µg/g	290	1610
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Acenaphthylene	µg/g	0.093	0.30
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Anthracene	µg/g	0.16	0.17
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Benz(a)anthracene	µg/g	0.36	1.1
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Benzo(a)pyrene	µg/g	0.3	1.2
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Benzo(b)fluoranthene	µg/g	0.47	2.0
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Benzo(g,h,i)perylene	µg/g	0.68	0.97
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Benzo(k)fluoranthene	µg/g	0.48	0.59
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Dibenz(a,h)anthracene	µg/g	0.1	0.17
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Fluoranthene	µg/g	0.56	1.1
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Indeno(1,2,3-cd)pyrene	µg/g	0.23	0.70
8981537	BH1 SS3 – SS6	ON T1 S RPI/ICC	O. Reg. 153(511) - PAHs (Soil)	Pyrene	µg/g	1	1.2

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD　　AGAT WORK ORDER: 17T295914

PROJECT: 17-2118G　　ATTENTION TO: Bujing Guan

SAMPLING SITE:　　SAMPLED BY:Jim Wei

Soil Analysis

RPT Date: Dec 22, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8981535	8981535	<0.8	<0.8	NA	< 0.8	78%	70%	130%	97%	80%	120%	74%	70%	130%
Arsenic	8981535	8981535	4	5	NA	< 1	115%	70%	130%	101%	80%	120%	108%	70%	130%
Barium	8981535	8981535	48	49	2.1%	< 2	101%	70%	130%	102%	80%	120%	95%	70%	130%
Beryllium	8981535	8981535	<0.5	<0.5	NA	< 0.5	114%	70%	130%	108%	80%	120%	109%	70%	130%
Boron	8981535	8981535	<5	<5	NA	< 5	78%	70%	130%	101%	80%	120%	91%	70%	130%
Boron (Hot Water Soluble)	8981535	8981535	0.35	0.34	NA	< 0.10	114%	60%	140%	102%	70%	130%	102%	60%	140%
Cadmium	8981535	8981535	<0.5	0.5	NA	< 0.5	93%	70%	130%	104%	80%	120%	108%	70%	130%
Chromium	8981535	8981535	27	29	7.1%	< 2	103%	70%	130%	106%	80%	120%	110%	70%	130%
Cobalt	8981535	8981535	5.2	5.4	3.8%	< 0.5	111%	70%	130%	104%	80%	120%	109%	70%	130%
Copper	8981535	8981535	20	21	4.9%	< 1	105%	70%	130%	107%	80%	120%	107%	70%	130%
Lead	8981535	8981535	62	63	1.6%	< 1	108%	70%	130%	105%	80%	120%	106%	70%	130%
Molybdenum	8981535	8981535	<0.5	<0.5	NA	< 0.5	104%	70%	130%	103%	80%	120%	109%	70%	130%
Nickel	8981535	8981535	14	14	0.0%	< 1	108%	70%	130%	104%	80%	120%	107%	70%	130%
Selenium	8981535	8981535	0.5	0.5	NA	< 0.4	122%	70%	130%	99%	80%	120%	106%	70%	130%
Silver	8981535	8981535	0.5	0.5	NA	< 0.2	100%	70%	130%	108%	80%	120%	106%	70%	130%
Thallium	8981535	8981535	<0.4	<0.4	NA	< 0.4	94%	70%	130%	99%	80%	120%	98%	70%	130%
Uranium	8981535	8981535	<0.5	<0.5	NA	< 0.5	113%	70%	130%	106%	80%	120%	109%	70%	130%
Vanadium	8981535	8981535	18	19	5.4%	< 1	108%	70%	130%	105%	80%	120%	111%	70%	130%
Zinc	8981535	8981535	77	80	3.8%	< 5	107%	70%	130%	109%	80%	120%	119%	70%	130%
Chromium VI	8981123		<0.2	<0.2	NA	< 0.2	81%	70%	130%	100%	80%	120%	106%	70%	130%
Cyanide	8976458		<0.040	<0.040	NA	< 0.040	93%	70%	130%	92%	80%	120%	91%	70%	130%
Mercury	8981535	8981535	<0.10	<0.10	NA	< 0.10	97%	70%	130%	100%	80%	120%	104%	70%	130%
Electrical Conductivity	8981535	8981535	0.142	0.145	2.1%	< 0.005	99%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8981535	8981535	0.102	0.098	4.0%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8976458		7.48	7.53	0.7%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD
PROJECT: 17-2118G
SAMPLING SITE:

AGAT WORK ORDER: 17T295914
ATTENTION TO: Bujing Guan
SAMPLED BY:Jim Wei

Trace Organics Analysis

RPT Date: Dec 22, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	8977497		< 0.05	< 0.05	NA	< 0.05	86%	50%	140%	104%	50%	140%	71%	50%	140%
Vinyl Chloride	8977497		< 0.02	< 0.02	NA	< 0.02	105%	50%	140%	88%	50%	140%	124%	50%	140%
Bromomethane	8977497		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	96%	50%	140%	115%	50%	140%
Trichlorofluoromethane	8977497		< 0.05	< 0.05	NA	< 0.05	104%	50%	140%	100%	50%	140%	125%	50%	140%
Acetone	8977497		< 0.50	< 0.50	NA	< 0.50	94%	50%	140%	93%	50%	140%	106%	50%	140%
1,1-Dichloroethylene	8977497		< 0.05	< 0.05	NA	< 0.05	83%	50%	140%	103%	60%	130%	89%	50%	140%
Methylene Chloride	8977497		< 0.05	< 0.05	NA	< 0.05	83%	50%	140%	106%	60%	130%	96%	50%	140%
Trans- 1,2-Dichloroethylene	8977497		< 0.05	< 0.05	NA	< 0.05	78%	50%	140%	107%	60%	130%	109%	50%	140%
Methyl tert-butyl Ether	8977497		< 0.05	< 0.05	NA	< 0.05	70%	50%	140%	99%	60%	130%	116%	50%	140%
1,1-Dichloroethane	8977497		< 0.02	< 0.02	NA	< 0.02	91%	50%	140%	112%	60%	130%	119%	50%	140%
Methyl Ethyl Ketone	8977497		< 0.50	< 0.50	NA	< 0.50	110%	50%	140%	106%	50%	140%	113%	50%	140%
Cis- 1,2-Dichloroethylene	8977497		< 0.02	< 0.02	NA	< 0.02	73%	50%	140%	112%	60%	130%	108%	50%	140%
Chloroform	8977497		< 0.04	< 0.04	NA	< 0.04	89%	50%	140%	82%	60%	130%	101%	50%	140%
1,2-Dichloroethane	8977497		< 0.03	< 0.03	NA	< 0.03	98%	50%	140%	90%	60%	130%	109%	50%	140%
1,1,1-Trichloroethane	8977497		< 0.05	< 0.05	NA	< 0.05	73%	50%	140%	113%	60%	130%	104%	50%	140%
Carbon Tetrachloride	8977497		< 0.05	< 0.05	NA	< 0.05	77%	50%	140%	110%	60%	130%	98%	50%	140%
Benzene	8977497		< 0.02	< 0.02	NA	< 0.02	71%	50%	140%	83%	60%	130%	81%	50%	140%
1,2-Dichloropropane	8977497		< 0.03	< 0.03	NA	< 0.03	75%	50%	140%	95%	60%	130%	92%	50%	140%
Trichloroethylene	8977497		< 0.03	< 0.03	NA	< 0.03	74%	50%	140%	91%	60%	130%	86%	50%	140%
Bromodichloromethane	8977497		< 0.05	< 0.05	NA	< 0.05	88%	50%	140%	111%	60%	130%	106%	50%	140%
Methyl Isobutyl Ketone	8977497		< 0.50	< 0.50	NA	< 0.50	96%	50%	140%	106%	50%	140%	104%	50%	140%
1,1,2-Trichloroethane	8977497		< 0.04	< 0.04	NA	< 0.04	120%	50%	140%	118%	60%	130%	114%	50%	140%
Toluene	8977497		< 0.02	< 0.02	NA	< 0.02	90%	50%	140%	102%	60%	130%	104%	50%	140%
Dibromochloromethane	8977497		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	112%	60%	130%	115%	50%	140%
Ethylene Dibromide	8977497		< 0.04	< 0.04	NA	< 0.04	111%	50%	140%	113%	60%	130%	115%	50%	140%
Tetrachloroethylene	8977497		< 0.05	< 0.05	NA	< 0.05	71%	50%	140%	100%	60%	130%	99%	50%	140%
1,1,1,2-Tetrachloroethane	8977497		< 0.04	< 0.04	NA	< 0.04	97%	50%	140%	107%	60%	130%	106%	50%	140%
Chlorobenzene	8977497		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	99%	60%	130%	96%	50%	140%
Ethylbenzene	8977497		< 0.05	< 0.05	NA	< 0.05	96%	50%	140%	95%	60%	130%	92%	50%	140%
m & p-Xylene	8977497		< 0.05	< 0.05	NA	< 0.05	78%	50%	140%	109%	60%	130%	105%	50%	140%
Bromoform	8977497		< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	117%	60%	130%	112%	50%	140%
Styrene	8977497		< 0.05	< 0.05	NA	< 0.05	71%	50%	140%	88%	60%	130%	78%	50%	140%
1,1,2,2-Tetrachloroethane	8977497		< 0.05	< 0.05	NA	< 0.05	104%	50%	140%	98%	60%	130%	115%	50%	140%
o-Xylene	8977497		< 0.05	< 0.05	NA	< 0.05	79%	50%	140%	112%	60%	130%	107%	50%	140%
1,3-Dichlorobenzene	8977497		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	94%	60%	130%	88%	50%	140%
1,4-Dichlorobenzene	8977497		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	118%	60%	130%	106%	50%	140%
1,2-Dichlorobenzene	8977497		< 0.05	< 0.05	NA	< 0.05	87%	50%	140%	104%	60%	130%	95%	50%	140%
1,3-Dichloropropene	8977497		< 0.04	< 0.04	NA	< 0.04	114%	50%	140%	79%	60%	130%	80%	50%	140%
n-Hexane	8977497		< 0.05	< 0.05	NA	< 0.05	111%	50%	140%	106%	60%	130%	108%	50%	140%

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD
PROJECT: 17-2118G
SAMPLING SITE:

AGAT WORK ORDER: 17T295914
ATTENTION TO: Bujing Guan
SAMPLED BY:Jim Wei

Trace Organics Analysis (Continued)

RPT Date: Dec 22, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
O. Reg. 153(511) - PHCs F1 - F4 (with PAHs) (Soil)															
F1 (C6 to C10)	8981537	8981537	< 5	< 5	NA	< 5	77%	60%	130%	86%	85%	115%	76%	70%	130%
F2 (C10 to C16)	8979065		< 10	< 10	NA	< 10	95%	60%	130%	106%	80%	120%	77%	70%	130%
F3 (C16 to C34)	8979065		< 50	< 50	NA	< 50	96%	60%	130%	104%	80%	120%	96%	70%	130%
F4 (C34 to C50)	8979065		< 50	< 50	NA	< 50	92%	60%	130%	88%	80%	120%	98%	70%	130%
O. Reg. 153(511) - PAHs (Soil)															
Naphthalene	8980034		< 0.05	< 0.05	NA	< 0.05	89%	50%	140%	75%	50%	140%	97%	50%	140%
Acenaphthylene	8980034		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	77%	50%	140%	99%	50%	140%
Acenaphthene	8980034		< 0.05	< 0.05	NA	< 0.05	96%	50%	140%	74%	50%	140%	97%	50%	140%
Fluorene	8980034		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	79%	50%	140%	99%	50%	140%
Phenanthrene	8980034		< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	84%	50%	140%	99%	50%	140%
Anthracene	8980034		< 0.05	< 0.05	NA	< 0.05	108%	50%	140%	90%	50%	140%	90%	50%	140%
Fluoranthene	8980034		< 0.05	< 0.05	NA	< 0.05	98%	50%	140%	82%	50%	140%	97%	50%	140%
Pyrene	8980034		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	83%	50%	140%	97%	50%	140%
Benz(a)anthracene	8980034		< 0.05	< 0.05	NA	< 0.05	89%	50%	140%	81%	50%	140%	112%	50%	140%
Chrysene	8980034		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	96%	50%	140%	97%	50%	140%
Benzo(b)fluoranthene	8980034		< 0.05	< 0.05	NA	< 0.05	120%	50%	140%	87%	50%	140%	114%	50%	140%
Benzo(k)fluoranthene	8980034		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	103%	50%	140%	105%	50%	140%
Benzo(a)pyrene	8980034		< 0.05	< 0.05	NA	< 0.05	112%	50%	140%	95%	50%	140%	108%	50%	140%
Indeno(1,2,3-cd)pyrene	8980034		< 0.05	< 0.05	NA	< 0.05	103%	50%	140%	91%	50%	140%	100%	50%	140%
Dibenz(a,h)anthracene	8980034		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	90%	50%	140%	109%	50%	140%
Benzo(g,h,i)perylene	8980034		< 0.05	< 0.05	NA	< 0.05	105%	50%	140%	87%	50%	140%	104%	50%	140%
2-and 1-methyl Naphthalene	8980034		< 0.05	< 0.05	NA	< 0.05	106%	50%	140%	82%	50%	140%	106%	50%	140%
O. Reg. 153(511) - PCBs (Soil)															
Polychlorinated Biphenyls	8986193		< 0.1	< 0.1	NA	< 0.1	108%	60%	140%	102%	60%	140%	101%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

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Method Summary

CLIENT NAME: GEOPRO CONSULTING LTD
PROJECT: 17-2118G
SAMPLING SITE:

AGAT WORK ORDER: 17T295914
ATTENTION TO: Bujing Guan
SAMPLED BY:Jim Wei

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

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Method Summary

CLIENT NAME: GEOPRO CONSULTING LTD
AGAT WORK ORDER: 17T295914
PROJECT: 17-2118G
ATTENTION TO: Bujing Guan
SAMPLING SITE:
SAMPLED BY:Jim Wei

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluorene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Phenanthrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benz(a)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Chrysene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(b)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(k)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(a)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Indeno(1,2,3-cd)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Dibenz(a,h)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(g,h,i)perylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
2-and 1-methyl Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Moisture Content	ORG-91-5106	EPA SW-846 3541 & 8270	BALANCE
Chrysene-d12	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Polychlorinated Biphenyls	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	GC / FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F2 (C10 to C16) minus Naphthalene	VOL-91-5009	CCME Tier 1 Method	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F3 (C16 to C34) minus PAHs	VOL-91-5009	CCME Tier 1 Method	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID
Dichlorodifluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromomethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Acetone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chloroform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Benzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS

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Method Summary

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
o-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
n-Hexane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS

AGAT Laboratories

1 Bag SR3

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 17T295914

Cooler Quantity:

Arrival Temperatures: 2.9 | 2.9 | 2.7 ; 2.6 | 2.8 | 2.7

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: GeoPro Consulting Limited
Contact: Bujing Guan
Address: Unit 57, 40 Vogell Road, Richmond Hill, ON
Phone: 905-237-8336 Fax: 905-248-3699
Reports to be sent to:
1. Email: bguan@geoproconsulting.ca
2. Email: dylanx@geoproconsulting.ca

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☒ Regulation 153/04
Table 1 (Indicate One)
☐Ind/Com
☐Res/Park
☐Agriculture
Soil Texture (Check One)
☐Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region ____ (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
____ (Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on Certificate of Analysis ☒ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 17-2118G
Site Location: York
Sampled By: Jim Wei
AGAT Quote #: Geo Pro PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☒ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use						
BH1 SS2B	Dec. 7/2017	AM	1	S			X																			
BH2 SS1B	Dec. 7/2017	AM	1	S			X																			
BH SS3 - SS6	Dec. 7/2017	AM	3	S									X	X		X	X									

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Dylan Xiao	15/12/2017		[signature]	12/15/17	12:30
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign): [signature]	12/15/17	5:10	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

Nº: T 059330

LIMITATIONS TO THE REPORT

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. The boundaries between the various strata as shown on the borehole logs are based on non-continuous sampling and represent an inferred transition between the various strata and their lateral continuation rather than a precise plane of geological change. Subsurface and groundwater conditions between and beyond the test holes and test pits may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report. Otherwise, our responsibility is limited to interpreting the subsurface information at the borehole or test pit locations.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GeoPro Consulting Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

Environmental Site Assessment Report

CITY OF TORONTO

SUPPLEMENTAL PHASE II ENVIRONMENTAL SITE ASSESSMENT

1230 AND 1234 WESTON ROAD

NOVEMBER 2018

wsp

SUPPLEMENTAL PHASE II ENVIRONMENTAL SITE ASSESSMENT

1230 AND 1234 WESTON ROAD

CITY OF TORONTO

PROJECT NO.: 15M-00656-01
DATE: NOVEMBER 2018

WSP
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON, CANADA L3T 0A1

TEL.: +1 905 882-1100
FAX: +1 905 882-0055
WSP.COM

November 9, 2018

City of Toronto, Facilities Management
Metro Hall, 2nd Floor
55 John Street
Toronto, Ontario MV5 3C8

Attention: Janice Green, Senior Environmental Project Manager

Dear Ms. Green:

Subject: Supplemental Phase II Environmental Site Assessment for 1230 and 1234 Weston Road, Toronto, Ontario

---

WSP is pleased to present the Supplemental Phase II Environmental Site Assessment report for the Subject Property located at 1230 and 1234 Weston Road in Toronto, Ontario. The report was originally issued in September 2017 and has been updated to support a divisional transfer from Real Estate to Transportation Services of a 2.83 road widening along Weston Road.

Thank you for the opportunity to provide our services to the City of Toronto. If you have any questions, please contact the undersigned.

Yours sincerely,

WSP CANADA GROUP LIMITED

Chris Roach

Chris Roach, P. Eng., QP_{ESA}
Senior Project Manager
Environmental Management

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EXECUTIVE SUMMARY

WSP Canada Group Ltd. (WSP) was retained by the City of Toronto to conduct a Supplemental Phase II Environmental Site Assessment (ESA) for 1230 and 1234 Weston Road in Toronto, Ontario (the "Subject Property").

We understand that the City of Toronto is considering the purchase of the Subject Property and proposes to redevelop the Subject Property as a day care facility. As the Subject Property will not be changing to a more stringent land use, the filing of a Record of Site Condition (RSC), as regulated by Ontario Regulation (O. Reg.) 153/04 made under the Environmental Protection Act, is not mandatory. Therefore, the Phase II ESA was conducted for environmental due-diligence purposes in general accordance with the Canadian Standards Association (CSA) Z769-00 (R2013), which is the accepted industry standards in the absence of a mandatory RSC.

A Phase II ESA was completed by Coffey Geotechnics Inc. (Coffey) in August 2013. The results of chemical analyses from the Phase II ESA identified three soil samples within 5 m of a municipal road allowance with an elevated value of sodium adsorption ratio (SAR) in soil exceeding the applicable Ontario Ministry of the Environment, Conservation and Parks (MECP) Table 3 Residential/Parkland/Institutional site condition standards for coarse-textured soil in a non-potable groundwater condition (the "Table 3 SCS") and trichloroethylene (TCE) in groundwater at a concentration exceeding the Table 3 SCS in one of three monitoring wells, located near the northern property boundary. It is concluded by WSP that the SAR in soil was likely related to the use of de-icing salts on the adjacent municipal road allowance (Weston Road) and, therefore, SAR is not considered to a contaminant in accordance with Section 48(3) of O. Reg. 153/04. The presence of the elevated TCE concentration in groundwater was likely related to former off-site dry cleaning operations or automobile service stations.

The purpose of the Supplemental Phase II ESA was to further characterize volatile organic compounds (VOCs) in groundwater. The ESA consisted of the completion of five boreholes, four of which were to a depth of approximately 15.2 m below ground surface (mbgs) and one of which was advanced to 25.9 mbgs. All boreholes were completed as monitoring wells. Soil samples were screened from each borehole, and one worst case sample from each borehole was submitted for VOC analysis. A groundwater sample from each well was also submitted for VOC analysis. Due to the proposed redevelopment of the Subject Property as a day care facility, the applicable soil and groundwater standards selected for evaluating the subsurface conditions are the Table 3 SCS.

The results of the Supplemental Phase II ESA identified the following:

- No VOC parameters in soil exceeded the applicable Table 3 SCS.
- Elevated concentrations of VOCs (1,1-dichloroethylene and trichloroethylene) in groundwater were identified in two monitoring well locations, MW101 screened at a depth of 22.1 to 25.1 mbgs and MW104 screened at a depth of 10.7 to 13.7 mbgs.

Based on the findings of the Phase II ESA, the following recommendations are made:

- Prior to redevelopment of the Subject Property as a day care facility, a due-diligence Risk Assessment and Risk Management Plan that considers the use of risk management measures to allow impacted groundwater to be managed in place should be undertaken; and
  - The monitoring wells on the Subject Property should be decommissioned as per O. Reg. 903 under the Ontario Water Resources Act.

1 INTRODUCTION

1.1 BACKGROUND

WSP Canada Group Limited (WSP) was retained by the City of Toronto (the "City") to conduct a Supplemental Phase II Environmental Site Assessment (ESA) for 1230 and 1234 Weston Road in Toronto, Ontario (the "Subject Property"). The Subject Property is currently vacant and was previously in operation as a day care centre (Photograph 1). The location of the Subject Property is shown in Figure 1.

We understand that the City is considering the purchase of the Subject Property and proposes to redevelop the Subject Property as a new day care facility. As the Subject Property will not be changing to a more stringent land use, the filing of a Record of Site Condition (RSC), as regulated by Ontario Regulation (O. Reg.) 153/04 made under the *Environmental Protection Act*, is not mandatory. Therefore, the Phase II ESA was conducted for environmental due-diligence purposes in general accordance with the Canadian Standards Association (CSA) Z769-00 (R2013), which is the accepted industry standards in the absence of a mandatory RSC.

1.2 SUBJECT PROPERTY DESCRIPTION

The Subject Property is approximately 1750 m^2 and is located at the southwest corner of Weston Road and Glen Valley Drive in Toronto, Ontario. It consists of two contiguous parcels of land with municipal addresses of 1230 and 1234 Weston Road. The NAD 83 Zone 17 UTM coordinates of the centroid of the Subject Property are approximately 621447 E, 4838319 N. A site plan is shown in Figure 2.

1.3 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

WSP reviewed a report titled "Phase Two Environmental Site Assessment, 1230 and 1234 Weston Road, Toronto, Ontario", which was completed by Coffey Geotechnics Inc. (Coffey) and dated in August 2013. This investigation was conducted to address potential environmental issues identified in a Phase One ESA conducted by AMEC Earth & Environmental in July 2013. The investigation completed by Coffey included advancing five boreholes and installing three monitoring wells to address potential environmental soil and groundwater impacts associated with areas of potential environmental concerns identified in the Phase One ESA. Comparison of the results of chemical analyses for soil and groundwater collected by Coffey in August 2013 identified soil and groundwater contaminants exceeding the MECP Table 3 Residential/Parkland/Institutional site condition standards (the "Table 3 SCS"). Sodium adsorption ratio (SAR) exceeded the Table 3 SCS in three soil samples in close proximity to Weston Road. Trichloroethylene (TCE) in one groundwater sample collected from BH1 exceeded the Table 3 SCS.

Coffey concluded that elevated SAR contaminants in soil were likely related to the use of de-icing salts on the adjacent municipal road and the presence of the elevated TCE concentration in groundwater is likely related to former off-site dry cleaning operations or automobile service stations.

WSP conducted a peer review of the Coffey report in December 2015 and recommended a Supplemental Phase II ESA to further characterize soil and groundwater conditions at the Subject Property. The potential contaminants of concern for the Supplemental Phase II ESA focused on VOC contaminants. As the three soil samples with elevated SAR values exceeding the Table 3 SCS were located within 5 m of a municipal road allowance, it is WSP's opinion that the SAR in soil was likely related to the use of de-icing salts on the adjacent municipal road allowance (Weston Road) and, therefore, SAR is not considered to be contaminant in accordance with Section 48(3) of O. Reg. 153/04. Therefore, further assessment of SAR was not considered for the scope of work for the Supplemental Phase II ESA.

1.4 SCOPE OF WORK

The Supplemental Phase II ESA was conducted according to the CSA Z769-00 (R2013) Phase II Environmental Site Assessment standard. The tasks completed for the Phase II ESA included:

- Preparing a Sampling and Analysis Plan (SAP) including information documenting the identification and rationale for sampling media, number of samples, sample frequency, sample depth and location and other information obtained during the Supplemental Phase II ESA;
- Retaining a driller to complete utility locates prior to drilling, including clearances through a private utility locator to confirm the absence of services in vicinity of proposed boreholes;
- Advancing four boreholes to a maximum depth of 15.24 metres below ground surface (mbgs), and one environmental borehole to a maximum depth of 25.91 mbgs and recovering soil samples from each borehole at continuous depth intervals to characterize subsurface conditions. The soil characteristics observed in the samples were logged and screened in the field with a photoionization detector (PID) and a combustible gas indicator (CGI) for the presence of combustible and/or volatile compounds to aid in selecting "worst-case" samples for laboratory analysis
- Installing groundwater monitoring wells in each of the five boreholes to further characterize soil and groundwater impacts in vicinity of Coffey's BH1 location (where TCE impacts in groundwater were identified by Coffey in 2013). The wells were constructed of 51 mm diameter PVC screen completed with monument casings.
- Developing the monitoring wells to remove fine grained sediment from the vicinity of the well screen to ensure the collected samples are representative of the shallow groundwater aquifer.
- Measuring depth to groundwater and the thickness of non-aqueous phase liquids (if present) prior to sample collection.
- Collecting representative groundwater samples for laboratory analysis of suspected contaminants.
- Submitting soil and groundwater samples to a laboratory qualified under O. Reg. 153/04 for chemical analysis of suspected contaminants of potential concern. Submitted soil samples were selected based on field observations to characterize the distribution of potential environmental impacts.
- Collecting quality control duplicate samples at a frequency of 10% throughout the field program, resulting in one additional soil sample and one additional groundwater sample.
- Comparing the results of analysis to soil and groundwater standards documented in the Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act, April 2011.

2 METHOD OF INVESTIGATION

2.1 OVERVIEW OF SITE INVESTIGATION

The Phase II ESA was completed under the supervision of WSP field staff from July 2017 to August 2017. Drilling was completed from July 24 to 27 2017 and groundwater sampling was completed on August 15, 2017.

2.2 UTILITY CLEARANCES

Prior to the drilling program, Profile Drilling Inc. (Profile) retained All Clear Locates to obtain public and private utility clearances to ensure underground infrastructure was not located in close proximity to the boreholes proposed for the Phase II ESA.

2.3 DRILLING PROGRAM

The borehole drilling program was completed by Profile under the supervision of WSP field staff from July 24 to July 27, 2017.

Five boreholes (MW101 to MW105) were drilled and completed as monitoring wells using a sonic drill rig (Photograph 2). MW101 was advanced to a maximum depth of 25.91 mbgs to determine whether concentrations of VOCs extend beneath the depth of the previously installed monitoring well by Coffey (BH1). MW102 to MW105 was advanced to a maximum depth of 15.24 mbgs to determine the lateral extent of VOCs present in soil and groundwater.

The borehole logs are presented in Appendix A and borehole locations are presented in Figure 2.

2.4 SOIL SAMPLING

Soil samples were collected continuously using plastic dual tube liners inserted into an outer rod (also known as an outer extension). Prior to sampling at each depth interval (1.5 m), a new tube was inserted into the outer rod to prevent potential cross-contamination of the recovered samples. Each interval was further split into two soil samples for characterization and field screening for combustible gases and/or volatile compounds.

The geological conditions at the Subject Property were observed in the soil samples and recorded to a field log by a WSP technician. Soil samples were collected with dedicated nitrile gloves to prevent cross contamination between sampling locations and were split into two portions: one placed into labeled polyethylene bags for field screening and another jarred into the appropriate laboratory-supplied sample containers and stored in a cooler with ice for possible laboratory analysis. For samples submitted for VOCs analysis, a core of soil was placed in a pre-weighed laboratory prepared vial containing a measured amount of methanol.

Soil samples considered to be representative of “worst-case” environmental conditions were selected for chemical analysis based on visual and olfactory observations made in the field and vapour readings.

2.5 GROUNDWATER SAMPLING

Well development and groundwater sampling was conducted on August 15, 2017. The groundwater level in each well was measured using an interface probe with water level measurements recorded from the top of the monitoring well pipe. No non-aqueous phase liquid, NAPL (i.e., free-product) was noted at any of the monitoring well locations. The wells were then developed using Waterra tubing and an inertial lift system to remove three well volumes of groundwater and any fine grained material from around the well screen to ensure proper groundwater movement through each monitoring well. Groundwater was then purged and sampled using a bladder pump and dedicated polyethylene tubing at each monitoring well. The outlet of the bladder pump was connected to an in-line flow through cell to allow for continuous monitoring of water quality parameters. The bladder pump was decontaminated using Alconox and distilled water after each use. A YSI 556 multi-meter, designed for use with the flow-through cell, was used to monitor groundwater conditions. Measurements were recorded for groundwater temperature, pH, oxidation/reduction potential (ORP), and dissolved oxygen (DO). These parameters provided an indication of stabilized groundwater conditions prior to sampling. Indicator parameters were deemed to be stable when measurements had stabilized to within 10%.

Groundwater samples were conveyed from the polyethylene tubing directly into laboratory-prepared sample containers and then placed in a cooler with ice prior to shipment to the laboratory.

2.6 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance and quality control of the soil and groundwater samples was monitored and maintained in a number of ways:

- The field investigation was completed under operation of WSP standard operating procedures for Phase II ESAs;
- Samples were given unique identifications as they were collected, typically identifying the project number, date, sample location and depth. The sample numbers were recorded in field notes for each location;
- All non-dedicated sampling and monitoring equipment (e.g., interface probe) was cleaned using Alconox and distilled water following each use;
- A chain-of-custody form was filled out for the samples prior to submitting the samples to the laboratory. The chain-of-custody documented sample movement from collection to receipt at the laboratory and provided sample identification, requested analysis and conditions of samples upon arrival at the laboratory (e.g., temperature, container status, etc.);
- Soil and groundwater samples were randomly selected by the WSP field staff for duplicate testing; and
- Samples were randomly selected by the laboratory for quality assurance checks. Generally, one sample for every ten samples submitted is checked. For each parameter, there is an acceptable upper and lower limit for the measured concentration of the parameter. If the sample results fall outside the acceptable limits, the sample must be re-analysed or the data must be qualified.

3 DATA INTERPRETATION

3.1 APPLICABLE SITE CONDITION STANDARD

WSP chose the applicable generic soil and groundwater standards based on the following information available for the Subject Property:

- The Subject Property would not be classified as a Shallow Soil Property under Section 43.1 of O. Reg. 153/04;
- No water bodies were identified within 30 m of the Subject Property;
- pH values of soil samples from the Phase II ESA conducted by Coffey for the Subject Property were measured at values between 5 and 9; therefore, the site was not classified as environmentally sensitive;
- The Study Area is serviced by a municipal water supply;
- The Subject Property is proposed for redevelopment as a day care facility, which is an institutional property as defined in O. Reg. 153/04;
- Field observations and results of grain size analysis indicate that the soil at the Subject Property is consistent with the definition of "coarse textured" in O. Reg. 153/04; and
- Stratified site conditions were not used for evaluating laboratory results.

Based on the above site specific details, soil and groundwater quality at the Subject Property was compared to the full depth SCS documented in Table 3 of *Soil, Groundwater and Sediment Standards* for *Residential, Parkland, Institutional land use under Part XV.1 of the Environmental Protection Act*, April 2011.

3.2 SUBSURFACE CONDITIONS

3.2.1 Soil Characteristics

Soil stratigraphy generally consisted of a fill layer consisting of brown sand and gravel, extending to depths ranging from surface to approximately 1.5 mbgs, underlain by native sand to approximately 10.7 mbgs. This layer was underlain by mixed layers of sand and silt to 15.2 mbgs. Bedrock was not encountered during this investigation.

Subsets of the recovered soil cores were screened using an RKI Eagle 2 which measures both combustible gases and total VOCs. The VOCs in the soil samples were relatively low and did not exceed 5.1 ppm, measured as isobutylene. Similarly, combustible gases in the soil samples were relatively low and did not exceed 350 ppm, measured as hexane. The readings obtained during the field monitoring are not indicative of gross contamination.

3.2.2 Groundwater Characteristics

The groundwater level measurements for the monitoring wells are shown in Table 1.

Table 1: Groundwater Monitoring Results

Monitoring Well ID	Coordinates (UTM, NAD 83, Zone 17	Screen Interval (mbgs)	Water Level 27 July 2017 (mbtop)	Water Level 15 August 2017 (mbtop)
MW101	621458 E 4838334 N	22.1-25.1	12.16	12.16
MW102	621457 E 4838332 N	12.19-15.24	12.01	11.99
MW103	621449 E 4838332 N	10.1-13.1	11.96	11.94
MW104	621458 E 4838334 N	10.67-13.72	11.82	11.80
MW105	621468 E 4838329 N	10.67-13.72	12.20	12.20

Notes:
mbgs: metres below ground surface
mbtop: metres below top of pipe

No odours, sheen or evidence of free product was detected in any of the wells monitored as part of this investigation.

3.3 ANALYTICAL RESULTS

Soil and groundwater samples were submitted for chemical analyses to ALS Environmental in Waterloo, ON, a laboratory accredited by Canadian Association for Laboratory Accreditation (CALA). The Certificates of Analysis are provided in Appendix B.

3.3.1 Soil Quality

The soil analytical results from the Phase II ESA are provided in Table 2.

Five soil samples and one duplicate sample were submitted for laboratory analysis for VOCs. Comparison of analytical results to the Table 3 SCS did not identify any contaminants.

A composite soil sample composed of drilling cuttings from each of the five boreholes was submitted for laboratory toxicity characteristic leaching procedure (TCLP) analyses of metals and VOCs. Based on the leachate testing results, the soil would be classified as a solid, non-hazardous waste. TCLP waste characterization results are provided in Table 3.

3.3.2 Groundwater Quality

The analytical groundwater results from the Phase II ESA are provided in Table 4.

Five groundwater samples and one duplicate sample were submitted for laboratory analysis for VOCs. Comparison of the analytical results to the Table 3 SCS identified elevated concentrations of VOCs in groundwater samples at two of five sample locations. Parameters and samples exceeding the Table 3 SCS include:

- Elevated 1,1-Dichloroethylene concentration of 4.52 µg/L was identified in MW101. The applicable standard is 1.6 µg/L.
- Elevated trichloroethylene concentrations were identified: 4.4 µg/L at MW101 and 6.58 µg/L at MW104. The applicable standard is 1.6 µg/L.

The distribution of VOC parameters exceeding the Table 3 SCS at each borehole location is shown in Figure 3.

3.4 QUALITY ASSURANCE AND QUALITY CONTROL RESULTS

WSP submitted one duplicate soil sample for laboratory analyses:

- DUP 1 (collected on July 27, 2017) was a duplicate of MW105 (11.4 mbgs to 12.2 mbgs) and was analyzed for VOCs.

WSP submitted one duplicate groundwater sample for laboratory analyses:

- DUP 1 (collected on August 15, 2017) was a duplicate of MW104 for VOCs.

The results from the duplicate samples were used to assess the accuracy and reliability of the laboratory procedures and instruments.

A calculation of the relative percent difference (RPD) between the samples and their duplicates was performed and compared to the acceptance limits outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the *Environmental Protection Act*, April 2011. The RPD calculation is only applicable when both the sample and the field duplicate concentrations are greater than five times the reported detection limit (RDL). Relative percent difference for soil was not calculated as all VOC parameters were below detection limits. The results of the calculated RPDs for groundwater were below the MECP Alert Criteria.

Based on a review the results of the quality control data, we conclude that the analysis of the submitted samples for soil and groundwater accurately represent the Subject Property conditions and that the results met the quality objectives of the investigation. Therefore, the overall objectives of the field investigation were met.

4 CONCLUSIONS AND RECOMMENDATIONS

The results of the Supplemental Phase II ESA identified the following:

- Five soil samples and one duplicate sample were submitted for laboratory analysis for VOCs. No VOC parameters in the soil samples exceeded the Table 3 SCS.
- One composite soil sample was submitted for TCLP analysis. The results of the TCLP analysis indicates that soil at the Subject Property can be characterized as solid, non-hazardous waste.
- Five groundwater samples and one duplicate sample were submitted for laboratory analysis for VOCs. Parameters and samples exceeding the Table 3 SCS include:
  - Elevated 1,1-Dichloroethylene concentration of 4.52 µg/L was identified in deep monitoring well MW101 at a depth of 22.1 to 25.1 mbgs. The applicable standard is 1.6 µg/L.
  - Elevated trichloroethylene concentrations were identified: 4.4 µg/L at MW101 and 6.58 µg/L at MW104 at a depth of 10.7 to 13.7. The applicable standard is 1.6 µg/L.

Based on the findings of the Phase II ESA, the following recommendations are made:

- Prior to redevelopment of a new day care facility, a due-diligence Risk Assessment and Risk Management Plan that considers the use of risk management measures to allow impacted groundwater to be managed in place should be undertaken; and
- The monitoring wells on the Subject Property should be decommissioned as per O. Reg. 903 under the Ontario Water Resources Act.

5 QUALIFICATIONS OF ASSESSORS

5.1 QUALIFIED PERSON

Mr. Asif Rashid, P.Eng., QP_{ESA} supervised and managed the Phase II ESA for the Subject Property. He is a chemical engineer with 13 years of experience and has conducted numerous Phase I and Phase II ESAs, including hazardous materials surveys at industrial, commercial and residential properties. Mr. Rashid is a registered Qualified Person under O. Reg. 153/04, as amended. He is familiar with operating practices and production materials that may have an adverse impact on the environment and had conducted remedial actions at contaminated sites to address these impacts. His involvement with the Phase II ESA allows him to arrive at the conclusions presented in this report.

5.2 TECHNICAL SUPPORT

Site reconnaissance, supervision of drilling, and soil and groundwater sampling was completed by Mr. Ahmed Negm, M.Env.Sc. The report was completed by Mr. Carl Tin, B.A.Sc., EIT. The noted individuals conduct Phase I and Phase II ESAs including document research, site visits, interviews, and reporting. As well, they all implement field investigations, including soil sampling through drilling, test pitting and surface sampling and groundwater monitoring and sampling.

6 STANDARD LIMITATIONS

Standard limitations are presented in Appendix C as they apply to this report. This report has been prepared for use by the City of Toronto in accordance with generally accepted environmental investigation practices at the time of the assessment within the scope suggested by Canadian Standard Association's Phase II Environmental Site Assessment document (CSA Z769-00, R2013).

7 REFERENCES

Canadian Standards Association (CSA) Z769-00, revised 2013. Phase II Environmental Site Assessment.

Coffey Geotechnics Inc. (2013) Phase Two Environmental Site Assessment, 1230 and 1234 Weston Road, Toronto, Ontario.

Ontario Ministry of the Environment and Climate Change. 2011a. Ontario Regulation 153/04 (as amended), Records of Site Condition – Part XV.1 of the Act. July 2011.

Ontario Ministry of the Environment and Climate Change, 2011b. Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the *Environmental Protection Act*. July 2011.

Ontario Ministry of the Environment and Climate Change, 2011c. Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*. April 15.

TABLES

Table 2: Summary of Analytical Results in Soil
VOCs
1230 and 1234 Weston Road, Toronto, Ontario

Sample ID	MOECC TABLE 3 STANDARD	REPORTING LIMIT	UNITS	MW101 /11	MW102 / 18	MW103 / 9	MW 104 /11	MW 105 /16	DUP 1 Duplicate of MW 105 /16	AVERAGE MW 105 / 16
Depth (mbgs)				7.0-7.3	13.0-13.7	6.1-6.6	7.6 -8.2	11.4-12.2	11.4-12.2	11.4-12.2
Lab Job #				L1966007	L1966007	L1966007	L1966007	L1966007	L1966007	L1966007
Sampling Date				24-Jul-2017	25-Jul-2017	25-Jul-2017	26-Jul-2017	27-Jul-2017	27-Jul-2017	27-Jul-2017
Volatile Organic Compounds (VOCs)										
Acetone	16	0.5	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Benzene	0.21	0.0068	ug/g	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068
Bromodichloromethane	13	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromoform	0.27	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromomethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Carbon Tetrachloride	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chlorobenzene	2.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloroform	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibromochloromethane	9.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichlorobenzene	3.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,3-Dichlorobenzene	4.8	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,4-Dichlorobenzene	0.083	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethane	3.5	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloroethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethylene	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cis-1,2-Dichloroethylene	3.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trans-1,2-Dichloroethylene	0.084	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloropropane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cis-1,3-Dichloropropylene	NV	0.03	ug/g	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Trans-1,3-Dichloropropylene	NV	0.03	ug/g	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
1,3-Dichloropropylene	0.05	0.042	ug/g	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042
Ethylbenzene	2	0.018	ug/g	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Ethylene Dibromide	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methyl Ethyl Ketone	16	0.5	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	0.1	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methyl Isobutyl Ketone	1.7	0.5	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl-t-Butyl Ether	0.75	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Styrene	0.7	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,1,2-Tetrachloroethane	0.058	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Toluene	2.3	0.08	ug/g	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
Tetrachloroethylene	0.28	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,1-Trichloroethane	0.38	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2-Trichloroethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trichloroethylene	0.061	0.1	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.02	0.02	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
m-Xylene & p-Xylene	NV	0.03	ug/g	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
o-Xylene	NV	0.02	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	3.1	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dichlorodifluoromethane	16	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dioxane, 1,4-	1.8	NV	ug/g	NA	NA	NA	NA	NA	NA	NA
Hexane(n)	2.8	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trichlorofluoromethane	4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:

'NV ' : No Standard established NA: Parameter not analyzed

MOECC Table 3: Ontario Ministry of the Environment, "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, " March 2004, amended July 1, 2011. Full Depth Generic Site Condition Standards for Soil in a Non-Potable Ground Water Condition for Residential/Parkland/Institutional Property Use with Coarse Textured Soils.

100	Exceeds MOECC Table 3 Standards
100	Detection Limit Exceeds MOECC Standard

Table 3: Waste Characterization
Metals, VOCs and PCBs
1230 and 1234 Weston Road, Toronto, Ontario

Sample ID Lab Job # Date Sampled	MOE O.Reg. 558 SCH. 4	REPORTING LIMIT	Units	COMPOSITE 1 L1966022 27-Jul-2017
TCLP Metals				
Leachable Fluoride (F-)	150	10	mg/L	<10
Leachable Free Cyanide	20	0.1	mg/L	<0.1
Leachable Nitrite (N)	NV	2.0	mg/L	<2.0
Leachable Nitrate (N)	NV	2.0	mg/L	<2.0
Leachable Nitrate + Nitrite	1000	4.0	mg/L	<4.0
Leachable Mercury (Hg)	0.1	0.00010	mg/L	<0.00010
Leachable Arsenic (As)	2.5	0.05	mg/L	<0.050
Leachable Barium (Ba)	100	0.5	mg/L	<0.50
Leachable Boron (B)	500	2.5	mg/L	<2.5
Leachable Cadmium (Cd)	0.5	0.005	mg/L	<0.0050
Leachable Chromium (Cr)	5	0.05	mg/L	<0.050
Leachable Lead (Pb)	5	0.05	mg/L	<0.050
Leachable Selenium (Se)	1	0.025	mg/L	<0.025
Leachable Silver (Ag)	5	0.005	mg/L	<0.0050
Leachable Uranium (U)	10	0.25	mg/L	<0.25
Final pH	NV	0.10	pH	5.88
Initial pH	NV	0.10	pH	9.7
TCLP VOCs				
1,1-Dichloroethylene	1.4	0.025	mg/L	<0.025
1,2-Dichlorobenzene	20	0.025	mg/L	<0.025
1,2-Dichloroethane	0.5	0.025	mg/L	<0.025
1,4-Dichlorobenzene	0.5	0.025	mg/L	<0.025
Benzene	0.5	0.025	mg/L	<0.025
Carbon tetrachloride	0.5	0.025	mg/L	<0.025
Chlorobenzene	8	0.025	mg/L	<0.025
Chloroform	10	0.1	mg/L	<0.10
Dichloromethane	5	0.5	mg/L	<0.50
Methyl Ethyl Ketone	200	1	mg/L	<1.0
Tetrachloroethylene	3	0.025	mg/L	<0.025
Trichloroethylene	5	0.025	mg/L	<0.025
Vinyl chloride	0.2	0.05	mg/L	<0.050
TCLP PCBs				
Total polychlorinated biphenyls	1.1	NV	ug/L	<0.00040

Notes:
'NV ' : No Standard established NA: Parameter not analyzed
MOECC O.Reg. 558 Sch. 4: Ontario Ministry of Environment - Leachate Quality Criteria

100	Exceeds MOECC Leachate Quality Criteria

wsp

Table 4: Summary of Analytical Results in Groundwater
VOCs
1230 and 1234 Weston Road, Toronto, Ontario

Sample ID Screen Interval (mbgs) Lab Job # Sampling Date	MOECC TABLE 3 STANDARD	MOECC TABLE 3 STANDARD	REPORTING LIMIT	UNITS	MW101 MW101 22.1 - 25.1 L1976218 15-Aug-2017	MW102 MW102 12.2 - 15.2 L1976218 15-Aug-2017	MW103 MW103 10.1 - 13.1 L1976218 15-Aug-2017	MW104 MW104 10.7 - 13.7 L1976218 15-Aug-2017	DUP 1 Dupilcate of MW104 10.7 - 13.7 L1976218 15-Aug-2017	AVERAGE MW104 10.7 - 13.7 L1976218 15-Aug-2017	MW105 MW105 10.7 - 13.7 L1976218 15-Aug-2017
Volatile Organic Compounds (VOCs)											
Acetone	130000	130000	30	ug/L	<30	<30	<30	<30	<30	<30	<30
Benzene	44	430	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	85000	85000	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	380	770	5	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	5.6	56	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon Tetrachloride	0.79	8.4	0.2	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	630	630	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.20	<0.20	<0.50
Chloroform	2.4	22	1	ug/L	<1.0	1.3	<1.0	1.2	1.2	1.2	<1.0
Dibromochloromethane	82000	82000	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,2-Dichlorobenzene	4600	9600	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	9600	9600	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	8	67	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethane	320	3100	0.5	ug/L	7.71	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	1.6	12	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	1.6	17	0.5	ug/L	**4.62**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Cis-1,2-Dichloroethylene	1.6	17	0.5	ug/L	<0.65	<0.50	<0.50	<0.60	<0.60	<0.60	<0.50
Trans-1,2-Dichloroethylene	1.6	17	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloropropane	16	140	0.5	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cis-1,3-Dichloropropylene	NV	NV	0.3	ug/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Trans-1,3-Dichloropropylene	NV	NV	0.3	ug/L	<0.3	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropylene	5.2	45	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	2300	2300	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylene Dibromide	0.25	0.83	0.2	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Methyl Ethyl Ketone	470000	1500000	20	ug/L	<20	<20	<20	<20	<20	<20	<20
Methylene Chloride	610	5500	5	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	140000	580000	20	ug/L	<20	<20	<20	<20	<20	<20	<20
Methyl-t-Butyl Ether	190	1400	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	1300	9100	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1,2-Tetrachloroethane	3.3	28	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	3.2	15	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	18000	18000	0.5	ug/L	<0.50	0.55	<0.50	<0.50	<0.50	<0.50	<0.65
Tetrachloroethylene	1.6	17	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	640	6700	0.5	ug/L	6.12	1.63	0.8	7.65	7.87	7.76	<0.5
1,1,2-Trichloroethane	4.7	30	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	1.6	17	0.5	ug/L	**4.4**	1.41	0.7	**6.43**	**6.73**	**6.58**	0.61
Vinyl Chloride	0.5	1.7	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
m-Xylene & p-Xylene	NV	NV	0.4	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
o-Xylene	NV	NV	0.3	ug/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total Xylenes	4200	4200	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	4400	4400	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Dioxane, 1,4-	1900000	7300000	NV	ug/L	NA	NA	NA	NA	NA	NA	NA
Hexane(n)	51	520	0.5	ug/L	<0.50	<0.50	<0.50	1.04	1.33	1.185	<0.50
Trichlorofluoromethane	2500	2500	5	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

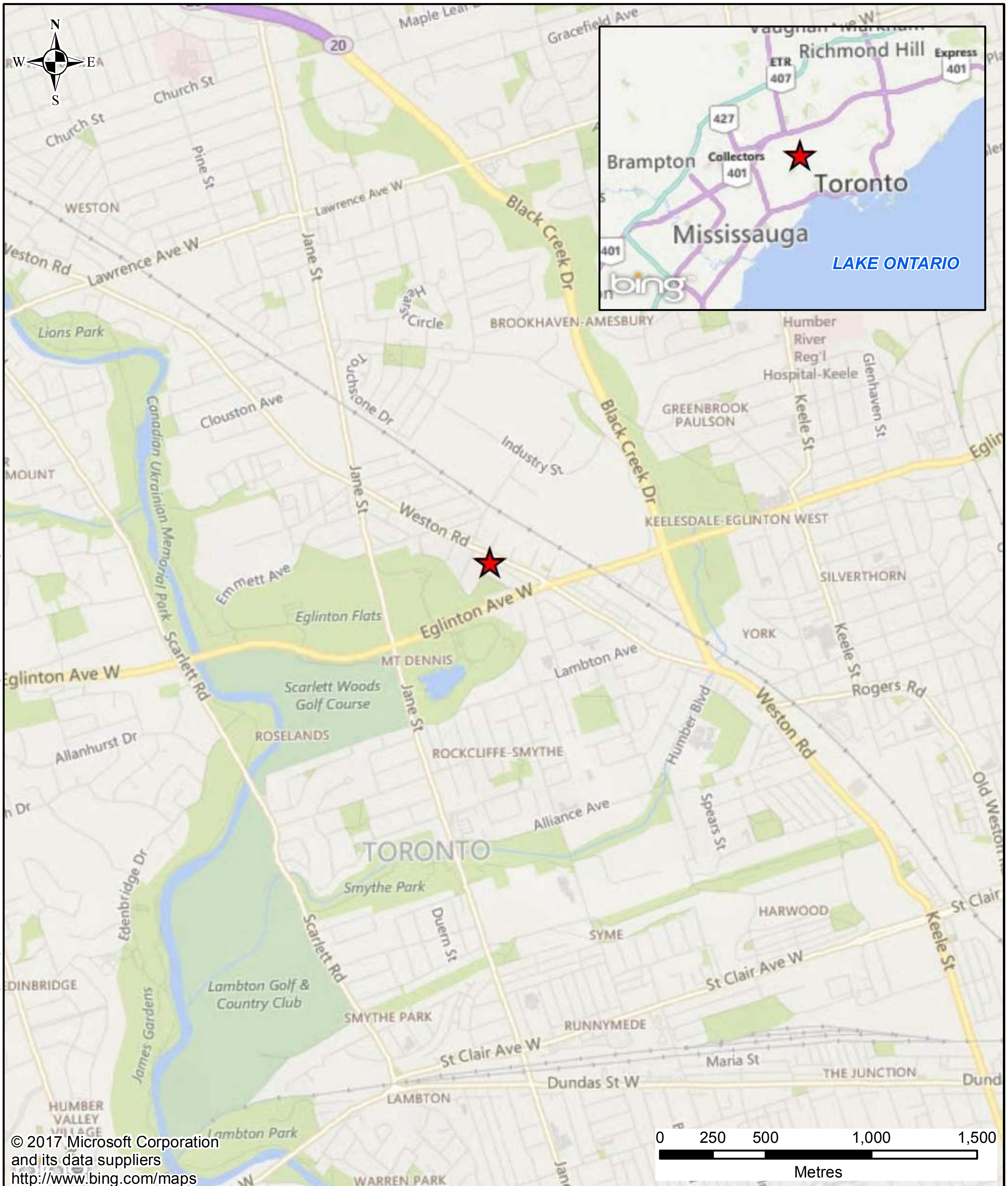
Notes:

'NV ' : No Standard established   NA: Parameter not analyzed

MOECC Table 3: Ontario Ministry of the Environment, "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, " March 2004, amended July 1, 2011. Full Depth Generic Site Condition Standards for Non-Potable Ground Water for All Types of Property Use with coarse textured soils.

100	Exceeds MOECC Table 3 Standards
100	Detection Limit Exceeds MOECC TABLE 3 STANDARD

FIGURES



\\thfiler1.mmm.ca\ENVDATA$\1442 Projects by Job Number\2015\3315469 Weston Road\Mapping\MXD\Phase II ESA\Figure 1 Site Location.mxd

Legend

★ Site Location

Client:	**City of Toronto**
Title:	**Site Location**
Prepared By:	

15M-00656-01	Scale as Shown	Review: CR
Date: August 2017	**Figure: 1**	
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J:\1442 Projects by Job Number\2015\3315469 Weston Road\Mapping\MXD\Phase II ESA\Figure 2 Site Plan.mxd

Legend

Property Boundary

Monitoring Well

Borehole (Coffey, 2013)

Monitoring Well (Coffey, 2013)

Monitoring Well (WSP, 2017)

Client: **City of Toronto**

Title: **Site Plan**

Prepared By: wsp

15M-00656-01	Scale as Shown	Review: AR
Date: August 2017	**Figure: 2**	
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Acroymn	Parameter	Standard (ug/L)
Volatile Organic Compounds (VOCs)		
1,1-DCE	1,1-Dichloroethylene	1.6
TCE	Trichloroethylene	1.6

Standard: MOECC Table 3 -- Ontario Ministry of the Environment, "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, " March 2004, amended July 1, 2011. Full Depth Generic Site Condition Standards for Non-Potable Ground Water for All Types of Property Use with coarse textured soils.

Red text indicates exceedances above the applicable standard

J:\1442 Projects by Job Number\2015\3315469 Weston Road\Mapping\MXD\Phase II ESA\Figure 3 GW Exceedances.mxd

Legend

Property Boundary

Monitoring Locations

Borehole (Coffey, 2013)

Monitoring Well (Coffey, 2013)

Monitoring Well (WSP, 2017)

1,1-DCE	4.62	22.1-25.1	15-Aug-17
Parameter	Concentration	Screened Interval (mbgs)	Date Sampled

Client: **City of Toronto**

Title: **Distribution of Volatile Organic Compounds (VOCs) in Groundwater**

Prepared By: wsp

15M-00656-01	Scale as Shown	Review: CR
Date: August 2017	**Figure: 3**	

PHOTOGRAPHS

Photograph 1: Subject Property Facing West

Photograph 2: Installed Monitoring Wells (MW101, MW102 and MW104)

APPENDIX

A BOREHOLE LOGS

Figure No. ____________

LOG OF MONITORING WELL MW101

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621458E, 4838334N
Date Drilled: July 24, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	SOIL DESCRIPTION	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST
0.05	**Asphalt** Black, 50mm layer	Concrete		
	SAND AND GRAVEL Brown, some pebbles, rootlets and trace silt, dry, second layer of black asphalt at 0.80 m, no staining/odour	Bentonite Seal	1	
			2	
1.52	**SAND** Brown, well-sorted, trace silt, loose, dry		3	
	- brownish-grey at 2.70 m		4	
	- fine gravel at 3.05 m		5	
			6	
	- pale grey, trace silt and fine gravel at 4.57 m			
	- brown, moist at 4.87 m		7	
	- trace clay and medium gravel, dry at 5.79 m		8	
	- brown, damp at 6.10 m		9	
			10	
	- grey, damp at 7.01 m		11	VOCs
	- brown at 7.32 m		12	
			13	
	- trace clay and silt at 8.38 m		14	
			15	

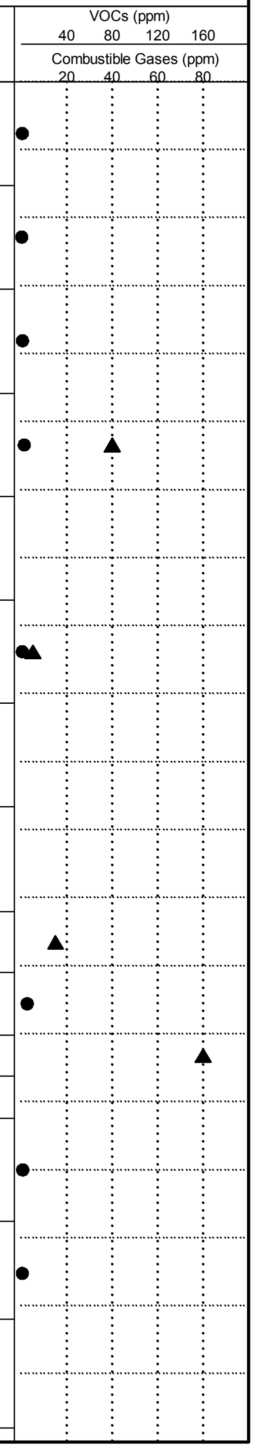

Figure No. ____________

LOG OF MONITORING WELL MW101

Project No.	15M-00656-01
Project:	Phase II Environmental Site Assessment
Location:	1230/1234 Weston Road, Toronto, ON
Date Drilled:	July 24, 2017
Drill Type:	Sonic
Drilling Contractor:	Profile Drilling Inc.
Co-ordinates:	621458E, 4838334N
Datum:	UTM NAD 83 Zone 17
Logged By:	A.N
Checked By:	C.R

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		- moist at 9.90 m **SAND** *(continued)*			16		
		- saturated at 10.67 m			17		
11.32 11.43		**SILT** Brown, trace clay, saturated			18		
12.19		- no recovery from 12.19 to 13.72 m			19		
13.72		**SAND** Brown, some silt, damp			20		
					21		
					22		
					23		
16.76		**SILT** Greyish brown, trace clay, wet			24		
					25		
18.29		**CLAYEY SILT** - Grey, moist			26		
		- wet at 19.80 m			27		

WSP MW REPORT VER.3 WSP DATA TEMPLATE.GPJ GINT STD CANADA LAB.GDT 30/08/17

Figure No. ____________

LOG OF MONITORING WELL MW101

Project No.	15M-00656-01
Project:	Phase II Environmental Site Assessment
Location:	1230/1234 Weston Road, Toronto, ON
Date Drilled:	July 24, 2017
Drill Type:	Sonic
Drilling Contractor:	Profile Drilling Inc.
Co-ordinates:	621458E, 4838334N
Datum:	UTM NAD 83 Zone 17
Logged By:	A.N
Checked By:	C.R

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	SOIL DESCRIPTION	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
	CLAYEY SILT *(continued)*		28		●
20.57	**SAND** Grey, some silt, damp		29		●
		Sand Pack	30		●
		Screen	31		●
			32		●
23.62	**SILT** Grey, trace clay, wet		33		●
24.38	**CLAY** Grey, trace silt, moist		34		●
		Soil Cuttings	35		●
25.91	End of borehole at 25.91 mbgs	Water measured on August 15, 2017 masl 11.32 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

Figure No. ____________

LOG OF MONITORING WELL MW102

Project No.	15M-00656-01		
Project:	Phase II Environmental Site Assessment		
Location:	1230/1234 Weston Road, Toronto, ON	Co-ordinates:	621457E, 4838332N
Date Drilled:	July 25, 2017	Datum:	UTM NAD 83 Zone 17
Drill Type:	Sonic	Logged By:	A.N
Drilling Contractor:	Profile Drilling Inc.	Checked By:	C.R

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS
0.05		**ASPHALT** Black, 50mm layer		Concrete
		SAND AND GRAVEL Brown, dry, second layer of black asphalt at 0.8 m, no staining/odour		Bentonite Seal
1.52		**SAND** Brown, well-sorted, trace silt and medium gravel dry, no staining/odour		
		- Brown/pale grey, trace coarse gravel at 2.29 m		
		- trace fine gravel at 3.81 m		
		- trace clay at 5.33 m		
		- damp at 6.10 m		
		- wet at 8.38 m		

SAMPLE ID	SOIL SAMPLE TEST
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

VOCs (ppm): 40 80 120 160

Combustible Gases (ppm): 20 40 60 80

Figure No. ______________

LOG OF MONITORING WELL MW102

Project No.	15M-00656-01		
Project:	Phase II Environmental Site Assessment		
Location:	1230/1234 Weston Road, Toronto, ON	Co-ordinates:	621457E, 4838332N
Date Drilled:	July 25, 2017	Datum:	UTM NAD 83 Zone 17
Drill Type:	Sonic	Logged By:	A.N
Drilling Contractor:	Profile Drilling Inc.	Checked By:	C.R

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		- damp at 9.90 m **SAND** *(continued)*			14		●
10.67		**SILT** - Brown with greyish tint, trace sand, saturated			15		
11.11		- olive brown, trace clay, wet at 11.43 m			16		
		- some sand at 12.19 m		Sand Pack Screen	17		●
12.95		**SANDY SILT** Brown, moist			18	VOCs	● ▲ 120
13.72		**SILTY SAND** Brown, moist			19		
15.24					20		▲
		End of borehole at 15.24 mbgs		Water measured on August 15, 2017 masl 11.11 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

Figure No. ____________

LOG OF MONITORING WELL MW103

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621449E, 4838330N
Date Drilled: July 26, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST
0.05		**ASPAHLT** Black, 50mm layer		Concrete		
		SAND Dark brown, well-sorted, trace silt and medium gravel at 0.8 m, dry, no staining/odour		Bentonite Seal	1	
					2	
					3	
		- trace corase gravel at 2.29 m			4	
		- damp at 3.05 m			5	
		- pale grey, some medium gravel, dry at 3.81 m			6	
					7	
		- black outer layer with trace fine gravel at 5.33 m			8	
					9	VOCs
		- pale grey at 6.55 m			10	
		- brown, some silt, trace medium gravel, damp at 7.32 m			11	
					12	
					13	
				Sand Pack		

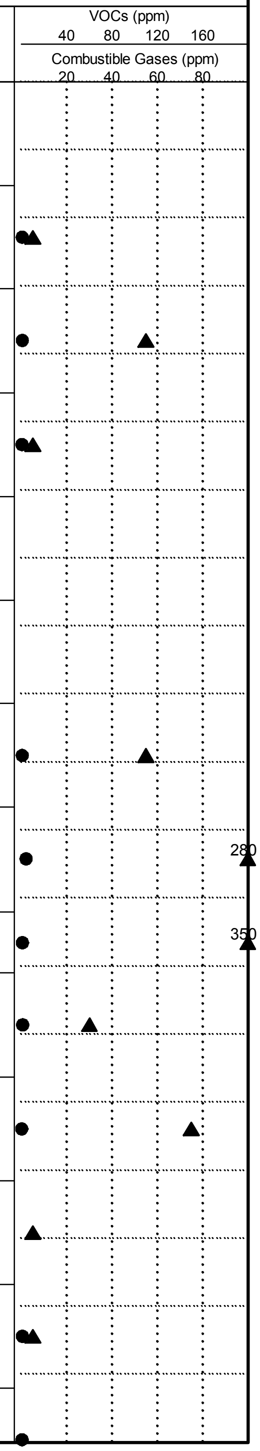

Figure No. ______

LOG OF MONITORING WELL MW103

Project No.: **15M-00656-01**
Project: **Phase II Environmental Site Assessment**
Location: **1230/1234 Weston Road, Toronto, ON**
Co-ordinates: **621449E, 4838330N**
Date Drilled: **July 26, 2017**
Datum: **UTM NAD 83 Zone 17**
Drill Type: **Sonic**
Logged By: **A.N**
Drilling Contractor: **Profile Drilling Inc.**
Checked By: **C.R**

● VOCs (ppm)
▲ Combustible Gases (ppm)

VOCs (ppm): 40, 80, 120, 160
Combustible Gases (ppm): 20, 40, 60, 80

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST
		SAND *(continued)*		Screen	14	
10.36		**SANDY SILT** Brown, trace clay, moist, no staining/odour			15	
11.05 / 11.13		**SILT** Olive brown with grey tint, trace clay, wet, no staining/odour			16	
11.89		**SILTY SAND** Light brown, damp, no staining/no odour			17	
				Soil Cuttings	18	
13.41		**SAND** Olive brown, some silt, trace clay, damp, no staining/no odour			19	
		- grey at 14.32 m			20	
15.24		End of borehole at 15.24 mbgs		Water measured on August 15, 2017 masl 11.05 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC		

Figure No. ______________

LOG OF MONITORING WELL MW104

Project No.	15M-00656-01
Project:	Phase II Environmental Site Assessment
Location:	1230/1234 Weston Road, Toronto, ON
Co-ordinates:	621450E, 4838337N
Date Drilled:	July 26, 2017
Datum:	UTM NAD 83 Zone 17
Drill Type:	Sonic
Logged By:	A.N
Drilling Contractor:	Profile Drilling Inc.
Checked By:	C.R

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST
0.05		**ASPHALT** Black, 50mm layer		Concrete		
		SAND Brown, some medium/coarse gravel, dry, no staining/odour		Bentonite Seal	1	
		- dark brown, trace silt, black outer layer at 0.8 m			2	
1.52		**SILTY SAND** Dark brown, well-sorted, moist, no staining/odour			3	
					4	
					5	
3.81		**SAND** Brown, well-sorted, trace silt and medium gravel, damp, no staining/odour			6	
					7	
					8	
		- trace fine gravel at 6.10 m			9	
		- pale grey/brown at 6.86 m			10	
7.62		**SANDY SILT** Brown, trace clay, dry, no staining/odour			11	VOCs
					12	
8.84		**SAND** Brown, trace silt, dry, no staining/odour - trace clay at 9.20 m			13	

VOCs (ppm): 40 80 120 160

Combustible Gases (ppm): 20 40 60 80

Figure No. ______________

LOG OF MONITORING WELL MW104

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621450E, 4838337N
Date Drilled: July 26, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	SOIL DESCRIPTION	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
10.36	**SAND** *(continued)*		14		
11.03 / 11.13	**SILT** Brown, some sand, trace clay, damp, no staining/odour	Sand Pack; Screen	15		▲
11.89	**SILTY SAND** Brown, damp, no staining/odour		16		▲
12.65	**SANDY SILT** Brown, trace clay at 11.90 - 12.20 m, saturated at 12.50 to 12.80 m, no staining/odour		17		●
13.41	**SILTY SAND** Brown, saturated to 12.80 m, no staining/odour		18		●
14.32	**SANDY SILT** Brown, trace clay, wet no staining/odour	Soil Cuttings	19		●
15.24	**SILTY SAND** Brown, wet, no staining/odour		20		

End of borehole at 15.24 mbgs

Water measured on August 15, 2017
masl
11.03 mbgs

Well Diameter:
50 mm

Well Material:
Schedule 40 PVC

Figure No. ____________

LOG OF MONITORING WELL **MW105**

Project No.	**15M-00656-01**
Project:	**Phase II Environmental Site Assessment**
Location:	**1230/1234 Weston Road, Toronto, ON**
Co-ordinates:	**621468E, 4838329N**
Date Drilled:	**July 26, 2017**
Datum:	**UTM NAD 83 Zone 17**
Drill Type:	**Sonic**
Logged By:	**A.N**
Drilling Contractor:	**Profile Drilling Inc.**
Checked By:	**C.R**

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		SAND Dark brown, well-sorted, trace silt, damp, 30mm black rubber at surface,no staining/odour		Concrete Bentonite Seal	1		●
					2		●
		- light brown, trace clay and silt at 1.40 to 1.52 m, dry			3		●
		- greyish-brown, trace silt and fine gravel at 2.29 to 3.8 m bgs, dry			4		●
					5		●
					6		●
4.57		- brown, trace medium gravel, dry			7		●
5.33		- brown, pale grey, trace gravel, dry			8		●
6.10		- brown trace silt and gravel, dry			9		●
					10		●
					11		●
					12		
9.14		- trace silt			13		●

Figure No. ____________

LOG OF MONITORING WELL MW105

Project No.: **15M-00656-01**
Project: **Phase II Environmental Site Assessment**
Location: **1230/1234 Weston Road, Toronto, ON**
Co-ordinates: **621468E, 4838329N**
Date Drilled: **July 26, 2017**
Datum: **UTM NAD 83 Zone 17**
Drill Type: **Sonic**
Logged By: **A.N**
Drilling Contractor: **Profile Drilling Inc.**
Checked By: **C.R**

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	SOIL DESCRIPTION	WELL / INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST
	SAND *(continued)* - trace clay at 10.50 to 10.70 m	Sand Pack	14	
10.67	**SANDY SILT** Olive brown, trace clay, wet	Screen	15	
11.35 / 11.43	**CLAYEY SILT** Olive brown, moist		16	VOCs + Dup 1
12.19	**SAND** Olive brown, trace silt, moist up to 12.50 m		17	
			18	
13.72	**SILTY SAND** Olive brown, wet - moist at 14.48 m	Soil Cuttings	19	
			20	
15.24	End of borehole at 15.24 mbgs	Water measured on August 15, 2017 masl 11.35 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC		

VOCs (ppm): 40 80 120 160
Combustible Gases (ppm): 20 40 60 80

APPENDIX

B

CERTIFICATES OF ANALYSIS

WSP Canada Inc. (Thornhill)
ATTN: ASIF RASHID
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Date Received: 27-JUL-17
Report Date: 31-JUL-17 14:35 (MT)
Version: FINAL

Client Phone: 905-882-1100

Certificate of Analysis

Lab Work Order #: L1966007

Project P.O. #:	NOT SUBMITTED
Job Reference:	15M-00656-01
C of C Numbers:	15-574489
Legal Site Desc:	

Emerson Omar Perez

Emerson Perez, B.S.E
Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit

Ontario Regulation 153/04 - April 15, 2011 Standards - T3-Soil-Res/Park/Inst. Property Use (Coarse)

(No parameter exceedances)

Ontario Regulation 153/04 - April 15, 2011 Standards - T3-Soil-Res/Park/Inst. Property Use (Fine)

(No parameter exceedances)

ALS Environmental

ANALYTICAL REPORT

Physical Tests - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	L1966007-1	L1966007-2	L1966007-3	L1966007-4	L1966007-5	L1966007-6
Sample Date				24-JUL-17	25-JUL-17	25-JUL-17	26-JUL-17	27-JUL-17	24-JUL-17
Sample ID				MW 101/11	MW 102/18	MW 103/9	MW 104/11	MW 105/16	DUP 1
% Moisture	%	-	-	11.3	13.4	4.81	5.33	14.7	14.5

Guide Limit #1: T3-Soil-Res/Park/Inst. Property Use (Coarse)
Guide Limit #2: T3-Soil-Res/Park/Inst. Property Use (Fine)

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Volatile Organic Compounds - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	L1966007-1	L1966007-2	L1966007-3	L1966007-4	L1966007-5	L1966007-6
Sample Date				24-JUL-17	25-JUL-17	25-JUL-17	26-JUL-17	27-JUL-17	24-JUL-17
Sample ID				MW 101/11	MW 102/18	MW 103/9	MW 104/11	MW 105/16	DUP 1
Acetone	ug/g	16	28	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Benzene	ug/g	0.21	0.17	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068
Bromodichloromethane	ug/g	13	13	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromoform	ug/g	0.27	0.26	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromomethane	ug/g	0.05	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Carbon tetrachloride	ug/g	0.05	0.12	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chlorobenzene	ug/g	2.4	2.7	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibromochloromethane	ug/g	9.4	9.4	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloroform	ug/g	0.05	0.18	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dibromoethane	ug/g	0.05	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichlorobenzene	ug/g	3.4	4.3	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,3-Dichlorobenzene	ug/g	4.8	6	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,4-Dichlorobenzene	ug/g	0.083	0.097	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dichlorodifluoromethane	ug/g	16	25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethane	ug/g	3.5	11	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloroethane	ug/g	0.05	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethylene	ug/g	0.05	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
cis-1,2-Dichloroethylene	ug/g	3.4	30	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
trans-1,2-Dichloroethylene	ug/g	0.084	0.75	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methylene Chloride	ug/g	0.1	0.96	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloropropane	ug/g	0.05	0.085	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
cis-1,3-Dichloropropene	ug/g	-	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
trans-1,3-Dichloropropene	ug/g	-	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
1,3-Dichloropropene (cis & trans)	ug/g	0.05	0.083	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042
Ethylbenzene	ug/g	2	15	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
n-Hexane	ug/g	2.8	34	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methyl Ethyl Ketone	ug/g	16	44	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Isobutyl Ketone	ug/g	1.7	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
MTBE	ug/g	0.75	1.4	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Styrene	ug/g	0.7	2.2	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Guide Limit #1: T3-Soil-Res/Park/Inst. Property Use (Coarse)
Guide Limit #2: T3-Soil-Res/Park/Inst. Property Use (Fine)

ALS Environmental

ANALYTICAL REPORT

Volatile Organic Compounds - SOIL

			Lab ID	L1966007-1	L1966007-2	L1966007-3	L1966007-4	L1966007-5	L1966007-6
			Sample Date	24-JUL-17	25-JUL-17	25-JUL-17	26-JUL-17	27-JUL-17	24-JUL-17
			Sample ID	MW 101/11	MW 102/18	MW 103/9	MW 104/11	MW 105/16	DUP 1
		Guide Limits							
Analyte	**Unit**	**#1**	**#2**						
1,1,1,2-Tetrachloroethane	ug/g	0.058	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Tetrachloroethylene	ug/g	0.28	2.3	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Toluene	ug/g	2.3	6	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
1,1,1-Trichloroethane	ug/g	0.38	3.4	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2-Trichloroethane	ug/g	0.05	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trichloroethylene	ug/g	0.061	0.52	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Trichlorofluoromethane	ug/g	4	5.8	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Vinyl chloride	ug/g	0.02	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
o-Xylene	ug/g	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
m+p-Xylenes	ug/g	-	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Xylenes (Total)	ug/g	3.1	25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Surrogate: 4-Bromofluorobenzene	%	-	-	97.8	94.2	95.6	93.5	99.7	93.3
Surrogate: 1,4-Difluorobenzene	%	-	-	105.9	102.4	102.9	102.6	105.2	101.7

Guide Limit #1: T3-Soil-Res/Park/Inst. Property Use (Coarse)
Guide Limit #2: T3-Soil-Res/Park/Inst. Property Use (Fine)

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

15-574489

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information.

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT	**Soil**							
Batch R3784890								
WG2580060-3 DUP		**L1966007-6**						
% Moisture		14.5	14.8		%	2.3	20	28-JUL-17
WG2580060-2 LCS								
% Moisture			99.7		%		90-110	28-JUL-17
WG2580060-1 MB								
% Moisture			<0.10		%		0.1	28-JUL-17
Batch R3784895								
WG2580023-3 DUP		**L1966007-4**						
% Moisture		5.33	5.46		%	2.4	20	29-JUL-17
WG2580023-2 LCS								
% Moisture			99.3		%		90-110	29-JUL-17
WG2580023-1 MB								
% Moisture			<0.10		%		0.1	29-JUL-17
VOC-511-HS-WT	**Soil**							
Batch R3785708								
WG2580013-4 DUP		**WG2580013-3**						
1,1,1,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,1,1-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,1,2-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,1-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,1-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,2-Dibromoethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,2-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,2-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,2-Dichloropropane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,3-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
1,4-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Acetone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	31-JUL-17
Benzene		<0.0068	<0.0068	RPD-NA	ug/g	N/A	40	31-JUL-17
Bromodichloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Bromoform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Bromomethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Carbon tetrachloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Chlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch **R3785708**								
WG2580013-4 DUP		**WG2580013-3**						
Chloroform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
cis-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
cis-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	31-JUL-17
Dibromochloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Dichlorodifluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Ethylbenzene		<0.018	<0.018	RPD-NA	ug/g	N/A	40	31-JUL-17
n-Hexane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Methylene Chloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
MTBE		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
m+p-Xylenes		<0.030	<0.030	RPD-NA	ug/g	N/A	40	31-JUL-17
Methyl Ethyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	31-JUL-17
Methyl Isobutyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	31-JUL-17
o-Xylene		<0.020	<0.020	RPD-NA	ug/g	N/A	40	31-JUL-17
Styrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Tetrachloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Toluene		<0.080	<0.080	RPD-NA	ug/g	N/A	40	31-JUL-17
trans-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
trans-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	31-JUL-17
Trichloroethylene		<0.010	<0.010	RPD-NA	ug/g	N/A	40	31-JUL-17
Trichlorofluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	31-JUL-17
Vinyl chloride		<0.020	<0.020	RPD-NA	ug/g	N/A	40	31-JUL-17
WG2580013-2 LCS								
1,1,1,2-Tetrachloroethane			99.5		%		60-130	31-JUL-17
1,1,2,2-Tetrachloroethane			102.6		%		60-130	31-JUL-17
1,1,1-Trichloroethane			103.8		%		60-130	31-JUL-17
1,1,2-Trichloroethane			103.0		%		60-130	31-JUL-17
1,1-Dichloroethane			108.6		%		60-130	31-JUL-17
1,1-Dichloroethylene			87.8		%		60-130	31-JUL-17
1,2-Dibromoethane			103.1		%		70-130	31-JUL-17
1,2-Dichlorobenzene			103.9		%		70-130	31-JUL-17
1,2-Dichloroethane			106.7		%		60-130	31-JUL-17
1,2-Dichloropropane			107.2		%		70-130	31-JUL-17
1,3-Dichlorobenzene			96.9		%		70-130	31-JUL-17

Quality Control Report

Workorder: L1966007 Report Date: 31-JUL-17

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R3785708								
WG2580013-2 LCS								
1,4-Dichlorobenzene			102.1		%		70-130	31-JUL-17
Acetone			108.1		%		60-140	31-JUL-17
Benzene			108.5		%		70-130	31-JUL-17
Bromodichloromethane			103.7		%		50-140	31-JUL-17
Bromoform			98.9		%		70-130	31-JUL-17
Bromomethane			108.2		%		50-140	31-JUL-17
Carbon tetrachloride			103.2		%		70-130	31-JUL-17
Chlorobenzene			101.3		%		70-130	31-JUL-17
Chloroform			107.5		%		70-130	31-JUL-17
cis-1,2-Dichloroethylene			104.0		%		70-130	31-JUL-17
cis-1,3-Dichloropropene			106.3		%		70-130	31-JUL-17
Dibromochloromethane			107.9		%		60-130	31-JUL-17
Dichlorodifluoromethane			65.8		%		50-140	31-JUL-17
Ethylbenzene			99.1		%		70-130	31-JUL-17
n-Hexane			105.1		%		70-130	31-JUL-17
Methylene Chloride			113.5		%		70-130	31-JUL-17
MTBE			100.8		%		70-130	31-JUL-17
m+p-Xylenes			102.0		%		70-130	31-JUL-17
Methyl Ethyl Ketone			112.9		%		60-140	31-JUL-17
Methyl Isobutyl Ketone			103.7		%		60-140	31-JUL-17
o-Xylene			101.0		%		70-130	31-JUL-17
Styrene			100.7		%		70-130	31-JUL-17
Tetrachloroethylene			95.5		%		60-130	31-JUL-17
Toluene			95.3		%		70-130	31-JUL-17
trans-1,2-Dichloroethylene			106.8		%		60-130	31-JUL-17
trans-1,3-Dichloropropene			104.3		%		70-130	31-JUL-17
Trichloroethylene			100.8		%		60-130	31-JUL-17
Trichlorofluoromethane			100.6		%		50-140	31-JUL-17
Vinyl chloride			89.9		%		60-140	31-JUL-17
WG2580013-1 MB								
1,1,1,2-Tetrachloroethane			<0.050		ug/g		0.05	31-JUL-17
1,1,2,2-Tetrachloroethane			<0.050		ug/g		0.05	31-JUL-17
1,1,1-Trichloroethane			<0.050		ug/g		0.05	31-JUL-17
1,1,2-Trichloroethane			<0.050		ug/g		0.05	31-JUL-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R3785708								
WG2580013-1 MB								
1,1-Dichloroethane			<0.050		ug/g		0.05	31-JUL-17
1,1-Dichloroethylene			<0.050		ug/g		0.05	31-JUL-17
1,2-Dibromoethane			<0.050		ug/g		0.05	31-JUL-17
1,2-Dichlorobenzene			<0.050		ug/g		0.05	31-JUL-17
1,2-Dichloroethane			<0.050		ug/g		0.05	31-JUL-17
1,2-Dichloropropane			<0.050		ug/g		0.05	31-JUL-17
1,3-Dichlorobenzene			<0.050		ug/g		0.05	31-JUL-17
1,4-Dichlorobenzene			<0.050		ug/g		0.05	31-JUL-17
Acetone			<0.50		ug/g		0.5	31-JUL-17
Benzene			<0.0068		ug/g		0.0068	31-JUL-17
Bromodichloromethane			<0.050		ug/g		0.05	31-JUL-17
Bromoform			<0.050		ug/g		0.05	31-JUL-17
Bromomethane			<0.050		ug/g		0.05	31-JUL-17
Carbon tetrachloride			<0.050		ug/g		0.05	31-JUL-17
Chlorobenzene			<0.050		ug/g		0.05	31-JUL-17
Chloroform			<0.050		ug/g		0.05	31-JUL-17
cis-1,2-Dichloroethylene			<0.050		ug/g		0.05	31-JUL-17
cis-1,3-Dichloropropene			<0.030		ug/g		0.03	31-JUL-17
Dibromochloromethane			<0.050		ug/g		0.05	31-JUL-17
Dichlorodifluoromethane			<0.050		ug/g		0.05	31-JUL-17
Ethylbenzene			<0.018		ug/g		0.018	31-JUL-17
n-Hexane			<0.050		ug/g		0.05	31-JUL-17
Methylene Chloride			<0.050		ug/g		0.05	31-JUL-17
MTBE			<0.050		ug/g		0.05	31-JUL-17
m+p-Xylenes			<0.030		ug/g		0.03	31-JUL-17
Methyl Ethyl Ketone			<0.50		ug/g		0.5	31-JUL-17
Methyl Isobutyl Ketone			<0.50		ug/g		0.5	31-JUL-17
o-Xylene			<0.020		ug/g		0.02	31-JUL-17
Styrene			<0.050		ug/g		0.05	31-JUL-17
Tetrachloroethylene			<0.050		ug/g		0.05	31-JUL-17
Toluene			<0.080		ug/g		0.08	31-JUL-17
trans-1,2-Dichloroethylene			<0.050		ug/g		0.05	31-JUL-17
trans-1,3-Dichloropropene			<0.030		ug/g		0.03	31-JUL-17

ALS Environmental

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R3785708								
WG2580013-1 MB								
Trichloroethylene			<0.010		ug/g		0.01	31-JUL-17
Trichlorofluoromethane			<0.050		ug/g		0.05	31-JUL-17
Vinyl chloride			<0.020		ug/g		0.02	31-JUL-17
Surrogate: 1,4-Difluorobenzene			105.7		%		50-140	31-JUL-17
Surrogate: 4-Bromofluorobenzene			97.1		%		50-140	31-JUL-17
WG2580013-5 MS		**WG2580013-3**						
1,1,1,2-Tetrachloroethane			112.3		%		50-140	31-JUL-17
1,1,2,2-Tetrachloroethane			115.8		%		50-140	31-JUL-17
1,1,1-Trichloroethane			118.8		%		50-140	31-JUL-17
1,1,2-Trichloroethane			116.6		%		50-140	31-JUL-17
1,1-Dichloroethane			124.8		%		50-140	31-JUL-17
1,1-Dichloroethylene			106.9		%		50-140	31-JUL-17
1,2-Dibromoethane			117.4		%		50-140	31-JUL-17
1,2-Dichlorobenzene			113.0		%		50-140	31-JUL-17
1,2-Dichloroethane			122.5		%		50-140	31-JUL-17
1,2-Dichloropropane			122.0		%		50-140	31-JUL-17
1,3-Dichlorobenzene			106.1		%		50-140	31-JUL-17
1,4-Dichlorobenzene			110.5		%		50-140	31-JUL-17
Acetone			143.7	MES	%		50-140	31-JUL-17
Benzene			122.8		%		50-140	31-JUL-17
Bromodichloromethane			117.6		%		50-140	31-JUL-17
Bromoform			112.5		%		50-140	31-JUL-17
Bromomethane			87.2		%		50-140	31-JUL-17
Carbon tetrachloride			118.1		%		50-140	31-JUL-17
Chlorobenzene			113.0		%		50-140	31-JUL-17
Chloroform			122.6		%		50-140	31-JUL-17
cis-1,2-Dichloroethylene			117.1		%		50-140	31-JUL-17
cis-1,3-Dichloropropene			102.1		%		50-140	31-JUL-17
Dibromochloromethane			123.3		%		50-140	31-JUL-17
Dichlorodifluoromethane			77.3		%		50-140	31-JUL-17
Ethylbenzene			108.4		%		50-140	31-JUL-17
n-Hexane			115.7		%		50-140	31-JUL-17
Methylene Chloride			123.4		%		50-140	31-JUL-17
MTBE			112.8		%		50-140	31-JUL-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R3785708								
WG2580013-5 MS		**WG2580013-3**						
m+p-Xylenes			111.9		%		50-140	31-JUL-17
Methyl Ethyl Ketone			125.2		%		50-140	31-JUL-17
Methyl Isobutyl Ketone			113.6		%		50-140	31-JUL-17
o-Xylene			110.5		%		50-140	31-JUL-17
Styrene			108.9		%		50-140	31-JUL-17
Tetrachloroethylene			103.1		%		50-140	31-JUL-17
Toluene			106.1		%		50-140	31-JUL-17
trans-1,2-Dichloroethylene			110.0		%		50-140	31-JUL-17
trans-1,3-Dichloropropene			95.9		%		50-140	31-JUL-17
Trichloroethylene			111.4		%		50-140	31-JUL-17
Trichlorofluoromethane			123.3		%		50-140	31-JUL-17
Vinyl chloride			84.2		%		50-140	31-JUL-17

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1966007-COFC

COC Number: 15 - 574489

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	WSP Group Limited.
Contact:	Asif Rashid
Phone:	905-882-4211 ext. 6440
	Company address below will appear on the final report
Street:	100 Commerce Valley Drive west
City/Province:	Thornhill / Ontario
Postal Code:	L3T 0A1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: asif.rashid@wsp.com

Email 2: ahmed.negm@wsp.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: asif.rashid@wsp.com

Email 2:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:

Job #: 15M-00656-01

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only): L1966007 276

ALS Contact:

Sampler: A.N.

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs	TCLP	Number of Containers
1	MW101/11	24/7/17	18:00	Soil	X		3
2	MW102/18	25/7/17	12:00		X		3
3	MW103/9	25/7/17	17:00		X		3
4	MW104/11	26/7/17	13:00		X		3
5	MW105/16	27/7/17	9:30	Soil	X		3
6	Composite 1	27/7/17	9:30	Soil		X	1
7	Dup 1	—	—	Soil	X		3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Table 3 R/P/I

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 19.5

FINAL COOLER TEMPERATURES °C: 7.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ahmed Negm	Date: July 27, 2017	Time: 12:45	Received by: B	Date: July 27/17	Time: 12:45	Received by: RW	Date: Jul-27-2017	Time: 17:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY — OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

WSP Canada Inc. (Thornhill)
ATTN: ASIF RASHID
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Date Received: 27-JUL-17
Report Date: 04-AUG-17 14:06 (MT)
Version: FINAL

Client Phone: 905-882-1100

Certificate of Analysis

Lab Work Order #: L1966022

Project P.O. #: NOT SUBMITTED
Job Reference: 15M-00656-01
C of C Numbers: 15-574489
Legal Site Desc:

Emerson Omar Perez

Emerson Perez, B.S.E
Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Federal & Provincial Waste Regulations (MAR, 2008) - Ontario Ministry of the Environment, General Waste Control Regulation No. 347/90						
(No parameter exceedances)						
Federal & Provincial Waste Regulations (MAR, 2008) - Polychlorinated Biphenyls (PCBs) - Ontario Regulation 347/90						
(No parameter exceedances)						

Environmental

ANALYTICAL REPORT

Sample Preparation - WASTE

			Lab ID	L1966022-1
			Sample Date	27-JUL-17
			Sample ID	COMPOSITE 1
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Initial pH	pH units	-	-	9.70
Final pH	pH units	-	-	5.88

Guide Limit #1: Ontario Ministry of the Environment, General Waste Control Regulation No. 347/90
Guide Limit #2: Polychlorinated Biphenyls (PCBs) - Ontario Regulation 347/90

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Environmental

ANALYTICAL REPORT

TCLP Extractables - WASTE

			Lab ID	L1966022-1
			Sample Date	27-JUL-17
			Sample ID	COMPOSITE 1
		Guide Limits		
Analyte	Unit	#1	#2	
Aroclor 1242	mg/L	-	-	<0.00020
Aroclor 1248	mg/L	-	-	<0.00020
Aroclor 1254	mg/L	-	-	<0.00020
Aroclor 1260	mg/L	-	-	<0.00020
Cyanide, Weak Acid Diss	mg/L	20	-	<0.10
Fluoride (F)	mg/L	150.0	-	<10
Nitrate and Nitrite as N	mg/L	1000	-	<4.0
Nitrate-N	mg/L	-	-	<2.0
Nitrite-N	mg/L	-	-	<2.0
Total PCBs	mg/L	0.3	-	<0.00040
Surrogate: 2-Fluorobiphenyl	%	-	-	90.7

Guide Limit #1: Ontario Ministry of the Environment, General Waste Control Regulation No. 347/90
Guide Limit #2: Polychlorinated Biphenyls (PCBs) - Ontario Regulation 347/90

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Environmental

ANALYTICAL REPORT

TCLP Metals - WASTE

				Lab ID	L1966022-1
				Sample Date	27-JUL-17
				Sample ID	COMPOSITE 1
		Guide Limits			
Analyte	Unit	#1	#2		
Arsenic (As)	mg/L	2.5	-		<0.050
Barium (Ba)	mg/L	100	-		<0.50
Boron (B)	mg/L	500	-		<2.5
Cadmium (Cd)	mg/L	0.5	-		<0.0050
Chromium (Cr)	mg/L	5.0	-		<0.050
Lead (Pb)	mg/L	5.0	-		<0.050
Mercury (Hg)	mg/L	0.1	-		<0.00010
Selenium (Se)	mg/L	1.0	-		<0.025
Silver (Ag)	mg/L	5.0	-		<0.0050
Uranium (U)	mg/L	10	-		<0.25

Guide Limit #1: Ontario Ministry of the Environment, General Waste Control Regulation No. 347/90
Guide Limit #2: Polychlorinated Biphenyls (PCBs) - Ontario Regulation 347/90

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

TCLP VOCs - WASTE

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L1966022-1 Sample Date 27-JUL-17 Sample ID COMPOSITE 1
1,1-Dichloroethylene	mg/L	1.4	-	<0.025
1,2-Dichlorobenzene	mg/L	20.0	-	<0.025
1,2-Dichloroethane	mg/L	0.5	-	<0.025
1,4-Dichlorobenzene	mg/L	0.5	-	<0.025
Benzene	mg/L	0.5	-	<0.025
Carbon tetrachloride	mg/L	0.5	-	<0.025
Chlorobenzene	mg/L	8	-	<0.025
Chloroform	mg/L	10	-	<0.10
Dichloromethane	mg/L	5.0	-	<0.50
Methyl Ethyl Ketone	mg/L	200.0	-	<1.0
Tetrachloroethylene	mg/L	3	-	<0.025
Trichloroethylene	mg/L	5	-	<0.025
Vinyl chloride	mg/L	0.2	-	<0.050
Surrogate: 4-Bromofluorobenzene	%	-	-	101.5

Guide Limit #1: Ontario Ministry of the Environment, General Waste Control Regulation No. 347/90
Guide Limit #2: Polychlorinated Biphenyls (PCBs) - Ontario Regulation 347/90

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ALS Environmental

ANALYTICAL REPORT

Volatile Organic Compounds - WASTE

Analyte	Unit	Guide Limits #1	Guide Limits #2	L1966022-1
			Lab ID	L1966022-1
			Sample Date	27-JUL-17
			Sample ID	COMPOSITE 1
Surrogate: 1,4-Difluorobenzene	%	-	-	101.6

Guide Limit #1: Ontario Ministry of the Environment, General Waste Control Regulation No. 347/90
Guide Limit #2: Polychlorinated Biphenyls (PCBs) - Ontario Regulation 347/90

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CN-TCLP-WT	Waste	Cyanide for O. Reg 347	APHA 4500CN C E
F-TCLP-WT	Waste	Fluoride (F) for O. Reg 347	APHA 4110 B-Ion Chromatography
HG-TCLP-WT	Waste	Mercury (CVAA) for O.Reg 347	SW846 7470A
LEACH-TCLP-WT	Waste	Leachate Procedure for Reg 347	EPA 1311

Inorganic and Semi-Volatile Organic contaminants are leached from waste samples in strict accordance with US EPA Method 1311, "Toxicity Characteristic Leaching Procedure" (TCLP). Test results are reported in leachate concentration units (normally mg/L).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-TCLP-WT	Waste	O.Reg 347 TCLP Leachable Metals	EPA 200.8
N2N3-TCLP-WT	Waste	Nitrate/Nitrite-N for O. Reg 347	APHA 4110 B-Ion Chromatography
PCB-TCLP-WT	Waste	PCBs for O. Reg 347	SW846 8270
VOC-TCLP-WT	Waste	VOC for O. Reg 347	SW846 8260

A sample of waste is leached in a zero headspace extractor at 30–2 rpm for 18–2.0 hours with the appropriate leaching solution. After tumbling the leachate is analyzed directly by headspace technology, followed by GC/MS using internal standard quantitation.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

15-574489

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information.

ALS Environmental

Quality Control Report

Workorder: L1966022 Report Date: 04-AUG-17

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TCLP-WT	**Waste**							
Batch R3786176								
WG2581798-3 DUP		**L1965048-1**						
Cyanide, Weak Acid Diss		<0.10	<0.10	RPD-NA	mg/L	N/A	20	31-JUL-17
WG2581798-2 LCS								
Cyanide, Weak Acid Diss			98.9		%		70-130	31-JUL-17
WG2581798-1 MB								
Cyanide, Weak Acid Diss			<0.10		mg/L		0.1	31-JUL-17
WG2581798-4 MS		**L1965048-1**						
Cyanide, Weak Acid Diss			101.9		%		50-150	31-JUL-17
F-TCLP-WT	**Waste**							
Batch R3790650								
WG2583688-3 DUP		**L1965436-1**						
Fluoride (F)		<10	<10	RPD-NA	mg/L	N/A	30	02-AUG-17
WG2583688-2 LCS								
Fluoride (F)			86.2		%		70-130	02-AUG-17
WG2583688-1 MB								
Fluoride (F)			<10		mg/L		10	02-AUG-17
WG2583688-4 MS		**L1965436-1**						
Fluoride (F)			85.6		%		50-150	02-AUG-17
HG-TCLP-WT	**Waste**							
Batch R3785657								
WG2581732-3 DUP		**L1965961-1**						
Mercury (Hg)		<0.00010	<0.00010	RPD-NA	mg/L	N/A	50	31-JUL-17
WG2581732-2 LCS								
Mercury (Hg)			101.0		%		70-130	31-JUL-17
WG2581732-1 MB								
Mercury (Hg)			<0.00010		mg/L		0.0001	31-JUL-17
WG2581732-4 MS		**L1965436-1**						
Mercury (Hg)			95.9		%		50-140	31-JUL-17
MET-TCLP-WT	**Waste**							
Batch R3788248								
WG2582317-4 DUP		**WG2582317-3**						
Silver (Ag)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	40	01-AUG-17
Arsenic (As)		<0.050	<0.050	RPD-NA	mg/L	N/A	40	01-AUG-17
Boron (B)		<2.5	<2.5	RPD-NA	mg/L	N/A	40	01-AUG-17
Barium (Ba)		0.81	0.81		mg/L	1.1	40	01-AUG-17
Cadmium (Cd)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	40	01-AUG-17
Chromium (Cr)		<0.050	<0.050	RPD-NA	mg/L	N/A	40	01-AUG-17

Quality Control Report

Workorder: L1966022 Report Date: 04-AUG-17

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TCLP-WT	**Waste**							
Batch R3788248								
WG2582317-4 DUP		**WG2582317-3**						
Lead (Pb)		0.085	0.086		mg/L	1.0	40	01-AUG-17
Selenium (Se)		<0.025	<0.025	RPD-NA	mg/L	N/A	40	01-AUG-17
Uranium (U)		<0.25	<0.25	RPD-NA	mg/L	N/A	40	01-AUG-17
WG2582317-6 DUP		**L1965961-1**						
Silver (Ag)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	40	01-AUG-17
Arsenic (As)		<0.050	<0.050	RPD-NA	mg/L	N/A	40	01-AUG-17
Boron (B)		<2.5	<2.5	RPD-NA	mg/L	N/A	40	01-AUG-17
Barium (Ba)		<0.50	<0.50	RPD-NA	mg/L	N/A	40	01-AUG-17
Cadmium (Cd)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	40	01-AUG-17
Chromium (Cr)		<0.050	<0.050	RPD-NA	mg/L	N/A	40	01-AUG-17
Lead (Pb)		<0.050	<0.050	RPD-NA	mg/L	N/A	40	01-AUG-17
Selenium (Se)		<0.025	<0.025	RPD-NA	mg/L	N/A	40	01-AUG-17
Uranium (U)		<0.25	<0.25	RPD-NA	mg/L	N/A	40	01-AUG-17
WG2582317-2 LCS								
Silver (Ag)			102.4		%		70-130	01-AUG-17
Arsenic (As)			99.6		%		70-130	01-AUG-17
Boron (B)			95.4		%		70-130	01-AUG-17
Barium (Ba)			99.5		%		70-130	01-AUG-17
Cadmium (Cd)			99.5		%		70-130	01-AUG-17
Chromium (Cr)			98.9		%		70-130	01-AUG-17
Lead (Pb)			100.5		%		70-130	01-AUG-17
Selenium (Se)			98.6		%		70-130	01-AUG-17
Uranium (U)			102.7		%		70-130	01-AUG-17
WG2582317-1 MB								
Silver (Ag)			<0.0050		mg/L		0.005	01-AUG-17
Arsenic (As)			<0.050		mg/L		0.05	01-AUG-17
Boron (B)			<2.5		mg/L		2.5	01-AUG-17
Barium (Ba)			<0.50		mg/L		0.5	01-AUG-17
Cadmium (Cd)			<0.0050		mg/L		0.005	01-AUG-17
Chromium (Cr)			<0.050		mg/L		0.05	01-AUG-17
Lead (Pb)			<0.050		mg/L		0.05	01-AUG-17
Selenium (Se)			<0.025		mg/L		0.025	01-AUG-17
Uranium (U)			<0.25		mg/L		0.25	01-AUG-17
WG2582317-5 MS		**WG2582317-3**						

Quality Control Report

Workorder: L1966022 Report Date: 04-AUG-17

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TCLP-WT	**Waste**							
Batch R3788248								
WG2582317-5 MS		**WG2582317-3**						
Silver (Ag)			120.2		%		50-150	01-AUG-17
Arsenic (As)			100.2		%		50-150	01-AUG-17
Boron (B)			94.3		%		50-150	01-AUG-17
Barium (Ba)			98.3		%		50-150	01-AUG-17
Cadmium (Cd)			99.6		%		50-150	01-AUG-17
Chromium (Cr)			97.9		%		50-150	01-AUG-17
Lead (Pb)			98.6		%		50-150	01-AUG-17
Selenium (Se)			100.8		%		50-150	01-AUG-17
Uranium (U)			97.2		%		50-150	01-AUG-17
N2N3-TCLP-WT	**Waste**							
Batch R3790650								
WG2583688-3 DUP		**L1965436-1**						
Nitrate-N		<2.0	<2.0	RPD-NA	mg/L	N/A	30	02-AUG-17
Nitrite-N		<2.0	<2.0	RPD-NA	mg/L	N/A	30	02-AUG-17
WG2583688-2 LCS								
Nitrate-N			98.2		%		70-130	02-AUG-17
Nitrite-N			95.5		%		70-130	02-AUG-17
WG2583688-1 MB								
Nitrate-N			<2.0		mg/L		2	02-AUG-17
Nitrite-N			<2.0		mg/L		2	02-AUG-17
WG2583688-4 MS		**L1965436-1**						
Nitrate-N			99.2		%		50-150	02-AUG-17
Nitrite-N			97.3		%		50-150	02-AUG-17
PCB-TCLP-WT	**Waste**							
Batch R3791230								
WG2583447-4 DUP		**WG2583447-3**						
Aroclor 1242		<0.00020	<0.00020	RPD-NA	mg/L	N/A	50	04-AUG-17
Aroclor 1248		<0.00020	<0.00020	RPD-NA	mg/L	N/A	50	04-AUG-17
Aroclor 1254		<0.00020	<0.00020	RPD-NA	mg/L	N/A	50	04-AUG-17
Aroclor 1260		<0.00020	<0.00020	RPD-NA	mg/L	N/A	50	04-AUG-17
WG2583447-2 LCS								
Aroclor 1242			81.4		%		65-130	04-AUG-17
Aroclor 1248			80.9		%		65-130	04-AUG-17
Aroclor 1254			94.0		%		65-130	04-AUG-17

ALS Environmental

Quality Control Report

Workorder: L1966022 Report Date: 04-AUG-17

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PCB-TCLP-WT	**Waste**							
Batch R3791230								
WG2583447-2 LCS								
Aroclor 1260			86.8		%		65-130	04-AUG-17
WG2583447-1 MB								
Aroclor 1242			<0.00020		mg/L		0.0002	04-AUG-17
Aroclor 1248			<0.00020		mg/L		0.0002	04-AUG-17
Aroclor 1254			<0.00020		mg/L		0.0002	04-AUG-17
Aroclor 1260			<0.00020		mg/L		0.0002	04-AUG-17
Surrogate: 2-Fluorobiphenyl			96.0		%		40-160	04-AUG-17
WG2583447-5 MS		**WG2583447-3**						
Aroclor 1242			89.2		%		50-150	04-AUG-17
Aroclor 1254			104.5		%		50-150	04-AUG-17
Aroclor 1260			94.2		%		50-150	04-AUG-17
VOC-TCLP-WT	**Waste**							
Batch R3786217								
WG2579431-4 DUP		**WG2579431-3**						
1,1-Dichloroethylene		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
1,2-Dichlorobenzene		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
1,2-Dichloroethane		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
1,4-Dichlorobenzene		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
Benzene		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
Carbon tetrachloride		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
Chlorobenzene		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
Chloroform		<0.10	<0.10	RPD-NA	mg/L	N/A	50	01-AUG-17
Dichloromethane		<0.50	<0.50	RPD-NA	mg/L	N/A	50	01-AUG-17
Methyl Ethyl Ketone		<1.0	<1.0	RPD-NA	mg/L	N/A	50	01-AUG-17
Tetrachloroethylene		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
Trichloroethylene		<0.025	<0.025	RPD-NA	mg/L	N/A	50	01-AUG-17
Vinyl chloride		<0.050	<0.050	RPD-NA	mg/L	N/A	50	01-AUG-17
WG2579431-1 LCS								
1,1-Dichloroethylene			89.8		%		70-130	01-AUG-17
1,2-Dichlorobenzene			93.6		%		70-130	01-AUG-17
1,2-Dichloroethane			97.6		%		70-130	01-AUG-17
1,4-Dichlorobenzene			94.3		%		70-130	01-AUG-17
Benzene			98.4		%		70-130	01-AUG-17
Carbon tetrachloride			97.0		%		60-140	01-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-TCLP-WT	**Waste**							
Batch R3786217								
WG2579431-1 LCS								
Chlorobenzene			95.5		%		70-130	01-AUG-17
Chloroform			97.9		%		70-130	01-AUG-17
Dichloromethane			101.5		%		70-130	01-AUG-17
Methyl Ethyl Ketone			99.7		%		50-150	01-AUG-17
Tetrachloroethylene			91.7		%		70-130	01-AUG-17
Trichloroethylene			92.8		%		70-130	01-AUG-17
Vinyl chloride			90.5		%		60-130	01-AUG-17
WG2579431-2 MB								
1,1-Dichloroethylene			<0.025		mg/L		0.025	01-AUG-17
1,2-Dichlorobenzene			<0.025		mg/L		0.025	01-AUG-17
1,2-Dichloroethane			<0.025		mg/L		0.025	01-AUG-17
1,4-Dichlorobenzene			<0.025		mg/L		0.025	01-AUG-17
Benzene			<0.025		mg/L		0.025	01-AUG-17
Carbon tetrachloride			<0.025		mg/L		0.025	01-AUG-17
Chlorobenzene			<0.025		mg/L		0.025	01-AUG-17
Chloroform			<0.10		mg/L		0.1	01-AUG-17
Dichloromethane			<0.50		mg/L		0.5	01-AUG-17
Methyl Ethyl Ketone			<1.0		mg/L		1	01-AUG-17
Tetrachloroethylene			<0.025		mg/L		0.025	01-AUG-17
Trichloroethylene			<0.025		mg/L		0.025	01-AUG-17
Vinyl chloride			<0.050		mg/L		0.05	01-AUG-17
Surrogate: 1,4-Difluorobenzene			102.3		%		70-130	01-AUG-17
Surrogate: 4-Bromofluorobenzene			100.7		%		70-130	01-AUG-17
COMMENTS: 29-JUL-17								
WG2579431-6 MB								
1,1-Dichloroethylene			<0.025		mg/L		0.025	01-AUG-17
1,2-Dichlorobenzene			<0.025		mg/L		0.025	01-AUG-17
1,2-Dichloroethane			<0.025		mg/L		0.025	01-AUG-17
1,4-Dichlorobenzene			<0.025		mg/L		0.025	01-AUG-17
Benzene			<0.025		mg/L		0.025	01-AUG-17
Carbon tetrachloride			<0.025		mg/L		0.025	01-AUG-17
Chlorobenzene			<0.025		mg/L		0.025	01-AUG-17
Chloroform			<0.10		mg/L		0.1	01-AUG-17
Dichloromethane			<0.50		mg/L		0.5	01-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-TCLP-WT	**Waste**							
Batch R3786217								
WG2579431-6 MB								
Methyl Ethyl Ketone			<1.0		mg/L		1	01-AUG-17
Tetrachloroethylene			<0.025		mg/L		0.025	01-AUG-17
Trichloroethylene			<0.025		mg/L		0.025	01-AUG-17
Vinyl chloride			<0.050		mg/L		0.05	01-AUG-17
Surrogate: 1,4-Difluorobenzene			102.0		%		70-130	01-AUG-17
Surrogate: 4-Bromofluorobenzene			101.4		%		70-130	01-AUG-17
COMMENTS: 31-JUL-17								
WG2579431-5 MS		**WG2579431-3**						
1,1-Dichloroethylene			89.6		%		50-140	01-AUG-17
1,2-Dichlorobenzene			93.7		%		50-140	01-AUG-17
1,2-Dichloroethane			105.5		%		50-140	01-AUG-17
1,4-Dichlorobenzene			91.7		%		50-140	01-AUG-17
Benzene			100.3		%		50-140	01-AUG-17
Carbon tetrachloride			94.7		%		50-140	01-AUG-17
Chlorobenzene			94.0		%		50-140	01-AUG-17
Chloroform			100.5		%		50-140	01-AUG-17
Dichloromethane			107.0		%		50-140	01-AUG-17
Methyl Ethyl Ketone			114.6		%		50-140	01-AUG-17
Tetrachloroethylene			86.3		%		50-140	01-AUG-17
Trichloroethylene			92.9		%		50-140	01-AUG-17
Vinyl chloride			99.1		%		50-140	01-AUG-17

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1966022-COFC

COC Number: 15 - 574489

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	WSP Group Limited.
Contact:	Asif Rashid
Phone:	905-882-4211 ext. 6440
	Company address below will appear on the final report
Street:	100 Commerce Valley Drive west
City/Province:	Thornhill / Ontario
Postal Code:	L3T 0A1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	asif.rashid@wsp.com
Email 2	ahmed.negm@wsp.com
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	asif.rashid@wsp.com
Email 2	

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]	☑	Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days)	4 day [P4] ☐	EMERGENCY: 1 Business day [E1] ☐
	3 day [P3] ☐	Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐	
Date and Time Required for all E&P TATs:		

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #: 15M-00656-01		Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	~~L1966007~~ L1966022 276	ALS Contact:	Sampler: A.N

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs	TCLP	Number of Containers
1	MW101/11	24/7/17	18:00	Soil	X		3
2	MW102/18	25/7/17	12:00		X		3
3	MW103/9	25/7/17	17:00		X		3
4	MW104/11	26/7/17	13:00		X		3
5	~~M~~ MW105/16	27/7/17	9:30	Soil	X		3
#1	Composite 1	27/7/17	9:30	Soil		X	1
6	Dup 1	—	—	Soil	X		3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Table 3 R/P/I

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice Packs	☐	Ice Cubes ☑	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
19.5			7.6		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ahmed Negm	Date: July 27, 2017	Time: 12:45	Received by: B	Date: July 27/17	Time: 12:45	Received by: RW	Date: Jul-27-2017	Time: 17:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SIF

WSP Canada Inc. (Thornhill)
ATTN: ASIF RASHID
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Date Received: 15-AUG-17
Report Date: 22-AUG-17 14:59 (MT)
Version: FINAL

Client Phone: 905-882-1100

Certificate of Analysis

Lab Work Order #: L1976218

Project P.O. #: NOT SUBMITTED
Job Reference: 15M-00656-01
C of C Numbers: 15-574163
Legal Site Desc:

Emerson Perez, B.S.E
Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Regulation 153/04 - April 15, 2011 Standards - T3-Non-Potable Ground Water-All Types of Property Uses (Coarse)						
L1976218-1	MW104	Volatile Organic Compounds	Trichloroethylene	6.43	1.6	ug/L
L1976218-2	DUP 1	Volatile Organic Compounds	Trichloroethylene	6.73	1.6	ug/L
L1976218-3	MW101	Volatile Organic Compounds	1,1-Dichloroethylene	4.62	1.6	ug/L
			Trichloroethylene	4.40	1.6	ug/L
Ontario Regulation 153/04 - April 15, 2011 Standards - T3-Non-Potable Ground Water-All Types of Property Uses (Fine)						
(No parameter exceedances)						

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	L1976218-1	L1976218-2	L1976218-3	L1976218-4	L1976218-5	L1976218-6	L1976218-7
Sample Date				15-AUG-17		15-AUG-17	15-AUG-17	15-AUG-17	15-AUG-17	
Sample ID				MW104	DUP 1	MW101	MW103	MW105	MW102	TRIP BLANK
Acetone	ug/L	130000	130000	<30	<30	<30	<30	<30	<30	<30
Benzene	ug/L	44	430	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	85000	85000	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	380	770	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	5.6	56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	0.79	8.4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	630	630	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	82000	82000	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	ug/L	2.4	22	1.2	1.2	<1.0	<1.0	<1.0	1.3	<1.0
1,2-Dibromoethane	ug/L	0.25	0.83	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	4600	9600	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	9600	9600	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	8	67	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	4400	4400	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	320	3100	<0.50	<0.50	7.71	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	1.6	12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	1.6	17	<0.50	<0.50	4.62	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	1.6	17	<0.60 DLQ	<0.60 DLQ	<0.65 DLQ	<0.50	<0.50	<0.50	<0.50
trans-1,2-Dichloroethylene	ug/L	1.6	17	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	610	5500	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	16	140	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	5.2	45	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	2300	2300	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	51	520	1.04	1.33	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	470000	1500000	<20	<20	<20	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	140000	580000	<20	<20	<20	<20	<20	<20	<20
MTBE	ug/L	190	1400	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	1300	9100	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: T3-Non-Potable Ground Water-All Types of Property Uses (Coarse)
Guide Limit #2: T3-Non-Potable Ground Water-All Types of Property Uses (Fine)

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	L1976218-1	L1976218-2	L1976218-3	L1976218-4	L1976218-5	L1976218-6	L1976218-7
Sample Date				15-AUG-17		15-AUG-17	15-AUG-17	15-AUG-17	15-AUG-17	
Sample ID				MW104	DUP 1	MW101	MW103	MW105	MW102	TRIP BLANK
1,1,1,2-Tetrachloroethane	ug/L	3.3	28	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	3.2	15	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	1.6	17	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	18000	18000	<0.50	<0.50	<0.50	<0.50	0.65	0.55	<0.50
1,1,1-Trichloroethane	ug/L	640	6700	7.65	7.87	6.12	0.80	<0.50	1.63	<0.50
1,1,2-Trichloroethane	ug/L	4.7	30	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	1.6	17	6.43	6.73	4.40	0.70	0.61	1.41	<0.50
Trichlorofluoromethane	ug/L	2500	2500	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	0.5	1.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	-	-	<0.40	<0.40	<0.40	<0.40	0.40	<0.40	<0.40
Xylenes (Total)	ug/L	4200	4200	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	101.2	103.0	102.8	101.9	102.1	102.3	102.4
Surrogate: 1,4-Difluorobenzene	%	-	-	103.6	103.5	103.1	103.4	103.4	103.3	103.3

Guide Limit #1: T3-Non-Potable Ground Water-All Types of Property Uses (Coarse)
Guide Limit #2: T3-Non-Potable Ground Water-All Types of Property Uses (Fine)

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

ALS Test Code	Matrix	Test Description	Method Reference**
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

15-574163

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information.

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch **R3802289**								
WG2589803-4 DUP		**WG2589803-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	17-AUG-17
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	17-AUG-17
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
Bromodichloromethane		4.5	4.5		ug/L	0.2	30	17-AUG-17
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	17-AUG-17
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	17-AUG-17
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
Chloroform		6.0	6.0		ug/L	0.3	30	17-AUG-17
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-AUG-17
Dibromochloromethane		3.1	3.2		ug/L	1.9	30	17-AUG-17
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-AUG-17
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	17-AUG-17
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	17-AUG-17
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	17-AUG-17
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	17-AUG-17
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-AUG-17
o-Xylene		0.59	0.56		ug/L	5.2	30	17-AUG-17
Styrene		<0.50	<0.50		ug/L			17-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3802289								
WG2589803-4 DUP		**WG2589803-3**						
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
Toluene		1.24	1.18		ug/L	5.0	30	17-AUG-17
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-AUG-17
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	17-AUG-17
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-AUG-17
WG2589803-1 LCS								
1,1,1,2-Tetrachloroethane			91.4		%		70-130	17-AUG-17
1,1,2,2-Tetrachloroethane			88.6		%		70-130	17-AUG-17
1,1,1-Trichloroethane			95.3		%		70-130	17-AUG-17
1,1,2-Trichloroethane			93.6		%		70-130	17-AUG-17
1,1-Dichloroethane			96.5		%		70-130	17-AUG-17
1,1-Dichloroethylene			90.1		%		70-130	17-AUG-17
1,2-Dibromoethane			92.3		%		70-130	17-AUG-17
1,2-Dichlorobenzene			92.8		%		70-130	17-AUG-17
1,2-Dichloroethane			95.5		%		70-130	17-AUG-17
1,2-Dichloropropane			95.5		%		70-130	17-AUG-17
1,3-Dichlorobenzene			91.8		%		70-130	17-AUG-17
1,4-Dichlorobenzene			93.7		%		70-130	17-AUG-17
Acetone			104.4		%		60-140	17-AUG-17
Benzene			96.9		%		70-130	17-AUG-17
Bromodichloromethane			93.4		%		70-130	17-AUG-17
Bromoform			87.4		%		70-130	17-AUG-17
Bromomethane			97.8		%		60-140	17-AUG-17
Carbon tetrachloride			95.1		%		70-130	17-AUG-17
Chlorobenzene			93.4		%		70-130	17-AUG-17
Chloroform			97.0		%		70-130	17-AUG-17
cis-1,2-Dichloroethylene			96.1		%		70-130	17-AUG-17
cis-1,3-Dichloropropene			94.2		%		70-130	17-AUG-17
Dibromochloromethane			95.4		%		70-130	17-AUG-17
Dichlorodifluoromethane			80.2		%		50-140	17-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3802289								
WG2589803-1 LCS								
Ethylbenzene			90.3		%		70-130	17-AUG-17
n-Hexane			104.4		%		70-130	17-AUG-17
m+p-Xylenes			91.6		%		70-130	17-AUG-17
Methyl Ethyl Ketone			99.2		%		60-140	17-AUG-17
Methyl Isobutyl Ketone			95.5		%		60-140	17-AUG-17
Methylene Chloride			98.7		%		70-130	17-AUG-17
MTBE			94.0		%		70-130	17-AUG-17
o-Xylene			90.0		%		70-130	17-AUG-17
Styrene			97.1		%		70-130	17-AUG-17
Tetrachloroethylene			95.8		%		70-130	17-AUG-17
Toluene			92.9		%		70-130	17-AUG-17
trans-1,2-Dichloroethylene			96.3		%		70-130	17-AUG-17
trans-1,3-Dichloropropene			91.5		%		70-130	17-AUG-17
Trichloroethylene			96.4		%		70-130	17-AUG-17
Trichlorofluoromethane			97.2		%		60-140	17-AUG-17
Vinyl chloride			91.0		%		60-140	17-AUG-17
WG2589803-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	17-AUG-17
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	17-AUG-17
1,1,1-Trichloroethane			<0.50		ug/L		0.5	17-AUG-17
1,1,2-Trichloroethane			<0.50		ug/L		0.5	17-AUG-17
1,1-Dichloroethane			<0.50		ug/L		0.5	17-AUG-17
1,1-Dichloroethylene			<0.50		ug/L		0.5	17-AUG-17
1,2-Dibromoethane			<0.20		ug/L		0.2	17-AUG-17
1,2-Dichlorobenzene			<0.50		ug/L		0.5	17-AUG-17
1,2-Dichloroethane			<0.50		ug/L		0.5	17-AUG-17
1,2-Dichloropropane			<0.50		ug/L		0.5	17-AUG-17
1,3-Dichlorobenzene			<0.50		ug/L		0.5	17-AUG-17
1,4-Dichlorobenzene			<0.50		ug/L		0.5	17-AUG-17
Acetone			<30		ug/L		30	17-AUG-17
Benzene			<0.50		ug/L		0.5	17-AUG-17
Bromodichloromethane			<2.0		ug/L		2	17-AUG-17
Bromoform			<5.0		ug/L		5	17-AUG-17
Bromomethane			<0.50		ug/L		0.5	17-AUG-17

Quality Control Report

Workorder: L1976218 Report Date: 22-AUG-17

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3802289								
WG2589803-2 MB								
Carbon tetrachloride			<0.20		ug/L		0.2	17-AUG-17
Chlorobenzene			<0.50		ug/L		0.5	17-AUG-17
Chloroform			<1.0		ug/L		1	17-AUG-17
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-AUG-17
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	17-AUG-17
Dibromochloromethane			<2.0		ug/L		2	17-AUG-17
Dichlorodifluoromethane			<2.0		ug/L		2	17-AUG-17
Ethylbenzene			<0.50		ug/L		0.5	17-AUG-17
n-Hexane			<0.50		ug/L		0.5	17-AUG-17
m+p-Xylenes			<0.40		ug/L		0.4	17-AUG-17
Methyl Ethyl Ketone			<20		ug/L		20	17-AUG-17
Methyl Isobutyl Ketone			<20		ug/L		20	17-AUG-17
Methylene Chloride			<5.0		ug/L		5	17-AUG-17
MTBE			<2.0		ug/L		2	17-AUG-17
o-Xylene			<0.30		ug/L		0.3	17-AUG-17
Styrene			<0.50		ug/L		0.5	17-AUG-17
Tetrachloroethylene			<0.50		ug/L		0.5	17-AUG-17
Toluene			<0.50		ug/L		0.5	17-AUG-17
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-AUG-17
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	17-AUG-17
Trichloroethylene			<0.50		ug/L		0.5	17-AUG-17
Trichlorofluoromethane			<5.0		ug/L		5	17-AUG-17
Vinyl chloride			<0.50		ug/L		0.5	17-AUG-17
Surrogate: 1,4-Difluorobenzene			103.6		%		70-130	17-AUG-17
Surrogate: 4-Bromofluorobenzene			102.5		%		70-130	17-AUG-17
WG2589803-5 MS		**WG2589803-3**						
1,1,1,2-Tetrachloroethane			92.4		%		50-140	17-AUG-17
1,1,2,2-Tetrachloroethane			99.7		%		50-140	17-AUG-17
1,1,1-Trichloroethane			91.0		%		50-140	17-AUG-17
1,1,2-Trichloroethane			100.5		%		50-140	17-AUG-17
1,1-Dichloroethane			96.0		%		50-140	17-AUG-17
1,1-Dichloroethylene			83.2		%		50-140	17-AUG-17
1,2-Dibromoethane			101.2		%		50-140	17-AUG-17
1,2-Dichlorobenzene			92.1		%		50-140	17-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3802289								
WG2589803-5 MS		**WG2589803-3**						
1,2-Dichloroethane			104.1		%		50-140	17-AUG-17
1,2-Dichloropropane			99.6		%		50-140	17-AUG-17
1,3-Dichlorobenzene			88.3		%		50-140	17-AUG-17
1,4-Dichlorobenzene			91.2		%		50-140	17-AUG-17
Acetone			112.6		%		50-140	17-AUG-17
Benzene			96.9		%		50-140	17-AUG-17
Bromodichloromethane			98.4		%		50-140	17-AUG-17
Bromoform			96.2		%		50-140	17-AUG-17
Bromomethane			97.3		%		50-140	17-AUG-17
Carbon tetrachloride			89.1		%		50-140	17-AUG-17
Chlorobenzene			93.3		%		50-140	17-AUG-17
Chloroform			97.7		%		50-140	17-AUG-17
cis-1,2-Dichloroethylene			97.1		%		50-140	17-AUG-17
cis-1,3-Dichloropropene			106.0		%		50-140	17-AUG-17
Dibromochloromethane			101.3		%		50-140	17-AUG-17
Dichlorodifluoromethane			63.5		%		50-140	17-AUG-17
Ethylbenzene			86.1		%		50-140	17-AUG-17
n-Hexane			91.3		%		50-140	17-AUG-17
m+p-Xylenes			87.7		%		50-140	17-AUG-17
Methyl Ethyl Ketone			113.6		%		50-140	17-AUG-17
Methyl Isobutyl Ketone			113.4		%		50-140	17-AUG-17
Methylene Chloride			102.0		%		50-140	17-AUG-17
MTBE			93.7		%		50-140	17-AUG-17
o-Xylene			87.9		%		50-140	17-AUG-17
Styrene			94.2		%		50-140	17-AUG-17
Tetrachloroethylene			88.8		%		50-140	17-AUG-17
Toluene			89.8		%		50-140	17-AUG-17
trans-1,2-Dichloroethylene			93.1		%		50-140	17-AUG-17
trans-1,3-Dichloropropene			103.6		%		50-140	17-AUG-17
Trichloroethylene			94.1		%		50-140	17-AUG-17
Trichlorofluoromethane			86.4		%		50-140	17-AUG-17
Vinyl chloride			81.4		%		50-140	17-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3803006								
WG2589804-4 DUP		**WG2589804-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,1,1-Trichloroethane		1.63	1.66		ug/L	1.8	30	18-AUG-17
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	18-AUG-17
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	18-AUG-17
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-AUG-17
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-AUG-17
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	18-AUG-17
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
Chloroform		1.3	1.3		ug/L	0.8	30	18-AUG-17
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-AUG-17
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-AUG-17
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-AUG-17
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	18-AUG-17
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	18-AUG-17
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	18-AUG-17
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-AUG-17
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-AUG-17
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-AUG-17
Styrene		<0.50	<0.50		ug/L			18-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3803006								
WG2589804-4 DUP		**WG2589804-3**						
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
Toluene		0.55	0.55		ug/L	0.0	30	18-AUG-17
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-AUG-17
Trichloroethylene		1.41	1.44		ug/L	2.1	30	18-AUG-17
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-AUG-17
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-AUG-17
WG2589804-1 LCS								
1,1,1,2-Tetrachloroethane			91.1		%		70-130	18-AUG-17
1,1,2,2-Tetrachloroethane			84.2		%		70-130	18-AUG-17
1,1,1-Trichloroethane			97.9		%		70-130	18-AUG-17
1,1,2-Trichloroethane			90.6		%		70-130	18-AUG-17
1,1-Dichloroethane			98.3		%		70-130	18-AUG-17
1,1-Dichloroethylene			92.3		%		70-130	18-AUG-17
1,2-Dibromoethane			89.1		%		70-130	18-AUG-17
1,2-Dichlorobenzene			93.0		%		70-130	18-AUG-17
1,2-Dichloroethane			93.3		%		70-130	18-AUG-17
1,2-Dichloropropane			93.6		%		70-130	18-AUG-17
1,3-Dichlorobenzene			95.0		%		70-130	18-AUG-17
1,4-Dichlorobenzene			96.6		%		70-130	18-AUG-17
Acetone			98.9		%		60-140	18-AUG-17
Benzene			97.5		%		70-130	18-AUG-17
Bromodichloromethane			92.9		%		70-130	18-AUG-17
Bromoform			85.0		%		70-130	18-AUG-17
Bromomethane			99.9		%		60-140	18-AUG-17
Carbon tetrachloride			98.5		%		70-130	18-AUG-17
Chlorobenzene			93.5		%		70-130	18-AUG-17
Chloroform			97.6		%		70-130	18-AUG-17
cis-1,2-Dichloroethylene			96.6		%		70-130	18-AUG-17
cis-1,3-Dichloropropene			93.8		%		70-130	18-AUG-17
Dibromochloromethane			93.7		%		70-130	18-AUG-17
Dichlorodifluoromethane			79.5		%		50-140	18-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3803006								
WG2589804-1 LCS								
Ethylbenzene			89.5		%		70-130	18-AUG-17
n-Hexane			107.0		%		70-130	18-AUG-17
m+p-Xylenes			92.3		%		70-130	18-AUG-17
Methyl Ethyl Ketone			91.7		%		60-140	18-AUG-17
Methyl Isobutyl Ketone			84.6		%		60-140	18-AUG-17
Methylene Chloride			99.7		%		70-130	18-AUG-17
MTBE			94.3		%		70-130	18-AUG-17
o-Xylene			88.6		%		70-130	18-AUG-17
Styrene			94.6		%		70-130	18-AUG-17
Tetrachloroethylene			98.7		%		70-130	18-AUG-17
Toluene			92.7		%		70-130	18-AUG-17
trans-1,2-Dichloroethylene			98.2		%		70-130	18-AUG-17
trans-1,3-Dichloropropene			89.6		%		70-130	18-AUG-17
Trichloroethylene			98.8		%		70-130	18-AUG-17
Trichlorofluoromethane			100.4		%		60-140	18-AUG-17
Vinyl chloride			91.0		%		60-140	18-AUG-17
WG2589804-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	18-AUG-17
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	18-AUG-17
1,1,1-Trichloroethane			<0.50		ug/L		0.5	18-AUG-17
1,1,2-Trichloroethane			<0.50		ug/L		0.5	18-AUG-17
1,1-Dichloroethane			<0.50		ug/L		0.5	18-AUG-17
1,1-Dichloroethylene			<0.50		ug/L		0.5	18-AUG-17
1,2-Dibromoethane			<0.20		ug/L		0.2	18-AUG-17
1,2-Dichlorobenzene			<0.50		ug/L		0.5	18-AUG-17
1,2-Dichloroethane			<0.50		ug/L		0.5	18-AUG-17
1,2-Dichloropropane			<0.50		ug/L		0.5	18-AUG-17
1,3-Dichlorobenzene			<0.50		ug/L		0.5	18-AUG-17
1,4-Dichlorobenzene			<0.50		ug/L		0.5	18-AUG-17
Acetone			<30		ug/L		30	18-AUG-17
Benzene			<0.50		ug/L		0.5	18-AUG-17
Bromodichloromethane			<2.0		ug/L		2	18-AUG-17
Bromoform			<5.0		ug/L		5	18-AUG-17
Bromomethane			<0.50		ug/L		0.5	18-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3803006								
WG2589804-2 MB								
Carbon tetrachloride			<0.20		ug/L		0.2	18-AUG-17
Chlorobenzene			<0.50		ug/L		0.5	18-AUG-17
Chloroform			<1.0		ug/L		1	18-AUG-17
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	18-AUG-17
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	18-AUG-17
Dibromochloromethane			<2.0		ug/L		2	18-AUG-17
Dichlorodifluoromethane			<2.0		ug/L		2	18-AUG-17
Ethylbenzene			<0.50		ug/L		0.5	18-AUG-17
n-Hexane			<0.50		ug/L		0.5	18-AUG-17
m+p-Xylenes			<0.40		ug/L		0.4	18-AUG-17
Methyl Ethyl Ketone			<20		ug/L		20	18-AUG-17
Methyl Isobutyl Ketone			<20		ug/L		20	18-AUG-17
Methylene Chloride			<5.0		ug/L		5	18-AUG-17
MTBE			<2.0		ug/L		2	18-AUG-17
o-Xylene			<0.30		ug/L		0.3	18-AUG-17
Styrene			<0.50		ug/L		0.5	18-AUG-17
Tetrachloroethylene			<0.50		ug/L		0.5	18-AUG-17
Toluene			<0.50		ug/L		0.5	18-AUG-17
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	18-AUG-17
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	18-AUG-17
Trichloroethylene			<0.50		ug/L		0.5	18-AUG-17
Trichlorofluoromethane			<5.0		ug/L		5	18-AUG-17
Vinyl chloride			<0.50		ug/L		0.5	18-AUG-17
Surrogate: 1,4-Difluorobenzene			103.6		%		70-130	18-AUG-17
Surrogate: 4-Bromofluorobenzene			101.3		%		70-130	18-AUG-17
WG2589804-5 MS		**WG2589804-3**						
1,1,1,2-Tetrachloroethane			93.0		%		50-140	18-AUG-17
1,1,2,2-Tetrachloroethane			98.7		%		50-140	18-AUG-17
1,1,1-Trichloroethane			92.6		%		50-140	18-AUG-17
1,1,2-Trichloroethane			100.8		%		50-140	18-AUG-17
1,1-Dichloroethane			98.6		%		50-140	18-AUG-17
1,1-Dichloroethylene			82.5		%		50-140	18-AUG-17
1,2-Dibromoethane			101.4		%		50-140	18-AUG-17
1,2-Dichlorobenzene			93.1		%		50-140	18-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1

Contact: ASIF RASHID

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R3803006								
WG2589804-5 MS		**WG2589804-3**						
1,2-Dichloroethane			106.8		%		50-140	18-AUG-17
1,2-Dichloropropane			100.6		%		50-140	18-AUG-17
1,3-Dichlorobenzene			89.9		%		50-140	18-AUG-17
1,4-Dichlorobenzene			92.4		%		50-140	18-AUG-17
Acetone			117.7		%		50-140	18-AUG-17
Benzene			98.4		%		50-140	18-AUG-17
Bromodichloromethane			101.6		%		50-140	18-AUG-17
Bromoform			97.2		%		50-140	18-AUG-17
Bromomethane			96.4		%		50-140	18-AUG-17
Carbon tetrachloride			91.1		%		50-140	18-AUG-17
Chlorobenzene			93.1		%		50-140	18-AUG-17
Chloroform			100.9		%		50-140	18-AUG-17
cis-1,2-Dichloroethylene			99.1		%		50-140	18-AUG-17
cis-1,3-Dichloropropene			105.8		%		50-140	18-AUG-17
Dibromochloromethane			102.0		%		50-140	18-AUG-17
Dichlorodifluoromethane			59.0		%		50-140	18-AUG-17
Ethylbenzene			83.0		%		50-140	18-AUG-17
n-Hexane			87.8		%		50-140	18-AUG-17
m+p-Xylenes			86.0		%		50-140	18-AUG-17
Methyl Ethyl Ketone			114.2		%		50-140	18-AUG-17
Methyl Isobutyl Ketone			108.5		%		50-140	18-AUG-17
Methylene Chloride			105.1		%		50-140	18-AUG-17
MTBE			94.0		%		50-140	18-AUG-17
o-Xylene			84.7		%		50-140	18-AUG-17
Styrene			93.9		%		50-140	18-AUG-17
Tetrachloroethylene			87.8		%		50-140	18-AUG-17
Toluene			87.4		%		50-140	18-AUG-17
trans-1,2-Dichloroethylene			93.2		%		50-140	18-AUG-17
trans-1,3-Dichloropropene			98.9		%		50-140	18-AUG-17
Trichloroethylene			95.6		%		50-140	18-AUG-17
Trichlorofluoromethane			85.6		%		50-140	18-AUG-17
Vinyl chloride			77.6		%		50-140	18-AUG-17

Quality Control Report

Client: WSP Canada Inc. (Thornhill)
100 Commerce Valley Drive West
Thornhill ON L3T 0A1
Contact: ASIF RASHID

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1976218-COFC

COC Number: 15 - 574163

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	WSP Canada Group Inc.
Contact:	Asif Rashid
Phone:	905-882-4211 ext. 6440
	Company address below will appear on the final report
Street:	100 Commerce Valley Drive. West.
City/Province:	Thornhill, ON
Postal Code:	L3T 0A1
Invoice To	Same as Report To [✓] YES [ ] NO
	Copy of Invoice with Report [✓] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: [✓] PDF [ ] EXCEL [ ] EDD (DIGITAL)

Quality Control (QC) Report with Report [✓] YES [ ] NO

[ ] Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: [✓] EMAIL [ ] MAIL [ ] FAX

Email 1 or Fax: asif.rashid@wsp.com

Email 2: ahmed.negm@wsp.com

Email 3:

Invoice Distribution

Select Invoice Distribution: [✓] EMAIL [ ] MAIL [ ] FAX

Email 1 or Fax: asif.rashid@wsp.com

Email 2:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] [✓] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] [ ] 3 day [P3] [ ] 2 day [P2] [ ]

EMERGENCY: 1 Business day [E1] [ ] Same Day, Weekend or Statutory holiday [E0] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:

Job #: 15M-00656-01

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#

Major/Minor Code: | Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only): L1976218 RW

ALS Contact: E

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs	Number of Containers
1	MW104	15/8/17	11:30	GW	X	3
2	Dup 1	〃	—	〃	X	3
3	MW101 (labelled as MW107)	〃	13:00	〃	X	3
4	MW103	〃	12:00	〃	X	3
5	MW105	〃	12:30	〃	X	3
6	MW102	〃	13:30	GW	X	3
7	Trip blank	—	—	GW	X	2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [ ] NO

Are samples for human drinking water use? [ ] YES [ ] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Table 8 R/P/I

MW101 is labeled as MW107, please record it as MW101.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice Packs [ ] Ice Cubes [✓] Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

[redacted] INITIAL COOLER TEMPERATURES °C: 15.4

FINAL COOLER TEMPERATURES °C: 4.2 | 2.8

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only) [redacted]			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ahmed Negm	Date: Aug 15, 2017	Time:	Received by:	Date: Aug 15/17	Time: 16:50	Received by: RW	Date: Aug. 16. 2017	Time: 18:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

APPENDIX

C

STANDARD LIMITATIONS

STANDARD LIMITATIONS
PHASE II ENVIRONMENTAL SITE ASSESSMENT (PHASE II ESA)

These Standard Limitations form part of the Report to which they are appended and any use of the Report is subject to them.

1. Exclusive Use By Client

This Report was prepared for the exclusive use of the client identified as the intended recipient. Any use of the report by any other party without the written consent of WSP Canada Group Limited is the sole responsibility of such party. WSP Canada Group Limited accepts no responsibility for damages that may be suffered by any third party as a result of decisions made or actions taken based on this Report.

2. Scope, Terms and Conditions of Contract

The observations and investigations (hereinafter referred to as the "Work") upon which this Report is based were carried out in accordance with the scope, terms and conditions of the contract or the proposal pursuant to which the Work was commissioned. The conclusions presented in the Report are based solely upon the scope of services described in the contract or the proposal and governed by the time and budgetary constraints imposed by them.

3. Standard of Care

The Phase II ESA was carried out in accordance with generally accepted environmental study and/or professional practices, industry standards and applicable environmental regulations. No other warranties are either expressed or implied with respect to the professional services provided under the terms of the contract or proposal and represented in this Report.

4. Scope of the Phase II ESA

A Phase II ESA is conducted to obtain information about environmental conditions in the land or water on, in or under the subject property. This Report has been prepared based on information obtained at discrete borehole, test pit, monitoring well, or other (e.g., surface water) sampling locations. The conditions reported herein were those encountered at the subject property at the time the Work was performed and as present at the discrete sampling locations. Conditions between sampling locations may be different than those encountered at the sampling locations and WSP Canada Group Limited is not responsible for such differences.

5. Reasonable Conclusions

The conclusions of the Phase II ESA regarding the environmental conditions at the subject property are based on the investigations conducted during the Work and information from other sources as may be indicated in the Report. The accuracy of information from other sources was not verified unless specifically noted in the Report, nor was it determined if the reviewed information constituted all information that exists and pertains to the subject property.

The conclusions made are based on reasonable and professional interpretation of the information considered. If additional information concerning environmental conditions of relevance to this Report is obtained during future work at the subject property, WSP Canada Group Limited should be notified in order that we may determine if modifications to the conclusions presented in this Report are necessary.

6. Report as a Complete document

This Report must be read as a whole and sections taken out of context may be misleading. If discrepancies exist between the preliminary (draft) and final versions of the Report, the final version of the Report shall take precedence.

7. Limitation of Liability

WSP Canada Group Limited's liability with respect to the Phase II ESA is limited to re-performing, without cost, any part of the Work that is unacceptable solely as a result of failure to comply with industry standards. WSP Canada Group Limited's maximum liability is limited in accordance with terms in the original contract, provided that notice of claim is made within regulated timelines as of the date of delivery of the Report.

Risk Assessment Report

CITY OF TORONTO

MODIFIED GENERIC RISK ASSESSMENT REPORT

1230 AND 1234 WESTON ROAD, TORONTO, ONTARIO

MODIFIED GENERIC RISK ASSESSMENT REPORT

1230 AND 1234 WESTON ROAD, TORONTO, ONTARIO

CITY OF TORONTO

PROJECT NO.: 15M-00656-02
DATE: NOVEMBER 2018

WSP
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON, CANADA L3T 0A1

TEL.: +1 905 882-1100
FAX: +1 905 882-0055
WSP.COM

November 9, 2018

City of Toronto
Metro Hall, 2nd Floor
55 John Street
Toronto, ON M5V 3C6

Attention: Janice Green

Dear Janice:

Subject: Modified Generic Risk Assessment Report for 1230 and 1234 Weston Road, Toronto, Ontario

WSP Canada Group Limited (WSP), formerly MMM Group Limited (MMM), is pleased to provide the City of Toronto (the "City") with our Modified Generic Risk Assessment completed for environmental due-diligence purposes to support the proposed redevelopment of 1230 and 1234 Weston Road in Toronto, Ontario (the "Subject Property") as a day care facility. The MGRA was originally issued in October 2017 and has been updated to assess the risks the VOCs in groundwater pose to maintenance and construction workers (including subsurface or trench workers).

Thank you for the opportunity to provide our services to the City of Toronto. If you have any questions or concerns, please contact the undersigned.

Yours sincerely,

Chris Roach, P.Eng., QP $_{\text{ESA|RA}}$
Senior Project Manager

100 Commerce Valley Drive West
Thornhill, ON, Canada L3T 0A1

Tel.: +1 905 882-1100
Fax: +1 905 882-0055
wsp.com

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B SUMMARY OF ENVIRONMENTAL SITE ASSESSMENTS

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EXECUTIVE SUMMARY

Under the authorization of the City of Toronto (the "City"), WSP Canada Group Limited (WSP) was contracted to perform a risk assessment for 1230 and 1234 Weston Road in Toronto, Ontario (the "Subject Property"). The Subject Property is currently vacant and was formerly occupied by a day care facility (i.e., Pinetree Weston Day Care).

It is understood that the City is considering acquiring the Subject Property for redevelopment with a new day care facility through the Delegation of Authority assigned to the City's Real Estate Services Division. Real Estate's Delegated Authority requires that the environmental condition of any property considered for acquisition comply with applicable industry best practices and legislation, such that it will be fit for its intended future use. As the Subject Property will not be redeveloped for a more stringent land use, the filing of a Record of Site Condition (RSC), as regulated by Ontario Regulation (O. Reg.) 153/04 made under the *Environmental Protection Act*, is not mandatory.

A Phase II ESA was completed by Coffey Geotechnics Inc. (Coffey) in August 2013. The results of chemical analyses from the Phase II ESA identified three soil samples within 5 m of a municipal road allowance with an elevated value of sodium adsorption ratio (SAR) in soil exceeding the applicable Ontario Ministry of the Environment, Conservation and Parks (MECP) Table 3 Residential/Parkland/Institutional site condition standards for coarse-textured soil in a non-potable groundwater condition (the "Table 3 SCS") and trichloroethylene (TCE) in groundwater at a concentration exceeding the Table 3 SCS in one of three monitoring wells, located near the northern property boundary. It is concluded by WSP that the SAR in soil was likely related to the use of de-icing salts on the adjacent municipal road allowance (Weston Road) and, therefore, SAR is not considered to a contaminant in accordance with Section 48(3) of O. Reg. 153/04. The presence of the elevated TCE concentration in groundwater was likely related to former off-site dry cleaning operations or automobile service stations.

WSP completed a Supplemental Phase II ESA in September 2017. The purpose of the Supplemental Phase II ESA was to further characterize volatile organic compounds (VOCs) in groundwater. The ESA consisted of the completion of five boreholes, four of which were to a depth of approximately 15.2 m below ground surface (mbgs) and one of which was advanced to 25.9 mbgs. All boreholes were completed as monitoring wells. Soil samples were screened from each borehole, and one worst case sample from each borehole was submitted for VOC analysis. A groundwater sample from each monitoring well was also submitted for VOC analysis.

The results of the Supplemental Phase II ESA identified the following:

— No VOC parameters in soil exceeded the applicable Table 3 SCS.
— Elevated concentrations of VOCs (1,1-dichloroethylene and trichloroethylene) in groundwater were identified in two monitoring well locations: MW101, which was screened at a depth of 22.1 to 25.1 mbgs and MW104, which was screened at a depth of 10.7 to 13.7 mbgs.

It was recommended that a due-diligence Risk Assessment and Risk Management Plan that considers the use of risk management measures to allow impacted groundwater to be managed in place should be undertaken.

In accordance with the recommendation of the Phase II ESA, the risk assessment is presented herein. This risk assessment report, in general, was prepared in the format specified by the MECP using the *Template for Risk Assessment Reports Based Entirely on Use of The Approved Model* with a supplementary section describing the risk management measures (RMMs) that may be required to control exposures. The risk assessment was generally performed in accordance with the requirements in O. Reg. 153/04 with the following exceptions: the risk assessment was not being completed to support a Record of Site Condition and a Pre-Submission Form has not been completed. It should be noted that the risk assessment has not been, and was not intended to be, submitted to the MECP for review and comment.

The objectives of the risk assessment are to evaluate the potential human health and ecological risks associated with the presence of the contaminants of concern (COCs) in groundwater (i.e., VOCs) and to develop property specific standards (PSSs) for those parameters.

The human receptors potentially exposed to the COCs include day care occupants (toddlers and teachers), site visitors, and maintenance and construction workers (including subsurface or trench workers). A quantitative approach was used to evaluate exposure assuming no risk management measures. Soil at the Subject Property is not impacted and, therefore, exposures via the pathways of incidental ingestion of soil, dermal contact with soil, inhalation of particulate matter, and inhalation of vapours indoors and outdoors from soil are considered incomplete. The MECP's Modified Generic Risk Assessment (MGRA) model (the "Approved Model") was used to quantify exposures via the inhalation of indoor vapours from groundwater and assess risks to maintenance and construction workers (including risks to trench workers from inhalation of vapours arising from groundwater in an excavation trench). Groundwater at the Subject Property is considered too deep to be contacted by a subsurface worker during a typical excavation for maintaining utilities and, therefore, exposures via the pathways of incidental ingestion of groundwater and dermal contact with groundwater are considered incomplete.

The on-site ecological receptors, termed Valued Ecosystem Components (VECs), may include small mammals, birds, vegetation, and soil invertebrates. Soil at the Subject Property is not impacted and, therefore, exposures via the pathways of ingestion and/or direct contact are considered incomplete. Exposure may occur via inhalation of VOC vapours from groundwater, but there is presently a lack of available toxicity data to evaluate the risks to ecological receptors from this route of exposure. Due to the depth of the groundwater at the Subject Property, root uptake of the COCs from groundwater is considered incomplete as the roots of vegetation typically do not extend more than 1.5 mbgs.

The risk assessment identified potentially unacceptable risks to human health via inhalation of volatile vapours in indoor air within an enclosed building for 1,1-dichloroethylene and trichloroethylene. To mitigate this risk, any enclosed buildings at the Subject Property should include a vapour intrusion mitigation system, designed by a Professional Engineer (P.Eng.) licensed to practice in Ontario, installed below the floor slab. The subsurface vapour control system should consist of a geomembrane that is chemically resistant to VOCs and a passive soil vapour venting system that can be readily converted to operation as an active system, if necessary. Alternatively, a vapour intrusion mitigation system would not be required if it can be demonstrated through the completion of a subsurface vapour investigation that the MECP's subsurface vapour screening criteria is met for the groundwater source. The risk assessment did not identify unacceptable risks to maintenance and construction workers (including a trench worker responsible for utility installation, maintenance and repair).

ATTACHMENT

A

MODIFIED RISK ASSESSMENT REPORT

1 Summary of Recommendations and Findings

1. (a) Risk Assessment Objectives and Approach

The risk assessment objective is to develop standards for all Contaminants of Concern (COCs) listed in Table 1-1 (Section 1.(c)) for a current property use of [see below] and a proposed property use of [see below] using the conceptual model and equations described in the Ministry publication *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011 (the "*Rationale Document*") except as specified in this report. The applicable generic site condition standards (SCS) for the property are Table 3 SCS.

A Modified Generic risk assessment approach has been used for this assessment.
All property specific standards (PSS) developed in the risk assessment use the "approved model" made available by the Ministry of Environment and Climate Change.

Current property use	Residential/Parkland/Institutional
Proposed property use	Residential/Parkland/Institutional
Applicable SCS	Table 3
Soil texture	Coarse
Approved Model date	01-Nov-16

1. (b) Deviations from Pre-submission Form

As this risk assessment was completed for due-diligence purposes, a PSF was not required.

1. (c) Risk Assessment Standards

The property specific standards are shown in **Table 1-1 (Proposed Standards for Property Use).**

1. (d) Risk Assessment Assumptions

The assumptions used in this risk assessment are described in the *Rationale Document* with the exceptions shown in **Table 1-2 (Risk Assessment Assumptions).**

1. (e) Risk Management Requirements

The risk management measures are shown in **Table 7-1**and further described in the Risk Managment Plan in Attachment D.

2 Risk Assessment Team Membership

The technical team which considered the applicability of the approach, assumptions, data input and risk management measures for the approved model included the members included in **Table 2-1 (Risk Assessment Team Membership).**

3 Property Information, Site Plan and Geological Interpretation

3. (a) Property Information – Property Location and Ownership

This information is summarized in **Table 3-1 (Property Location and Ownership).**

The risk assessment property characteristics are estimated in the generic conceptual model described in the *Rationale Document*. Site specific characteristics considered in this risk assessment are presented in **Table 1-2 (Risk Assessment Assumptions).**

3. (b) Site Plan and Hydrogeological Interpretation of RA Property

The hydrogeological interpretation of the RA property is contained in the ESA Summaries (Attachment B)

3. (c) Contaminants of Concern

Contaminants of concern are listed in **Table 1-1**.

3. (c)(i) Sampling Programs

The sampling program which supports this risk assessment is included in the Phase Two ESA Report.

4 Human Health Risk Assessment (HHRA)

4. (a) Problem Formulation

4. (a) (i) Human Health Conceptual Site Model

The human health conceptual site model, without any RMMs applied to the site, is that described in *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011 . The human health conceptual site model, with RMMs applied to the site, is the same as above, with the exception(s) that the measures listed in **Section 7 (Risk Management Measures)** have been applied. Property information and geological interpretation as described in Section 3 have been incorporated and relied upon for the human health conceptual site model. **Table 4-1** presents Approved Model input parameters affecting human health component values. Human health CSMs are presented in Figures 4 and 5.

4. (a) (ii) Risk Assessment Objectives

The human health risk assessment objective is to develop standards for the COCs listed in Table 1-1, using the conceptual site model and equations described in the Ministry publication *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011 except as specified in this report.

The human receptors assessed and exposure pathways evaluated are in included in **Table 4-2 (Human Receptors Included and Exposure Pathways Evaluated in the RA).** Risks to maintenance workers and construction workers from inhalation of vapours in a trench was assessed through comparison of Property-Specific Standards (PSS) to the industrial GW2 component value of the Table 3 SCS.

The ministry's approved model has been used to develop standards using a quantitative approach. Site characterization information has been collected, as described in Section 3 ("Sampling Programs") section, above. The data used for the human health RA is considered sufficient to meet the objectives of the assessment.

Variability in the modified input (site specific characteristics or pathway modifiers) will be reflected in uncertainty regarding risk estimates. The variability is considered acceptable for meeting the data quality objectives for a modified generic risk assessment.

4. (b) Exposure Assessment

4. (b) (i) Receptor Characteristics

Human health receptor characteristics are described in the document *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, 2011 for the receptors included in the human health risk assessment and identified in **Table 4-2** (Human Receptors included in the Risk Assessment).

I consider the receptors at the property to be adequately represented by those included in the modified generic model.

4. (b) (ii) Pathway Analysis

Exposure pathways are described in the document *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011 as listed in Table 4-2. Pathways may be modified using the RMMs or soil vapour screening options in the approved model.

Where RMMS are selected, the pathways modified are found in **Table 7-1.**

4. (b) (iii) Exposure Estimates

Estimates of exposure for the relevant receptors are the same as, or lower than, exposures estimated in the generic exposure model (with respect to relative frequency and duration of relative magnitude of exposures) documented in *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011. Uncertainty in the exposure estimates will be reflected in uncertainty regarding risk estimates. They have been considered acceptable by the Ministry as meeting data quality objectives for a modified generic risk assessment.

4. (c) Toxicity Assessment

4. (c) (i) Nature of Toxicity (Hazard Assessment)

The relevant adverse health effects, dose response assessment and basis for selection of TRV's are provided in the *Rationale Document*, or as published by the Ministry (for updates since 2011). The hazard assessment for the relevant receptors is the same as documented in *Rationale Document*.

4. (c) (ii) Dose Response Assessment

All Toxicity Reference Values have been evaluated by the Ministry as described in the *Rationale Document* or as published by the Ministry (for updates since 2011). Uncertainty in the toxicity assessment will be reflected in uncertainty regarding risk estimates. They have been considered acceptable by the Ministry as meeting data quality objectives for a modified generic risk assessment.

4. (d) Risk Characterization

4. (d) (i) Interpretation of Health Risks

Table 4-4 lists the estimated risk of an adverse health effect due to exposure to the maximum concentration of each COC identified on the property. In cases for which the maximum measured COC concentration is less than or equal to the value generated by the "Approved Model" without any risk management measures (RMMs) selected, the risk is less than or equal to that intended by the generic standards and is not calculated. In cases for which a RMM is required to reduce exposure to the human receptor(s), the risk associated with the maximum measured COC without the presence of the RMM is reported in **Table 4-4 (Calculated Risk Levels in the Absence of Selected Risk Management Measures).**

4. (d) (ii) Quantitative Interpretation of Human Health Risks
Based on the most sensitive risk estimate, the soil and groundwater concentrations have been identified as standards for protection of human health and are shown as part of Table 1.1.

The proposed PSSs for 1,1-dichloroethylene (5.5 μg/L) and trichloroethylene (7.9 μg/L) are much lower than the GW2 industrial components (66 μg/L and 64 μg/L, respectively, for 1,1-dichloroethylene and trichloroethylene assuming a groundwater depth of 970 cm and no risk management measures), which is applicable to the adjacent roadway (industrial/ commercial/community or ICC land use). No risk management measures are required for maintenance or construction workers, including those responsible for utility installation, maintenance and repair.

4. (d) (iii) Special Considerations
The assessment of risk undertaken using the approved model considered parameters relating to human health risk exposure and pathways such as area of natural significance and pH of the soil at the property, which the QP_{RA} considered might result in designating the property as requiring special considerations. All values used in the approved model assumptions were based on information gathered from the Phase Two ESA and are listed in Table 1-2. A review of the generic and/or modified assumptions has been undertaken by the QP_{RA} and they are considered to be appropriate and applicable to the property.

4. (d) (iv) Interpretation of Off-Site Health Risks

The proposed human health standards are not expected to result in an exceedance of the applicable SCS at the nearest off-site human receptor.

4. (d) (v) Discussion of Uncertainty
Risk Assessments are, by their very nature, attended by many areas of uncertainty. These include the inherent uncertainty used in the mathematical models and/or equations used to derive the component values, as explained in the *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011 document, which formed the basis for the “approved model” used in this MGRA.

Variability in these assumptions will be reflected in uncertainty regarding risk estimates. The variability is considered acceptable for meeting the data quality objectives for a modified generic risk assessment.

In the risk characterization section of this MGRA, information generated in both the exposure assessment and the hazard assessment sections has been used to generate risk levels or hazard quotients. As such, the risk characterization values are influenced by the level of uncertainty that is proportional to the uncertainty identified in the exposure and toxicity input values.

These uncertainties have been described and, to the extent possible, quantified separately in each of the aforementioned sections.

Some of the exposure and hazard uncertainties could result in over-as well as under- estimations of exposure or hazard values. Likewise, the use of the exposure and hazard values in quantifying risk will reflect these uncertainties. However, in general, cautious assumptions were applied in order to ensure that exposure would not be underestimated. Therefore, the risks provided in this report can be taken as an upper bound of the potential for an adverse effect.

5 Ecological Risk Assessment (ERA)

5 (a) Problem Formulation

5 (a)(i) Ecological Conceptual Site Model

The conceptual site model is that described in *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011 with the exceptions listed in Section 1 under "Risk Assessment Assumptions", above. **Table 5-1** presents Approved Model inputs affecting VEC component values.

5 (a)(ii) Risk Assessment Objectives

The ecological risk assessment objective is to develop standards for the COCs included in Table 1-1 using the conceptual model and equations described in the Ministry publication *Rationale Document*. The ecological receptors assessed are included in **Table 5-2 (Ecological Receptors Included in the Risk Assessment).**

Site characterization information has been collected, as described in Section 3. (d) (i) "Sampling Programs", above. The data used for the ecological risk assessment are considered sufficient to meet the objectives of the assessment.

Variability in the modified input (site specific characteristics or pathway modifiers) will be reflected in uncertainty regarding risk estimates. The variability is considered acceptable for meeting the data quality objectives for a modified generic risk assessment.

5 (b)Receptor Characterization

Ecological receptor characteristics for generic VECs are described in the document *Rationale Document* for the receptors identified in **Table 5-2** ("Ecological Receptors included in the Risk Assessment").

5 (c) Exposure Assessment

5 (c) (i) Pathway Analysis

Exposure pathways are described in the document *Rationale Document*. Pathways may be modified using the RMMs or the Modified Ecological Potential (MEP) option in the approved model. Where RMMS are selected, the pathways modified are found in **Table 7-1.**

5 (c) (ii) Exposure Estimates

Estimates of exposure for the relevant receptors are the same as, or lower than, exposures estimated in the generic exposure model (with respect to frequency and duration of exposures) documented in *Rationale Document*.

5 (d) Hazard Assessment

The relevant adverse ecological effects are provided in the document *Rationale Document* (or modified in accordance with the Modified Ecological Protection (MEP) option as applicable).

Variability in the hazard assessment will be reflected in uncertainty regarding risk estimates. The variability is considered acceptable for meeting the data quality objectives for a modified generic risk assessment.

5 (e) Risk Characterization

5 (e)(i) Interpretation of Ecological Risks

Table 5-3 lists the estimated risk of an adverse ecological effect to VECs due to exposure to the maximum concentration of each Contaminant of Concern (COC) identified on the property. In cases for which the maximum measured COC concentration is less than or equal to the value generated by the “Approved Model” without any risk management measures (RMMs) or Modified Ecological Protection (MEP) selected, the risk is less than or equal to that intended by the generic standards and is not calculated. In cases for which a RMM is required to reduce exposure to the VEC(s), the risk associated with the maximum measured COC without the presence of the RMM is reported in **Table 5-3 (Calculated Risk Levels in the Absence of Selected Risk Management Measures)**

5 (e)(ii) Quantitative Interpretation of Ecological Risks

Based on the most sensitive risk estimate, the soil and groundwater concentrations have been identified as standards for protection of VECs are shown as part of Table 1.1.

5 (e) (iii) Special Considerations

The assessment of risk undertaken using the approved model considered parameters relating to human health risk exposure and pathways such as area of natural significance and pH of the soil at the property, which the QP_{RA} considered might result in designating the property as requiring special considerations. All values used in the approved model assumptions were based on information gathered from the Phase Two ESA and are listed in Table 1-2. A review of the generic and/or modified assumptions has been undertaken by the QP_{RA} and they are considered to be appropriate and applicable to the property.

5 (e) (iv) Interpretation of Off-Site Ecological Risks

The proposed ecological health standards are not expected to result in an exceedance of the applicable SCS at the nearest off-site ecological receptor.

5 (e) (v) Discussion of Uncertainty

Risk Assessments are, by their very nature, attended by many areas of uncertainty. These include the inherent uncertainty used in the mathematical models and/or equations used to derive the component values, as explained in the *Rationale Document*, which formed the basis for the “approved model” used in this MGRA.

Variability in these assumptions will be reflected in uncertainty regarding risk estimates. The variability is considered acceptable for meeting the data quality objectives for a modified generic risk assessment.

In the risk characterization section of this MGRA, information generated in both the exposure assessment and the hazard assessment sections has been used to generate risk levels or hazard quotients. As such, the risk characterization values are influenced by the level of uncertainty that is proportional to the uncertainty identified in the exposure and toxicity input values.

These uncertainties have been described and, to the extent possible, quantified separately in each of the aforementioned sections.
In addition, there are uncertainties related to the assumptions that have been made throughout the assessment due to data gaps, environmental fate complexities, or in the generalization of receptor characteristics.

In recognition of these uncertainties, cautious assumptions are generally used throughout the assessment to ensure that the potential for an adverse effect would not be underestimated.

As some of the exposure and hazard uncertainties could result in over-as well as under- estimations of exposure or hazard values, likewise, the use of the exposure and hazard values in quantifying risk will reflect these uncertainties. However, in general, cautious assumptions were applied in order to ensure that exposure would not be underestimated. Therefore, the risks provided in this report can be taken as an upper bound of the potential for an adverse effect.

Although uncertainties exist in the ecological assessment due to the assumptions of the relevant exposure pathways, there is expected to be minimal exposure to the ecological receptors due to the RMMs selected and/or site specific characteristics. As such, minimal risks are expected to be posed to the ecological receptors and so the uncertainties are not expected to have a significant effect on the outcome of the qualitative risk assessment values.

6 Conclusions and Recommendations

6 (a)(i) Recommended Standards
The property specific standards found in Table 1-1 are based on the lower of the appropriate human health and ecological standards (i.e. according to property use, potability and soil depth); however, the standards are not permitted to be below reporting limits (RLs) stipulated in the *Rationale for the Development of Soil and Ground Water Standards for Use At Contaminated Sites in Ontario*, Ontario Ministry of the Environment, April 15, 2011 or generic background values (Table 1 Full Depth Background Site Condition Standards) from the *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011, *or* above any of the half-solubility (in groundwater), the free phase product formation thresholds (in soils) or the reasonable estimate of maximum site concentrations.

Assumptions in this risk assessment are consistent with generic assumptions contained in the document *Rationale for the Development of Soil and Ground Water Standards for Use under Part XV.1 of the Environmental Protection Act*, Ontario Ministry of the Environment, April 15, 2011 with the exception of site characteristics specified in Section 3 of this report and any modifications to ecological habitat specified in Section 5 of this report. Variability in these assumptions will be reflected in uncertainty regarding risk estimates. I consider the variability acceptable for meeting the data quality objectives for a modified generic risk assessment.

6 (a)(ii) Special Considerations for Ground Water Standards
No standard generated by the modified generic risk assessment model will generate a property specific standard for ground water that is greater than the highest of a) 50% of the solubility limit (except in the case that the site investigation demonstrates no evidence of free product and solubility CVs are modified for PHC F1 and/or F2); b) the Reporting Limit; and c) background levels.

7 Summary of Risk Management Plan

7 (a) Risk Management Plan

7 (a)(i) Risk Management Performance Objectives

Where applicable, the risk management measure(s) is/are proposed and the associated modifications of the pathways are described in **Table 7-1 (Risk Management Measures).**

7 (a)(ii) Risk Management Measures

The Risk Management Measures specified in Table 7-1 must be implemented at the RA property/site. Although the MOECC recommends an active vapour intrusion system for residential/parkland/institutional properties, a passive vapour intrusion system that can readily be converted to an active system is considered to be a suitable RMM for the Subject Property, provided regular monitoring and maintenance of the system is undertaken as summarized in the Risk Management Plan (Attachment D).

7 (a)(iii) Duration of Risk Management Measures

The conclusions of this risk assessment assume that the Risk Management Measures will be maintained indefinitely.

7 (a)(iv)Requirements for Monitoring and Maintenance

Monitoring and Maintenance recommendation are provided in the Risk Management Plan (Attachment D)

8 Public Communication Plan (if applicable)

8 (a) Public Communication Plan

8 (a)(i) Optional Communication Plans

Not required

8 (a)(ii) Required Communication Plans For RA Properties in Wider Area of Abatement

Not required

Table 1-1: Proposed Standards for the following Property Use

Residential/Parkland/Institutional

	Chemical Name	Maximum Measured Concentration	Applicable Generic SCS for Table 3	Proposed Property Specific Standards	Is PSS based on REM?	Dominant Exposure Pathway	Eco Driver	Eco Standard	HH Driver	HH Standard	Potential to Exceed Applicable SCS at Nearest Off-Site Receptors?	Pathway Modifiers*
Ground Water	Dichloroethylene, 1,1-	4.62	1.6	5.5	YES	GW2	GW3	390000	GW2	860	NO	Vapour Intrusion Mitigation System
	Trichloroethylene	6.58	1.6	7.9	YES	GW2	GW3	7200000	GW2	840	NO	Vapour Intrusion Mitigation System

Table 1-2: Risk Assessment Assumptions

Site Specific Characteristic Modified	Generic Value	Site Specific Value Used	Units (if applicable)
Distance from source centre to downgradient water body	36.5	***1200***	m
Fraction of organic carbon (FOC) – water table to soil surface	0.005	0.005	g/g
Fraction of organic carbon (FOC) – in upper 0.5 m	0.01	0.01	g/g
Minimum depth below soil surface to the highest annual water table	300	***970***	m
Soil Type‡ – vadose zone	Generic Coarse	Generic Coarse	
Soil Type‡ – capillary fringe	Sand	Sand	
Number of frozen ground days per year	100	***50***	days
Aquifer horizontal hydraulic conductivity	3.00E-05	0.00003	m/sec
Aquifer hydraulic gradient	0.003	0.003	m/m
Aquifer dry bulk density	1.81	1.81	g/cm3
Aquifer fraction organic carbon	0.0003	0.0003	g/g
Absence of free product demonstrated and solubility CVs modified for PHC F1 and/or F2	N	N	

‡ Soil Type here refers to Property Soil Type (not the Area Soil Type required for soil vapour screening)

Table 2-1:Risk Assessment Team Membership

Team Member	Area of Expertise	Relevant Qualifications or Rationale for Omission
Chris Roach	QP_{RA}	B.Sc., B.Eng., P.Eng.; more than 15 years experience in completing risk assessments
Chris Roach	Human Health	B.Sc., B.Eng., P.Eng.; more than 10 years experience in completing risk assessments
Jeff Warren	Ecology	B.Sc.; 28 years experience in ecological assessments
Andrew Kulin	Geoscience/Hydrogeology	P.Eng; 27 years experience in conducting hydrogeological investigations
Chris Roach	Engineer	B.Sc., B.Eng., P.Eng.; more than 15 years experience completing risk management plans.
Asif Rashid	QP ESA	P.Eng.; more than 10 years experience completing ESAs

Table 3-1: Property Location and Ownership

Property Location	1230 and 1234 Weston Road, Toronto, Ontario
Property Ownership	City of Toronto
General Physical Characteristics of the Property (including size of property)	The Subject Property is approximately 1750 m2 and is located at the southwest corner of Weston Road and Glen Valley Drive in Toronto, Ontario. It consists of two contiguous parcels of land with municipal addresses of 1230 and 1234 Weston Road. The Subject Property consists of a vacant two-storey brick building located along the western portion of the site and a landscaped playground area on the eastern portion of the site. A small parking area with paved asphalt is located north and east of the building. Two storage sheds with aluminum sidings were located on the southern portion of the Subject Property.
Past Uses of the Property*	*The Subject Property was vacant prior to 1929. From 1929 until 1994, the Subject Property was used for residential purposes. From 1994 to 2013, the Subject Property was used as a daycare facility.*
Current Uses of the Property*	*The daycare facility has been closed and the Subject Property has remained vacant since 2013.*

Past and Current Uses of the Adjacent Properties*	*Off-site operations in close proximity with the potential to impact soil and groundwater quality at the Subject Property include former auto service garages (1255 and 1263 Weston Road) and several dry cleaners (1181, 1187, 1198, 1221 Weston Road)*
Off-Site Sources of Contaminants of Concern and Receptors	The Subject Property is located in an area of Toronto that has been used for commercial purposes for decades. The off-site operations identified above have the potential to impact soil and groundwater quality at the Subject Property from contaminant migration though groundwater movement. Contaminants of potential concern (COPCs) at the Subject Property include metals, PAHs, PHCs and VOCs. Sampling programs identified VOC impacts in groundwater. The primary receptors of concern are teachers (adults), students (toddlers), and visitors.
Proposed Uses of the Property	New Day Care Facility
Number of Stories Below Grade	1

Table 4-1: Approved Model Input Parameters affecting Human Health Component Values

Approved Model Input (Site Specific Characteristics or Pathway Modifiers) which affect Human Health Component Value Calculations
Change in depth to water table affects GW2.
Change in number of frozen ground days affects S-Odour.
Passive Soil Vapour Intrusion Mitigation System results in multiplying S-IA and GW2 components by a factor of 100

Table 4-2: Human Receptors Included and Exposure Pathways Evaluated in the Risk Assessment

Property Use	Receptor**	Pathway*
Residential/Parkland/Institutional	Toddler (0.5 – 4 years) Composite receptor (exposed from infancy through to and including adulthood)	Soil Ingestion Dermal Contact Dermal adsorption following contact Inhalation of soil particles Inhalation of indoor and outdoor air contaminated by subsurface vapour intrusion** Ingestion of groundwater as drinking water source

* : Exposure pathways considered (Column 3) are in the adsence of risk management measures (RMMs)

**: The "Approved" Model uses the lowest of the R/P/I and I/C/C values for the "inhalation of indoor air contaminated by subsurface vapour intrusion from groundwater" pathway (GW2) for all land uses. The model only generates one number (using R/P/I receptors) for the "inhalation of outdoor air" pathways (S-OA), and uses it for all land uses

Table 4-4: Calculated Risk Levels in the Absence of Selected Risk Management Measures

Chemical Name	Potential RMMs: "Shallow Soil Cap" or "Fill/hard Cap"				Potential RMMs: "Storage Garage", "Building Prohibition", "Passive/Active (SVIMS)", "No First Storey Residential Use", or "Minimum First Storey Ceiling Height"															
					Coarse Soil				Medium and Fine Soil				Groundwater (for coarse soil texture)				Groundwater (for Medium and Fine Soil Texture)			
	R/P/I		I/C/C		R/P/I		I/C/C		R/P/I		I/C/C		R/P/I		I/C/C		R/P/I		I/C/C	
	non-cancer HQ (from soil contact)	cancer Risk (from soil contact)	non-cancer HQ (from soil contact)	cancer Risk (from soil contact)	non-cancer HQ (from soil -IA)	cancer RIsk (from soil -IA)	non-cancer HQ (from soil -IA)	cancer RIsk (from soil -IA)	non-cancer HQ (from soil -IA)	cancer RIsk (from soil -IA)	non-cancer HQ (from soil -IA)	cancer RIsk (from soil -IA)	non-cancer HQ (from GW -IA)	cancer RIsk (from GW-IA)	non-cancer HQ (from GW-IA)	cancer RIsk (from GW -IA)	non-cancer HQ (from GW -IA)	cancer RIsk (from GW-IA)	non-cancer HQ (from GW-IA)	cancer RIsk (from GW -IA)
Dichloroethylene, 1,1-	0.000		0.000		0.000		0.000		0.000		0.000		0.256		0.017		0.057		0.004	
Trichloroethylene	0.000	0.00E+00	0.000	0.00E+00	0.000	0.00E+00	0.000	0.00E+00	0.000	0.00E+00	0.000	0.00E+00	0.102	1.89E-06	0.021	1.23E-07	0.025	4.57E-07	0.006	3.40E-08

Table 4-4: Calculated

Chemical Name	Shallow Soils								Potential RMM: No GW Use for Drinking	Potential RMM: Modified Subsurface Worker Protection	
	Groundwater (for coarse soil texture)				Groundwater (for Medium and Fine Soil Texture)				Groundwater	Soil	
	R/P/I		I/C/C		R/P/I		I/C/C		All	All	All
	non-cancer HQ (from GW -IA)	cancer RIsk (from GW-IA)	non-cancer HQ (from GW-IA)	cancer RIsk (from GW -IA)	non-cancer HQ (from GW -IA)	cancer RIsk (from GW-IA)	non-cancer HQ (from GW-IA)	cancer RIsk (from GW -IA)	max to the GW1 (drinking water), and may not be an actual HQ or cancer risk	non-cancer HQ (from S3)	cancer Risk (from S3)
Dichloroethylene, 1,1-	15.375		0.956		15.375		0.956		3.93E-01	0.00E+00	
Trichloroethylene	7.992	1.48E-04	1.598	9.19E-06	7.992	1.48E-04	1.598	9.19E-06	1.58E+00	0.00E+00	0.00E+00

Table 5.1: Approved Model Inputs Affecting VEC Component Values

Site Specific Characteristic Modified* (specific to Valued Ecosystem Component (VEC) exposure)
Change in distance to surface water affects S-GW3 and GW3

Table 5-2: Ecological Receptors Included in the Risk Assessment

Property Use	Receptor
Residential/Parkland/Institutional	Plants and soil-dwelling organisms‡ Aquatic biota (contaminant specific) Mammals and birds: · American woodcock (Scolopax minor) · Meadow vole (Microtus Pennsylvanicus) – also called field mouse · Red-tailed hawk (Buteo jamaicensis) · Red-winged blackbird (Agelarius phoeniceus) · Red fox (Vulpes vulpes) · Short tailed shrew (Blarina brevicauda)

‡: Level of protection depends on property use

Table 5-3: Calculated Risk Levels in the Absence of Selected Risk Management Measures

	Potential RMMs: "Modified Ecological Protection", "Shallow Soil Cap" or "Fill/hard Cap"					
	Plants and Soil Invertebrates (Hazard Quotient)				Mammals and Birds (Hazard Quotient)	
	R/P/I		I/C/C		R/P/I	I/C/C
Chemical Name	Coarse	Medium and Fine	Coarse	Medium and Fine		
Dichloroethylene, 1,1-	0.000	0.000	0.000	0.000	0.000	0.000
Trichloroethylene	0.000	0.000	0.000	0.000	0.000	0.000

Table 7-1: Risk Management Measures

Risk Management Measure Selected	Medium	Pathway Controlled	Exposure Reduction
Fill Cap or Hard Cap, Asphalt or Concrete Cap, or soil cap >1m thick, not selected	Not Applicable	Not Applicable	Not Applicable
	<-----Add Depth of Fill Cap if > 1m		
"Shallow Soil Cap" Soil Cap (>50cm) , not selected	Not Applicable	Not Applicable	Not Applicable
Modified Suburface Worker Protection, not selected	Not Applicable	Not Applicable	Not Applicable
"Building Prohibition" , not selected	Not Applicable	Not Applicable	Not Applicable
Building with Storage Garage, not selected	Not Applicable	Not Applicable	Not Applicable
"Active Soil Vapour Intrusion Mitigation System" , not selected	Not Applicable	Not Applicable	Not Applicable
"Passive Soil Vapour Intrusion Mitigation System"	Soil; Groundwater	S-IA (Soil to Indoor Air); GW2 (Groundwater to Indoor Air)	100 x
Building with No First Storey Residential, not selected	Not Applicable	Not Applicable	Not Applicable
Building with minimum first storey ceiling height not selected	Not Applicable	Not Applicable	Not Applicable
No groundwater use for drinking water, not selected	Not Applicable	Not Applicable	Not Applicable

Table of Soil Vapour Screening Level for Subslab Measurements

CHEMICAL NAME	Residential (with basement) ug/m3	Industrial (slab on grade) ug/m3
Dichloroethylene, 1,1-	7.30E+02	1.25E+04
Trichloroethylene	1.36E+01	2.18E+02

ATTACHMENT

B

SUMMARY OF ENVIRONMENTAL SITE ASSESSMENTS

1.0 SUMMARY OF PHASE I ESA

1.1 Property Information

A Phase I Environmental Assessment (ESA) was conducted by WSP in September 2017 for two contiguous parcels of land with municipal addresses of 1230 and 1234 Weston Road, Toronto, Ontario (the "Subject Property"). The Subject Property consists of a vacant two-storey building located in 1234 Weston Road which was previously occupied by a daycare facility (Pinetree Weston Day Care). It is our understanding that the City of Toronto (the "City") is considering acquiring the Subject Property for redevelopment as a day care facility. As the Subject Property will not be changing to a more stringent land use, the filing of a Record of Site Condition (RSC), as regulated by Ontario Regulation (O. Reg.) 153/04 made under the Environmental Protection Act, is not mandatory. The site location is illustrated on Figure 1.

Due to the absence of a change in land use, the Phase I ESA was conducted for environmental due-diligence purposes in general accordance with the Canadian Standards Association (CSA) Z768-01 (R2012), which is the accepted industry standard in the absence of a mandatory RSC.

1.2 Land Uses (Current and Historical)

The Subject Property was vacant prior to 1929. From 1929 until 1994, the Subject Property was used for residential purposes. From 1994 to 2013, the Subject Property was used as a daycare facility. The daycare facility has been closed and the Subject Property has remained vacant since 2013.

1.3 Previous Environmental Investigations

The reports for the following previous investigations by others conducted at the Subject Property were made available:

Phase One Environmental Site Assessment, 1230 Weston Road, Toronto, Ontario, prepared by AMEC Environment & Infrastructure, July 2013.

AMEC conducted a Phase One ESA at the Subject Property in July 2013. The Phase One ESA identified the following environmental concerns as follows:

- Possible former presence of fuel oil aboveground storage tank (AST) on Subject Property;
- Former retail fuel outlets at 1255 and 1263 Weston Road;
- Former dry cleaners to north and east of Subject Property;
- Generator of light fuel wastes adjacent to Subject Property and;
- Use of de-icing salt on adjacent roads (Weston Road and Glen Valley Drive).

Phase Two Environmental Site Assessment, 1230 and 1234 Weston Road, Toronto, ON, prepared by Coffey Geotechnics Inc. (Coffey), August 2013.

Coffey conducted a Phase Two ESA at the Subject Property on August 2013. The ESA consisted of five boreholes, of which three were completed as 51 mm groundwater monitoring wells with flush-mounted covers at grade. The boreholes were completed using a track mounted CME 75 auger drill rig to depths between 6.1 and 15.2 meters below ground surface (mbgs).

The soil encountered in the boreholes was reported to consist of a layer of brown silty sand fill to maximum depths of 2.1 to 4.0 mbgs, which was underlain by brown fine to medium grained sand to the depths the boreholes were terminated.

One to three "worst-case" soil samples from each borehole were collected for laboratory analyses, based on results of field screening using a PhotoCheck 1000 photoionization detector and visual and olfactory observations. These samples were submitted to AGAT Laboratories (AGAT) in Mississauga, Ontario for analyses of concentrations of one or more of the following parameters: volatile organic compounds (VOCs), petroleum hydrocarbon compound (PHC) fractions F1 to F4, polycyclic aromatic hydrocarbons (PAHs), metals and inorganics. Three field duplicate soil samples were submitted for VOCs, PHCs and metals and inorganics analyses for quality assurance/quality control (QA/QC) purposes.

Groundwater samples were recovered from the three monitoring wells on August 19, 2013 and submitted to AGAT for analyses of one or more of the following parameters: VOCs, PHC fractions F1 to F4, PAHs and metals and inorganics. Two field duplicate groundwater samples were submitted for VOCs and metals and inorganics analyses in addition to a VOCs trip blank for QA/QC purposes.

To evaluate the soil and groundwater quality at the Subject Property, the laboratory results were compared to the applicable Table 3 standards for residential, parkland, and institutional (RPI) property use. The comparison of the laboratory results identified elevated concentrations of sodium adsorption ratio (SAR) at one sample location for soil and elevated concentrations of trichloroethylene (TCE) at one sample location for groundwater. It was concluded that SAR is the result of de-icing activities on roads adjacent to the Subject Property and, therefore, not considered to be contamination under O. Reg. 153/04.

1.4 Issues of Potential Environmental Concerns

The Phase I ESA completed by WSP identified potential for environmental impacts to the Subject Property. Issues of potential environmental concern that were identified include the following:

- The inferred cross/up-gradient property with the municipal address of 1240 Weston Road, adjacent to the west of the Subject Property was a generator of light fuel wastes from approximately 2002 to 2004. Contaminants of potential concern (COPCs) include PHCs and PAHs;
- The inferred up-gradient property with the municipal address of 1255 (formerly 1253) Weston Road, located adjacent (across Weston Road) to and approximately 25 m north of the Subject Property was historically occupied by auto service stations/retail fuel outlets from at approximately 1928 to 1994. COPCs include metals, VOCs, PHCs and PAHs;
- The inferred up/cross-gradient property with the municipal address of 1263 Weston Road, located approximately 75 m northwest of the Subject Property was historically occupied by auto service garages/retail fuel outlets from approximately 1923 to 1970. COPCs include metals, VOCs, PHCs and PAHs;
- The inferred up-gradient property with the municipal address of 15 Oxford Drive, located approximately 125 m northeast of the Subject Property was historically occupied by an asphalt roofing manufacturing company which reportedly operated from 1922 to 1950 by coal tar and then continued to 1978 with petroleum-based asphalt manufacturing. COPCs include metals, PHCs and PAHs;
- A number of up/cross-gradient neighbouring properties along Weston Road were historically occupied by dry cleaning operations from approximately 1963 to 2000. These included 1181 Weston Road, located approximately 175 m east, 1187 Weston Road, located approximately 150 m east, 1198 Weston Road, located approximately 100 m east, 1205 Weston Road, located approximately 75 m east and 1221 Weston Road, located approximately 25 m northeast of the Subject Property. COPCs include VOCs;
- The inferred up-cross gradient neighbouring property with the municipal address of 1265 Weston Road, located approximately 75 m northwest of the Subject Property was occupied by an auto sales operation with a tank record in 1947. COPCs include metals, VOCs, PHCs and PAHs; and

  - The inferred up-cross gradient neighbouring with the municipal address of 1195 Weston Road, located approximately 125 m east of the Subject Property was occupied by an auto sales operation with a tank record in 1950. COPCs include metals, VOCs, PHCs and PAHs.

The potential environmental concerns identified above were investigated through a previous soil and groundwater sampling program by Coffey in 2013. WSP conducted a peer review of the Coffey investigation and recommended a Supplemental Phase II ESA focused on VOC contaminants to further characterize soil and groundwater conditions at the Subject Property.

2.0 SUMMARY OF PHASE II ESA

A Phase II ESA was conducted by WSP at the Subject Property in July 2017. Details of the environmental work completed at the Subject Property are provided in the following sections.

2.1 Methodology

The Phase II ESA was conducted in general accordance with the CSA Z769-00 (R2013). The sampling methods complied with the requirements established by the MOECC in the Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, 1997 and technical updates provided to support regulatory amendments. The tasks completed during the Phase II ESA included:

- Retained a driller to complete utility locates prior to drilling events, including clearances through a private utility locator to confirm the absence of services in the vicinity of proposed boreholes;
- Completed drilling and soil sampling events, as follows:
  - Advanced five boreholes in July 2017, four of which were to a maximum depth of approximately 15.2 mbgs and one of which was advanced to 25.9 mbgs and recovered soil samples from each borehole at continuous depth intervals to characterize subsurface conditions. All five boreholes were completed as monitoring wells to assess the potential for contamination in groundwater. The wells were constructed of 51 mm diameter PVC screen completed with monument casings;
- Soil characteristics observed in the samples were logged and screened in the field with a photoionization detector (PID) and a combustible gas indicator (CGI) for the presence of combustible and/or volatile compounds to aid in selecting "worst-case" samples for laboratory analysis;
- Sampled all five monitoring wells in August 2017 to characterize groundwater impacts in the vicinity of Coffey's BH1 location (where TCE impacts in groundwater were identified by Coffey in 2013) and ensure that data is reliable to use for the completion of a Risk Assessment. Prior to sampling, three well volumes were removed to ensure the collected groundwater samples were representative of aquifer conditions and depths to groundwater were measured and wells were checked for the presence of non-aqueous phase liquids prior to groundwater sampling;
- Submitted soil and groundwater samples (including quality control samples) to a laboratory qualified under Ontario Regulation 153/04 for chemical analysis of suspected contaminants of potential concern (COPCs) and;
- Compared the results of analysis to the applicable site condition standards (SCS).

2.2 Applicable Generic Site Condition Standards

WSP chose the applicable generic soil and groundwater standards based on the following information available for the Subject Property:

- Bedrock was encountered at depths greater than 2 m (i.e., not a shallow soil site);
- All soil samples had pH values in the range of 5 to 9 (surface soil) and/or 5 to 11 (subsurface soil).
- No water bodies were identified within 30 m of the Subject Property;
- The study area is serviced by a municipal water supply;
- The proposed land use for the Subject Property is institutional;

- Field observations and results of grain size analysis indicate that the soil at the site is consistent with the definition of “coarse textured” in O. Reg. 153/04; and
- Stratified site conditions were not used for evaluating laboratory results.

Based on the above information, soil and groundwater quality at the Subject Property were compared to site condition standards for residential, parkland, and institutional (RPI) property use, as documented in Table 3 of *Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act*, 2011 (the “Table 3 SCS”).

2.3 Reliability of Historical Data

Historical data were evaluated by WSP during the preparation of field activities for the Phase II ESA. The evaluation concluded:

- Degradation of metals and PAHs in soil in the subsurface is expected to be minimal over time; therefore, data is considered to be sufficient to be relied upon;
- Current analytical methods for PHCs and VOCs were introduced in 2004; therefore, the historical data is considered reliable; and
- Groundwater quality results more than three years old are not likely representative of current subsurface conditions and, therefore, are not used in the risk assessment.

Elevated values of SAR are suspected to be from the use of road salt on adjacent road allowances during winter months for de-icing purposes. Under Section 48, Paragraph 3 of O. Reg. 153/04, impacts related to salt use for highways and de-icing are not considered as contamination. Therefore, SAR is not evaluated as a contaminant of concern (COC) in the risk assessment.

2.4 Soil Quality

The soil analytical results are provided in Table 2 (VOCs) and Table 3 (TCLP).

Comparison of analytical results to Table 3 SCS did not identify any exceedances for any parameters.

2.5 Groundwater Quality

The groundwater analytical results are provided in Table 4 (VOCs).

Comparison of analytical results to Table 3 SCS identified elevated concentrations of VOCs. Details of the frequency and distribution of the VOCs in groundwater exceeding the Table 3 SCS are provided below:

- An elevated 1,1-dichloroethylene concentration of 4.52 µg/L was identified in MW101 screened at a depth of 22.1 to 25.1 m. The applicable standard is 1.6 µg/L;
- Elevated trichloroethylene concentrations were identified: 4.4 µg/L at MW101 and 6.58 µg/L at MW104 screened at a depth of 10.7 to 13.7 mbgs. The applicable standard is 1.6 µg/L

The distribution of VOC parameters exceeding the Table 3 SCS at each borehole location is shown in Figure 3.

2.6 Quality Assurance and Quality Control Measures

Quality assurance and quality control (QA/QC) measures included as part of the Phase II ESA included blind field duplicate sampling and the analyses of trip blanks. The contracted laboratory also conducted its own internal QA/QC testing (e.g., calibration verification standards, laboratory duplicates, matrix spikes, and method blanks) as part of the analyses of samples collected from the Subject Property.

Data Quality Objectives

The data quality objectives (DQOs) of the Phase II ESA were to collect soil and groundwater samples in accordance with the sampling and analysis plan (SAP) and within the acceptable level of uncertainty. QA/QC of the soil and groundwater was monitored and maintained in a number of ways:

- This field investigation was completed under WSP standard operating procedures (SOPs) for borehole drilling, soil sampling, and groundwater sampling;
- The soil and groundwater samples submitted for laboratory analysis were collected in laboratory-supplied sample containers and analyzed within their applicable holding times using approved analytical methods;
- Samples were given unique identifications as they were collected, typically identifying the project number, date, sample location and depth. The sample numbers were recorded in field notes for each location;
- All non-dedicated sampling and monitoring equipment (e.g., interface probe) was cleaned using phosphate-free detergent and distilled water following each use;
- A chain-of-custody form was filled out for the samples prior to submitting the samples to the laboratory. The chain-of-custody documented sample movement from collection to receipt at the laboratory and provided sample identification, requested analysis and conditions of samples upon arrival at the laboratory (e.g., temperature, container status, etc.); and
- Soil and groundwater samples were randomly selected by the WSP field staff for field duplicate testing. For each requested analysis, approximately one duplicate sample was submitted for analysis for every 10 samples submitted.

QA/QC Results and Interpretation

Laboratory analyses were completed by a third-party laboratory in accordance with *Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act* dated March 9, 2004, amended as of July 1, 2011. No data qualifiers were provided in Certificates of Analysis (CoAs) received from the laboratory that would affect the ability to meet the DQOs.

A review of the CoAs indicate that hold times were met and the appropriate preservation methods were used. Samples were collected in the appropriate clean sample containers provided by the laboratory and were stored on sufficient ice to maintain the temperature between 0 and 10°C.
All CoAs received comply with subsection 47 (3) of the regulation; a CoA has been received for each sample submitted for analysis; and, all CoAs received have been included in the Phase II ESA Report.

The CoAs received from the laboratory indicate that the detection limits (DLs) were met for the tested parameters.

Soil samples and groundwater samples were submitted as blind field duplicate samples as part of the QA/QC program at a frequency in excess of 10%, in compliance with regulatory requirements. The field (blind) duplicate evaluates analytical precision, field precision and sample homogeneity. A calculation of the relative percent difference (RPD) between the samples and its duplicate was performed and compared to recommended alert criteria as documented in the MOECC "Protocol for Analytical Method Used in Assessment of Properties under Part XV.1 of the *Environmental Protection Act*". Because of analytical limitations near detection limits, RPD calculations were only considered to be an indication of data quality if the concentrations are more than five times the laboratory reporting limit for the individual parameters.

Relative percent difference for soil was not calculated as all VOC parameters were below detection limits. The results of the calculated RPDs for groundwater were below the MOECC Alert Criteria.

Based on a review the results of the quality control data, we conclude that the analysis of the submitted samples for soil and groundwater accurately represent the site conditions and that the results met the quality objectives of the investigation. As a result, the decisions related to the contamination and its distribution was not affected by the quality of the samples. Therefore, the overall objectives of the environmental site assessment were met.

Adequacy of Sampling Program

Soil and groundwater samples collected from the Subject Property were submitted for laboratory analysis of VOCs to delineate and quantify impacts associated with former and current conducted issues of potential environmental concern on-site or on nearby properties. As described above, appropriate QA/QC were conducted during the site investigations. The quality and quantity of data provided for soil and groundwater were considered to be sufficient to meet the objectives of the risk assessment.

ATTACHMENT

C

RATIONALE FOR INPUT PARAMETERS USED IN MGRA MODEL

1.1 Input Parameters for Modified Generic Risk Assessment

The following sections provide supporting information regarding input parameters used in the modified generic risk assessment (MGRA) model spreadsheet.

1.1.1 Number of Frozen Ground Days per Year

Based on Appendix 2, Figure A2 of MOECC's document titled *A Guide to Using the "Approved Model" (November, 2016) When Submitting a Modified Generic Risk Assessment*, a value of 50 frozen ground days per year was used in the MGRA model spreadsheet.

1.1.2 Distance to Water Body

The distance from the Subject Property to the nearest water body (Humber River) is approximately 1,200 m.

1.1.3 Depth to Water Table

The groundwater table at the Subject Property was encountered between 11.05 meters below ground surface (mbgs) and 11.35 mbgs during the groundwater monitoring event conducted by WSP on July 27, 2016. Groundwater levels reported by Coffey during water levelling events on August 17, and August 22, 2013 were consistent with WSP measurements and ranged from 10.70 to 11.20 mbgs.

In accordance with guidance provided in Appendix 1 of A Guide to Using the Modified Generic Risk Assessment (Tier 2) Spreadsheet Model, one meter was subtracted from the highest water level taken from the groundwater monitoring conducted at the Subject Property. The value used in the MGRA was 970 cm, which is considered to be a conservative estimate.

1.1.4 Aquifer Horizontal Hydraulic Gradient

No change to the MOECC default value has been incorporated into the MGRA model spreadsheet for this parameter.

1.1.5 Aquifer Horizontal Hydraulic Conductivity

No change to the MOECC default value has been incorporated into the MGRA model spreadsheet for this parameter..

1.1.6 Aquifer Soil Dry Bulk Density

No change to the MOECC default value has been incorporated into the MGRA model spreadsheet for this parameter.

1.1.7 Soil Type in the Vadose Zone and Capillary Fringe

No change to the MOECC default value has been incorporated into the MGRA model spreadsheet for this parameter.

1.1.8 Fraction of Organic Carbon (FOC)

No change to the MOECC default value has been incorporated into the MGRA model spreadsheet for this parameter.

ATTACHMENT

D

RISK MANAGEMENT PLAN

1.1 Background

A Phase Two ESA completed at the Subject Property by WSP in September 2017 has identified volatile organic compounds (VOCs) in groundwater at concentrations exceeding the applicable Ontario Ministry of the Environment and Climate Change (MOECC) site condition standards.

A Modified Generic Risk Assessment (MGRA) was completed for environmental due-diligence purposes by WSP in October 2017 to establish the risks that groundwater contaminants at the Subject Property may pose to future site users. As a result, appropriate risk management measures (RMMs) were identified to ensure that the Subject Property is suitable for its intended future use as a day care facility. This letter provides the details of the RMMs recommended as part of the Risk Assessment.

1.2 Risk Management Plan

Risk Management Performance Objectives

The MGRA identified unacceptable risks for human health receptors exposed to VOCs via inhalation of groundwater vapours in an enclosed building (indoor air). Therefore, the risk management performance objective is to block or reduce exposures of day care occupants (toddlers and teachers) and site visitors via the indoor air exposure pathway.

The required reduction in exposure concentration that the RMMs must achieve is summarized below in Table 1.

TABLE 1: REQUIRED REDUCTIONS IN EXPOSURE CONCENTRATIONS

Contaminant of Concern	Units	REM	Human Health Standard	Ecological Standard	Required Reduction in Exposure Concentration
1,1-Dichloroethylene	µg/L	5.54	4.3	390,000	22.4%
Trichloroethylene	µg/L	7.90	4.2	7,200,000	46.8%

Description of Risk Management Measures

Any enclosed buildings on the Subject Property should be constructed with sealed foundation penetrations. A subsurface vapour control system, designed by a Professional Engineer (P.Eng.) licensed to practice in Ontario, should be installed below the floor slab. The subsurface vapour control system should consist of a vapour barrier that is chemically resistant to volatile COCs and isolate the building from underlying soil and groundwater, and a passive vapour removal system that can be converted to an active system, if required. Monitoring devices should be installed below the foundation floor slab across the building area for measurement of the (lower) air pressure differential, relative to the indoor air pressure within the building, being achieved by the vapour removal system, with the number and locations of the monitoring devices installed being as considered appropriate by a Licenced Professional Engineer in consultation with the Qualified Person (QP_{RA}), taking into account factors such as the building Area and the design and configuration of the building foundation.

Duration of Risk Management Measures

The proposed RMMs should remain in place as long as the Subject Property is being used as a day care facility. In the event that there is a proposed change in land use, then the RMMs should be re-evaluated.

Requirements for Monitoring and Maintenance

Post-construction monitoring will be required to ensure the continuing integrity and operation of any vapour control systems. An inspection, monitoring and maintenance program should be prepared and implemented under the supervision of an appropriately qualified person and should include, at a minimum, semi-annual (spring and fall) inspections. Inspections should note any building modifications that may have affected the vapour barrier and documented operation of monitors and sensors. Any deficiencies noted in the inspections should be immediately repaired. The inspection results should be recorded in a log book or an electronic log.

Subsurface vapour (i.e., sub-slab) monitoring should be carried out for any enclosed buildings constructed on the Subject Property, commencing upon the completion of building construction and prior to occupancy. The monitoring program should continue, at a minimum, on a semi-annual basis and should include vacuum testing of the vapour venting system by conducting pilot testing using powered fan(s), including with respect to the soil vapour venting layer being able to achieve a 6 Pascal lower air pressure differential objective below the foundation floor slab across the building Area, relative to the indoor air pressure within the building.

Contingency Plans

If differential pressure testing of the vapour venting system indicates that vapours are not being adequately removed, contingency measures should include evaluation of the following possible solutions:

- Repair of any identified damaged components;
- Modification of the vapour venting system;
- Increase the air exchange rate through the building;
- Convert the gas collection system from passive to active;
- Collection of sub-slab and/or indoor air samples for laboratory analysis; and/or
- Remediate groundwater to remove or isolate the source of the vapours.

The preferred solution should depend on the results of the system evaluation and may include one or more options. The evaluation of the system and the preferred restoration method should be determined by an appropriately qualified person.

1.3 Alternative Approach to Risk Management

The MGRA completed for environmental due-diligence purposes at the Subject Property identified unacceptable risks for human health receptors exposed to VOCs via inhalation of groundwater vapours in an enclosed building (indoor air). Indoor air quality was predicted through use of the Johnson-Ettinger (J&E) model, based on maximum groundwater concentrations measured at the Subject Property. For many sites, the assumptions used in the J&E model are considered to be overly conservative and may lead to overestimating indoor air concentrations directly from groundwater concentrations. Understanding this limitation, the MOECC allows for the collection and use of site-specific subsurface vapour data to better predict indoor air concentrations.

Due to spatial and temporal variability concerns related to subsurface vapour, it is an industry best practice and MOECC expectation that at least two rounds of vapour sampling (more than three months apart) be completed, with one event occurring when the ground is frozen. The data from the investigations would be used to better predict indoor air quality and whether RMMs (i.e., a vapour intrusion mitigation system) is required.

TABLES

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Table 1: Summary of Analytical Results in Soil
VOCs
1230 and 1234 Weston Road, Toronto, Ontario

Sample ID Depth (mbgs) Lab Job # Sampling Date	MOECC TABLE 3 STANDARD	REPORTING LIMIT	UNITS	MW101 /11 7.0-7.3 L1966007 24-Jul-2017	MW102 / 18 13.0-13.7 L1966007 25-Jul-2017	MW103 / 9 6.1-6.6 L1966007 25-Jul-2017	MW 104 /11 7.6 -8.2 L1966007 26-Jul-2017	MW 105 /16 11.4-12.2 L1966007 27-Jul-2017	DUP 1 Duplicate of MW 105 /16 11.4-12.2 L1966007 27-Jul-2017	AVERAGE MW 105 / 16 11.4-12.2 L1966007 27-Jul-2017
Volatile Organic Compounds (VOCs)										
Acetone	16	0.5	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Benzene	0.21	0.0068	ug/g	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068
Bromodichloromethane	13	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromoform	0.27	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromomethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Carbon Tetrachloride	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chlorobenzene	2.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloroform	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibromochloromethane	9.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichlorobenzene	3.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,3-Dichlorobenzene	4.8	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,4-Dichlorobenzene	0.083	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethane	3.5	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloroethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethylene	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cis-1,2-Dichloroethylene	3.4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trans-1,2-Dichloroethylene	0.084	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloropropane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cis-1,3-Dichloropropylene	NV	0.03	ug/g	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Trans-1,3-Dichloropropylene	NV	0.03	ug/g	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
1,3-Dichloropropylene	0.05	0.042	ug/g	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042
Ethylbenzene	2	0.018	ug/g	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Ethylene Dibromide	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methyl Ethyl Ketone	16	0.5	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	0.1	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methyl Isobutyl Ketone	1.7	0.5	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl-t-Butyl Ether	0.75	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Styrene	0.7	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,1,2-Tetrachloroethane	0.058	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Toluene	2.3	0.08	ug/g	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
Tetrachloroethylene	0.28	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,1-Trichloroethane	0.38	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2-Trichloroethane	0.05	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trichloroethylene	0.061	0.1	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.02	0.02	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
m-Xylene & p-Xylene	NV	0.03	ug/g	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
o-Xylene	NV	0.02	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	3.1	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dichlorodifluoromethane	16	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dioxane, 1,4-	1.8	NV	ug/g	NA	NA	NA	NA	NA	NA	NA
Hexane(n)	2.8	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trichlorofluoromethane	4	0.05	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:
'NV ' : No Standard established NA: Parameter not analyzed
MOECC Table 3: Ontario Ministry of the Environment, "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, " March 2004, amended July 1, 2011. Full Depth Generic Site Condition Standards for Soil in a Non-Potable Ground Water Condition for Residential/Parkland/Institutional Property Use with Coarse Textured Soils.

100	Exceeds MOECC Table 3 Standards
100	Detection Limit Exceeds MOECC Standard

Table 2: Waste Characterization

Metals, VOCs and PCBs

1230 and 1234 Weston Road, Toronto, Ontario

Sample ID Lab Job # Date Sampled	MOE O.Reg. 558 SCH. 4	REPORTING LIMIT	Units	COMPOSITE 1 L1966022 27-Jul-2017
TCLP Metals				
Leachable Fluoride (F-)	150	10	mg/L	<10
Leachable Free Cyanide	20	0.1	mg/L	<0.1
Leachable Nitrite (N)	NV	2.0	mg/L	<2.0
Leachable Nitrate (N)	NV	2.0	mg/L	<2.0
Leachable Nitrate + Nitrite	1000	4.0	mg/L	<4.0
Leachable Mercury (Hg)	0.1	0.00010	mg/L	<0.00010
Leachable Arsenic (As)	2.5	0.05	mg/L	<0.050
Leachable Barium (Ba)	100	0.5	mg/L	<0.50
Leachable Boron (B)	500	2.5	mg/L	<2.5
Leachable Cadmium (Cd)	0.5	0.005	mg/L	<0.0050
Leachable Chromium (Cr)	5	0.05	mg/L	<0.050
Leachable Lead (Pb)	5	0.05	mg/L	<0.050
Leachable Selenium (Se)	1	0.025	mg/L	<0.025
Leachable Silver (Ag)	5	0.005	mg/L	<0.0050
Leachable Uranium (U)	10	0.25	mg/L	<0.25
Final pH	NV	0.10	pH	5.88
Initial pH	NV	0.10	pH	9.7
TCLP VOCs				
1,1-Dichloroethylene	1.4	0.025	mg/L	<0.025
1,2-Dichlorobenzene	20	0.025	mg/L	<0.025
1,2-Dichloroethane	0.5	0.025	mg/L	<0.025
1,4-Dichlorobenzene	0.5	0.025	mg/L	<0.025
Benzene	0.5	0.025	mg/L	<0.025
Carbon tetrachloride	0.5	0.025	mg/L	<0.025
Chlorobenzene	8	0.025	mg/L	<0.025
Chloroform	10	0.1	mg/L	<0.10
Dichloromethane	5	0.5	mg/L	<0.50
Methyl Ethyl Ketone	200	1	mg/L	<1.0
Tetrachloroethylene	3	0.025	mg/L	<0.025
Trichloroethylene	5	0.025	mg/L	<0.025
Vinyl chloride	0.2	0.05	mg/L	<0.050
TCLP PCBs				
Total polychlorinated biphenyls	1.1	NV	ug/L	<0.00040

Notes:	
'NV ' : No Standard established	NA: Parameter not analyzed
MOECC O.Reg. 558 Sch. 4: Ontario Ministry of Environment - Leachate Quality Criteria	
100	Exceeds MOECC Leachate Quality Criteria

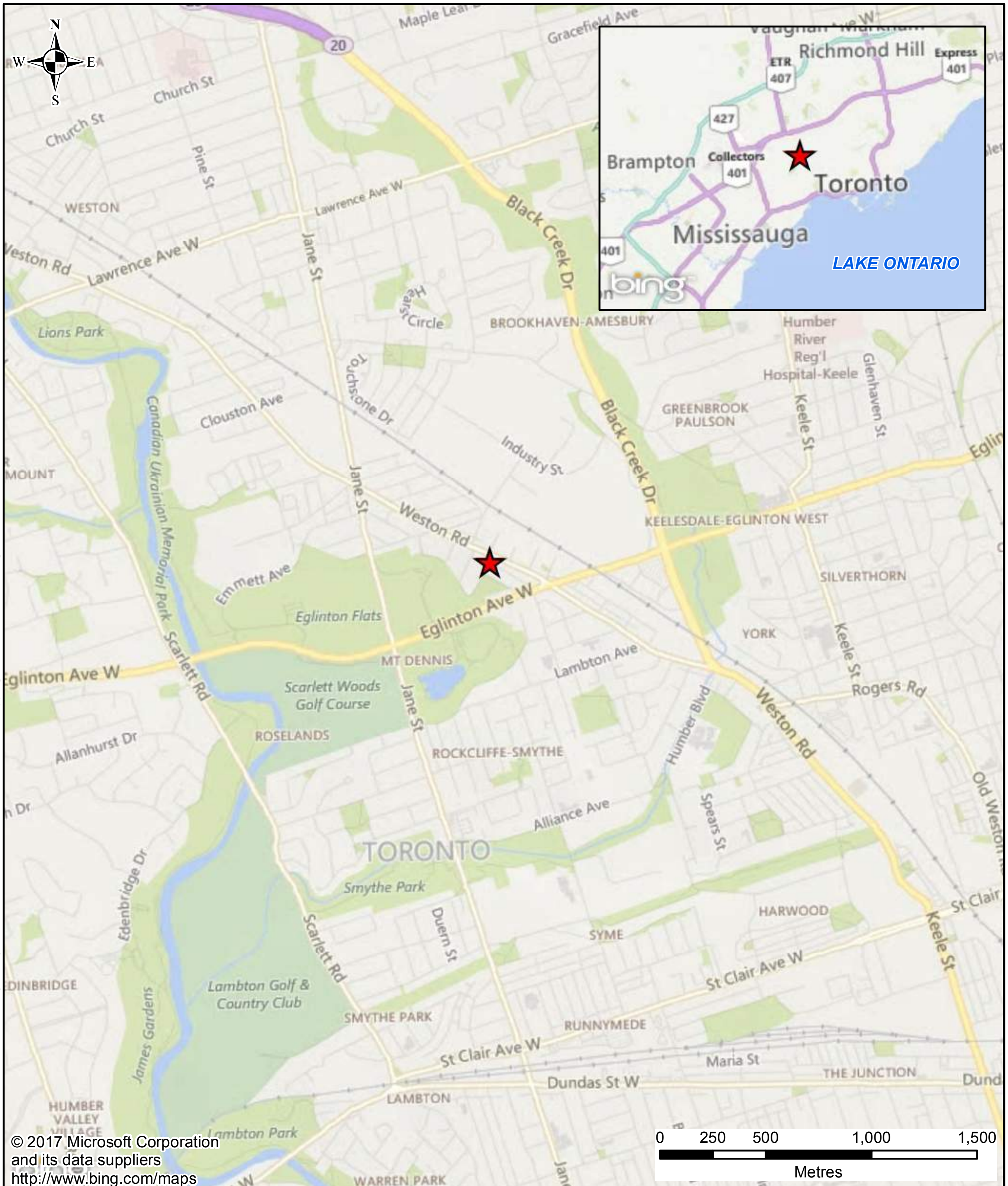
Table 3: Summary of Analytical Results in Groundwater
VOCs
1230 and 1234 Weston Road, Toronto, Ontario

Sample ID Screen Interval (mbgs) Lab Job # Sampling Date	MOECC TABLE 3 STANDARD	MOECC TABLE 3 STANDARD	REPORTING LIMIT	UNITS	MW101 MW101 22.1 - 25.1 L1976218 15-Aug-2017	MW102 MW102 12.2 - 15.2 L1976218 15-Aug-2017	MW103 MW103 10.1 - 13.1 L1976218 15-Aug-2017	MW104 MW104 10.7 - 13.7 L1976218 15-Aug-2017	DUP 1 Dupilcate of MW104 10.7 - 13.7 L1976218 15-Aug-2017	AVERAGE MW104 10.7 - 13.7 L1976218 15-Aug-2017	MW105 MW105 10.7 - 13.7 L1976218 15-Aug-2017
Volatile Organic Compounds (VOCs)											
Acetone	130000	130000	30	ug/L	<30	<30	<30	<30	<30	<30	<30
Benzene	44	430	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	85000	85000	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	380	770	5	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	5.6	56	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon Tetrachloride	0.79	8.4	0.2	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	630	630	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.20	<0.20	<0.50
Chloroform	2.4	22	1	ug/L	<1.0	1.3	<1.0	1.2	1.2	1.2	<1.0
Dibromochloromethane	82000	82000	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,2-Dichlorobenzene	4600	9600	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	9600	9600	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	8	67	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethane	320	3100	0.5	ug/L	7.71	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	1.6	12	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	1.6	17	0.5	ug/L	**4.62**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Cis-1,2-Dichloroethylene	1.6	17	0.5	ug/L	<0.65	<0.50	<0.50	<0.60	<0.60	<0.60	<0.50
Trans-1,2-Dichloroethylene	1.6	17	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloropropane	16	140	0.5	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cis-1,3-Dichloropropylene	NV	NV	0.3	ug/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Trans-1,3-Dichloropropylene	NV	NV	0.3	ug/L	<0.3	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropylene	5.2	45	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	2300	2300	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylene Dibromide	0.25	0.83	0.2	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Methyl Ethyl Ketone	470000	1500000	20	ug/L	<20	<20	<20	<20	<20	<20	<20
Methylene Chloride	610	5500	5	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	140000	580000	20	ug/L	<20	<20	<20	<20	<20	<20	<20
Methyl-t-Butyl Ether	190	1400	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	1300	9100	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1,2-Tetrachloroethane	3.3	28	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	3.2	15	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	18000	18000	0.5	ug/L	<0.50	0.55	<0.50	<0.50	<0.50	<0.50	<0.65
Tetrachloroethylene	1.6	17	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	640	6700	0.5	ug/L	6.12	1.63	0.8	7.65	7.87	7.76	<0.5
1,1,2-Trichloroethane	4.7	30	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	1.6	17	0.5	ug/L	**4.4**	1.41	0.7	**6.43**	**6.73**	**6.58**	0.61
Vinyl Chloride	0.5	1.7	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
m-Xylene & p-Xylene	NV	NV	0.4	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
o-Xylene	NV	NV	0.3	ug/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total Xylenes	4200	4200	0.5	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	4400	4400	2	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Dioxane, 1,4-	1900000	7300000	NV	ug/L	NA	NA	NA	NA	NA	NA	NA
Hexane(n)	51	520	0.5	ug/L	<0.50	<0.50	<0.50	1.04	1.33	1.185	<0.50
Trichlorofluoromethane	2500	2500	5	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Notes:
'NV ' : No Standard established   NA: Parameter not analyzed
MOECC Table 3: Ontario Ministry of the Environment, "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, " March 2004, amended July 1, 2011. Full Depth Generic Site Condition Standards for Non-Potable Ground Water for All Types of Property Use with coarse textured soils.

100	Exceeds MOECC Table 3 Standards
100	Detection Limit Exceeds MOECC TABLE 3 STANDARD

FIGURES



\\fhfiler1.mmm.ca\ENVDATA$\1442 Projects by Job Number\2015\3315469 Weston Road\Mapping\MXD\Phase II ESA\Figure 1 Site Location.mxd

Legend

★ Site Location

Client: **City of Toronto**

Title: **Site Location**

Prepared By: wsp

15M-00656-01	Scale as Shown	Review: CR
Date: August 2017	**Figure: 1**	
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J:\1442 Projects by Job Number\2015\3315469 Weston Road\Mapping\MXD\Phase II ESA\Figure 2 Site Plan.mxd

Legend

Property Boundary

Monitoring Well

Borehole (Coffey, 2013)

Monitoring Well (Coffey, 2013)

Monitoring Well (WSP, 2017)

Client: **City of Toronto**		
Title: **Site Plan**		
Prepared By: wsp		
15M-00656-01	Scale as Shown	Review: AR
Date: August 2017	**Figure: 2**	
© Queen's Printer for Ontario		

Legend

Property Boundary

Monitoring Locations

- Borehole (Coffey, 2013)
- Monitoring Well (Coffey, 2013)
- Monitoring Well (WSP, 2017)

1,1-DCE	4.62	22.1-25.1	15-Aug-17
Parameter	Concentration	Screened Interval (mbgs)	Date Sampled

Client: **City of Toronto**

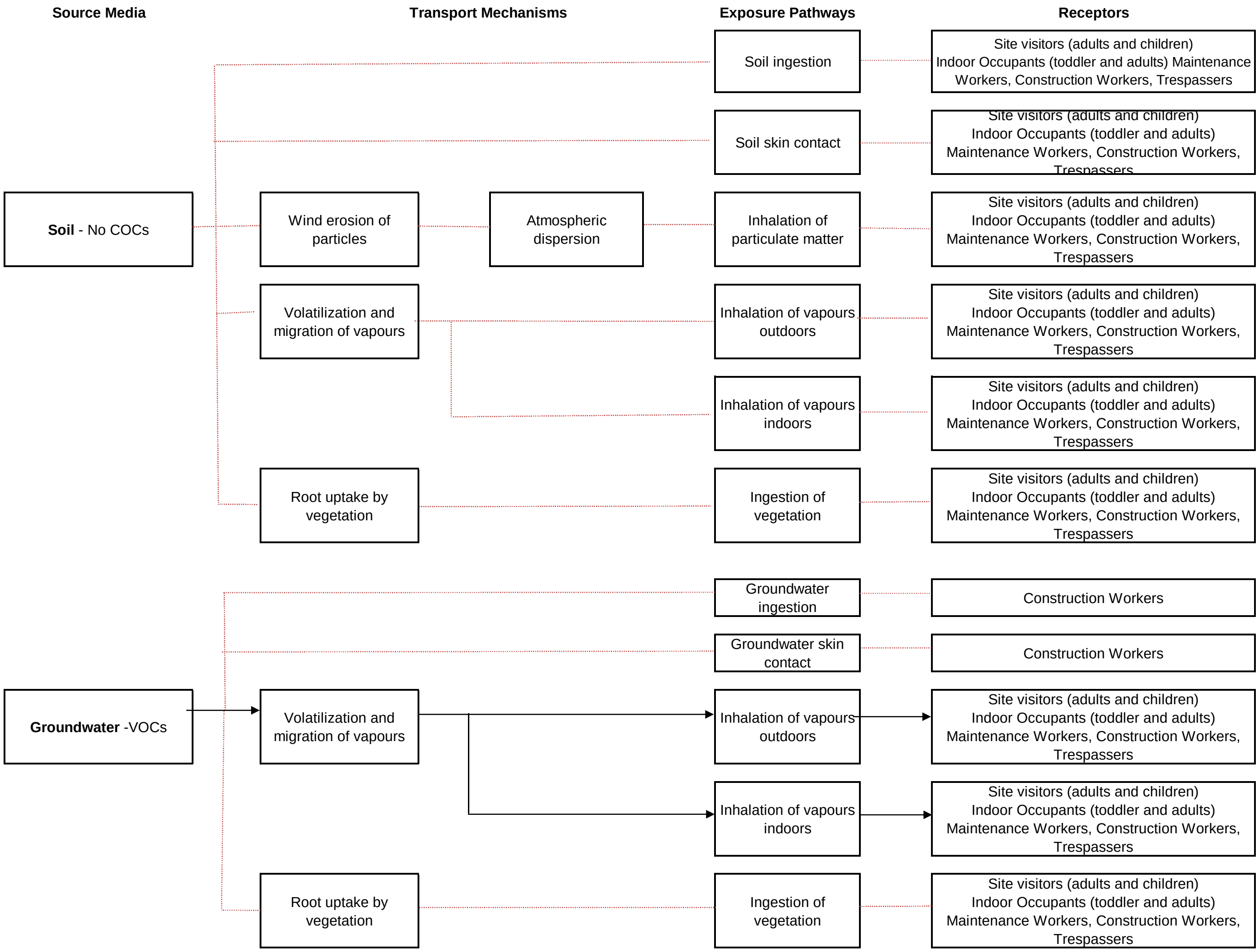
Title: **Distribution of Volatile Organic Compounds (VOCs) in Groundwater**

Prepared By: wsp

15M-00656-01	Scale as Shown	Review: CR
Date: August 2017	**Figure: 3**	
© Queen's Printer for Ontario		

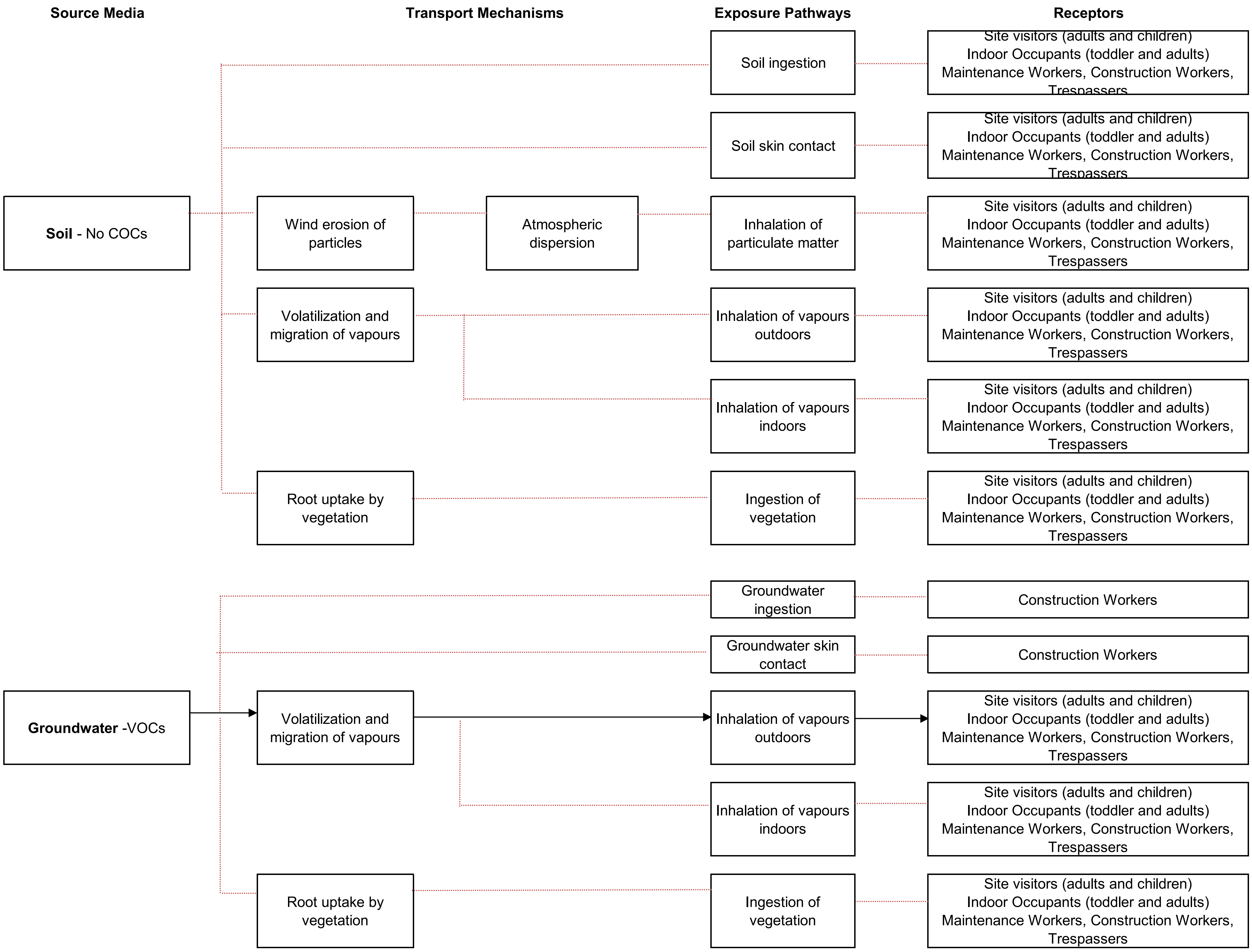
J:\1442 Projects by Job Number\2015\3315469 Weston Road\Mapping\MXD\Phase II ESA\Figure 3 GW Exceedances.mxd

FIGURE 4: HUMAN HEALTH CONCEPTUAL MODEL
WITHOUT RISK MANAGEMENT MEASURES
1230 and 1234 WESTON ROAD



NOTE:
Dashed line indicates incomplete pathway.

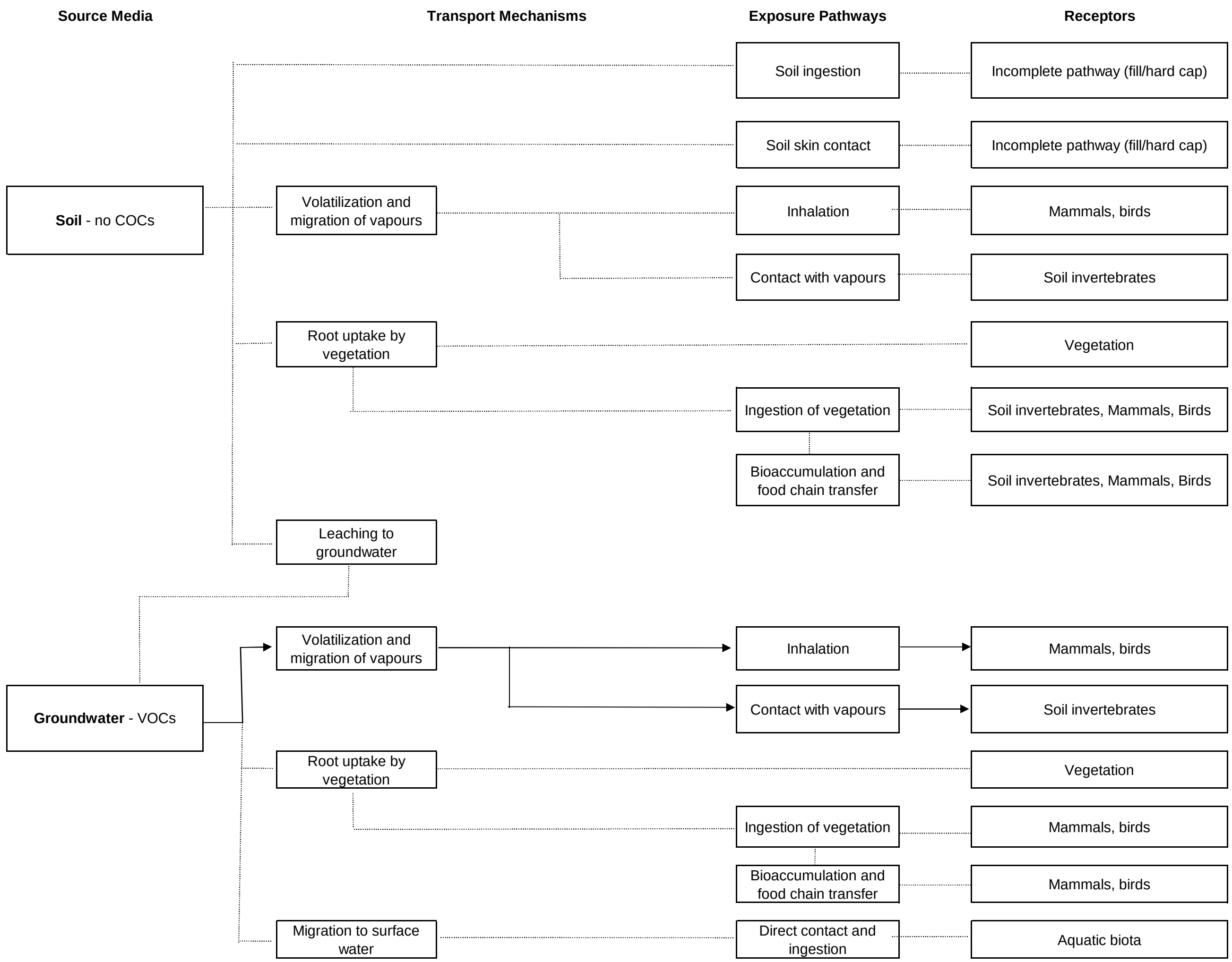
FIGURE 5: HUMAN HEALTH CONCEPTUAL MODEL
WITH RISK MANAGEMENT MEASURES
1230 and 1234 WESTON ROAD
(AFTER SITE REDEVELOPMENT)



NOTES:

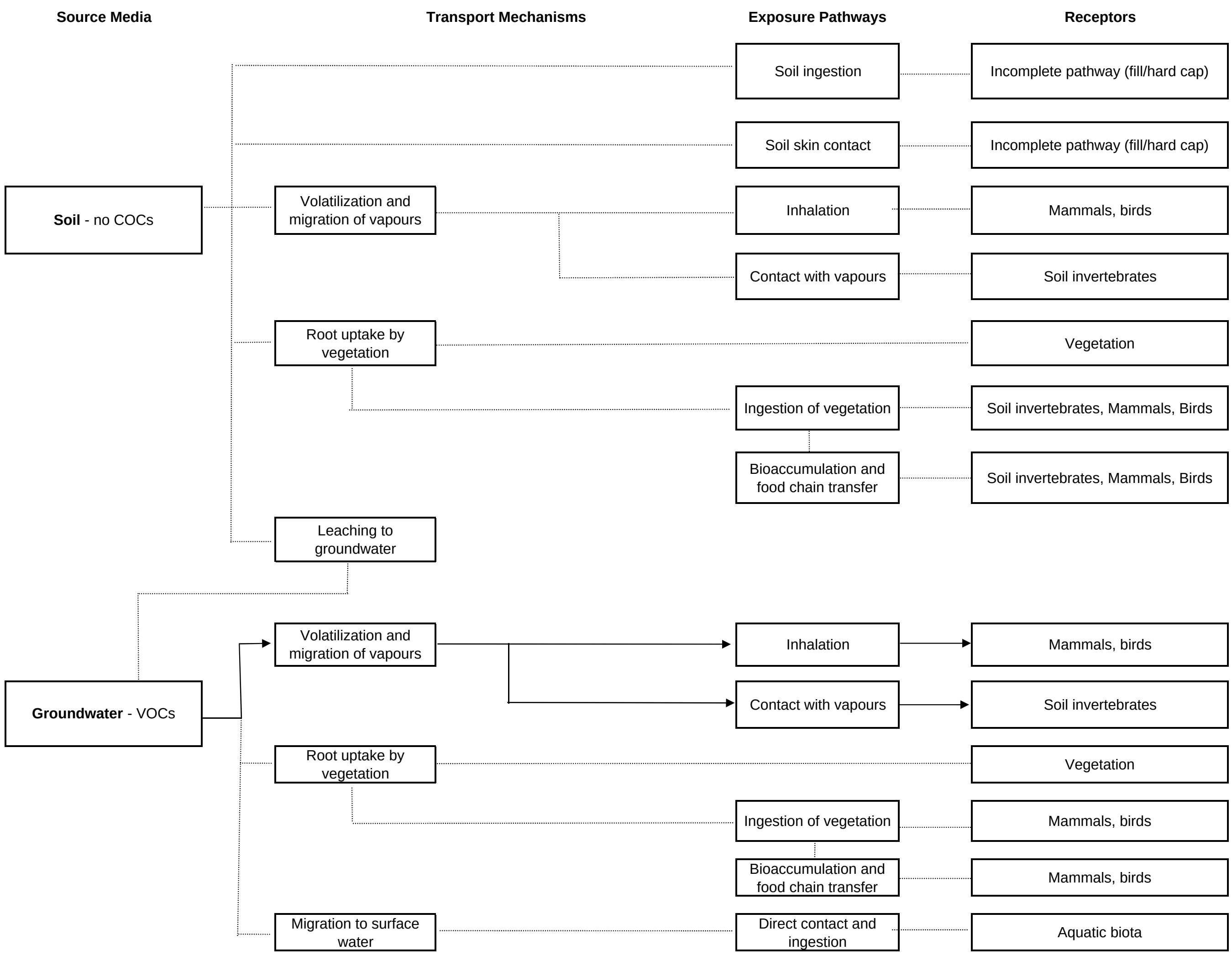
1. Risk management measures include installation of a vapour instrusion mitigation system beneath any enclosed buildings.
2. Dashed line indicates incomplete pathway.

FIGURE 5: ECOLOGICAL CONCEPTUAL MODEL WITHOUT RISK MANAGEMENT MEASURES 1230 and 1234 WESTON ROAD



NOTE:
Dashed line indicates incomplete pathway.

FIGURE 7: ECOLOGICAL CONCEPTUAL MODEL WITH RISK MANAGEMENT MEASURES 1230 and 1234 WESTON ROAD



NOTE:
Dashed line indicates incomplete pathway.

Remedial Options Analysis

October 23, 2017

Privileged & Confidential

Ms. Janice Green, C.E.T.
Senior Environmental Project Manager
City of Toronto, Facilities Management
Metro Hall, 2nd Floor
55 John Street
Toronto, ON M5V 3C6

Dear Ms. Green:

Subject: Remedial Options Analysis (DRAFT)
1230 and 1234 Weston Road, Toronto, Ontario

WSP Canada Group Limited (WSP), formerly MMM Group Limited (MMM), is pleased to provide the City of Toronto (the "City") with this Remedial Options Analysis to support the proposed redevelopment of 1230 and 1234 Weston Road in Toronto, Ontario (the "Subject Property") as a day care facility.

BACKGROUND

A Phase II Environmental Site Assessment (ESA) completed at the Subject Property by WSP in September 2017 has identified volatile organic compounds (VOCs) in groundwater at concentrations exceeding the applicable Ontario Ministry of the Environment and Climate Change (MOECC) site condition standards. The groundwater contamination was encountered at depths ranging from approximately 12 m below ground surface (mbgs) to deeper than 25 mbgs. It was concluded that the groundwater contamination may be migrating onto the Subject Property from a nearby off-site source such as a dry cleaner or an automobile repair garage.

A Modified Generic Risk Assessment (MGRA) was completed for environmental due-diligence purposes by WSP in October 2017 to establish the risks that groundwater contaminants at the Subject Property may pose to future site users. As a result, appropriate risk management measures (RMMs) were identified to ensure that the Subject Property is suitable for its intended future use as a day care facility.

This letter provides the details of the RMMs recommended as part of the Risk Assessment and provides alternative remediation and assessment approaches for the Subject Property.

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wsp.com

SCOPE AND OBJECTIVES

Our approach to completing the Remedial Options Analysis included the following tasks:

— Screening remediation approaches according to the contaminants of concern, the extent of the contamination, and the applicable site restoration criteria; and
— Assessing the remediation options and their estimated costs as a basis for selecting the most efficient and effective remediation strategy for the Subject Property.

Our evaluation of remedial alternatives considered the advantages and disadvantages of a full clean-up compared to a risk management approach along with an order-of-magnitude cost estimate of the options for planning purposes. Findings were integrated to create a strategy, recommend a specific approach to mitigate the contamination issues, and support discussions with applicable stakeholders.

APPLICABLE SITE CONDITION STANDARDS

The MOECC generic site condition standards (SCS) applicable to soil and groundwater at the Subject Property are the full depth site condition standards for residential, parkland, institutional land use in a coarse-textured soil setting, as documented in Table 3 of Soil, Groundwater and Sediment Standards under Part XV.1 of the Environmental Protection Act, 2011 (the "Table 3 SCS").

The MGRA developed site-specific human and ecological standards along with property-specific standards (PSSs) for the contaminants of concern (COCs) in groundwater for use at the Subject Property. The applicable assessment standards are summarized in **Table 1.**

TABLE 1 – APPLICABLE ASSESSMENT STANDARDS

Contaminant of Concern	Units	Table 3 SCS	Human Health Standard	Ecological Standard	PSS[1]
1,1-Dichloroethylene	µg/L	1.6	4.3	390,000	5.5
Trichloroethylene	µg/L	1.6	4.2	7,200,000	7.9

[1] *With risk management (i.e., vapour intrusion mitigation system) in place*

REMEDIAL OPTIONS ANALYSIS

Based on the data obtained during the Phase II ESA, the following remedial options were assessed for their applicability in addressing the known groundwater contamination to support the redevelopment of the Subject Property as day care facility. The evaluation considers the environmental requirements only and not the geotechnical requirements for the proposed redevelopment.

The remedial options evaluated to be most applicable to the Subject Property are:

— *In-situ* Chemical Injection;
— Groundwater Extraction (Pump and Treat); and
— Vapour Intrusion Mitigation System.

The remedial approaches are described in the following sections. The estimated costs are for remediating the Subject Property only and are considered a Class D opinion of cost. The traditional purpose of a Class D opinion of cost is to provide a rough cost projection used for budget planning purposes in the early stages of the conceptual development of a project. The objective in this case is to provide an Indicative Estimate based on the findings of the Phase II ESA.

OPTION 1 – IN-SITU CHEMICAL INJECTION

This option involves injecting chemicals into the subsurface to oxidize or reduce contaminants to inert compounds. These treatment chemicals are typically injected into the subsurface through injection wells or temporary delivery points which are driven below grade using a drill rig. As the groundwater contamination at the Subject Property have not been fully delineated, further characterization is recommended to refine the areas and depths of contamination to ensure that the remediation program targets the full extent of the on-site groundwater contamination. As part of the remediation, a barrier wall should be installed at the upgradient/cross-gradient property lines to prevent recontamination of the Subject Property from off-site sources. Following the completion of site remediation, post-remediation verification sampling of groundwater would be required to demonstrate that the remediation efforts were successful.

Advantages

— Proven technology.
— Rapidly lowers concentrations of dissolved phase organic contaminants.
— Minimal negative public perception.

Disadvantages

— Requires specialized expertise to design and implement.
— Rebound of the dissolved phase plume may occur after injections are finished and supplemental injections will be required.
— Some regulatory requirements (e.g., Mobile Environmental Compliance Approval or ECA).
— Cost prohibitive.

Estimate costs for this option are provided in **Table 2.**

TABLE - 2: PRELIMINARY COST ESTIMATE FOR *IN-SITU* CHEMICAL INJECTION

No.	Item	Quantity	Unit	Unit Price	Total
1	Groundwater Delineation Program	1	LS	$75,000	$75,000
2	*In-situ* Chemical Injections[1]	97	Point	$6,500	$630,500
3	Barrier Wall[2]	2,400	m^2	$400	$960,000
4	Post-Remediation Verification Program	1	LS	$25,000	$25,000
5	Tender and Specifications	1	LS	$15,000	$15,000
6	Construction Supervision	1	LS	$10,000	$10,000
				TOTAL (excluding HST)	$1,715,500

[1] *Assumes half of the site is contaminated (i.e., 875 m^2) to a depth of 30 m and injections on a 3m x 3m grid.*
[2] *Assumes a barrier wall length of up to 80m and depth of 30 m.*

OPTION 2– GROUNDWATER EXTRACTION (PUMP AND TREAT)

Pump and Treat (P&T) uses a series of recovery wells to collect the contaminated groundwater and pump it to the surface for treatment prior to release to either sewer, surface or re-injection into the water table. Prior to installation of the remediation system, a hydrogeological assessment is required to provide an indication of flow rates and to design the number and distribution of the pumping wells.

Similar to Option 1 (*In-situ* Chemical Injection), a barrier wall should be installed at the upgradient/cross-gradient property lines to prevent recontamination of the Subject Property from off-site sources. Following the completion of site remediation, post-remediation verification sampling of groundwater would be required to demonstrate that the remediation efforts were successful.

Advantages:

— Proven technology.
— Limited regulatory constraints.
— Minimal negative public perception.

Disadvantages:

— Long remediation time.
— High operations and maintenance (O&M) costs.
— Requires complex monitoring and control during operation.
— Produces inward gradients that may capture and treat off-site contamination.
— Above-grade infrastructure required to treat groundwater.
— Residual contaminants require natural attenuation or additional treatment.
— Cost prohibitive.

Estimate costs for this option are provided in **Table 3**.

TABLE - 3: PRELIMINARY COST ESTIMATE FOR PUMP AND TREAT SYSTEM

NO.	ITEM	QTY	UNIT	UNIT PRICE	TOTAL
1	Groundwater Delineation Program	1	LS	$75,000	$75,000
2	Hydrogeological Assessment	1	LS	$40,000	$40, 000
3	Ground Extraction System	1	LS	$300,000	$300,000
4	Groundwater Treatment[1]	60	mn	$25,000	$1,500,000
5	Barrier Wall[2]	2,400	m^2	$400	$960,000
6	Post-Remediation Verification Program	1	LS	$25,000	$25,000
7	Tender and Specifications	1	LS	$30,000	$30,000
8	Construction Supervision	1	LS	$15,000	$15,000
				TOTAL (excluding HST)	$2,945,000

[1] *Assumes up to 5 years to treat contaminated groundwater.*

[2] *Assumes a barrier wall length of up to 80m and depth of 30 m.*

OPTION 3– VAPOUR INTRUSION MITIGATION SYSTEM

This option involves the design and installation of a subsurface vapour control system below the floor slab of the new day care building. The subsurface vapour control system should consist of a vapour barrier that is chemically resistant to volatile COCs and can isolate the building from underlying soil and groundwater, and a passive vapour removal system that can be converted to an active system, if required. Monitoring devices should be installed below the foundation floor slab across the building area for measurement of the (lower) air pressure differential, relative to the indoor air pressure within the building, being achieved by the vapour removal system. Post-construction monitoring would be required to ensure the continuing integrity and operation of the vapour control system. In addition, a contingency plan would also be required for implementation if differential pressure testing of the vapour venting system indicates that vapours are not being adequately removed. The contingency measures should include evaluation of the following possible solutions:

— Repair of any identified damaged components;
— Modification of the vapour venting system;
— Increase the air exchange rate through the building;
— Convert the vapour collection system from passive to active;
— Collection of sub-slab and/or indoor air samples for laboratory analysis; and/or
— Remediate groundwater to remove or isolate the source of the vapours.

The preferred solution would depend on the results of the system evaluation and may include one or more options. The evaluation of the system and the preferred restoration method should be determined by an appropriately qualified person.

Advantages

— Proven technology.
— Can be easily incorporated into built form or design of new buildings.
— Does not require remediation of soil or groundwater.
— Cost effective.

Disadvantages

— Long term monitoring and maintenance required.
— Long term energy costs if system needs to be run in an active mode using motorized fans.

Estimate costs for this option are provided in **Table 4**.

TABLE - 4: PRELIMINARY COST ESTIMATE FOR VAPOUR INTRUSION MITIGATION SYSTEM

No.	Item	Qty	Unit	Unit Price	Total
1	Vapour Intrusion Mitigation System	200	M^2	$200	$40,000
2	Tender and Specifications	1	LS	$7,500	$7,500
3	Construction Supervision	1	LS	$10,000	$10,000
				TOTAL (excluding HST)	$57, 500

Note: *Assume the new daycare facility will be 200 m^2 in area. Annual inspection and monitoring are not included above, but are estimated to be approx. $5,000 to $10,000 per year.*

Please note that the costs for vapour intrusion mitigation systems are dependent on many factors such as building size, number of utility penetrations, sophistication of monitoring devices (i.e., automated vs manual), and the construction style of the building. Vendor quotes would be required for a more detailed and accurate cost evaluation, based on architectural design plans.

ALTERNATIVE APPROACH TO RISK MANAGEMENT

The MGRA completed for environmental due-diligence purposes at the Subject Property identified unacceptable risks for human health receptors exposed to VOCs via inhalation of groundwater vapours in an enclosed building (indoor air). Indoor air quality was predicted through use of the Johnson-Ettinger (J&E) model, based on maximum groundwater concentrations measured at the Subject Property. For many sites, the assumptions used in the J&E model are considered to be overly conservative and may lead to overestimating indoor air concentrations directly from groundwater concentrations. Understanding this limitation, the MOECC allows for the collection and use of site-specific subsurface vapour data to better predict indoor air concentrations.

Due to spatial and temporal variability concerns related to subsurface vapour, it is an industry best practice and MOECC expectation that at least two rounds of vapour sampling (more than three months apart) be completed, with one event occurring when the ground is frozen. The data from the investigations would be used to better predict indoor air quality and whether RMMs (i.e., a vapour intrusion mitigation system) is required. A vapour intrusion mitigation system (or site remediation) would not be required if it can be demonstrated through the completion of a subsurface vapour investigation that the MOECC's subsurface vapour screening criteria is met for the groundwater source.

The estimated cost for the subsurface vapour investigation is provided in **Table 5**.

TABLE 5: PRELIMINARY COST ESTIMATE FOR SUBSURFACE VAPOUR INVESTIGATION

Item	Cost
Professional Fees (Sampling and Reporting)	$6,000
Driller and Utility Locates	$4,000
Laboratory Analysis	$3,000
Disbursements	$1,500
TOTAL (excluding HST)	$14,500

CLOSING

This report was prepared to provide a professional opinion as to feasible remediation options and probable remediation costs for the Subject Property using standard engineering and scientific judgment, principles, and practices. The opinion of probable costs presented in the report represent a Class D opinion of cost to provide a rough cost projection used for budget planning purposes in the early stages of the conceptual development of a project. The cost opinions have been estimated based on the assumptions described in this report and past experience at similar sites. The new building design and varying soil and groundwater conditions between borehole locations may affect the estimated remediation and risk management costs and, as such, a contingency for such conditions should be considered. Vendor quotes will be required for a more detailed and accurate cost evaluation.

This report was prepared for the exclusive use of The City of Toronto. Any use of the report by any other party without the written consent of WSP is the sole responsibility of such party. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

Yours sincerely,

WSP CANADA GROUP LIMITED

DRAFT

Chris Roach, P.Eng., $QP_{ESA|RA}$
Senior Project Manager
Environmental Management

Soil Vapour Investigation

November 9, 2018
17M-02431-00

Ms. Janice Green
Senior Environmental Project Manager
City of Toronto, Facilities and Real Estate
Metro Hall, 2nd Floor
55 John Street
Toronto, ON M5V 3C6

Dear Ms. Green,

Subject: Soil Vapour Investigation at 1230-1234 Weston Road in Toronto, Ontario

WSP Canada Group Limited (WSP), formerly MMM Group Limited (MMM), was retained by the City of Toronto (the “City”) to complete a Soil Vapour Investigation at 1230-1234 Weston Road in Toronto, Ontario (the “Subject Property”). The location of the Subject Property is illustrated on Figure 1.

BACKGROUND

A Phase II Environmental Site Assessment (ESA) completed at the Subject Property by WSP in September 2017 identified volatile organic compounds (VOCs) in groundwater at concentrations exceeding the applicable Ontario Ministry of the Environment Conservation and Parks (MECP) site condition standards. Groundwater contamination was encountered at depths ranging from approximately 12 m below ground surface (mbgs) to deeper than 25 mbgs. It was concluded that the groundwater contamination may be migrating onto the Subject Property from a nearby off-site source such as a dry cleaner or an automobile repair garage.

A Modified Generic Risk Assessment (MGRA) was completed for environmental due-diligence purposes by WSP in October 2017 to establish the risks that groundwater contaminants at the Subject Property may pose to future site users. The MGRA identified unacceptable risks for human health receptors exposed to VOCs via inhalation of groundwater vapours in an enclosed building (indoor air). Indoor air quality was predicted through use of the Johnson-Ettinger (J&E) model, based on maximum groundwater concentrations measured at the Subject Property. For many sites, the assumptions used in the J&E model may be overly conservative and may lead to overestimating indoor air concentrations directly from groundwater concentrations. Understanding this limitation, the MECP allows for the collection and use of site-specific subsurface vapour data to better predict indoor air quality.

100 Commerce Valley Drive West
Thornhill, ON, Canada L3T 0A1

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wsp.com

SCOPE OF WORK

A Soil Vapour Investigation was completed by WSP between 15 December 2017 and 15 March 2018. The investigation included the following tasks:

- Retaining a drilling contractor to arrange for the completion of utility locates to confirm the absence of services in the vicinity of the proposed boreholes;
- Advancing two shallow boreholes for the purpose of installing subsurface vapour probes;
- Completing two rounds of soil vapour sampling include one event when the ground appeared to be frozen and another after the snow melt. Each sampling event included purging subsurface vapours, completing leak detection testing, and collecting representative subsurface vapour samples for chemical analyses from the two shallow vapour probes;
- Submitting soil vapour samples to ALS Laboratory (ALS), a laboratory accredited with the Canadian Association for Laboratory Accreditation (CALA), for chemical analyses of suspected contaminants; and
- Comparing the results of analysis to the applicable MECP soil vapour screening criteria.

METHODOLOGY

Drilling Program

Two soil vapour probes were installed within shallow boreholes (1.8 and 2.7 m deep) completed by Profile Drilling under the observation of WSP field staff on 15 December 2017. The boreholes were advanced to investigate soil vapour quality at the Subject Property. The locations of the probes are shown on Figure 2 and logs of the probes are presented in Appendix A.

The probes were installed within boreholes situated within the proposed footprint of the new daycare facility at a depth below the basement floor slab, based on preliminary design drawing received from the City. The boreholes were advanced using a Powerprobe 9700 VTR Track Mounted drill rig.

The vapour probes were installed at depths of 1.8 mbgs and 2.7 mbgs. Flexible teflon tubing was attached to the top of the probe to extend the sampling port above grade. The borehole annulus was backfilled with silica sand to 1.0 mbgs, then sealed with hydrated bentonite chips placed in lifts from 1.0 m to ground surface. The vapour wells were completed with monument casings.

Soil Vapour Sampling

Soil vapour samples were collected on 1 February 2018 and 15 March 2018. Prior to sampling, the void space was calculated for each vapour well and three well volumes were purged. A Sensidyne Gil-Air air pump calibrated to 200 mL/min purged each well for approximately 7 to 8 minutes.

After purging, a shroud was placed over and around the well casing. Field leak tests were conducted to identify and potentially quantify leaks by: a) completion of a shut-in test by closing valves on the opposite ends of the sampling train and monitoring the pressure or vacuum; and, b) introducing helium, a tracer gas, into the enclosed shroud. Helium was selected because it is non-toxic, non-flammable, and can be detected using hand-held instruments. With the shroud in place and under the influence of helium, the Gil-Air pump directed subsurface vapour into a Tedlar bag contained within a vacuum chamber sealed from ambient air. The filled Tedlar bag was removed and the concentration of helium was measured using a Dielectric MGD-2000 meter. Helium was detected between 2.6-5.6 % (marginally higher than target of < 5% at VP-02) for the February sampling event, however the shut-in tests were successful. Helium was not detected in any of the samples at a level greater than 1% for the March sampling event. The recovered vapours during both sampling events were considered to be representative of subsurface conditions. The results of the shut-in tests, which were successful, support this conclusion.

After the field leak tests, vapours were collected in laboratory-supplied 1.4 L summa canisters. Prior to sampling, each summa canister was regulated to accept flow for twenty minutes. Each canister was allowed to fill until the pressure gauge read -6 to -12 inches of Hg, at which time the valve between the probe and canister was closed. The canister was then disconnected from the vapour probe and transported to the laboratory for chemical analyses.

LABORATORY RESULTS

The results of the sampling were compared to the Soil Vapour Criteria for residential/parkland/institutional (RPI) land use, as specified in the MECP document titled “Approved Model, Modified Generic Risk Assessment” dated November 1, 2016. The data, which are are presented in Table 1, did not identify any exceedances of the applicable MECP criteria in any of the soil vapour samples. A copy of the laboratory certificates of analysis are provided in Appendix B.

Please note that the detection limits for 1,2-dibromoethane and 1,1,2,2-tetrachloroethane exceeded the MECP criteria. ALS has stated “*The MECP is aware that the Trigger Levels for these two compounds are not readily achievable by commercial laboratories and raised RLs do not indicate an exceedance of the Standard.*”

CONCLUSIONS

Based on the results of the investigation, it is concluded that the subsurface conditions are not suspected to result in unacceptable risks for human health receptors exposed to VOCs via inhalation of indoor air in an enclosed building. The laboratory results indicate that the installation of a vapour intrusion mitigation system beneath the proposed day care facility is not required.

Furthermore, the RPI scenario used to evaluate potential risk to indoor air in a day care facility is considered to more sensitive than an industrial/commercial/community (ICC) scenario (which would apply to trench workers). Therefore, it can be concluded that unacceptable risks to trench workers from inhalation of potential VOC vapours arising from groundwater are not anticipated.

CLOSING

We trust that this letter is sufficient for your requirements. If you have any question or comments, please do not hesitate to contact either of the undersigned at 905-882-1100.

Yours truly,

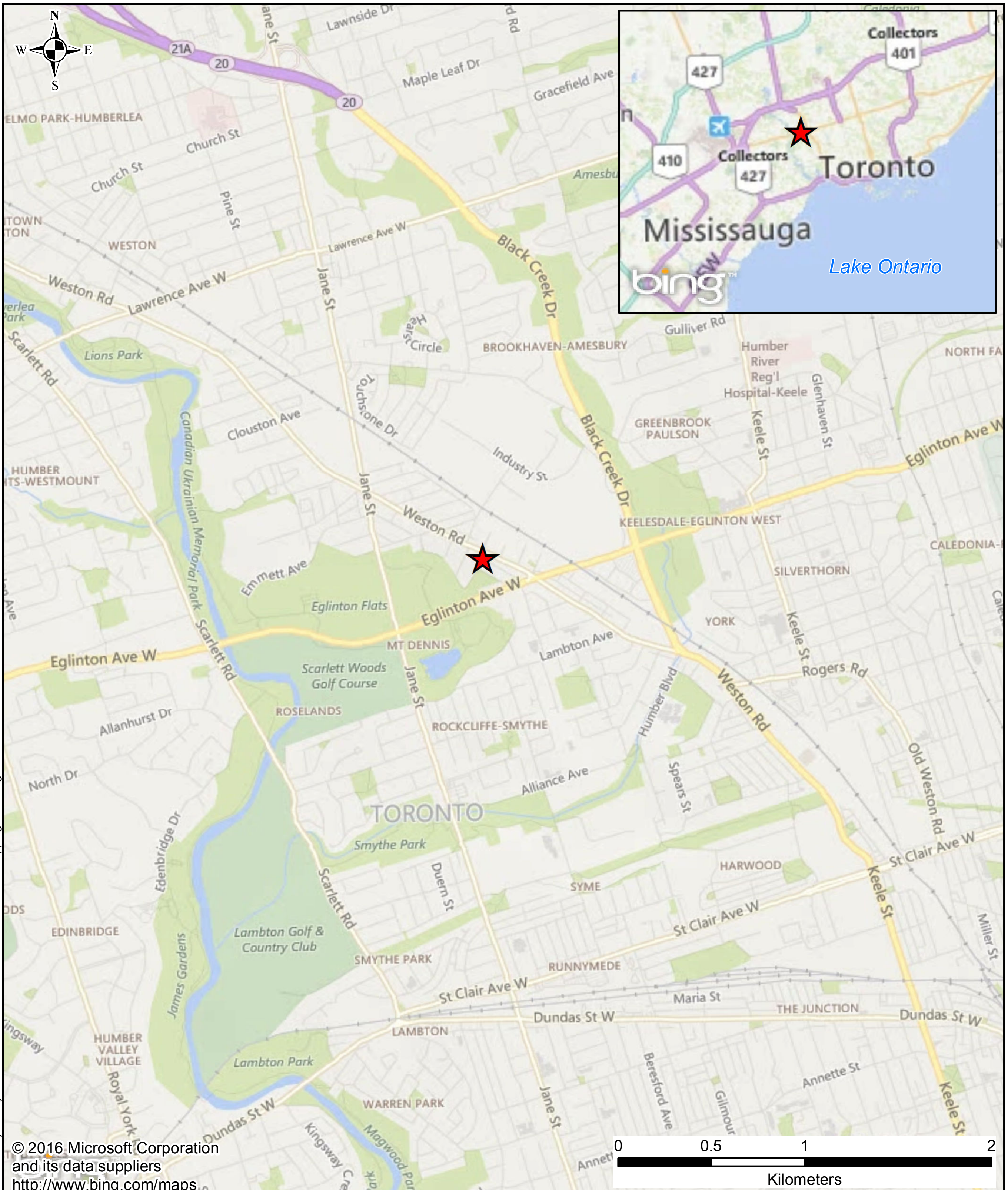
WSP CANADA GROUP LIMITED

Neelmoy C. Biswas, M.Sc., P.Geo.
Contaminant Hydrogeologist
Environmental Management

Chris Roach, P.Eng., $QP_{ESA|RA}$
Senior Project Manager
Environmental Management

APPENDIX

FIGURES



J:\1442 Projects by Job Number\2015\3315469 Weston Road\Mapping\MXD\Figure 1 Site Location.mxd

Legend

★ Site Location

Client:	**City of Toronto**
Title:	**Site Location**
Prepared By:	WSP MMM GROUP

33-15469-000-PH1	Scale as Shown	Review: AP
Date: April 2018	**Figure: 1**	
© Queen's Printer for Ontario		

Legend

Property Boundary

Monitoring Locations

- Soil Vapour Probe (WSP, 2017)
- Borehole (Coffey, 2013)
- Monitoring Well (Coffey, 2013)
- Monitoring Well (WSP, 2017)

Client: **City of Toronto**		
Title: **Site Plan**		
Prepared By: wsp		
15M-00656-01	Scale as Shown	Review: AR
Date: April 2018	**Figure: 2**	
© Queen's Printer for Ontario		

APPENDIX

TABLE

Table 1: Summary of Analytical Results in Soil Vapour
VOCs

Sample ID Depth (m) Lab Job # Sampling Date	MOECC SOIL VAPOUR CRITERIA	REPORTING LIMIT	UNITS	VP01 L2052053 1-Feb-2018	VP02 L2052053 1-Feb-2018	VP01 L2068457 15-Mar-2018	VP02 L2068457 15-Mar-2018
Volatile Organic Compounds (VOCs)							
Acetone	125000	1.2	ug/m3	8.8	11.8	3.2	3.6
Benzene	253	0.32	ug/m3	0.6	0.65	<0.32	<0.32
Bromoform	NV	2.1	ug/m3	<2.1	<2.1	<2.1	<2.1
Bromomethane	52.1	0.78	ug/m3	<0.78	<0.78	<0.78	<0.78
Carbon Tetrachloride	20.9	1.3	ug/m3	<1.3	<1.3	<1.3	<1.3
Chlorobenzene	10400	0.92	ug/m3	<0.92	<0.92	<0.92	<0.92
Chloroform	1040	0.98	ug/m3	<0.98	<0.98	<0.98	<0.98
1,2-Dibromoethane	0.0927	1.5	ug/m3	<1.5	<1.5	<1.5	<1.5
1,2-Dichlorobenzene	6260	1.2	ug/m3	<1.2	<1.2	<1.2	<1.2
1,4-Dichlorobenzene	13.9	1.2	ug/m3	2.2	<1.2	<1.2	<1.2
1,1-Dichloroethane	1720	0.81	ug/m3	<0.81	<0.81	<0.81	<0.81
1,2-Dichloroethane	2.14	0.81	ug/m3	<0.81	<0.81	<0.81	<0.81
1,1-Dichloroethene	730	0.79	ug/m3	<0.79	<0.79	<0.79	<0.79
cis-1,2-Dichloroethene	1560	0.79	ug/m3	<0.79	<0.79	<0.79	<0.79
trans-1,2-Dichloroethene	626	0.79	ug/m3	<0.79	<0.79	<0.79	<0.79
Methylene chloride	2420	0.69	ug/m3	<0.69	<0.69	<0.69	<0.69
1,2-Dichloropropane	41.7	0.92	ug/m3	<0.92	<0.92	<0.92	<0.92
1,3-Dichloropropene (cis & trans)	13.9	1.3	ug/m3	<1.3	<1.3	<1.3	<1.3
1,4-Dioxane	37500	0.72	ug/m3	<0.72	<0.72	<0.72	<0.72
Ethylbenzene	104000	0.87	ug/m3	1.12	<0.87	<0.87	<0.87
Hexachlorobutadiene	2.53	2.1	ug/m3	<2.1	<2.1	<2.1	<2.1
n-Hexane	261000	0.7	ug/m3	<0.70	<0.70	<0.70	<0.70
Methyl ethyl ketone	50100	0.59	ug/m3	0.83	1.17	<0.59	<0.59
Methyl isobutyl ketone	30100	0.82	ug/m3	<0.82	<0.82	<0.82	<0.82
MTBE	214	0.72	ug/m3	<0.72	<0.72	<0.72	<0.72
Naphthalene	386	2.6	ug/m3	<2.6	<2.6	<2.6	<2.6
Styrene	2710	0.85	ug/m3	<0.85	<0.85	<0.85	<0.85
1,1,1,2-Tetrachloroethane	7.51	1.4	ug/m3	<1.4	<1.4	<1.4	<1.4
1,1,2,2-Tetrachloroethane	0.959	1.4	ug/m3	<1.4	<1.4	<1.4	<1.4
Tetrachloroethylene	214	1.4	ug/m3	<1.4	<1.4	<1.4	<1.4
Toluene	521000	0.75	ug/m3	3.35	2.66	1.92	1.56
1,2,4-Trichlorobenzene	83.4	1.5	ug/m3	<1.5	<1.5	<1.5	<1.5
1,1,1-Trichloroethane	10400	1.1	ug/m3	17.7	<1.1	16.9	<1.1
1,1,2-Trichloroethane	3.48	1.1	ug/m3	<1.1	<1.1	<1.1	<1.1
Trichloroethylene	13.6	1.1	ug/m3	<1.1	<1.1	<1.1	<1.1
Vinyl chloride	6.32	0.51	ug/m3	<0.51	<0.51	<0.51	<0.51
Xylenes (Total)	73000	2	ug/m3	4.4	3.2	<2.0	<2.0

Notes:
'NV ' : No Criteria established by MOECC

ALS Laboratory has indicated that the MOECC criteria for 1,2-Dibromoethane and 1,1,2,2-Tetrachloroethane is not achievable by available analytical methods

MOECC Soil Vapour Criteria: Ontario Ministry of the Environment and Climate Change (MOECC), MGRA Model, November 2016. Calculated from health-based indoor air criteria for residential/parkland/institutional sites and MOECC recommended empirical attenuation factor of 0.02 and MOECC bioattenuation factors (10x) for naphthalene and PHC-related paramenters.

100	Exceeds MOECC Soil Vapour Criteria

APPENDIX

A BOREHOLE LOGS

Figure No. ______________

LOG OF VAPOUR PROBE VP-01

Project No.	17M-02431-00-SUB		
Project:	Soil Vapour Sampling		
Location:	1230-1234 Weston Road	Co-ordinates:	621451.18E, 4838319.19N
Date Drilled:	December 15, 2017	Datum:	UTM NAD 83 Zone
Drill Type:	Powerprobe 9700 Direct Push/Auger	Logged By:	N.B.
Drilling Contractor:	Profile Drilling	Checked By:	C.R.

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	VAPOUR PROBE	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		NO RECOVERY		CONCRETE HYDRATED BEN-SEAL			
0.76		SAND (MEDIUM) Some silt, brown, moist, no staining, no odour. - Occasional cobble - Some silt, trace clay		SCREEN			
3.10		End of borehole at 3.10 mbgs		Vapour Probe Diameter: 15 mm Vapour Probe Material: Stainless Steel			

WSP VP REPORT VER.3 WESTON ROAD SOIL VAPOUR PROBES.GPJ GINT STD CANADA LAB.GDT 4/10/18

Figure No. ____________

LOG OF VAPOUR PROBE VP-02

Project No. **17M-02431-00-SUB**

Project: **Soil Vapour Sampling**

Location: **1230-1234 Weston Road**

Co-ordinates: **621455.25E, 4838336.01N**

Date Drilled: **December 15, 2017**

Datum: **UTM NAD 83 Zone**

Drill Type: **Powerprobe 9700 Direct Push/Auger**

Logged By: **N.B.**

Drilling Contractor: **Profile Drilling**

Checked By: **C.R.**

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	VAPOUR PROBE	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		NO RECOVERY		CONCRETE HYDRATED BEN-SEAL			
0.61		SAND AND GRAVEL - Brown, damp, some brick and tile, no odour, some black staining.		SCREEN			
2.10		End of borehole at 2.10 mbgs		Vapour Probe Diameter: 15 mm Vapour Probe Material: Stainless Steel			

WSP VP REPORT VER.3 WESTON ROAD SOIL VAPOUR PROBES.GPJ GINT STD CANADA LAB.GDT 4/10/18

APPENDIX

B LAB CERTIFICATES

WSP Canada Inc.
ATTN: CHRIS ROACH
100 COMMERCE VALLEY DRIVE WEST
THORNHILL ON L3T0A1

Date Received: 01-FEB-18
Report Date: 13-FEB-18 13:32 (MT)
Version: FINAL

Client Phone: 905-882-4211

Certificate of Analysis

Lab Work Order #: L2052053
Project P.O. #: NOT SUBMITTED
Job Reference: 17M-02431-00-SUB
C of C Numbers:
Legal Site Desc:

Mary-Lynn Pike
Client Services Supervisor

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2052053-1 VP01							
Sampled By: N.BISWAS/N NWODDIN on 01-FEB-18 @ 11:15							
Matrix: AIR CAN							
Volatile Organic Compounds							
Acetone	8.8		1.2	ug/m3		07-FEB-18	R3956376
Acetone	3.69		0.50	ppb(V)		07-FEB-18	R3956376
Benzene	0.60		0.32	ug/m3		07-FEB-18	R3956376
Benzene	0.19		0.10	ppb(V)		07-FEB-18	R3956376
Bromoform	<2.1		2.1	ug/m3		07-FEB-18	R3956376
Bromoform	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Bromomethane	<0.78		0.78	ug/m3		07-FEB-18	R3956376
Bromomethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Carbon Tetrachloride	<1.3		1.3	ug/m3		07-FEB-18	R3956376
Carbon Tetrachloride	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Chlorobenzene	<0.92		0.92	ug/m3		07-FEB-18	R3956376
Chlorobenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Chloroform	<0.98		0.98	ug/m3		07-FEB-18	R3956376
Chloroform	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dibromoethane	<1.5		1.5	ug/m3		07-FEB-18	R3956376
1,2-Dibromoethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		07-FEB-18	R3956376
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,4-Dichlorobenzene	2.2		1.2	ug/m3		07-FEB-18	R3956376
1,4-Dichlorobenzene	0.37		0.20	ppb(V)		07-FEB-18	R3956376
1,1-Dichloroethane	<0.81		0.81	ug/m3		07-FEB-18	R3956376
1,1-Dichloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dichloroethane	<0.81		0.81	ug/m3		07-FEB-18	R3956376
1,2-Dichloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1-Dichloroethene	<0.79		0.79	ug/m3		07-FEB-18	R3956376
1,1-Dichloroethene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		07-FEB-18	R3956376
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		07-FEB-18	R3956376
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Methylene chloride	<0.69		0.69	ug/m3		07-FEB-18	R3956376
Methylene chloride	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dichloropropane	<0.92		0.92	ug/m3		07-FEB-18	R3956376
1,2-Dichloropropane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		07-FEB-18	R3956376
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		07-FEB-18	R3956376
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,3-Dichloropropene (cis & trans)	<0.28		0.28	ppb(V)		07-FEB-18	
1,3-Dichloropropene (cis & trans)	<1.3		1.3	ug/m3		07-FEB-18	
1,4-Dioxane	<0.72		0.72	ug/m3		07-FEB-18	R3956376
1,4-Dioxane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Ethylbenzene	1.12		0.87	ug/m3		07-FEB-18	R3956376
Ethylbenzene	0.26		0.20	ppb(V)		07-FEB-18	R3956376

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2052053-1 VP01							
Sampled By: N.BISWAS/N NWODDIN on 01-FEB-18 @ 11:15							
Matrix: AIR CAN							
Volatile Organic Compounds							
Hexachlorobutadiene	<2.1		2.1	ug/m3		07-FEB-18	R3956376
Hexachlorobutadiene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
n-Hexane	<0.70		0.70	ug/m3		07-FEB-18	R3956376
n-Hexane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Methyl ethyl ketone	0.83		0.59	ug/m3		07-FEB-18	R3956376
Methyl ethyl ketone	0.28		0.20	ppb(V)		07-FEB-18	R3956376
Methyl isobutyl ketone	<0.82		0.82	ug/m3		07-FEB-18	R3956376
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
MTBE	<0.72		0.72	ug/m3		07-FEB-18	R3956376
MTBE	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Naphthalene	<2.6		2.6	ug/m3		07-FEB-18	R3956376
Naphthalene	<0.50		0.50	ppb(V)		07-FEB-18	R3956376
Styrene	<0.85		0.85	ug/m3		07-FEB-18	R3956376
Styrene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1,1,2-Tetrachloroethane	<1.4		1.4	ug/m3		07-FEB-18	R3956376
1,1,1,2-Tetrachloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		07-FEB-18	R3956376
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Tetrachloroethylene	<1.4		1.4	ug/m3		07-FEB-18	R3956376
Tetrachloroethylene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Toluene	3.35		0.75	ug/m3		07-FEB-18	R3956376
Toluene	0.89		0.20	ppb(V)		07-FEB-18	R3956376
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		07-FEB-18	R3956376
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1,1-Trichloroethane	17.7		1.1	ug/m3		07-FEB-18	R3956376
1,1,1-Trichloroethane	3.25		0.20	ppb(V)		07-FEB-18	R3956376
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		07-FEB-18	R3956376
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Trichloroethylene	<1.1		1.1	ug/m3		07-FEB-18	R3956376
Trichloroethylene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Vinyl chloride	<0.51		0.51	ug/m3		07-FEB-18	R3956376
Vinyl chloride	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
o-Xylene	1.30		0.87	ug/m3		07-FEB-18	R3956376
o-Xylene	0.30		0.20	ppb(V)		07-FEB-18	R3956376
m&p-Xylene	3.1		1.7	ug/m3		07-FEB-18	R3956376
m&p-Xylene	0.72		0.40	ppb(V)		07-FEB-18	R3956376
Xylenes (Total)	1.02		0.45	ppb(V)		07-FEB-18	
Xylenes (Total)	4.4		2.0	ug/m3		07-FEB-18	
Surrogate: 4-Bromofluorobenzene	98.8		50-150	%		07-FEB-18	R3956376
Miscellaneous							
Batch Proof ID	171121.217				03-FEB-18	03-FEB-18	R3953228
Canister ID	01400-0201				03-FEB-18	03-FEB-18	R3953228
Pressure on Receipt	-10.4		-30	in Hg	03-FEB-18	03-FEB-18	R3953228
Regulator ID	G92				03-FEB-18	03-FEB-18	R3953228
L2052053-2 VP02							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2052053-2 VP02							
Sampled By: N.BISWAS/N NWODDIN on 01-FEB-18 @ 11:15							
Matrix: AIR CAN							
Volatile Organic Compounds							
Acetone	11.8	DLA	5.9	ug/m3		07-FEB-18	R3956376
Acetone	5.0	DLA	2.5	ppb(V)		07-FEB-18	R3956376
Benzene	0.65		0.32	ug/m3		07-FEB-18	R3956376
Benzene	0.20		0.10	ppb(V)		07-FEB-18	R3956376
Bromoform	<2.1		2.1	ug/m3		07-FEB-18	R3956376
Bromoform	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Bromomethane	<0.78		0.78	ug/m3		07-FEB-18	R3956376
Bromomethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Carbon Tetrachloride	<1.3		1.3	ug/m3		07-FEB-18	R3956376
Carbon Tetrachloride	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Chlorobenzene	<0.92		0.92	ug/m3		07-FEB-18	R3956376
Chlorobenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Chloroform	<0.98		0.98	ug/m3		07-FEB-18	R3956376
Chloroform	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dibromoethane	<1.5		1.5	ug/m3		07-FEB-18	R3956376
1,2-Dibromoethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		07-FEB-18	R3956376
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		07-FEB-18	R3956376
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1-Dichloroethane	<0.81		0.81	ug/m3		07-FEB-18	R3956376
1,1-Dichloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dichloroethane	<0.81		0.81	ug/m3		07-FEB-18	R3956376
1,2-Dichloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1-Dichloroethene	<0.79		0.79	ug/m3		07-FEB-18	R3956376
1,1-Dichloroethene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		07-FEB-18	R3956376
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		07-FEB-18	R3956376
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Methylene chloride	<0.69		0.69	ug/m3		07-FEB-18	R3956376
Methylene chloride	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,2-Dichloropropane	<0.92		0.92	ug/m3		07-FEB-18	R3956376
1,2-Dichloropropane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		07-FEB-18	R3956376
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		07-FEB-18	R3956376
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,3-Dichloropropene (cis & trans)	<0.28		0.28	ppb(V)		07-FEB-18	
1,3-Dichloropropene (cis & trans)	<1.3		1.3	ug/m3		07-FEB-18	
1,4-Dioxane	<0.72		0.72	ug/m3		07-FEB-18	R3956376
1,4-Dioxane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Ethylbenzene	<0.87		0.87	ug/m3		07-FEB-18	R3956376
Ethylbenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2052053-2 VP02							
Sampled By: N.BISWAS/N NWODDIN on 01-FEB-18 @ 11:15							
Matrix: AIR CAN							
Volatile Organic Compounds							
Hexachlorobutadiene	<2.1		2.1	ug/m3		07-FEB-18	R3956376
Hexachlorobutadiene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
n-Hexane	<0.70		0.70	ug/m3		07-FEB-18	R3956376
n-Hexane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Methyl ethyl ketone	1.17		0.59	ug/m3		07-FEB-18	R3956376
Methyl ethyl ketone	0.40		0.20	ppb(V)		07-FEB-18	R3956376
Methyl isobutyl ketone	<0.82		0.82	ug/m3		07-FEB-18	R3956376
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
MTBE	<0.72		0.72	ug/m3		07-FEB-18	R3956376
MTBE	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Naphthalene	<2.6		2.6	ug/m3		07-FEB-18	R3956376
Naphthalene	<0.50		0.50	ppb(V)		07-FEB-18	R3956376
Styrene	<0.85		0.85	ug/m3		07-FEB-18	R3956376
Styrene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1,1,2-Tetrachloroethane	<1.4		1.4	ug/m3		07-FEB-18	R3956376
1,1,1,2-Tetrachloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		07-FEB-18	R3956376
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Tetrachloroethylene	<1.4		1.4	ug/m3		07-FEB-18	R3956376
Tetrachloroethylene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Toluene	2.66		0.75	ug/m3		07-FEB-18	R3956376
Toluene	0.71		0.20	ppb(V)		07-FEB-18	R3956376
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		07-FEB-18	R3956376
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		07-FEB-18	R3956376
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		07-FEB-18	R3956376
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Trichloroethylene	<1.1		1.1	ug/m3		07-FEB-18	R3956376
Trichloroethylene	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
Vinyl chloride	<0.51		0.51	ug/m3		07-FEB-18	R3956376
Vinyl chloride	<0.20		0.20	ppb(V)		07-FEB-18	R3956376
o-Xylene	0.89		0.87	ug/m3		07-FEB-18	R3956376
o-Xylene	0.20		0.20	ppb(V)		07-FEB-18	R3956376
m&p-Xylene	2.4		1.7	ug/m3		07-FEB-18	R3956376
m&p-Xylene	0.54		0.40	ppb(V)		07-FEB-18	R3956376
Xylenes (Total)	0.75		0.45	ppb(V)		07-FEB-18	
Xylenes (Total)	3.2		2.0	ug/m3		07-FEB-18	
Surrogate: 4-Bromofluorobenzene	99.0		50-150	%		07-FEB-18	R3956376
Miscellaneous							
Batch Proof ID	171115.122				03-FEB-18	03-FEB-18	R3953228
Canister ID	01400-0223				03-FEB-18	03-FEB-18	R3953228
Pressure on Receipt	-3.9		-30	in Hg	03-FEB-18	03-FEB-18	R3953228
Regulator ID	G47				03-FEB-18	03-FEB-18	R3953228

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CAN-DATA-WT	Canister	Canister Information	EPA TO-15

Batch Proof ID, Canister ID, Pressure on Receipt, Regulator ID.

ALS Test Code	Matrix	Test Description	Method Reference**
VOC-1,3-DCP-CALC-WT	Canister	Sum of cis- and trans-dichloropropene	Calculation
VOC-GCMS-WT	Canister	Volatile Organic Compounds	EPA TO-15

This analysis is performed using procedures adapted from EPA Method TO-15. Air samples are collected into cleaned evacuated canisters. A volume of air sample is transferred from the canister to a preconcentrator system where the analytes are trapped & focused. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

Canister samples will be retained for 7 calendar days after final report. If you require a longer canister storage time, please contact your account manager.

ALS Test Code	Matrix	Test Description	Method Reference**
XYLENES-SUM-CALC-WT	Canister	Sum of Xylene Isomer Concentrations	CALCULATION

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2052053 Report Date: 13-FEB-18

Client: WSP Canada Inc.
100 COMMERCE VALLEY DRIVE WEST
THORNHILL ON L3T0A1

Contact: CHRIS ROACH

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CAN-DATA-WT	**Canister**							
Batch R3953228								
WG2710329-1 MB								
Pressure on Receipt			-29.8		in Hg			03-FEB-18
VOC-GCMS-WT	**Canister**							
Batch R3956376								
WG2711519-2 LCS								
1,1,1-Trichloroethane			104.2		%		70-130	07-FEB-18
1,1,1,2-Tetrachloroethane			108.5		%		70-130	07-FEB-18
1,1,2,2-Tetrachloroethane			112.4		%		70-130	07-FEB-18
1,1,2-Trichloroethane			111.3		%		70-130	07-FEB-18
1,1-Dichloroethane			107.6		%		70-130	07-FEB-18
1,1-Dichloroethene			99.4		%		70-130	07-FEB-18
1,2,4-Trichlorobenzene			81.5		%		70-130	07-FEB-18
1,2-Dibromoethane			111.1		%		70-130	07-FEB-18
1,2-Dichlorobenzene			100.8		%		70-130	07-FEB-18
1,2-Dichloroethane			109.6		%		70-130	07-FEB-18
1,2-Dichloropropane			107.6		%		70-130	07-FEB-18
1,4-Dichlorobenzene			100.9		%		70-130	07-FEB-18
1,4-Dioxane			75.3		%		70-130	07-FEB-18
Acetone			103.4		%		70-130	07-FEB-18
Benzene			108.7		%		70-130	07-FEB-18
Bromoform			106.7		%		70-130	07-FEB-18
Bromomethane			100.0		%		70-130	07-FEB-18
Carbon Tetrachloride			105.3		%		70-130	07-FEB-18
Chlorobenzene			107.5		%		70-130	07-FEB-18
Chloroform			107.4		%		70-130	07-FEB-18
cis-1,2-Dichloroethene			101.9		%		70-130	07-FEB-18
cis-1,3-Dichloropropene			108.0		%		70-130	07-FEB-18
Ethylbenzene			108.3		%		70-130	07-FEB-18
Hexachlorobutadiene			80.7		%		70-130	07-FEB-18
m&p-Xylene			98.0		%		70-130	07-FEB-18
Methyl ethyl ketone			108.4		%		70-130	07-FEB-18
Methyl isobutyl ketone			94.5		%		70-130	07-FEB-18
Methylene chloride			101.3		%		70-130	07-FEB-18
MTBE			111.2		%		70-130	07-FEB-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-GCMS-WT	**Canister**							
Batch R3956376								
WG2711519-2 LCS								
n-Hexane			114.6		%		70-130	07-FEB-18
Naphthalene			86.6		%		70-130	07-FEB-18
o-Xylene			105.9		%		70-130	07-FEB-18
Styrene			106.1		%		70-130	07-FEB-18
Tetrachloroethylene			109.6		%		70-130	07-FEB-18
Toluene			111.1		%		70-130	07-FEB-18
trans-1,2-Dichloroethene			109.5		%		70-130	07-FEB-18
trans-1,3-Dichloropropene			106.6		%		70-130	07-FEB-18
Trichloroethylene			98.9		%		70-130	07-FEB-18
Vinyl chloride			93.6		%		70-130	07-FEB-18
WG2711519-3 LCSD		**WG2711519-2**						
1,1,1-Trichloroethane		104.2	98		%	6.2	25	07-FEB-18
1,1,1,2-Tetrachloroethane		108.5	103		%	4.8	25	07-FEB-18
1,1,2,2-Tetrachloroethane		112.4	102		%	9.4	25	07-FEB-18
1,1,2-Trichloroethane		111.3	103		%	7.8	25	07-FEB-18
1,1-Dichloroethane		107.6	97		%	10	25	07-FEB-18
1,1-Dichloroethene		99.4	92		%	8.1	25	07-FEB-18
1,2,4-Trichlorobenzene		81.5	70		%	15	25	07-FEB-18
1,2-Dibromoethane		111.1	104		%	6.1	25	07-FEB-18
1,2-Dichlorobenzene		100.8	90		%	11	25	07-FEB-18
1,2-Dichloroethane		109.6	102		%	7.1	25	07-FEB-18
1,2-Dichloropropane		107.6	103		%	4.5	25	07-FEB-18
1,4-Dichlorobenzene		100.9	94		%	7.3	25	07-FEB-18
1,4-Dioxane		75.3	75		%	0.8	25	07-FEB-18
Acetone		103.4	95		%	8.9	25	07-FEB-18
Benzene		108.7	103		%	5.8	25	07-FEB-18
Bromoform		106.7	99		%	7.7	25	07-FEB-18
Bromomethane		100.0	94		%	5.9	25	07-FEB-18
Carbon Tetrachloride		105.3	99		%	6.3	25	07-FEB-18
Chlorobenzene		107.5	97		%	10	25	07-FEB-18
Chloroform		107.4	100		%	7.2	25	07-FEB-18
cis-1,2-Dichloroethene		101.9	95		%	7.1	25	07-FEB-18
cis-1,3-Dichloropropene		108.0	102		%	5.6	25	07-FEB-18
Ethylbenzene		108.3	101		%	6.6	25	07-FEB-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-GCMS-WT	**Canister**							
Batch R3956376								
WG2711519-3 LCSD		**WG2711519-2**						
Hexachlorobutadiene		80.7	69		%	16	25	07-FEB-18
m&p-Xylene		98.0	90		%	9.0	25	07-FEB-18
Methyl ethyl ketone		108.4	98		%	9.9	25	07-FEB-18
Methyl isobutyl ketone		94.5	86		%	9.5	25	07-FEB-18
Methylene chloride		101.3	94		%	7.4	25	07-FEB-18
MTBE		111.2	105		%	6.1	25	07-FEB-18
n-Hexane		114.6	107		%	7.3	25	07-FEB-18
Naphthalene		86.6	76		%	13	25	07-FEB-18
o-Xylene		105.9	98		%	7.7	25	07-FEB-18
Styrene		106.1	98		%	7.9	25	07-FEB-18
Tetrachloroethylene		109.6	102		%	7.4	25	07-FEB-18
Toluene		111.1	103		%	7.2	25	07-FEB-18
trans-1,2-Dichloroethene		109.5	101		%	8.0	25	07-FEB-18
trans-1,3-Dichloropropene		106.6	102		%	4.5	25	07-FEB-18
Trichloroethylene		98.9	91		%	7.9	25	07-FEB-18
Vinyl chloride		93.6	87		%	7.3	25	07-FEB-18
WG2711519-1 MB								
1,1,1-Trichloroethane			<0.20		ppb(V)		0.2	07-FEB-18
1,1,1,2-Tetrachloroethane			<0.20		ppb(V)		0.2	07-FEB-18
1,1,2,2-Tetrachloroethane			<0.20		ppb(V)		0.2	07-FEB-18
1,1,2-Trichloroethane			<0.20		ppb(V)		0.2	07-FEB-18
1,1-Dichloroethane			<0.20		ppb(V)		0.2	07-FEB-18
1,1-Dichloroethene			<0.20		ppb(V)		0.2	07-FEB-18
1,2,4-Trichlorobenzene			<0.20		ppb(V)		0.2	07-FEB-18
1,2-Dibromoethane			<0.20		ppb(V)		0.2	07-FEB-18
1,2-Dichlorobenzene			<0.20		ppb(V)		0.2	07-FEB-18
1,2-Dichloroethane			<0.20		ppb(V)		0.2	07-FEB-18
1,2-Dichloropropane			<0.20		ppb(V)		0.2	07-FEB-18
1,4-Dichlorobenzene			<0.20		ppb(V)		0.2	07-FEB-18
1,4-Dioxane			<0.20		ppb(V)		0.2	07-FEB-18
Acetone			<0.50		ppb(V)		0.5	07-FEB-18
Benzene			<0.10		ppb(V)		0.1	07-FEB-18
Bromoform			<0.20		ppb(V)		0.2	07-FEB-18
Bromomethane			<0.20		ppb(V)		0.2	07-FEB-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-GCMS-WT	**Canister**							
Batch R3956376								
WG2711519-1 MB								
Carbon Tetrachloride			<0.20		ppb(V)		0.2	07-FEB-18
Chlorobenzene			<0.20		ppb(V)		0.2	07-FEB-18
Chloroform			<0.20		ppb(V)		0.2	07-FEB-18
cis-1,2-Dichloroethene			<0.20		ppb(V)		0.2	07-FEB-18
cis-1,3-Dichloropropene			<0.20		ppb(V)		0.2	07-FEB-18
Ethylbenzene			<0.20		ppb(V)		0.2	07-FEB-18
Hexachlorobutadiene			<0.20		ppb(V)		0.2	07-FEB-18
m&p-Xylene			<0.40		ppb(V)		0.4	07-FEB-18
Methyl ethyl ketone			<0.20		ppb(V)		0.2	07-FEB-18
Methyl isobutyl ketone			<0.20		ppb(V)		0.2	07-FEB-18
Methylene chloride			<0.20		ppb(V)		0.2	07-FEB-18
MTBE			<0.20		ppb(V)		0.2	07-FEB-18
n-Hexane			<0.20		ppb(V)		0.2	07-FEB-18
Naphthalene			<0.25		ppb(V)		0.25	07-FEB-18
o-Xylene			<0.20		ppb(V)		0.2	07-FEB-18
Styrene			<0.20		ppb(V)		0.2	07-FEB-18
Tetrachloroethylene			<0.20		ppb(V)		0.2	07-FEB-18
Toluene			<0.20		ppb(V)		0.2	07-FEB-18
trans-1,2-Dichloroethene			<0.20		ppb(V)		0.2	07-FEB-18
trans-1,3-Dichloropropene			<0.20		ppb(V)		0.2	07-FEB-18
Trichloroethylene			<0.20		ppb(V)		0.2	07-FEB-18
Vinyl chloride			<0.20		ppb(V)		0.2	07-FEB-18
Surrogate: 4-Bromofluorobenzene			98.6		%		50-150	07-FEB-18

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Batch Proof Report

Batch ID	Canister ID	Parameters	Value	Units	Date	Analyst
B171115.308	06000-0145	1,1,1-Trichloroethane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,1,1,2-Tetrachloroethane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,1,2,2-Tetrachloroethane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,1,2-Trichloroethane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,1-Dichloroethane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,1-Dichloroethene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,2,4-Trichlorobenzene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,2,4-Trimethylbenzene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,2-Dibromoethane	<0.01	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,2-Dichlorobenzene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,2-Dichloroethane	<0.01	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,2-Dichloropropane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,3,5-Trimethylbenzene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,3-Butadiene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,3-Dichlorobenzene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,4-Dichlorobenzene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	1,4-Dioxane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	2-Chlorophenol	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	2-Hexanone	<1.0	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	4-Ethyltoluene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Acetone	<0.50	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Allyl Chloride	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Benzene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Benzyl Chloride	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Bromodichloromethane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Bromobenzene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Bromoform	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Bromomethane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Carbon Disulfide	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Carbon Tetrachloride	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Chlorobenzene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Chloroethane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Chloroform	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Chloromethane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	cis-1,2-Dichloroethene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	cis-1,3-Dichloropropene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Cyclohexane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Dibromochloromethane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Dichlorodifluoromethane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Ethyl Acetate	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Ethyl Benzene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Freon 113	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Freon 114	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Hexachlorobutadiene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Isooctane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Isopropyl Alcohol	<1.0	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Isopropylbenzene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	m&p-Xylene	<0.04	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Methyl Ethyl Ketone	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Methylcyclohexane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Methyl Isobutyl Ketone	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Methylene Chloride	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	MTBE	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Naphthalene	<0.05	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	n-Decane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	n-Heptane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	n-Hexane	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	o-Xylene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Propylene	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Styrene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Tetrachloroethylene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Tetrahydrofuran	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Toluene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	trans-1,2-Dichloroethene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	trans-1,3-Dichloropropene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Trichloroethylene	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Trichlorofluoromethane	<0.20	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Vinyl Acetate	<0.50	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	Vinyl Bromide	<0.20	ppb(V)	22-Nov-17	saf

B171115.308	06000-0145	Vinyl Chloride	<0.02	ppb(V)	22-Nov-17	saf
B171115.308	06000-0145	4-Bromofluorobenzene	102.7	%	22-Nov-17	saf

Batch Proof Report

Batch ID	Canister ID	Parameters	Value	Units	Date	Analyst
171121.203	01400-0076	1,1,1-Trichloroethane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,1,1,2-Tetrachloroethane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,1,2,2-Tetrachloroethane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,1,2-Trichloroethane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,1-Dichloroethane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,1-Dichloroethene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,2,4-Trichlorobenzene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,2,4-Trimethylbenzene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,2-Dibromoethane	<0.01	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,2-Dichlorobenzene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,2-Dichloroethane	<0.01	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,2-Dichloropropane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,3,5-Trimethylbenzene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,3-Butadiene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,3-Dichlorobenzene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,4-Dichlorobenzene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	1,4-Dioxane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	2-Chlorophenol	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	2-Hexanone	<1.0	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	4-Ethyltoluene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Acetone	<0.50	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Allyl Chloride	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Benzene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Benzyl Chloride	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Bromodichloromethane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Bromobenzene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Bromoform	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Bromomethane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Carbon Disulfide	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Carbon Tetrachloride	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Chlorobenzene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Chloroethane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Chloroform	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Chloromethane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	cis-1,2-Dichloroethene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	cis-1,3-Dichloropropene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Cyclohexane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Dibromochloromethane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Dichlorodifluoromethane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Ethyl Acetate	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Ethyl Benzene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Freon 113	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Freon 114	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Hexachlorobutadiene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Isooctane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Isopropyl Alcohol	<1.0	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Isopropylbenzene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	m&p-Xylene	<0.04	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Methyl Ethyl Ketone	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Methylcyclohexane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Methyl Isobutyl Ketone	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Methylene Chloride	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	MTBE	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Naphthalene	<0.05	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	n-Decane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	n-Heptane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	n-Hexane	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	o-Xylene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Propylene	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Styrene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Tetrachloroethylene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Tetrahydrofuran	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Toluene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	trans-1,2-Dichloroethene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	trans-1,3-Dichloropropene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Trichloroethylene	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Trichlorofluoromethane	<0.20	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Vinyl Acetate	<0.50	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	Vinyl Bromide	<0.20	ppb(V)	7-Dec-17	saf

171121.203	01400-0076	Vinyl Chloride	<0.02	ppb(V)	7-Dec-17	saf
171121.203	01400-0076	4-Bromofluorobenzene	105.4	%	7-Dec-17	saf

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
Toll Free: 1-800-668-9878

ALS Environmental

AIR QUALITY CHAIN OF CUSTODY FORM - Canister/Tube/Gas Bag

Page 1 of 1

Note: All TAT Quoted is in business days which exclude statutory holidays and weekends. TAT of samples received past 3:00 pm or Saturday / Sunday begin the next day.

DATE REQUIRED	SERVICE REQUESTED			
	10 day (regular) ☒	Rush 3 day (100%) ☐	Rush 2 day (200%) ☐	Rush 1 day (300%) - Enquire ☐
	Rush 5 day (50%) ☐			

All rush work requires lab approval before sample submission

COMPANY NAME	WSP Canada Group Ltd.
OFFICE	Thornhill
PROJECT MANAGER	Chris Roach
PROJECT #	17M-02431-00 - SUB
PHONE	FAX
ACCOUNT #	
QUOTATION #	Q49872
PO #	

REGULATION	O. Reg 153
CRITERIA	~~[illegible]~~ Soil Vapour
OTHER INFORMATION	

REPORT FORMAT/DISTRIBUTION

EMAIL X FAX ___ BOTH ___
SELECT: PDF ___ DIGITAL ___ BOTH X
EMAIL 1 neelmoy.biswas@wsp.com
EMAIL 2 Chris.roach@wsp.com

SUBMISSION #: L2052053
ENTERED BY: DA
DATE/TIME ENTERED: 01/02/18
BIN #:

SAMPLING INFORMATION

ANALYSIS REQUEST

Date (dd-mmm-yy)	Time (24hr) (hh:mm)	Canister or Tube ID# (e.g. 06000-XXXX or G0XXXXXX SVI) 01400—	Regulator Serial # CS1200-XXXX or GXX	Matrix Type	SAMPLE DESCRIPTION TO APPEAR ON REPORT	TUBE AIR VOLUME - L ☐ or m³ ☐	VOCs	STARTING PRESSURE - Pre-Sampling ("Hg)	ENDING PRESSURE - Post Sampling ("Hg)	COLLECTION TIME (HRS)	Field Conditions (Rain/Wind/Dust/Odour) Field PID Reading	LAB ID
01-Feb-18	11:15	0201	G92	SG	~~VP02~~ VP01		X	-29	-12	1	Snow	1
01-Feb-18	11:14	0223	G147	SG	~~VP01~~ VP02		X	-29	-6	0.3	Snow	2

L2052053-COFC

SPECIAL INSTRUCTIONS/COMMENTS

ONE EMPTY CANISTER. NO DETAILS ON TAG.

This Chain of Custody Form is only to be used for Air Quality Samples

Matrix Type: Soil Gas Vapour = SG; Indoor Air = IA; Ambient Air = AA; Industrial Hygiene = IH

SAMPLE CONDITION AS RECEIVED: FROZEN ☐ COLD ☐ COOLING INITIATED ☐ AMBIENT ☐ MEAN TEMP
OBSERVATIONS: Yes ☐ No ☐ If yes add SIF. INIT

SAMPLED BY: N. Biswas / N. Nuruddin	DATE & TIME 1 Feb 2018	RECEIVED BY: [signature]	Time 13:45	DATE & TIME Feb 01/18	
RELINQUISHED BY: N.N. [signature]	DATE & TIME	RECEIVED AT LAB BY: [signature]		DATE & TIME Feb 1/18 18:00	

Notes

1. Quote number must be provided to ensure proper pricing
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

REV6-2015

WSP Canada Inc.
ATTN: Chris Roach
100 Commerce Valley Drive West
Thornhill ON L3T0A1

Date Received: 15-MAR-18
Report Date: 22-MAR-18 14:40 (MT)
Version: FINAL

Client Phone: 905-882-4211

Certificate of Analysis

Lab Work Order #: L2068457

Project P.O. #: NOT SUBMITTED
Job Reference: 17M-02431-00-SUB
C of C Numbers:
Legal Site Desc:

Mary-Lynn Pike
Client Services Supervisor

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2068457-1 VP01							
Sampled By: N. BISWAS / C. TIN on 15-MAR-18 @ 10:32							
Matrix: SOIL GAS VAPOUR							
Volatile Organic Compounds							
Acetone	3.2		1.2	ug/m3		22-MAR-18	R3993414
Acetone	1.37		0.50	ppb(V)		22-MAR-18	R3993414
Benzene	<0.32		0.32	ug/m3		22-MAR-18	R3993414
Benzene	<0.10		0.10	ppb(V)		22-MAR-18	R3993414
Bromoform	<2.1		2.1	ug/m3		22-MAR-18	R3993414
Bromoform	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Bromomethane	<0.78		0.78	ug/m3		22-MAR-18	R3993414
Bromomethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Carbon Tetrachloride	<1.3		1.3	ug/m3		22-MAR-18	R3993414
Carbon Tetrachloride	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Chlorobenzene	<0.92		0.92	ug/m3		22-MAR-18	R3993414
Chlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Chloroform	<0.98		0.98	ug/m3		22-MAR-18	R3993414
Chloroform	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dibromoethane	<1.5		1.5	ug/m3		22-MAR-18	R3993414
1,2-Dibromoethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		22-MAR-18	R3993414
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		22-MAR-18	R3993414
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1-Dichloroethane	<0.81		0.81	ug/m3		22-MAR-18	R3993414
1,1-Dichloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dichloroethane	<0.81		0.81	ug/m3		22-MAR-18	R3993414
1,2-Dichloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1-Dichloroethene	<0.79		0.79	ug/m3		22-MAR-18	R3993414
1,1-Dichloroethene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		22-MAR-18	R3993414
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		22-MAR-18	R3993414
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Methylene chloride	<0.69		0.69	ug/m3		22-MAR-18	R3993414
Methylene chloride	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dichloropropane	<0.92		0.92	ug/m3		22-MAR-18	R3993414
1,2-Dichloropropane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		22-MAR-18	R3993414
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		22-MAR-18	R3993414
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,3-Dichloropropene (cis & trans)	<0.28		0.28	ppb(V)		22-MAR-18	
1,3-Dichloropropene (cis & trans)	<1.3		1.3	ug/m3		22-MAR-18	
1,4-Dioxane	<0.72		0.72	ug/m3		22-MAR-18	R3993414
1,4-Dioxane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Ethylbenzene	<0.87		0.87	ug/m3		22-MAR-18	R3993414
Ethylbenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2068457-1 VP01							
Sampled By: N. BISWAS / C. TIN on 15-MAR-18 @ 10:32							
Matrix: SOIL GAS VAPOUR							
Volatile Organic Compounds							
Hexachlorobutadiene	<2.1		2.1	ug/m3		22-MAR-18	R3993414
Hexachlorobutadiene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
n-Hexane	<0.70		0.70	ug/m3		22-MAR-18	R3993414
n-Hexane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Methyl ethyl ketone	<0.59		0.59	ug/m3		22-MAR-18	R3993414
Methyl ethyl ketone	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Methyl isobutyl ketone	<0.82		0.82	ug/m3		22-MAR-18	R3993414
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
MTBE	<0.72		0.72	ug/m3		22-MAR-18	R3993414
MTBE	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Naphthalene	<2.6		2.6	ug/m3		22-MAR-18	R3993414
Naphthalene	<0.50		0.50	ppb(V)		22-MAR-18	R3993414
Styrene	<0.85		0.85	ug/m3		22-MAR-18	R3993414
Styrene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1,1,2-Tetrachloroethane	<1.4		1.4	ug/m3		22-MAR-18	R3993414
1,1,1,2-Tetrachloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		22-MAR-18	R3993414
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Tetrachloroethylene	<1.4		1.4	ug/m3		22-MAR-18	R3993414
Tetrachloroethylene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Toluene	1.92		0.75	ug/m3		22-MAR-18	R3993414
Toluene	0.51		0.20	ppb(V)		22-MAR-18	R3993414
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		22-MAR-18	R3993414
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1,1-Trichloroethane	16.9		1.1	ug/m3		22-MAR-18	R3993414
1,1,1-Trichloroethane	3.09		0.20	ppb(V)		22-MAR-18	R3993414
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		22-MAR-18	R3993414
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Trichloroethylene	<1.1		1.1	ug/m3		22-MAR-18	R3993414
Trichloroethylene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Vinyl chloride	<0.51		0.51	ug/m3		22-MAR-18	R3993414
Vinyl chloride	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
o-Xylene	<0.87		0.87	ug/m3		22-MAR-18	R3993414
o-Xylene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
m&p-Xylene	1.8		1.7	ug/m3		22-MAR-18	R3993414
m&p-Xylene	0.41		0.40	ppb(V)		22-MAR-18	R3993414
Xylenes (Total)	<0.45		0.45	ppb(V)		22-MAR-18	
Xylenes (Total)	<2.0		2.0	ug/m3		22-MAR-18	
Surrogate: 4-Bromofluorobenzene	99.3		50-150	%		22-MAR-18	R3993414
Miscellaneous							
Batch Proof ID	180226.214				16-MAR-18	16-MAR-18	R3987029
Canister ID	01400-0252				16-MAR-18	16-MAR-18	R3987029
Pressure on Receipt	-10.0		-30	in Hg	16-MAR-18	16-MAR-18	R3987029
Regulator ID	G35				16-MAR-18	16-MAR-18	R3987029
L2068457-2 VP02							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2068457-2 VP02							
Sampled By: N. BISWAS / C. TIN on 15-MAR-18 @ 11:33							
Matrix: SOIL GAS VAPOUR							
Volatile Organic Compounds							
Acetone	3.6		1.2	ug/m3		22-MAR-18	R3993414
Acetone	1.53		0.50	ppb(V)		22-MAR-18	R3993414
Benzene	<0.32		0.32	ug/m3		22-MAR-18	R3993414
Benzene	<0.10		0.10	ppb(V)		22-MAR-18	R3993414
Bromoform	<2.1		2.1	ug/m3		22-MAR-18	R3993414
Bromoform	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Bromomethane	<0.78		0.78	ug/m3		22-MAR-18	R3993414
Bromomethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Carbon Tetrachloride	<1.3		1.3	ug/m3		22-MAR-18	R3993414
Carbon Tetrachloride	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Chlorobenzene	<0.92		0.92	ug/m3		22-MAR-18	R3993414
Chlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Chloroform	<0.98		0.98	ug/m3		22-MAR-18	R3993414
Chloroform	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dibromoethane	<1.5		1.5	ug/m3		22-MAR-18	R3993414
1,2-Dibromoethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		22-MAR-18	R3993414
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		22-MAR-18	R3993414
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1-Dichloroethane	<0.81		0.81	ug/m3		22-MAR-18	R3993414
1,1-Dichloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dichloroethane	<0.81		0.81	ug/m3		22-MAR-18	R3993414
1,2-Dichloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1-Dichloroethene	<0.79		0.79	ug/m3		22-MAR-18	R3993414
1,1-Dichloroethene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		22-MAR-18	R3993414
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		22-MAR-18	R3993414
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Methylene chloride	<0.69		0.69	ug/m3		22-MAR-18	R3993414
Methylene chloride	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,2-Dichloropropane	<0.92		0.92	ug/m3		22-MAR-18	R3993414
1,2-Dichloropropane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		22-MAR-18	R3993414
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		22-MAR-18	R3993414
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,3-Dichloropropene (cis & trans)	<0.28		0.28	ppb(V)		22-MAR-18	
1,3-Dichloropropene (cis & trans)	<1.3		1.3	ug/m3		22-MAR-18	
1,4-Dioxane	<0.72		0.72	ug/m3		22-MAR-18	R3993414
1,4-Dioxane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Ethylbenzene	<0.87		0.87	ug/m3		22-MAR-18	R3993414
Ethylbenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2068457-2 VP02							
Sampled By: N. BISWAS / C. TIN on 15-MAR-18 @ 11:33							
Matrix: SOIL GAS VAPOUR							
Volatile Organic Compounds							
Hexachlorobutadiene	<2.1		2.1	ug/m3		22-MAR-18	R3993414
Hexachlorobutadiene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
n-Hexane	<0.70		0.70	ug/m3		22-MAR-18	R3993414
n-Hexane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Methyl ethyl ketone	<0.59		0.59	ug/m3		22-MAR-18	R3993414
Methyl ethyl ketone	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Methyl isobutyl ketone	<0.82		0.82	ug/m3		22-MAR-18	R3993414
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
MTBE	<0.72		0.72	ug/m3		22-MAR-18	R3993414
MTBE	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Naphthalene	<2.6		2.6	ug/m3		22-MAR-18	R3993414
Naphthalene	<0.50		0.50	ppb(V)		22-MAR-18	R3993414
Styrene	<0.85		0.85	ug/m3		22-MAR-18	R3993414
Styrene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1,1,2-Tetrachloroethane	<1.4		1.4	ug/m3		22-MAR-18	R3993414
1,1,1,2-Tetrachloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		22-MAR-18	R3993414
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Tetrachloroethylene	<1.4		1.4	ug/m3		22-MAR-18	R3993414
Tetrachloroethylene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Toluene	1.56		0.75	ug/m3		22-MAR-18	R3993414
Toluene	0.41		0.20	ppb(V)		22-MAR-18	R3993414
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		22-MAR-18	R3993414
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		22-MAR-18	R3993414
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		22-MAR-18	R3993414
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Trichloroethylene	<1.1		1.1	ug/m3		22-MAR-18	R3993414
Trichloroethylene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
Vinyl chloride	<0.51		0.51	ug/m3		22-MAR-18	R3993414
Vinyl chloride	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
o-Xylene	<0.87		0.87	ug/m3		22-MAR-18	R3993414
o-Xylene	<0.20		0.20	ppb(V)		22-MAR-18	R3993414
m&p-Xylene	1.8		1.7	ug/m3		22-MAR-18	R3993414
m&p-Xylene	0.41		0.40	ppb(V)		22-MAR-18	R3993414
Xylenes (Total)	<0.45		0.45	ppb(V)		22-MAR-18	
Xylenes (Total)	<2.0		2.0	ug/m3		22-MAR-18	
Surrogate: 4-Bromofluorobenzene	95.4		50-150	%		22-MAR-18	R3993414
Miscellaneous							
Batch Proof ID	180226.215				16-MAR-18	16-MAR-18	R3987029
Canister ID	01400-0264				16-MAR-18	16-MAR-18	R3987029
Pressure on Receipt	-7.8		-30	in Hg	16-MAR-18	16-MAR-18	R3987029
Regulator ID	G232				16-MAR-18	16-MAR-18	R3987029

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CAN-DATA-WT	Canister	Canister Information	EPA TO-15

Batch Proof ID, Canister ID, Pressure on Receipt, Regulator ID.

ALS Test Code	Matrix	Test Description	Method Reference**
VOC-1,3-DCP-CALC-WT	Canister	Sum of cis- and trans-dichloropropene	Calculation
VOC-GCMS-WT	Canister	Volatile Organic Compounds	EPA TO-15

This analysis is performed using procedures adapted from EPA Method TO-15. Air samples are collected into cleaned evacuated canisters. A volume of air sample is transferred from the canister to a preconcentrator system where the analytes are trapped & focused. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

Canister samples will be retained for 7 calendar days after final report. If you require a longer canister storage time, please contact your account manager.

ALS Test Code	Matrix	Test Description	Method Reference**
XYLENES-SUM-CALC-WT	Canister	Sum of Xylene Isomer Concentrations	CALCULATION

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: WSP Canada Inc.
100 Commerce Valley Drive West
Thornhill ON L3T0A1
Contact: Chris Roach

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CAN-DATA-WT	**Canister**							
Batch R3987029								
WG2733948-1 MB								
Pressure on Receipt			-29.8		in Hg			16-MAR-18
VOC-GCMS-WT	**Canister**							
Batch R3993414								
WG2737492-4 DUP		**L2068457-1**						
1,1,1-Trichloroethane		3.09	3.20		ppb(V)	3.6	30	22-MAR-18
1,1,1,2-Tetrachloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,1,2,2-Tetrachloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,1,2-Trichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,1-Dichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,1-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,2,4-Trichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,2-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,2-Dichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,2-Dichloropropane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,4-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
1,4-Dioxane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Acetone		1.37	1.32		ppb(V)	3.0	30	22-MAR-18
Benzene		<0.10	<0.10	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Bromoform		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Bromomethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Carbon Tetrachloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Chlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Chloroform		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
cis-1,2-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
cis-1,3-Dichloropropene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Ethylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Hexachlorobutadiene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
m&p-Xylene		0.41	0.40		ppb(V)	2.5	30	22-MAR-18
Methyl ethyl ketone		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Methyl isobutyl ketone		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Methylene chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
MTBE		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-GCMS-WT	**Canister**							
Batch R3993414								
WG2737492-4 DUP		**L2068457-1**						
n-Hexane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Naphthalene		<0.50	<0.50	RPD-NA	ppb(V)	N/A	30	22-MAR-18
o-Xylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Styrene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Tetrachloroethylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Toluene		0.51	0.55		ppb(V)	8.1	30	22-MAR-18
trans-1,2-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
trans-1,3-Dichloropropene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Trichloroethylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
Vinyl chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	22-MAR-18
WG2737492-2 LCS								
1,1,1-Trichloroethane			91.0		%		70-130	22-MAR-18
1,1,1,2-Tetrachloroethane			101.4		%		70-130	22-MAR-18
1,1,2,2-Tetrachloroethane			95.5		%		70-130	22-MAR-18
1,1,2-Trichloroethane			101.3		%		70-130	22-MAR-18
1,1-Dichloroethane			99.0		%		70-130	22-MAR-18
1,1-Dichloroethene			102.1		%		70-130	22-MAR-18
1,2,4-Trichlorobenzene			101.2		%		70-130	22-MAR-18
1,2-Dibromoethane			103.9		%		70-130	22-MAR-18
1,2-Dichlorobenzene			89.5		%		70-130	22-MAR-18
1,2-Dichloroethane			91.5		%		70-130	22-MAR-18
1,2-Dichloropropane			88.6		%		70-130	22-MAR-18
1,4-Dichlorobenzene			88.6		%		70-130	22-MAR-18
1,4-Dioxane			94.1		%		70-130	22-MAR-18
Acetone			80.7		%		70-130	22-MAR-18
Benzene			102.7		%		70-130	22-MAR-18
Bromoform			91.2		%		70-130	22-MAR-18
Bromomethane			91.6		%		70-130	22-MAR-18
Carbon Tetrachloride			95.9		%		70-130	22-MAR-18
Chlorobenzene			110.1		%		70-130	22-MAR-18
Chloroform			98.8		%		70-130	22-MAR-18
cis-1,2-Dichloroethene			96.0		%		70-130	22-MAR-18
cis-1,3-Dichloropropene			100.8		%		70-130	22-MAR-18
Ethylbenzene			95.6		%		70-130	22-MAR-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-GCMS-WT	**Canister**							
Batch R3993414								
WG2737492-2 LCS								
Hexachlorobutadiene			95.1		%		70-130	22-MAR-18
m&p-Xylene			97.6		%		70-130	22-MAR-18
Methyl ethyl ketone			99.7		%		70-130	22-MAR-18
Methyl isobutyl ketone			100.1		%		70-130	22-MAR-18
Methylene chloride			95.5		%		70-130	22-MAR-18
MTBE			111.2		%		70-130	22-MAR-18
n-Hexane			119.5		%		70-130	22-MAR-18
Naphthalene			112.8		%		70-130	22-MAR-18
o-Xylene			94.1		%		70-130	22-MAR-18
Styrene			90.2		%		70-130	22-MAR-18
Tetrachloroethylene			91.1		%		70-130	22-MAR-18
Toluene			99.3		%		70-130	22-MAR-18
trans-1,2-Dichloroethene			100.2		%		70-130	22-MAR-18
trans-1,3-Dichloropropene			103.9		%		70-130	22-MAR-18
Trichloroethylene			92.7		%		70-130	22-MAR-18
Vinyl chloride			88.0		%		70-130	22-MAR-18
WG2737492-3 LCSD		**WG2737492-2**						
1,1,1-Trichloroethane		91.0	84		%	7.6	25	22-MAR-18
1,1,1,2-Tetrachloroethane		101.4	114		%	12	25	22-MAR-18
1,1,2,2-Tetrachloroethane		95.5	105		%	9.6	25	22-MAR-18
1,1,2-Trichloroethane		101.3	92		%	9.5	25	22-MAR-18
1,1-Dichloroethane		99.0	97		%	1.6	25	22-MAR-18
1,1-Dichloroethene		102.1	94		%	8.5	25	22-MAR-18
1,2,4-Trichlorobenzene		101.2	100		%	0.7	25	22-MAR-18
1,2-Dibromoethane		103.9	94		%	10	25	22-MAR-18
1,2-Dichlorobenzene		89.5	86		%	3.7	25	22-MAR-18
1,2-Dichloroethane		91.5	106		%	15	25	22-MAR-18
1,2-Dichloropropane		88.6	98		%	9.7	25	22-MAR-18
1,4-Dichlorobenzene		88.6	100		%	12	25	22-MAR-18
1,4-Dioxane		94.1	82		%	14	25	22-MAR-18
Acetone		80.7	69		%	16	25	22-MAR-18
Benzene		102.7	101		%	1.2	25	22-MAR-18
Bromoform		91.2	104		%	13	25	22-MAR-18
Bromomethane		91.6	92		%	0.4	25	22-MAR-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-GCMS-WT	**Canister**							
Batch R3993414								
WG2737492-3 LCSD		**WG2737492-2**						
Carbon Tetrachloride		95.9	91		%	5.1	25	22-MAR-18
Chlorobenzene		110.1	115		%	4.2	25	22-MAR-18
Chloroform		98.8	86		%	14	25	22-MAR-18
cis-1,2-Dichloroethene		96.0	96		%	0.3	25	22-MAR-18
cis-1,3-Dichloropropene		100.8	101		%	0.2	25	22-MAR-18
Ethylbenzene		95.6	106		%	9.9	25	22-MAR-18
Hexachlorobutadiene		95.1	88		%	7.4	25	22-MAR-18
m&p-Xylene		97.6	100		%	2.7	25	22-MAR-18
Methyl ethyl ketone		99.7	103		%	3.3	25	22-MAR-18
Methyl isobutyl ketone		100.1	94		%	5.9	25	22-MAR-18
Methylene chloride		95.5	101		%	5.9	25	22-MAR-18
MTBE		111.2	107		%	4.2	25	22-MAR-18
n-Hexane		119.5	111		%	7.5	25	22-MAR-18
Naphthalene		112.8	112		%	0.8	25	22-MAR-18
o-Xylene		94.1	108		%	14	25	22-MAR-18
Styrene		90.2	104		%	14	25	22-MAR-18
Tetrachloroethylene		91.1	101		%	10	25	22-MAR-18
Toluene		99.3	100		%	0.4	25	22-MAR-18
trans-1,2-Dichloroethene		100.2	94		%	5.8	25	22-MAR-18
trans-1,3-Dichloropropene		103.9	98		%	6.1	25	22-MAR-18
Trichloroethylene		92.7	85		%	8.5	25	22-MAR-18
Vinyl chloride		88.0	92		%	3.9	25	22-MAR-18
WG2737492-1 MB								
1,1,1-Trichloroethane			<0.20		ppb(V)		0.2	22-MAR-18
1,1,1,2-Tetrachloroethane			<0.20		ppb(V)		0.2	22-MAR-18
1,1,2,2-Tetrachloroethane			<0.20		ppb(V)		0.2	22-MAR-18
1,1,2-Trichloroethane			<0.20		ppb(V)		0.2	22-MAR-18
1,1-Dichloroethane			<0.20		ppb(V)		0.2	22-MAR-18
1,1-Dichloroethene			<0.20		ppb(V)		0.2	22-MAR-18
1,2,4-Trichlorobenzene			<0.20		ppb(V)		0.2	22-MAR-18
1,2-Dibromoethane			<0.20		ppb(V)		0.2	22-MAR-18
1,2-Dichlorobenzene			<0.20		ppb(V)		0.2	22-MAR-18
1,2-Dichloroethane			<0.20		ppb(V)		0.2	22-MAR-18
1,2-Dichloropropane			<0.20		ppb(V)		0.2	22-MAR-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-GCMS-WT	**Canister**							
Batch R3993414								
WG2737492-1 MB								
1,4-Dichlorobenzene			<0.20		ppb(V)		0.2	22-MAR-18
1,4-Dioxane			<0.20		ppb(V)		0.2	22-MAR-18
Acetone			<0.50		ppb(V)		0.5	22-MAR-18
Benzene			<0.10		ppb(V)		0.1	22-MAR-18
Bromoform			<0.20		ppb(V)		0.2	22-MAR-18
Bromomethane			<0.20		ppb(V)		0.2	22-MAR-18
Carbon Tetrachloride			<0.20		ppb(V)		0.2	22-MAR-18
Chlorobenzene			<0.20		ppb(V)		0.2	22-MAR-18
Chloroform			<0.20		ppb(V)		0.2	22-MAR-18
cis-1,2-Dichloroethene			<0.20		ppb(V)		0.2	22-MAR-18
cis-1,3-Dichloropropene			<0.20		ppb(V)		0.2	22-MAR-18
Ethylbenzene			<0.20		ppb(V)		0.2	22-MAR-18
Hexachlorobutadiene			<0.20		ppb(V)		0.2	22-MAR-18
m&p-Xylene			<0.40		ppb(V)		0.4	22-MAR-18
Methyl ethyl ketone			<0.20		ppb(V)		0.2	22-MAR-18
Methyl isobutyl ketone			<0.20		ppb(V)		0.2	22-MAR-18
Methylene chloride			<0.20		ppb(V)		0.2	22-MAR-18
MTBE			<0.20		ppb(V)		0.2	22-MAR-18
n-Hexane			<0.20		ppb(V)		0.2	22-MAR-18
Naphthalene			<0.25		ppb(V)		0.25	22-MAR-18
o-Xylene			<0.20		ppb(V)		0.2	22-MAR-18
Styrene			<0.20		ppb(V)		0.2	22-MAR-18
Tetrachloroethylene			<0.20		ppb(V)		0.2	22-MAR-18
Toluene			<0.20		ppb(V)		0.2	22-MAR-18
trans-1,2-Dichloroethene			<0.20		ppb(V)		0.2	22-MAR-18
trans-1,3-Dichloropropene			<0.20		ppb(V)		0.2	22-MAR-18
Trichloroethylene			<0.20		ppb(V)		0.2	22-MAR-18
Vinyl chloride			<0.20		ppb(V)		0.2	22-MAR-18
Surrogate: 4-Bromofluorobenzene			94.6		%		50-150	22-MAR-18

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Batch Proof Report

Batch ID	Canister ID	Parameters	Value	Units	Date	Analyst
180226.222	01400-0322	1,1,1-Trichloroethane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,1,1,2-Tetrachloroethane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,1,2,2-Tetrachloroethane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,1,2-Trichloroethane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,1-Dichloroethane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,1-Dichloroethene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,2,4-Trichlorobenzene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,2,4-Trimethylbenzene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,2-Dibromoethane	<0.01	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,2-Dichlorobenzene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,2-Dichloroethane	<0.01	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,2-Dichloropropane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,3,5-Trimethylbenzene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,3-Butadiene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,3-Dichlorobenzene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,4-Dichlorobenzene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	1,4-Dioxane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	2-Chlorophenol	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	2-Hexanone	<1.0	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	4-Ethyltoluene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Acetone	<0.50	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Allyl Chloride	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Benzene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Benzyl Chloride	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Bromodichloromethane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Bromobenzene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Bromoform	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Bromomethane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Carbon Disulfide	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Carbon Tetrachloride	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Chlorobenzene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Chloroethane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Chloroform	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Chloromethane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	cis-1,2-Dichloroethene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	cis-1,3-Dichloropropene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Cyclohexane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Dibromochloromethane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Dichlorodifluoromethane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Ethyl Acetate	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Ethyl Benzene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Freon 113	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Freon 114	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Hexachlorobutadiene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Isooctane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Isopropyl Alcohol	<1.0	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Isopropylbenzene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	m&p-Xylene	<0.04	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Methyl Ethyl Ketone	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Methylcyclohexane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Methyl Isobutyl Ketone	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Methylene Chloride	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	MTBE	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Naphthalene	<0.05	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	n-Decane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	n-Heptane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	n-Hexane	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	o-Xylene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Propylene	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Styrene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Tetrachloroethylene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Tetrahydrofuran	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Toluene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	trans-1,2-Dichloroethene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	trans-1,3-Dichloropropene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Trichloroethylene	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Trichlorofluoromethane	<0.20	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Vinyl Acetate	<0.50	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	Vinyl Bromide	<0.20	ppb(V)	14-Mar-18	saf

180226.222	01400-0322	Vinyl Chloride	<0.02	ppb(V)	14-Mar-18	saf
180226.222	01400-0322	4-Bromofluorobenzene	97.0	%	14-Mar-18	saf

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
Toll Free: 1-800-668-9878

ALS Environmental

AIR QUALITY CHAIN OF CUSTODY FORM - Canister/Tube/Gas Bag

Note: All TAT Quoted is in business days which exclude statutory holidays and weekends. TAT of samples received past 3:00 pm or Saturday / Sunday begin the next day.

DATE REQUIRED	SERVICE REQUESTED			
	10 day (regular) ☐		Rush 3 day (100%)	☐
	Rush 5 day (50%)	☒	Rush 2 day (200%)	☐
			Rush 1 day (300%) - Enquire	☐

All rush work requires lab approval before sample submission

COMPANY NAME	WSP Canada Group Ltd.
OFFICE	Thornhill
PROJECT MANAGER	Chris Roach
PROJECT #	17M-02431-00-SUB
PHONE	FAX
ACCOUNT #	
QUOTATION # Q49872	PO #
REGULATION	O.Reg. 153
CRITERIA	Soil vapours
OTHER INFORMATION	

REPORT FORMAT/DISTRIBUTION

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EMAIL 1 neelmoy.biswas@wsp.com
EMAIL 2 ___

SUBMISSION # L2068457
ENTERED BY: ESmith -es
DATE/TIME ENTERED: 15-Mar-18
BIN # ___

SAMPLING INFORMATION / **ANALYSIS REQUEST**

Date (dd-mmm-yy)	Time (24hr) (hh:mm)	Canister or Tube ID# (e.g. 060000-XXXX or G0XXXXXXSVI) 01400—	Regulator Serial # CS1200-XXXX or GXX	Matrix Type	SAMPLE DESCRIPTION TO APPEAR ON REPORT	TUBE AIR VOLUME - L ☐ or m³ ☐	VOCs	STARTING PRESSURE - Pre-Sampling ("Hg)	ENDING PRESSURE - Post Sampling ("Hg)	COLLECTION TIME (HRS)	Field Conditions (Rain/Wind/Dust/Odour) Field PID Reading	LAB ID
15-Mar-18	10:32	0252	G35	SG	VP01		X	-26	-8"	0.5	Wind	1
15-Mar-18	11:33	0264	G233	SG	VP02		X	-28	-8"	0.28	Wind	2

L2068457-COFC

This [illegible] Custody Form is only to be used for Air Quality Samples

SPECIAL INSTRUCTIONS/COMMENTS: One empty Canister returned as duplicate splitter was not provided.

Matrix Type: Soil Gas Vapour = SG; Indoor Air = IA; Ambient Air = AA; Industrial Hygiene = IH

SAMPLE CONDITION AS RECEIVED: FROZEN ☐ COLD ☐ COOLING INITIATED ☐ AMBIENT ☐ MEAN TEMP

SAMPLED BY: N. Biswas / C. Tin	DATE & TIME March 15, 2018	RECEIVED BY: CB	DATE & TIME March 15/18	OBSERVATIONS Yes ☐ No ☐ If yes add SIF	INIT
RELINQUISHED BY: [signature]	DATE & TIME 15 March 2018	RECEIVED AT LAB BY: [signature]	DATE & TIME 15-Mar-18 16:45		

Notes

1. Quote number must be provided to ensure proper pricing
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

REV6-2015

Time [13:30

Hydrogeological Evaluation

GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Hydrogeological Evaluation

Proposed Childcare Centre

1234 Weston Road, Toronto, ON

Prepared For:

Coolearth Architecture Inc.

GeoPro Project No.: 17-2118H04

Report Date: November 30, 2018

Professional, Proficient, Proactive

GeoPro Consulting Limited Tel. (905) 237-8336

Unit 57, 40 Vogell Road, Richmond Hill, Ontario L4B 3N6

GeoPro CONSULTING LIMITED

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Limitations to the Report

1.0 INTRODUCTION

GeoPro Consulting Limited ("GeoPro") was retained by Coolearth Architecture Inc. (the "Client") to conduct a hydrogeological evaluation for the Proposed Childcare Centre ("The Project") at 1234 Weston Road, in the City of Toronto (the "Toronto"), Ontario (the "Site"). The approximate location of the Site is shown on Drawing No. 1.

It is understood that the proposed development consists of a two story childcare centre with one level of basement. Design drawings are attached in Appendix E.

1.1 Purposes

The purposes of this hydrogeological evaluation were to evaluate the subsurface soil and groundwater conditions at the Site and to assess the need for groundwater control in order to facilitate the design of the Project.

It should be noted that the hydrogeological evaluation was based on the subsurface conditions from the borehole data from the investigations carried out by other consultants as well as the limited borehole data from the previous geotechnical investigation carried out by GeoPro.

1.2 Scope of Work

The hydrogeological evaluation comprised the following tasks:

1) Review available reports from previous investigations;
2) Conducting a search and review of the available geology and hydrogeology data sources, including Ministry of the Environment, Conservation and Parks ("MECP") Water Well Records ("WWR"), Ontario Geological Survey (OGS) and Ontario source water protection agencies;
3) Conducting a site visit to observe the site features and potential source(s) of contamination;
4) Completing data processing, interpretation and report preparation.

This report has been prepared for the Client. Third party use of this report without GeoPro's consent is prohibited. The limitation conditions presented in this report form an integral part of the report and they must be considered in conjunction with this report.

1.3 Previous Investigations and Reports

1.3.1 Phase II ESA by Another Consultant

A Phase II Environmental Site Assessment ("ESA") was conducted for due-diligence purpose at the Site by WSP Global Inc. in 2017. The Phase II ESA consisted of advancement of five (5) boreholes (MW101 to MW105) to depths ranging from about 15.24 to 25.91 meters below ground surface ("mBGS"), and installation of one (1) monitoring well in each of the advanced boreholes. The groundwater levels measured in the monitoring wells in 2017 ranges from 11.80 to 12.20 mBGS. The approximate borehole/monitoring well locations are shown on Drawing No. 2, and the Borehole Logs are provided in Appendix A.

It should be noted that only the borehole data from a hydrogeological perspective was referenced in our assessment. The environmental perspective, including the potential impact to the site, was not part of our scope of work. It is further understood that the monitoring wells installed at the site had been decommissioned at the time of preparing the report.

1.3.2 Geotechnical Investigation by GeoPro

Geotechnical investigation by GeoPro was conducted at the Site in 2017. The Geotechnical investigation consisted of advancement of two (2) boreholes (BH1 and BH2) to depths ranging from about 6.1 to 6.7 meters below ground surface ("mBGS"), and installation of one (1) monitoring well in borehole BH1. Both boreholes were found to be dry during and upon the completion of drilling. Monitoring well BH1 was found to be dry on December 9, 2017.

The hydraulic conductivity (K) was estimated based on the results obtained from the particle size analyses of selected soil samples and from in-situ single well response test (slug test). Based on the particle size analyses, the K values of tested soils ranged from 7.4×10^{-4} cm/s to 2.1×10^{-2} cm/s, and the maximum geometric mean value was about 1.9×10^{-2} cm/s. Based on the Slug test, the K values of the screened soil in the monitoring well were estimated to be 3.5×10^{-3} cm/s.

In addition, the field saturated hydraulic conductivity values (K_{fs}) were estimated based on the results obtained from the Guelph Permeameter Infiltration tests. Based on the Guelph Permeameter Infiltration tests, the K_{fs} values ranged from 7.7×10^{-6} cm/s to 5.1×10^{-4} cm/s. According to the values of K and K_{fs}, the estimated values of percolation time for the shallow fill materials at the Site range from 12 min/cm to 21 min/cm, while the values of infiltration rate range from 29 mm/hr to 50 mm/hr. The estimated values of percolation time for the native soils at the depths between 3.1 mBGS and 6.6 mBGS at the Site range from 4 min/cm to 15 min/cm, while the values of infiltration rate range from 40 mm/hour to 150 mm/hour.

The results of the geotechnical investigation were summarized in a separate report. The limited information and data obtained from GeoPro's geotechnical investigation has been incorporated in this hydrogeological investigation report. The approximate borehole and monitoring well locations are shown on Drawing No. 2, and the Borehole Logs are provided in Appendix A.

This hydrogeological investigation report should be read in conjunction with the geotechnical report.

2.0 SITE CONDITIONS

2.1 Site Feature Observations

A site visit was made on November 8, 2018 to observe the general site features and sources of potential contamination and/or environmental concern.

The Site is located in the southwest corner of the intersection of Weston Road and Glenvalley Drive, bounded by residential and commercial properties. The site is vacant.

No monitoring wells were observed on the day of the site visit.

Water valves, catch basins, and sanitary manholes were observed along the roadways near the Site.

A culvert crossing the roadway of Jane Street was observed about 370 m south of the intersection of Jane Street and Weston Road, where a tributary of Humber River (Black Creek) runs southeastwards, and drains to the Humber River approximately 1.3 km southwest of the site.

Auto garages (auto service shops) and dry cleaners were noted in the area within a 500 m radius from the Site, as summarized below:

- Louison Automotive Inc. (1295 Weston Road) about 233 m northwest of the Site;
- B M G Auto Service (4 Ray Avenue) about 172 m northwest of the Site;
- AB Auto Tinting (1 Ray Avenue Unit #1) about 117 m northwest of the Site;
- C Auto Collision Center (1140 Weston Road) about 327 m southeast of the Site;
- Loyal Custom Cleaners (at 1304 Weston Road) about 340 m northwest of the Site;
- Tommy's Dry Cleaners (at 1119 Weston Road) about 450 m south to southeast of the Site.

2.2 Physiography and Drainage

The Site is located within the physiographical region of Iroquois sand plain, according to the "Physiography Map of South Central Portion of Southern Ontario" (Map 2226, Scale 1:253,440) prepared by the Ontario Department of Mines and Northern Affairs, and based on the database maintained by the Ontario Geological Survey ("OGS").

The Site is located within the Lower Humber – Sliver Creek Subwatershed in the Humber River Watershed, under the jurisdiction of the Toronto and Region Conservation Authority ("TRCA"). A tributary of Humber River (Black Creek), located to the east of the Site, meanders around the Site from southeast to southwest, and drains to the Humber River approximately 1.3 km southwest of the site. The Humber River is located 1.46 km west from the Site, flows from north to south, and empties into Lake Ontario about 6.5 km southwest of the Site.

2.3 Geology

2.3.1 Bedrock Geology

The bedrock at the Site consists of Upper Ordovician deposits of shale, limestone, dolostone and siltstone. The bedrock depth ranges from 1 mBGS to 46 mBGS, according to the "Bedrock Geology of Southern Ontario" (Map 2544, Scale 1: 1,000,000) prepared by the Ontario Department of Mines and Northern Affairs and based on database maintained by OGS.

2.3.2 Surficial Geology

As shown on Drawing No. 3, the Site and its surrounding area are located in an area covered with foreshore-basinal deposits of sand, gravel, minor silt and clay, according to the database of "Surficial Geology of Southern Ontario" maintained by the OGS.

2.3.3 Site Stratigraphy

As shown on borehole logs prepared by GeoPro, and the borehole logs prepared by WSP provided by the Client, the soil stratigraphy at the Site generally consists of native soils below asphalt and fill materials. The native soils generally consist of cohesionless soils textured from silt to sand, with zones of cohesive clayey soils. No bedrock was encountered at the maximum advanced depth of 25.91 mBGS.

2.4 Hydrogeology

The hydrogeological conditions at the Site were evaluated based on the information obtained from the Ministry of Natural Resources and Forestry, the Ontario Source Protection Information Atlas, the water well data collected from the MECP database, the information obtained in GeoPro's geotechnical investigation and the Phase II ESA conducted by WSP at the Site.

2.4.1 MECP WWR

A search of the MECP WWR database was conducted focusing on a 500 m radius from the Site. The locations of the MECP water wells are shown on Drawing No. 5. A summary of water well records is included in Appendix B and presented in the following table.

Type of Well Record	Number of Record
Monitoring	80
Test Hole	2
Monitoring and Test Hole	22
Not Used	1
Unknown use	29
Total	**134**

No well records were found to be related to water supply. No bedrock was encountered at a maximum depth of 45.1 mBGS, and water was reported at recorded depths ranging from 4.3 to 14.3 mBGS in overburden deposits.

2.4.2 Highly Vulnerable Aquifer ("HVA")

Based on the Ontario Source Protection Information Atlas, the Site is located in an area with a Highly Vulnerable Aquifer ("HVA"). HVA was delineated according to Technical Rules under the Clean Water Act. In general, an HVA will consist of source granular aquifer materials or fractured rock that have a high permeability and are exposed near the ground surface with a relatively shallow water table.

An aquifer is indicated as vulnerable if possible contaminants could quickly flow into it and impact water quality. In addition, the plume of the possible contaminants would migrate quickly in an HVA.

2.4.3 Wellhead Protection Areas ("WHPA")

Based on the Ontario Source Protection Information Atlas, the Site is not located within a municipal Wellhead Protection Area ("WHPA").

2.4.4 Significant Groundwater Recharge Area ("SGRA")

Based on the information obtained from the Ontario Source Protection Information Atlas, the Site and its neighboring properties are not located within a Significant Groundwater Recharge Area (SGRA).

2.4.5 Intake Protection Zone ("IPZ")

Based on the information obtained from Ontario Source Protection Information Atlas, the Site is not located within the municipal surface water intake protection zone ("IPZ").

2.4.6 Groundwater Levels

Groundwater conditions were observed in the advanced boreholes during and immediately upon the completion of drilling. The results of observations are included in the Borehole Logs in Appendix A.

As discussed, all the monitoring wells installed during the previous investigations were found to be demolished. Therefore, no groundwater levels were measured during the hydrogeological investigation. However, groundwater levels were measured in the monitoring wells at the Site by GeoPro and WSP during the previous investigations in 2017, and the results are shown in the borehole logs and summarized in the following table.

Monitoring Well ID	**Screen Interval (mBGS)**	**Groundwater Level (mBGS)**	
		December 19, 2017	
BH1 (by GeoPro)	5.0 ~ 6.6	Dry	
Monitoring Well ID	**Screen Interval (mBGS)**	**Groundwater Level (mBGS)**	
		July 27, 2017	**August 15, 2017**
MW101 (WSP)	22.10 ~ 25.10	12.16	12.16
MW102 (WSP)	12.19 ~ 15.24	12.01	11.99
MW103 (WSP)	10.10 ~ 13.10	11.96	11.94
MW104 (WSP)	10.67 ~ 13.72	11.82	11.80
MW105 (WSP)	10.67 ~ 13.72	12.20	12.20

As shown in above table, the groundwater levels measured by WSP ranged from 11.80 to 12.20 mBGS.

No groundwater contours were prepared, as no elevations of the monitoring wells were available. However, the local shallow groundwater flow direction is expected to be from northeast to southwest towards the Humber River.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations.

2.4.6 Groundwater Quality

The two boreholes completed by GeoPro were both dry and groundwater could not be sampled. WSP took five groundwater samples from each of the five monitoring wells, and tested for VOCs. Comparison of the analytical results to the Table 3 SCS identified the following two exceedances:

- 1,1-Dichloroethylene concentration of 4.52 µg/L was identified in MW101. The applicable standard is 1.6 µg/L.
- Trichloroethylene concentrations were identified to be 4.4 µg/L at MW101 and 6.58 µg/L at MW104. The applicable standard is 1.6 µg/L.

3.0 ESTIMATED HYDRAULIC CONDUCTIVITY

The hydraulic conductivity (K-value) of the soils was estimated based on the results obtained from the grain size analyses of selected soil samples and from the single well response tests (slug tests).

In addition, the field saturated hydraulic conductivity (K_{fs}) values were estimated based on the results obtained from the Guelph Permeameter Infiltration tests.

3.1 Grain Size Distribution Method

Grain size analysis (sieve and hydrometer) of two (2) soil samples collected at the Site was conducted by GeoPro, and the results of grain size analysis are presented in Figure No. 1.

The hydraulic conductivity of the tested soil samples was estimated using applicable empirical equations based on the particle size gradation details. As shown in the following table, the estimated K values of the tested soil samples are 1.2 x 10^{-3} cm/s and 1.2 x 10^{-2} cm/s.

Borehole ID	Sample #	Soil sample Depth (mBGS)	Soil Type	K Value (cm/s)
BH1	SS7B	4.9 ~ 5.3	Sand	1.2 x 10^{-3}
BH2	SS5	3.1 ~ 3.8	Sand	1.9 x 10^{-2}

3.2 Single Well Response Test (Slug Test) Method

GeoPro conducted single well response test (slug test) in one (1) monitoring well (BH1). The field slug test was completed using falling head method in which a certain volume of potable water was added into the tested monitoring well, and the drawdown of water level was measured and recorded. Before introducing the water, a datalogger was placed in the monitoring well to record the change in water head versus time throughout the test. The retrieved water level data was plotted on a semi-logarithmic scale using Hvorslev's method to estimate the hydraulic conductivity values.

Slug Test analysis graph and calculation are included in Appendix C. A summary of the K value and related information estimated from the slug test is presented in the following table.

Monitoring Well No.	Screen Depth (mBGS)	Soil Type	Estimated K-Value (cm/s)
BH1	5.1 ~ 6.6	Sand	3.5×10^{-3}

Based on the slug test result, the estimated hydraulic conductivity value of the screened soil is approximate 3.5×10^{-3} cm/s.

3.3 Guelph Permeameter Infiltration Test Method

Guelph Permeameter infiltration testing is one of the recommended infiltration test methods discussed in Stormwater Management Criteria (SWMC), Version 1.0, dated August 2012, issued by the Toronto and Region Conservation Authority ("TRCA").

Guelph Permeameter Infiltration Testing was carried out at three (3) locations (G1 to G3) as shown on Drawing No. 2 at depth ranging from 0.75 mBGS to 0.95 mBGS. Based on the results obtained from Guelph Permeameter infiltration tests, the field saturated hydraulic conductivity (K_{fs}) values were estimated. The results of Guelph Permeameter tests and data processing are presented in Appendix E, and are summarized in the following table.

Test Location	Soil Depth (mBGS)	Primary Soil	Hydraulic Conductivity (cm/s)
G1	0.75	Silty Sand (Fill)	7.7×10^{-6}
G2	0.75	Silty Sand (Fill)	1.5×10^{-5}
G3	0.95	Silty Sand (Fill)	5.1×10^{-4}

Due to the presence of fill materials at the site, variation of hydraulic conductivity may be anticipated at different locations.

4.0 TEMPORARY DEWATERING REQUIREMENTS

The groundwater levels measured by WSP ranged from 11.80 to 12.20 mBGS. The two wells installed by GeoPro to the depths of 6.7 and 6. 1 mBGS were found to be dry.

Based on the design drawings provided by the Client, the depth of basement floor is 4.2 mBGS, corresponding to an elevation of 119.05 mASL. The invert depth of utility lines is assumed to be one meter lower than the depth of the basement floor, which is 5.5 mBGS. Comparing with the groundwater levels observed from monitoring wells, it is found that the basement floor and the invert of utility lines are much higher than groundwater levels. Therefore, groundwater should not be a significant issue for the proposed development, and forced dewatering would not be anticipated.

Should perched water be encountered during the excavation, it may be handled by sump pumping at the bottom of excavation. The collected water could be contained in tanks and hauled away to a licensed water treatment facility.

It is known that the subsurface soil conditions may change significantly between and beyond the on-site boreholes. As the information obtained and assumptions made in this evaluation report are based on the results obtained from a limited number of boreholes carried out for geotechnical investigation and Phase II ESA study, unexpected water bearing zones with a hydraulic conductivity higher than assumed may be present.

Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all time and at all costs.

5.0 POTENTIAL TEMPORARY DEWATERING IMPACTS

Based on the above evaluation, no dewatering is anticipated during construction. Therefore, impact to the surface water and groundwater features, and to the existing facilities due to dewatering is not anticipated.

6.0 HYDROGEOLOGICAL RECOMMENDATIONS

The following summarises the hydrogeological recommendations based on the findings of the above GeoPro's hydrogeological site assessment.

6.1 Permit-to-Take-Water/Registration for EASR Posting

According to O. Reg. 387/04, water taking over 50,000 litres per day requires a Permit to Take Water ("PTTW"), which shall be obtained in accordance with the MOECC's PTTW Manual, dated April 2005.

According to O. Reg. 63/16, a PTTW would not be required for temporary dewatering at a construction site in an amount less than 400,000 L/day. However, the dewatering at a construction site in an amount between 50,000 L/day and 400,000 L/day shall be registered through the Environmental Activity and Sector Registry ("EASR").

Given the deep groundwater levels compared to the invert depths of the proposed development at the Site, temporary groundwater control would not be anticipated. Therefore, a PTTW or EASR posting will not be required.

6.2 Impacts Due to Dewatering Activities

Given that forced dewatering for the proposed development is not anticipated, impacts on the adjacent structures, water wells, and surface water would not be anticipated due to the proposed development.

6.3 Monitoring Well Decommissioning

According to Ontario Regulation 903 ("O. Reg. 903"), when the monitoring wells are no longer used, they should be decommissioned by a licensed water well contractor.

7.0 CLOSURE

We trust that the information contained in this report is complete within our terms of reference. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely,

GeoPro Consulting Limited

Geotechnical - Hydrogeology - Environmental - Materials Testing – Inspection

for **Kaiying Qiu, B.Sc, M.Sc.**
Assistant Project Manager

PROFESSIONAL GEOSCIENTISTS
CHENG YU LIU
PRACTISING MEMBER
1413
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Frank C. Liu, P. Geo., P. Eng.
Senior Hydrogeologist

David B. Liu, P. Eng., Principal

8.0 REFERENCES

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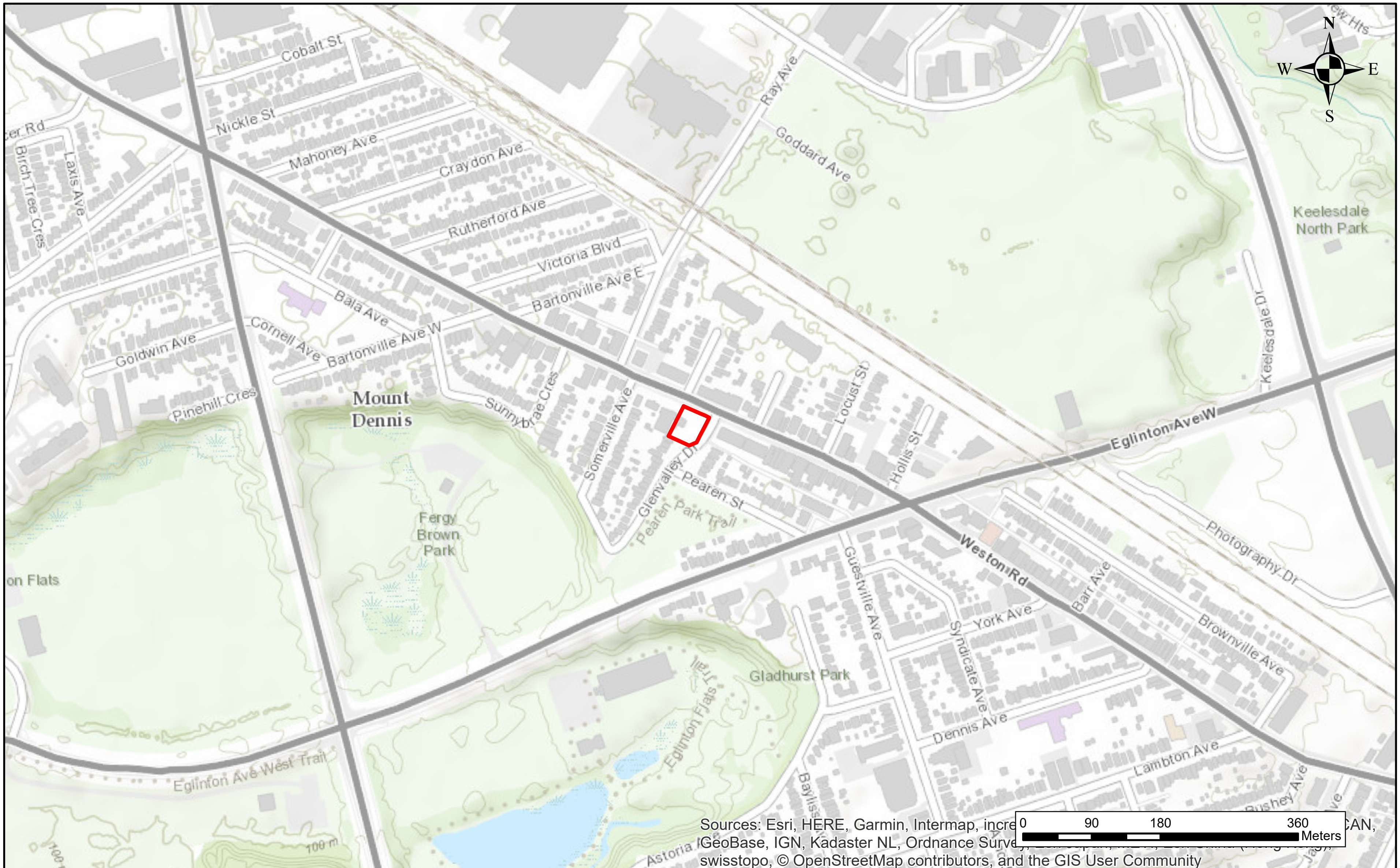
Ontario Ministry of Environment and Climate Change, Permit to Take Water Manual, April 2005

DRAWINGS

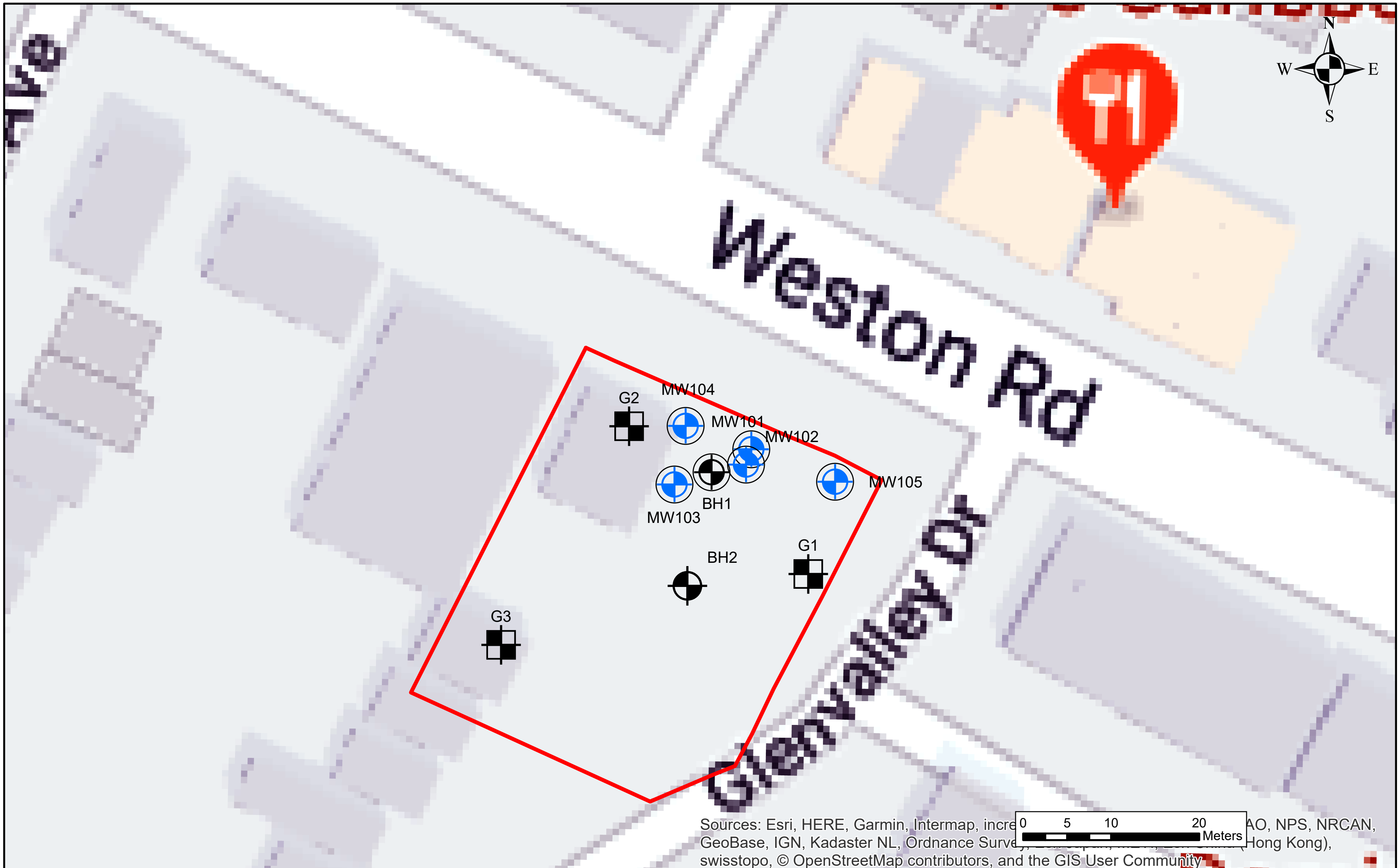


Legend
SITE LOCATION

Data Source:
ArcGIS Basemap -Topographic Map

Date: Nov 2018	Scale: As Shown	Prepared by: YM	Approved by: KY	Rev: KY	Project No.: 17-2118H04	Drawing No.: 1	Original Size: Letter

Client: Coolearth Architecture Inc.	Title: Site Location Plan	Project: Hydrogeological EvaluationProposed Child Care Centre1234Weston Road, Toronto, Ontario	GeoPro Consulting Limited



Legend
SITE LOCATION
TestPit Lication (By GeoPro)
Boreholel location (by GeoPro)
Monitoring Well location (by GeoPro)
Existing Monitoring Well Location (by another consultant)

Data Source:
ArcGIS Basemap -Topographic Map

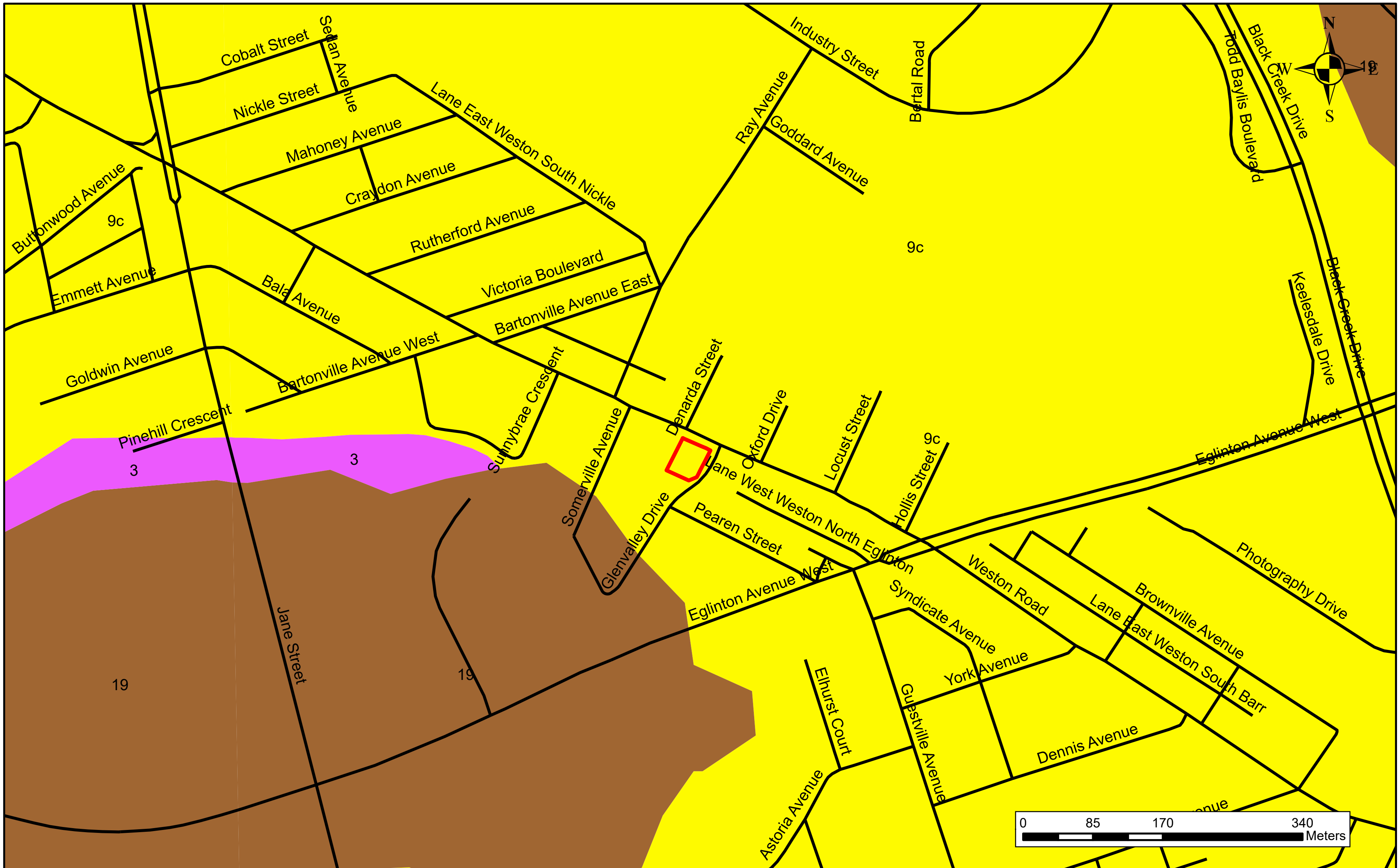
Date: Nov 2018	Scale: As Shown	Prepared by: YM	Approved by: KY	Rev: KY	Project No.: 17-2118H04	Drawing No.: 2	Original Size: Letter

Client:
Coolearth Architecture Inc.

Title:
Borehole Location Plan

Project:
Hydrogeological EvaluationProposed
Child Care Centre1234Weston Road,
Toronto, Ontario

GeoPro Consulting Limited



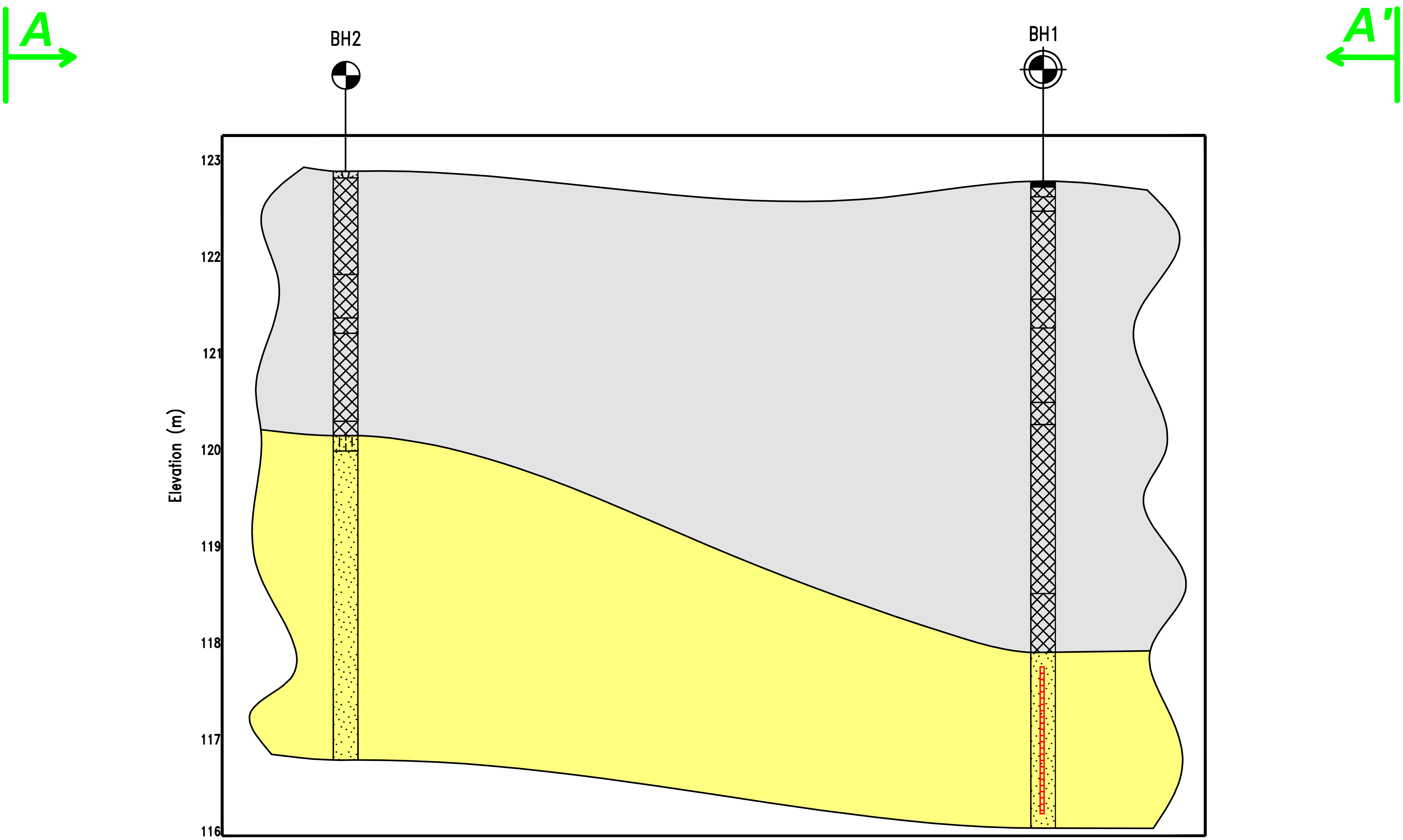
Legend

SITE LOCATION 3: Paleozoic bedrock 9c: Foreshore-basinal deposits 19: Modern alluvial deposits

Data Source:
1. Surficial Geology Southern Ontario
2. Natural Resources Canada

Date: Nov 2018	Scale: As Shown	Prepared by: YM	Approved by: KY	Rev: KY	Project No.: 17-2118H04	Drawing No.: 3	Original Size: Letter

Client: Coolearth Architecture Inc.	Title: Surficial Geology	Project: Hydrogeological EvaluationProposed Childcare Centre 1234 Weston Road, Toronto, Ontario	GeoPro Consulting Limited



LEGEND

Asphalt, Topsoil, Fill	Till Deposits	Silt to Fine Sand
Clay to Clayey Silt	Sand to Gravel	BedRock

Monitoring Well

W. L. 75.2 m Mar 15, 2018 — Groundwater level and Date Recorded

Monitoring Well Screen

Note:

1. Please note that the hydrogeological profiles are prepared according to the inferred site stratigraphy based on the information obtained from the limited number of boreholes. The subsurface soil between and beyond the boreholes may differ significantly from those encountered at the borehole locations. The inferred boundary between the different soil strata should be considered as approximate and for reference only.

2. Please also note that the groundwater levels shown on the hydrogeological profiles were measured in limited number of monitoring wells at different screen depths. The groundwater levels between and beyond the monitoring wells may differ significantly from those encountered at the monitoring well locations and screen depths. Groundwater levels were measured on a specific date and may change due to the seasonal fluctuation.

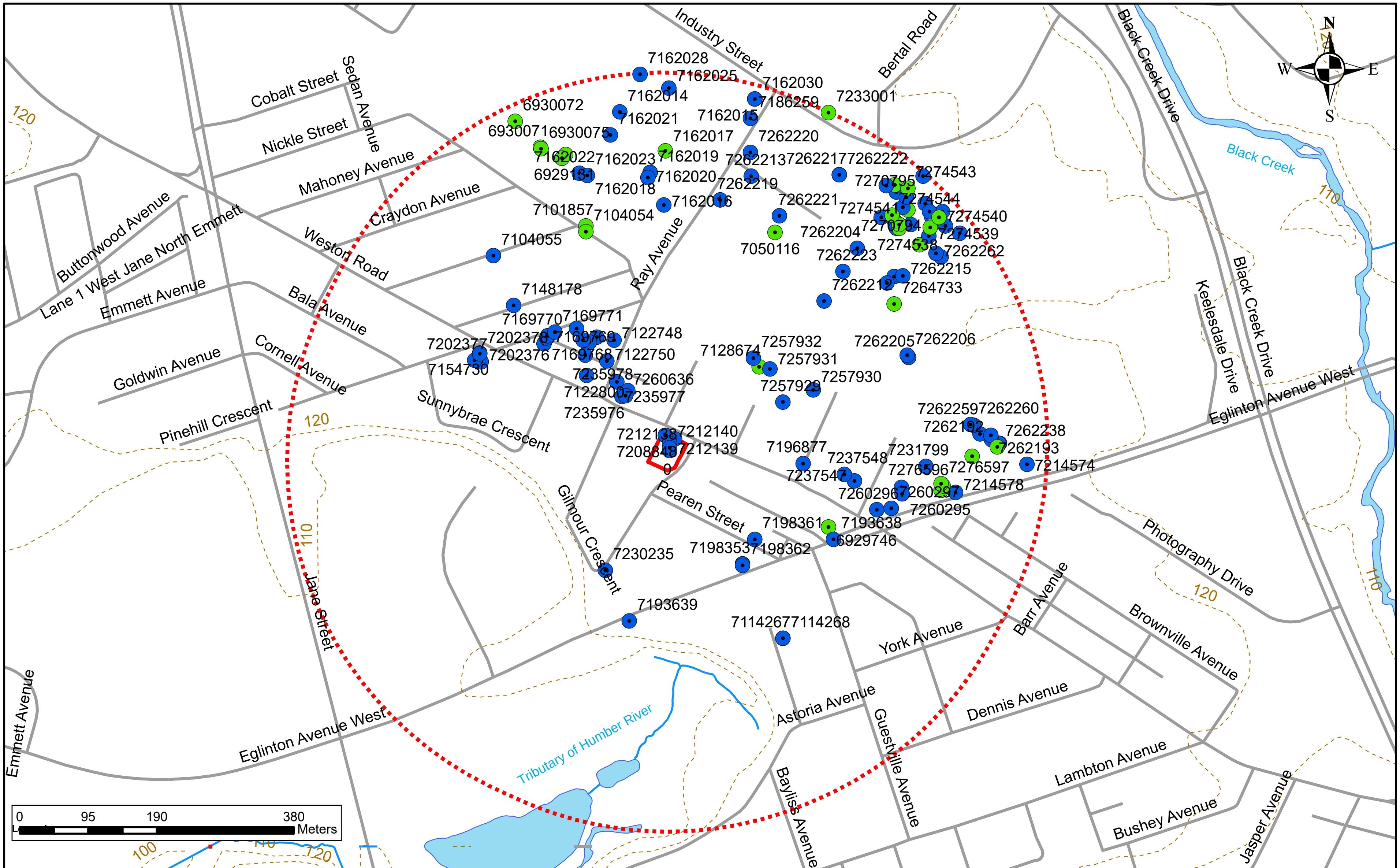
Date: **October 2018**	Scale: **As Shown**	Drawn: **YM**	Approved: **KY**	Rev: **KY**	Project No.: **17-2118H04**	Drawing No.: **4**	Original Size: **Letter**

Client: **Coolearth Architecture Inc.**

Title: **Subsurface Projection Diagram A-A'**

Project
Hydrogeological EvaluationProposed
Childcare Centre
1234 Weston Rd, Toronto, Ontario

GeoPro Consulting Limited



Legend

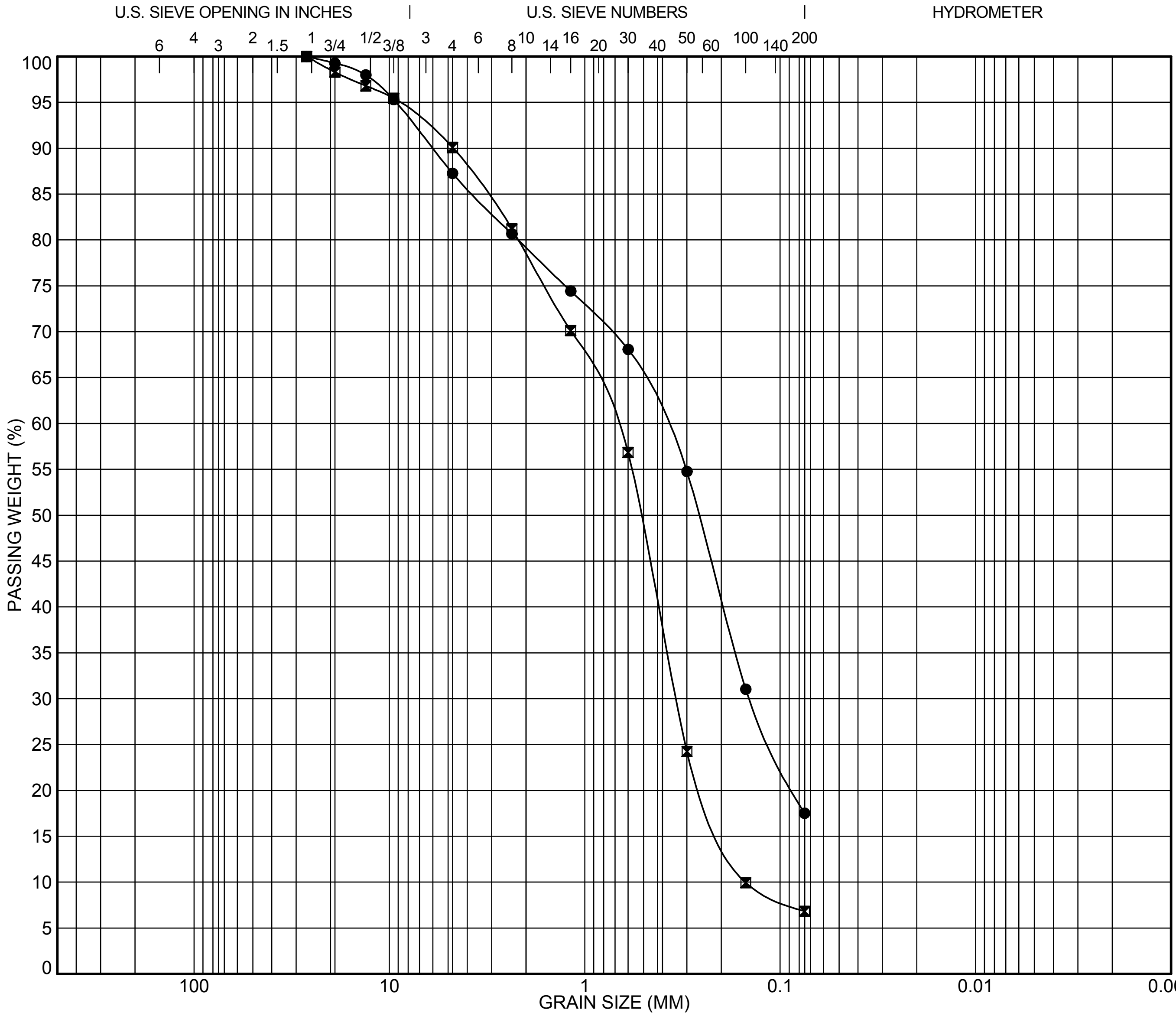
- SITE LOCATION
- 500m Radius from The Site
- Not Used/ Unknown Use
- Waterbody
- Monitoring/ MonitoringTestHole/ Test Hole
- Elevation Contour
- Road
- Watercourse

Data Source:
1. Atlas Canada - Toporama
2. MOECC Water Well Database
3. Resources Canada

Date: Nov 2018	Scale: As Shown	Prepared by: SL	Approved by: KY	Rev: KY	Project No.: 17-2118H04	Drawing No.: 5	Original Size: Letter

Client:	Title:	Project:	
Coolearth Architecture Inc.	MOECC Water Well Location Plan	Hydrogeological EvaluationProposed Childcare Centre1234WestonRoad, Toronto, Ontario	GeoPro Consulting Limited

FIGURES



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

	Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	BH1	SS7B	4.88						
⊠	BH2	SS5	3.05					1.08	4.69

	Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BH1	SS7B	4.88	26.5	0.394	0.142		12.7	69.8	17.5	
⊠	BH2	SS5	3.05	26.5	0.705	0.339	0.15	9.9	83.3	6.8	

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Tel: 905-237-8336 Fax: 905-248-3699
office@geoproconsulting.ca www.geoproconsulting.ca

GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical Investigation for Proposed Residential

LOCATION: 1234 Weston Road, Toronto,ON

PROJECT NO.: 17-2118G	SAMPLED ON: 2017-12-07
FIGURE NO.: 1	TESTED ON: 2017-12-18

APPENDIX A

GeoPro CONSULTING LIMITED

LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation for Proposed Mount Dennis Childcare Centre
CLIENT: Coolearth Architecture Inc.
PROJECT LOCATION: 1234 Weston Road, Toronto,ON
DATUM: Geodetic
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Split Spoon
FIELD ENGINEER: ED
SAMPLE REVIEW: DX
CHECKED: DL

DIAMETER: 51 mm
DATE: 2017-12-07
REF. NO.: 17-2118GH
ENCL. NO.: 2

SOIL PROFILE

ELEV / DEPTH (m)	DESCRIPTION
122.8 / 0.0	**ASPHALT CONCRETE:** (55 mm)
122.7 / 0.1	**GRANULAR BASE/SUBBASE:** (105 mm)
122.6 / 0.2	**FILL:** organic sand and silt, trace clay, trace rootlets, dark brown, moist, very loose
122.5 / 0.3	**FILL:** silty sand, some organics, trace rootlets, dark brown, moist, very loose
121.6 / 1.2	**FILL:** slag, trace to some sand, containing coal fragments, black to grey, moist, very loose
121.3 / 1.5	**FILL:** sand and silt to silty sand, trace organics, trace rootlets, containing red bricks fragments, dark brown, moist, loose
120.5 / 2.3	**FILL:** sandy silt, some clay, trace gravel, some organics, trace rootlets, dark brown, wet, loose
120.3 / 2.5	**FILL:** sand and silt to silty sand, trace clay, trace gravel, trace to some organics, containing slag fragments, containing red bricks fragments, dark brown to brown, moist to wet, loose
118.5 / 4.3	**FILL:** sand, trace to some silt, trace gravel, brown, moist, loose to compact
117.9 / 4.9	**SAND:** trace to some silt, brown, moist, compact to dense
116.1 / 6.7	**END OF BOREHOLE**

NoteS:
1) Borehole caved at a depth of 6.6 m below ground surface (mBGS) upon completion of drilling.
2) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.

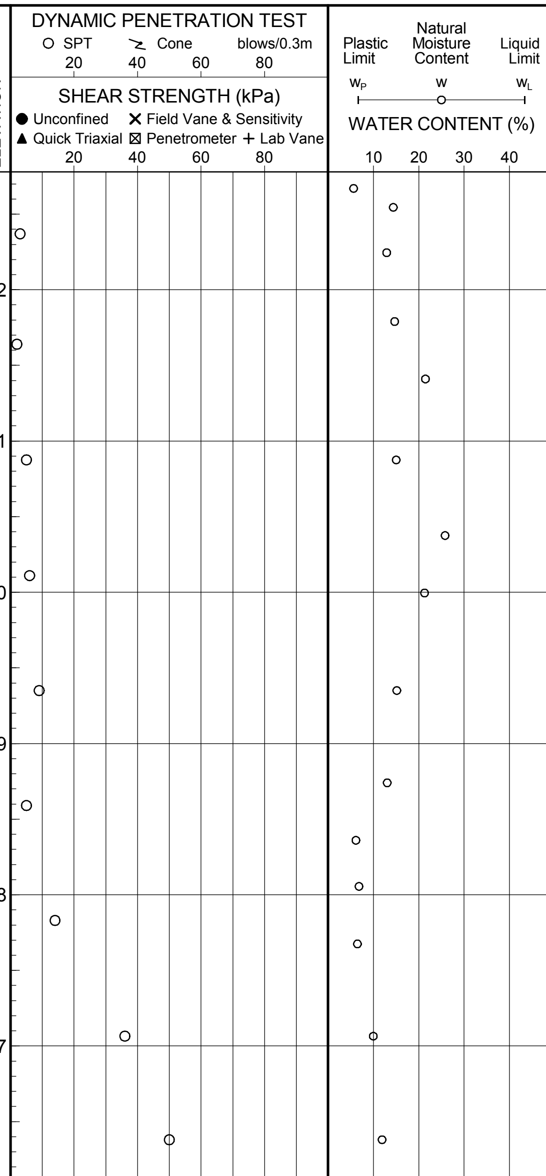
Water Level Readings

Date	W. L. Depth (mBGS)
Dec. 19, 2017	dry

SAMPLES

NUMBER	TYPE	"N" BLOWS/0.3m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
1A	SS	3	
1B	SS		
1C	SS		
2A	SS	2	
2B	SS		
3	SS	5	
4A	SS	6	
4B	SS		
5	SS	9	
6A	SS	5	
6B	SS		
7A	SS	14	
7B	SS		13 70 18
8	SS	36	
9	SS	50	

GROUND WATER: Concrete; Bentonite; Sand; Screen; Bentonite



GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

GeoPro CONSULTING LIMITED

LOG OF BOREHOLE BH2

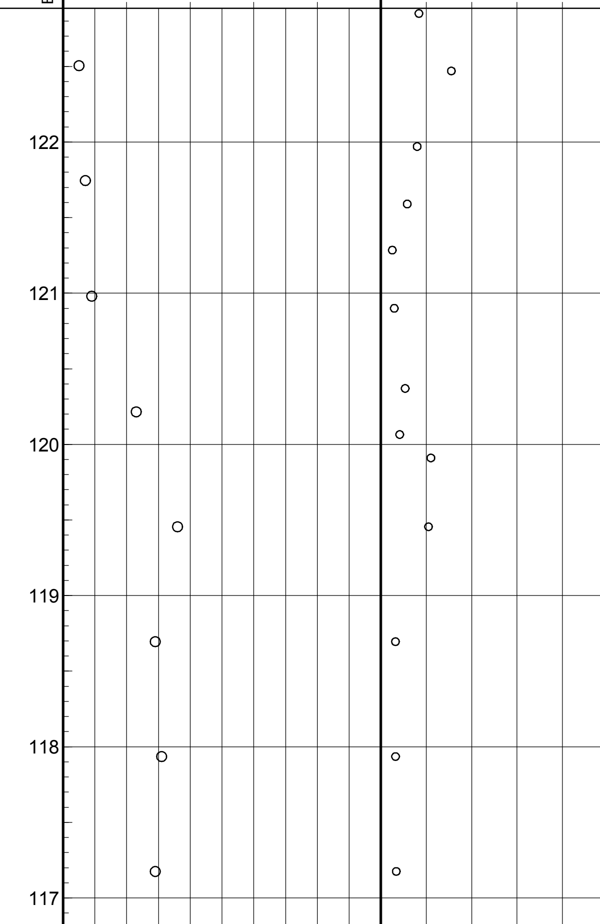
PROJECT: Geotechnical Investigation for Proposed Mount Dennis Childcare Centre
CLIENT: Coolearth Architecture Inc.
PROJECT LOCATION: 1234 Weston Road, Toronto,ON
DATUM: Geodetic
BH LOCATION: See Borehole Locatiion Plan

DRILLING DATA
METHOD: Continuous Split Spoon
FIELD ENGINEER: ED
SAMPLE REVIEW: DX
CHECKED: DL
DIAMETER: 51 mm
DATE: 2017-12-07
REF. NO.: 17-2118GH
ENCL. NO.: 3

ELEV DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
122.9					
122.8 0.1	**TOPSOIL:** (70 mm)	1A	SS		
	FILL: silty sand, trace clay, some to trace organics, trace rootlets, layers of clayey silt, containing slag fragments, dark brown to brown, moist, loose	1B	SS	5	
		2A	SS		
121.8 1.1	**FILL:** sand, trace to some silt, trace gravel, pockets of clayey silt, brown, moist, loose	2B	SS	7	
121.4 1.5	**FILL:** clayey silt, some sand to sandy, trace gravel, seams of sandy silt, brown, moist, stiff	3A	SS		
121.2 1.7	**FILL:** sand, trace to some silt, trace to some gravel, pockets of sandy silt, brown, moist, loose to compact	3B	SS	9	
120.3	---layers of silty fine sand	4A	SS	23	
120.3 2.6	**FILL:** gravelly sand, trace to some silt, brown, moist, compact	4B	SS		
120.2 2.7	**SILTY FINE SAND:** brown, moist, compact	4C	SS		
120.0 2.9	**SAND:** trace to some silt, trace to some gravel, containing cobbles and boulders, brown, moist, compact to dense	5	SS	36	10 83 7
		6	SS	29	
		7	SS	31	
		8	SS	29	
116.8 6.1	**END OF BOREHOLE**				

Note:
1) Borehole caved at a depth of 5.1 m below ground surface (mBGS) upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, Cone, blows/0.3m (20 40 60 80)
SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane (20 40 60 80)
Plastic Limit w_P, Natural Moisture Content w, Liquid Limit w_L
WATER CONTENT (%) (10 20 30 40)
UNIT WT (kN/m³)



GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity
▲ ε=3% Strain at Failure

Figure No. ____________

LOG OF MONITORING WELL MW101

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621458E, 4838334N
Date Drilled: July 24, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	SOIL DESCRIPTION	INSTALLATION DETAILS
0.05	**Asphalt** Black, 50mm layer	Concrete
	SAND AND GRAVEL Brown, some pebbles, rootlets and trace silt, dry, second layer of black asphalt at 0.80 m, no staining/odour	Bentonite Seal
1.52	**SAND** Brown, well-sorted, trace silt, loose, dry	
	- brownish-grey at 2.70 m	
	- fine gravel at 3.05 m	
	- pale grey, trace silt and fine gravel at 4.57 m	
	- brown, moist at 4.87 m	
	- trace clay and medium gravel, dry at 5.79 m	
	- brown, damp at 6.10 m	
	- grey, damp at 7.01 m	
	- brown at 7.32 m	
	- trace clay and silt at 8.38 m	

SAMPLE ID	SOIL SAMPLE TEST
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	VOCs
12	
13	
14	
15	

VOCs (ppm): 40 80 120 160
Combustible Gases (ppm): 20 40 60 80

WSP MW REPORT VER.3 WSP DATA TEMPLATE.GPJ GINT STD CANADA LAB.GDT 30/08/17

Figure No. ____________

LOG OF MONITORING WELL MW101

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621458E, 4838334N
Date Drilled: July 24, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
	- moist at 9.90 m **SAND** *(continued)*			16		
	- saturated at 10.67 m			17		
11.32 11.43	**SILT** Brown, trace clay, saturated			18		
12.19	- no recovery from 12.19 to 13.72 m			19		
13.72	**SAND** Brown, some silt, damp			20		
				21		
				22		
				23		
16.76	**SILT** Greyish brown, trace clay, wet			24		
				25		
18.29	**CLAYEY SILT** - Grey, moist			26		
				27		
	- wet at 19.80 m					

Figure No. ____________

LOG OF MONITORING WELL MW101

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621458E, 4838334N
Date Drilled: July 24, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		CLAYEY SILT *(continued)*			28		●
20.57		**SAND** Grey, some silt, damp			29		●
				Sand Pack	30		●
				Screen	31		●
					32		●
23.62		**SILT** Grey, trace clay, wet			33		●
24.38		**CLAY** Grey, trace silt, moist			34		●
				Soil Cuttings	35		●
25.91		End of borehole at 25.91 mbgs		Water measured on August 15, 2017 masl 11.32 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

Figure No. ____________

LOG OF MONITORING WELL MW102

Project No. 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621457E, 4838332N
Date Drilled: July 25, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
0.05		**ASPHALT** Black, 50mm layer		Concrete			
		SAND AND GRAVEL Brown, dry, second layer of black asphalt at 0.8 m, no staining/odour			1		
				Bentonite Seal	2		
1.52		**SAND** Brown, well-sorted, trace silt and medium gravel dry, no staining/odour			3		
		- Brown/pale grey, trace coarse gravel at 2.29 m			4		
					5		▲
		- trace fine gravel at 3.81 m			6		
					7		▲
		- trace clay at 5.33 m			8		
		- damp at 6.10 m			9		● ▲
					10		
					11		
		- wet at 8.38 m			12		▲
					13		

WSP MW REPORT VER.3 WSP DATA TEMPLATE.GPJ GINT STD CANADA LAB.GDT 30/08/17

Figure No. ____________

LOG OF MONITORING WELL MW102

Project No. **15M-00656-01**
Project: **Phase II Environmental Site Assessment**
Location: **1230/1234 Weston Road, Toronto, ON** Co-ordinates: **621457E, 4838332N**
Date Drilled: **July 25, 2017** Datum: **UTM NAD 83 Zone 17**
Drill Type: **Sonic** Logged By: **A.N**
Drilling Contractor: **Profile Drilling Inc.** Checked By: **C.R**

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		- damp at 9.90 m **SAND** *(continued)*			14		●
10.67		**SILT** - Brown with greyish tint, trace sand, saturated					
11.11					15		
		- olive brown, trace clay, wet at 11.43 m			16		
				Sand Pack			
		- some sand at 12.19 m		Screen	17		●
12.95		**SANDY SILT** Brown, moist			18	VOCs	● ▲ 120
13.72		**SILTY SAND** Brown, moist			19		
					20		▲
15.24		End of borehole at 15.24 mbgs		Water measured on August 15, 2017 masl 11.11 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

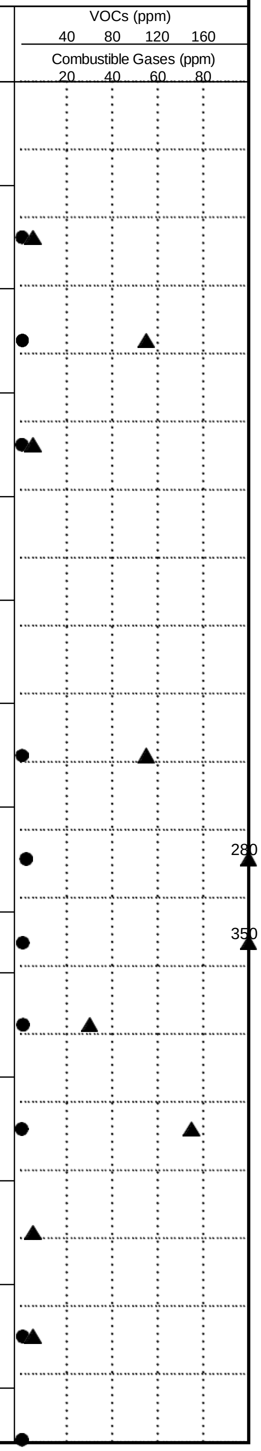
Figure No. ____________

LOG OF MONITORING WELL MW103

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621449E, 4838330N
Date Drilled: July 26, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST
0.05		**ASPAHLT** Black, 50mm layer		Concrete		
		SAND Dark brown, well-sorted, trace silt and medium gravel at 0.8 m, dry, no staining/odour		Bentonite Seal	1	
					2	
					3	
		- trace corase gravel at 2.29 m			4	
		- damp at 3.05 m			5	
		- pale grey, some medium gravel, dry at 3.81 m			6	
					7	
		- black outer layer with trace fine gravel at 5.33 m			8	
					9	VOCs
		- pale grey at 6.55 m			10	
		- brown, some silt, trace medium gravel, damp at 7.32 m			11	
					12	
					13	
				Sand Pack		



WSP MW REPORT VER.3 WSP DATA TEMPLATE.GPJ GINT STD CANADA LAB.GDT 30/08/17

Figure No. ____________

LOG OF MONITORING WELL MW103

Project No. **15M-00656-01**
Project: **Phase II Environmental Site Assessment**
Location: **1230/1234 Weston Road, Toronto, ON** Co-ordinates: **621449E, 4838330N**
Date Drilled: **July 26, 2017** Datum: **UTM NAD 83 Zone 17**
Drill Type: **Sonic** Logged By: **A.N**
Drilling Contractor: **Profile Drilling Inc.** Checked By: **C.R**

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		SAND *(continued)*		Screen	14		
10.36		**SANDY SILT** Brown, trace clay, moist, no staining/odour			15		
11.05 / 11.13		**SILT** Olive brown with grey tint, trace clay, wet, no staining/odour			16		
11.89		**SILTY SAND** Light brown, damp, no staining/no odour			17		
				Soil Cuttings	18		
13.41		**SAND** Olive brown, some silt, trace clay, damp, no staining/no odour - grey at 14.32 m			19		
					20		
15.24		End of borehole at 15.24 mbgs		Water measured on August 15, 2017 masl 11.05 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

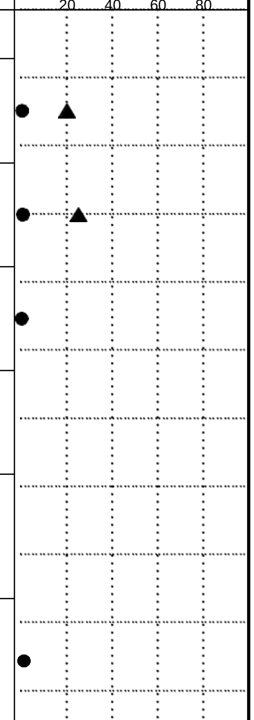


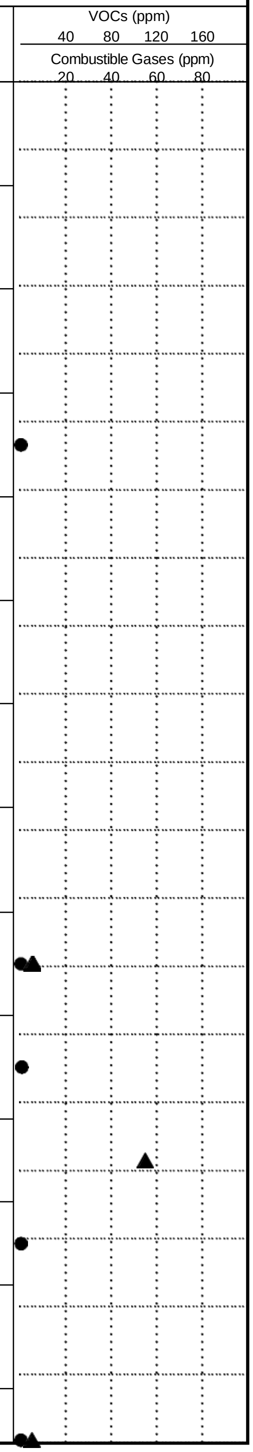
Figure No. ______________

LOG OF MONITORING WELL MW104

Project No. 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621450E, 4838337N
Date Drilled: July 26, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	SOIL DESCRIPTION	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST
0.05	**ASPHALT** Black, 50mm layer	Concrete		
	SAND Brown, some medium/coarse gravel, dry, no staining/odour - dark brown, trace silt, black outer layer at 0.8 m	Bentonite Seal	1	
			2	
1.52	**SILTY SAND** Dark brown, well-sorted, moist, no staining/odour		3	
			4	
			5	
3.81	**SAND** Brown, well-sorted, trace silt and medium gravel, damp, no staining/odour - trace fine gravel at 6.10 m - pale grey/brown at 6.86 m		6	
			7	
			8	
			9	
			10	
7.62	**SANDY SILT** Brown, trace clay, dry, no staining/odour		11	VOCs
			12	
8.84	**SAND** Brown, trace silt, dry, no staining/odour - trace clay at 9.20 m		13	



WSP MW REPORT VER.3 WSP DATA TEMPLATE.GPJ GINT STD CANADA LAB.GDT 30/08/17

Figure No. ____________

LOG OF MONITORING WELL MW104

Project No. **15M-00656-01**

Project: **Phase II Environmental Site Assessment**

Location: **1230/1234 Weston Road, Toronto, ON**

Co-ordinates: **621450E, 4838337N**

Date Drilled: **July 26, 2017**

Datum: **UTM NAD 83 Zone 17**

Drill Type: **Sonic**

Logged By: **A.N**

Drilling Contractor: **Profile Drilling Inc.**

Checked By: **C.R**

● VOCs (ppm)

▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
10.36		**SAND** *(continued)*			14		
11.03		**SILT** Brown, some sand, trace clay, damp, no staining/odour		Sand Pack Screen	15		
11.13 / 11.89		**SILTY SAND** Brown, damp, no staining/odour			16		
12.65		**SANDY SILT** Brown, trace clay at 11.90 - 12.20 m, saturated at 12.50 to 12.80 m, no staining/odour			17		
13.41		**SILTY SAND** Brown, saturated to 12.80 m, no staining/odour			18		
14.32		**SANDY SILT** Brown, trace clay, wet no staining/odour		Soil Cuttings	19		
15.24		**SILTY SAND** Brown, wet, no staining/odour			20		
		End of borehole at 15.24 mbgs		Water measured on August 15, 2017 masl 11.03 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

Figure No. ____________

LOG OF MONITORING WELL MW105

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621468E, 4838329N
Date Drilled: July 26, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		SAND Dark brown, well-sorted, trace silt, damp, 30mm black rubber at surface,no staining/odour		Concrete Bentonite Seal	1		●
		- light brown, trace clay and silt at 1.40 to 1.52 m, dry			2		●
					3		●
		- greyish-brown, trace silt and fine gravel at 2.29 to 3.8 m bgs, dry			4		●
					5		●
					6		●
4.57		- brown, trace medium gravel, dry			7		●
5.33		- brown, pale grey, trace gravel, dry			8		●
6.10		- brown trace silt andgravel, dry			9		●
					10		●
					11		●
					12		
9.14		- trace silt			13		●

Figure No. ____________

LOG OF MONITORING WELL MW105

Project No.: 15M-00656-01
Project: Phase II Environmental Site Assessment
Location: 1230/1234 Weston Road, Toronto, ON
Co-ordinates: 621468E, 4838329N
Date Drilled: July 26, 2017
Datum: UTM NAD 83 Zone 17
Drill Type: Sonic
Logged By: A.N
Drilling Contractor: Profile Drilling Inc.
Checked By: C.R

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (m bgs) (m asl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
		SAND *(continued)* - trace clay at 10.50 to 10.70 m		Sand Pack	14		●
10.67		**SANDY SILT** Olive brown, trace clay, wet		Screen	15		●
11.35 / 11.43		**CLAYEY SILT** Olive brown, moist			16	VOCs + Dup 1	●
12.19		**SAND** Olive brown, trace silt, moist up to 12.50 m			17		
					18		●
13.72		**SILTY SAND** Olive brown, wet		Soil Cuttings	19		
		- moist at 14.48 m			20		
15.24		End of borehole at 15.24 mbgs		Water measured on August 15, 2017 masl 11.35 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

APPENDIX B

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
ETOBICOKE BOROUGH	17 621449 4838322 W	2013-10 7241	2			MT		7212138 (Z179876) A	GREY GRVL 0000 BRWN SAND SILT 0050
MISSISSAUGA CITY	17 621606 4838062 W	2008-08 6607		FR 0020		MO		7114267 (M03037) A067371 A	
MISSISSAUGA CITY	17 621606 4838062 W	2008-06 6607	2.00	UK 0022		MO		7114268 (M03001) A067371	BRWN GRVL SAND FILL 0002 GREY GRVL SILT TILL 0015 GREY SILT TILL DNSE 0025
TORONTO CITY	17 630895 4841115 W	2008-10 6032	1.97			MO	0040 10	7116497 (M01924) A068182	GREY ---- HARD 0001 BRWN GRVL SAND PCKD 0002 BRWN FILL SAND SOFT 0015 BRWN FSND GRVL SOFT 0050 GREY CLAY SILT DNSE 0070 GREY SILT CLAY DNSE 0075
TORONTO CITY	17 621205 4838592 W	2008-02 7215	2			MO		7104055 (Z68042) A066125	BRWN SAND GRVL LOOS 0006 GREY SAND SILT 0010
TORONTO CITY	17 621333 4838625 W	2008-02 7215						7104054 (Z68043) A045770 A	
TORONTO CITY	17 621333 4838633 W	2007-11 7230	2.04	FR 0026		NU	0026 11	7101857 (Z70157) A045770	BRWN FILL LOOS 0004 BRWN SAND SILT DNSE 0036 GRVL
TORONTO CITY	17 621760 4838563 W	2007-01 7215	2		///:	MO		7101624 (Z79548) A061936	GREY GRVL 0002 BLUE SAND GRVL 0010 BLUE SILT SAND WBRG 0020
TORONTO CITY	17 621305 4838732 W	2004-08 6032	1.97				0026 10	6928406 (Z05448) A005025	BRWN LOAM 0003 BRWN SAND 0030 BRWN SAND WBRG 0036
TORONTO CITY	17 621981 4838080 W	2008-07 6607	2.00	FR 0039		MO		7111064 (M02483) A067374	GREY GRVL SAND FILL 0002 GREY CLAY SAND 0012 BRWN SAND SILT 0033 BRWN SAND 0051
TORONTO CITY	17 621595 4838624 W	2007-08 6607	2.31	FR 0032			0030 10	7050116 (Z72461) A059245	BRWN SAND GRVL 0002 BRWN MSND 0032 BRWN SAND CSND 0039
YORK BOROUGH	17 621550 4838165 W	2013-02 7501	2			MO	0080 10	7198353 (Z165129) A143168	BRWN SAND 0010 BRWN SAND FSND DNSE 0080 BRWN SAND LOOS 0090
YORK BOROUGH	17 621634 4838304 W	2013-01 7501	2			MO	0080 10	7196877 (Z165033) A137427	BRWN SAND 0014 BRWN SAND PCKD 0040 BRWN SAND LOOS 0070 GREY SAND DNSE 0090

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621393 4838086 W	2012-11 7230	2.04	FR 0047		MO	0045 5	7193639 (Z097999) A130778	BRWN FILL LOOS 0016 GREY SAND SILT 0050
YORK BOROUGH	17 621676 4838199 W	2012-11 7230	2.04	FR 0014		MO	0045 5	7193638 (Z097998) A138135	BRWN FILL 0008 GREY SAND SILT DNSE 0050
YORK BOROUGH	17 621561 4838782 W	2012-07 7241	2			MT	0025 10	7186259 (Z154734) A109927	BRWN FILL 0007 BRWN SAND 0025 BRWN SAND 0035
YORK BOROUGH	17 621408 4838843 W	2011-04 7241				MO		7162028 (Z131061) A	
YORK BOROUGH	17 621567 4838809 W	2011-04 7241				MT		7162030 (Z131058) A	
YORK BOROUGH	17 621567 4838199 W	7501	2			MO	0080 10	7198361 (Z165128) A143166	BRWN SAND 0014 BRWN SAND GRVL DNSE 0025 BRWN CLAY SILT DNSE 0040 GREY CLAY SILT HARD 0060 BRWN SAND SILT DNSE 0090
YORK BOROUGH	17 621275 4838470 W	2011-09 7241	5.19			MT		7169768 (Z138850) A	
YORK BOROUGH	17 621456 4838338 W	2013-08 7383	2	0035		MO	0040 10	7208847 (Z166105) A151211	SAND FILL 0006 SAND SLTY 0050
YORK BOROUGH	17 621279 4838478 W	2011-09 7241	5.19			MT		7169769 (Z138851) A	
YORK BOROUGH	17 621280 4838481 W	2011-09 7241	5.19			MT		7169770 (Z138853) A	
YORK BOROUGH	17 621290 4838486 W	2011-09 7241	5.19			MT		7169771 (Z138852) A066155 A	
YORK BOROUGH	17 621550 4838163 W	2013-02 7501	2			MO	0050 16	7198362 (Z165130) A143169	BRWN SAND 0010 BRWN SAND DNSE 0050 BRWN SAND LOOS 0065
YORK BOROUGH	17 621188 4838445 W	2013-05 7472	2.04			MO	0035 10	7202376 (Z168489) A145798	BRWN FILL 0004 BRWN SAND LOOS 0033 BRWN SAND WBRG 0045
YORK BOROUGH	17 621179 4838447 W	2013-05 7472	2.04			MO	0035 10	7202377 (Z168488) A145797	BRWN FILL 0004 BRWN SAND LOOS 0036 BRWN SAND WBRG 0045
YORK BOROUGH	17 621186 4838456 W	2013-05 7472	2.04			MO	0035 10	7202378 (Z168487) A145796	BRWN FILL 0004 BRWN SAND LOOS 0036 BRWN SAND WBRG 0045
YORK BOROUGH	17 621448 4838824 W	2011-04 7241				MO		7162025 (Z131064) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621868 4838314 W	2013-08 7201						7207472 (M08324) A125021 P	
YORK BOROUGH	17 621422 4838707 W	2011-04 7241				MO		7162018 (Z131071) A	
YORK BOROUGH	17 621443 4838343 W	2013-08 7383	2	0035		MO	0035 10	7208848 (Z166104) A151199	SAND FILL 0006 SAND SLTY 0045
YORK BOROUGH	17 621449 4838332 W	2013-10 7241	2			MT		7212139 (Z179874) A151210 A	BLCK LOAM 0000 BRWN SAND SILT 0050
YORK BOROUGH	17 621449 4838326 W	2013-10 7241	2			MT		7212140 (Z179875) A151211 A	BLCK 0000 BRWN SAND SILT 0050
YORK BOROUGH	17 621906 4838332 W	2013-10 7472	2.04			MO	0037 10	7214564 (Z183772) A158998	BRWN FILL LOOS 0008 BRWN FSND SILT GRVL 0047
YORK BOROUGH	17 621905 4838332 W	2013-10 7472	2.04			MO	0055 10	7214565 (Z183771) A158997	BRWN FILL LOOS 0008 BRWN FSND SILT GRVL 0065
YORK BOROUGH	17 621944 4838303 W	2013-10 7472	2.04			MO	0055 10	7214574 (Z183770) A158988	BRWN FILL LOOS 0008 BRWN FSND SILT GRVL 0065
YORK BOROUGH	17 621770 4838271 W	2013-05 1663	5 5	UT	43/76/12/1:30	TH	0075 10	7205674 (Z170209) A140545	BRWN FILL 0002 BRWN SILT SAND CLAY 0010 BRWN SAND GRVL CLAY 0052 GREY FSND CLAY 0080 GREY FSND CLAY 0088 GREY CLAY 0098
YORK BOROUGH	17 621233 4838523 W	2009-12 7320	1.01			MO		7148178 (M05840) A072854	BRWN FILL 0004 BRWN SAND GRVL DNSE 0035
YORK BOROUGH	17 621300 4838727 W	2005-05 6032	1.97					6929124 (Z05318) A005025 A	
YORK BOROUGH	17 621300 4838727 W	2005-05 6032						6929131 (Z05586) A005025	
YORK BOROUGH	17 621669 4838216 W	2005-12 7215					0006 15	6929746 (Z33977) A025548	
YORK BOROUGH	17 621270 4838742 W	2005-02 7075						6930071 (Z43591) A039235 A	SAND

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621235 4838778 W	2006-02 7075						6930072 (Z43602) A039237 A	SAND
YORK BOROUGH	17 621271 4838740 W	2005-10 7075						6930075 (Z43592) A039236 A	SAND
YORK BOROUGH	17 621348 4838479 W	2008-12 7215	2			MO		7120212 (Z79531) A066155	BRWN SAND DRY 0022 BRWN SAND WBRG 0035
YORK BOROUGH	17 621338 4838472 W	2009-03 7241	1.5			MO	0025 15	7122734 (Z096521) A081059	BRWN SAND DNSE 0032 BRWN SAND WBRG 0040
YORK BOROUGH	17 621329 4838475 W	2009-03 7241	1.5			MO	0025 15	7122735 (Z096520) A081058	BRWN SAND DNSE 0032 BRWN SAND WBRG 0040
YORK BOROUGH	17 621372 4838475 W	2009-04 7241	2.04			MT	0030 15	7122748 (Z096505) A081074	BRWN CSND SOFT 0013 BRWN CSND PCKD 0045
YORK BOROUGH	17 621332 4838454 W	2009-04 7241	2.04			MT	0025 15	7122749 (Z096518) A081073	BRWN CSND SOFT 0013 BRWN CSND PCKD 0040
YORK BOROUGH	17 621362 4838446 W	2009-04 7241	2.04			MO	0023 15	7122750 (Z096519) A081072	BRWN CSND SOFT 0013 BRWN CSND PCKD 0038
YORK BOROUGH	17 621419 4838700 W	2011-04 7241				MO		7162020 (Z131069) A	
YORK BOROUGH	17 621573 4838438 W	2007-11 6607						7128674 (M00674) A	
YORK BOROUGH	17 621335 4838703 W	2011-04 7241				MO		7162023 (Z131066) A	
YORK BOROUGH	17 621320 4838491 W	2010-06 6607	2.00			MO		7149413 (M06642) A100996	BRWN SAND FILL 0007 BRWN SAND SILT SOFT 0062 GREY SILT CLAY SOFT 0064
YORK BOROUGH	17 621186 4838457 W	2010-05 6809	0.79 0.79			MT		7154730 (M06689) A100806	BRWN SAND DRY 0123 BRWN SAND WBRG 0148
YORK BOROUGH	17 621779 4838655 W	2011-01 6607						7161792 (M08404) A110402 P	
YORK BOROUGH	17 621380 4838791 W	2011-04 7241				MO		7162014 (Z131075) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621567 4838809 W	2011-04 7241				MO		7162015 (Z131074) A	
YORK BOROUGH	17 621441 4838662 W	2011-04 7241				MO		7162016 (Z131073) A	
YORK BOROUGH	17 621443 4838737 W	2011-04 7241				MO		7162017 (Z131072) A	
YORK BOROUGH	17 621319 4838144 W	2014-07 7360						7227476 (C25986) A167938 P	
YORK BOROUGH	17 621422 4838707 W	2011-04 7241				MO		7162019 (Z131070) A	
YORK BOROUGH	17 621879 4838345 W	2014-07 7201	2			MO	0105 10	7224704 (Z187548) A164208	BRWN GRVL SAND 0008 BRWN SAND 0078 GREY SILT CLAY 0115
YORK BOROUGH	17 621367 4838759 W	2011-04 7241				MO		7162021 (Z131068) A	
YORK BOROUGH	17 621324 4838706 W	2011-04 7241				MO		7162022 (Z131067) A	
YORK BOROUGH	17 621334 4838426 W	2009-04 7241	2.04			MT	0030 15	7122800 (Z096506) A081075	BRWN CSND SOFT 0013 BRWN CSND PCKD 0045
YORK BOROUGH	17 621689 4838570 W	2016-03 6946	2			MO		7262223 (Z232380) A	
YORK BOROUGH	17 621795 4838607 W	2016-05 6946	2					7264732 (Z232465) A	
YORK BOROUGH	17 621818 4838595 W	2016-03 6946	2			MO		7262262 (Z232412) A	
YORK BOROUGH	17 621866 4838358 W	2016-03 6946	2	0020		MO		7262260 (Z232415) A	
YORK BOROUGH	17 621870 4838357 W	2016-03 6946	2	0030		MO		7262259 (Z232416) A	
YORK BOROUGH	17 621831 4838633 W	2016-03 6946	2			MO		7262247 (Z232429) A175502 A	
YORK BOROUGH	17 621845 4838264 W	2013-10 7472	2.04			MO	0090 10	7214578 (Z183764) A158984	BRWN FILL LOOS 0010 BRWN FSND SILT PCKD 0066 GREY SILT CLAY PCKD 0100
YORK BOROUGH	17 621819 4838640 W	2016-03 6946	2			MO		7262225 (Z232378) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621817 4838645 W	2016-05 6946	2					7264735 (Z232441) A	
YORK BOROUGH	17 621684 4838704 W	2016-03 6946	2			MO		7262222 (Z232381) A110470 A	
YORK BOROUGH	17 621601 4838647 W	2016-03 6946	2			MO		7262221 (Z232382) A	
YORK BOROUGH	17 621561 4838735 W	2016-03 6946	2			MO		7262220 (Z232383) A	
YORK BOROUGH	17 621519 4838669 W	2016-03 6946	2			MO		7262219 (Z232384) A	
YORK BOROUGH	17 621684 4838704 W	2016-03 6946	2			MO		7262217 (Z232386) A	
YORK BOROUGH	17 621803 4838664 W	2016-03 6946	2			MO		7262216 (Z232387) A	
YORK BOROUGH	17 621903 4838327 W	2016-03 6946	2					7262238 (Z232452) A	
YORK BOROUGH	17 621809 4838653 W	2016-08 7238	2			MO	0030 10	7270794 (Z232940) A202866	SAND DRY 0030 BRWN SAND SILT WBRG 0040
YORK BOROUGH	17 621828 4838273 W	2016-09 6946						7276596 (Z243161) A	
YORK BOROUGH	17 621757 4838648 W	2016-09 7201	0.79					7274544 (Z234142) A202869 A	
YORK BOROUGH	17 621779 4838685 W	2016-09 7201	0.79					7274543 (Z234140) A202871 A	
YORK BOROUGH	17 621767 4838635 W	2016-09 7201	0.79					7274541 (Z234143) A201606 A	
YORK BOROUGH	17 621822 4838645 W	2016-09 7201	2					7274540 (Z234154) A202867 A	
YORK BOROUGH	17 621810 4838631 W	2016-09 7201	0.79					7274539 (Z234152) A202868 A	
YORK BOROUGH	17 621760 4838525 W	2016-05 6946	2					7264733 (Z232466) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621777 4838673 W	2016-08 7238	2			MO	0030 10	7270795 (Z232944) A202871	BRWN SAND 0030 SAND SLTY 0040
YORK BOROUGH	17 621761 4838690 W	2016-05 6946	2					7264734 (Z232467) A	
YORK BOROUGH	17 621827 4838653 W	2016-08 7238	2			MO	0029 10	7270793 (Z232941) A202867	SAND DRY 0030 BRWN SAND SILT WBRG 0040
YORK BOROUGH	17 621808 4838619 W	2016-08 7238	2			MO	0028 10	7270792 (Z232942) A202868	SAND DRY 0030 BRWN SAND WBRG 0040
YORK BOROUGH	17 621763 4838630 W	2016-08 7238	2			MO	0030 10	7270791 (Z232939) A201606	SAND 0030 BRWN SAND SILT WBRG 0040
YORK BOROUGH	17 621760 4838641 W	2016-08 7238	2			MO	0029 10	7270790 (Z232943) A202869	SAND GRVL 0010 SAND DRY 0030 BRWN SAND SILT WBRG 0040
YORK BOROUGH	17 621749 4838689 W	2016-08 7238	2			MO	0030 10	7270789 (Z232945) A202870	BRWN SAND 0030 GREY SAND SLTY 0040
YORK BOROUGH	17 621562 4838702 W	2016-03 6946	2			MO		7262213 (Z232390) A	
YORK BOROUGH	17 621767 4838630 W	2016-09 7201	0.79					7274538 (Z234153) A202866 A	
YORK BOROUGH	17 621391 4838405 W	2014-11 7383	2	0035		MO	0030 10	7235978 (Z190364) A166582	---- 0003 FILL 0003 SAND GRVL 0040
YORK BOROUGH	17 621772 4838564 W	2016-03 6946	2			MO		7262215 (Z232388) A	
YORK BOROUGH	17 621763 4838680 W	2016-01 7201	2			MO	0028 10	7259688 (Z214682) A177812	BRWN SAND GRVL FGVL 0002 BRWN SAND CLAY FSND 0038
YORK BOROUGH	17 621565 4838450 W	2016-01 7241	1			MT	0014 10	7257932 (Z226009) A200855	GREY ---- 0000 BRWN SAND 0020 BRWN SAND SILT 0022 GREY SAND SILT 0024
YORK BOROUGH	17 621588 4838435 W	2016-01 7241	1.25			MT	0014 10	7257931 (Z226010) A200854	GREY ---- 0000 BRWN SAND 0019 BRWN SAND SILT 0021 GREY SAND SILT 0024
YORK BOROUGH	17 621648 4838406 W	2016-01 7241	2			MT	0040 10	7257930 (Z226007) A201143	BRWN FSND 0018 BRWN CSND GRVL 0040 BRWN SILT WBRG 0050

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621606 4838389 W	2016-01 7241	2			MT	0035 10	7257929 (Z226008) A201142	BRWN FSND 0018 BRWN CSND GRVL 0040 BRWN SILT WBRG 0045
YORK BOROUGH	17 621771 4838262 W	2016-02 7241	2			MT	0032 10	7260295 (Z213204) A200860	BLCK ---- 0003 BRWN SILT SAND 0032 BRWN SAND SILT WBRG 0042
YORK BOROUGH	17 621705 4838280 W	2015-01 7241	1.5			MT	0029 10	7237547 (Z202052) A176726	BRWN SAND SILT WBRG 0007 BRWN SAND LYRD 0023 BRWN SAND 0032 BRWN SAND SILT WBRG 0034 GREY SAND DNSE 0039
YORK BOROUGH	17 621736 4838240 W	2016-02 7241	2			MT	0038 10	7260296 (Z213205) A183264	BRWN SILT SAND 0038 BRWN SAND SILT WBRG 0048
YORK BOROUGH	17 621376 4838417 W	2014-11 7383	2	0035		MO	0031 10	7235977 (Z190365) A166580	---- 0003 FILL 0003 SAND GRVL 0041
YORK BOROUGH	17 621383 4838397 W	2014-11 7383	2	0035		MO	0030 10	7235976 (Z190366) A166579	---- 0003 FILL 0003 SAND GRVL 0040
YORK BOROUGH	17 621669 4838790 W	2014-10 7464						7233001 (C24896) A174527 P	
YORK BOROUGH	17 621804 4838300 W	2014-08 6032	1.97			MO		7231799 (Z183617) A	
YORK BOROUGH	17 621360 4838156 W	2014-09 7360	2			MO	0010 5	7230235 (Z182033) A166100	BRWN SAND DRY 0016
YORK BOROUGH	17 621825 4838267 W	2014-07 6032						7227552 (C24615) A138109 P	
YORK BOROUGH	17 621691 4838289 W	2015-01 7241	1.5			MT	0029 10	7237548 (Z202051) A174736	BRWN SAND SILT WBRG 0007 BRWN SAND LYRD 0023 BRWN SAND 0032 BRWN SAND SILT WBRG 0034 GREY SAND DNSE 0039
YORK BOROUGH	17 621800 4838702 W	2016-03 6946	2			MO		7262203 (Z232400) A	
YORK BOROUGH	17 621825 4838276 W	2016-09 6946	2					7276597 (Z243162) A138109 A	
YORK BOROUGH	17 621663 4838529 W	2016-03 6946	2			MO		7262212 (Z232391) A	
YORK BOROUGH	17 621825 4838590 W	2016-03 6946	2			MO		7262211 (Z232392) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
YORK BOROUGH	17 621750 4838554 W	2016-03 6946	2			MO		7262209 (Z232394) A	
YORK BOROUGH	17 621812 4838646 W	2016-03 6946	2			MO		7262208 (Z232395) A	
YORK BOROUGH	17 621778 4838454 W	2016-03 6946	2			MO		7262206 (Z232397) A	
YORK BOROUGH	17 621772 4838659 W	2016-01 7201	2			MO	0028 10	7259689 (Z214681) A177815	BRWN SAND GRVL 0002 BRWN SAND CLAY 0038
YORK BOROUGH	17 621709 4838602 W	2016-03 6946	2			MO		7262204 (Z232399) A	
YORK BOROUGH	17 621783 4838635 W	2016-03 6946	2			MO		7262214 (Z232389) A	
YORK BOROUGH	17 621742 4838645 W	2016-03 6946	2			MO		7262202 (Z232401) A	
YORK BOROUGH	17 621894 4838343 W	2016-03 6946	2			MO		7262193 (Z232410) A	
YORK BOROUGH	17 621895 4838337 W	2016-03 6946	1			MO		7262192 (Z232411) A	
YORK BOROUGH	17 621851 4838623 W	2016-03 6946	2			MO		7262183 (Z232356) A	
YORK BOROUGH	17 621388 4838398 W	2015-12 7383	2	0018		TH NU		7260636 (Z222080) A166580 A	
YORK BOROUGH	17 621756 4838242 W	2016-02 7241	2			MT	0034 10	7260297 (Z213206) A183379	BRWN SILT SAND 0034 BRWN SAND SILT 0044
YORK BOROUGH	17 621780 4838451 W	2016-03 6946	2			MO		7262205 (Z232398) A	

Notes:
UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completedand Well Contractor Licence Number
CASING DIA: .Casing diameter in inches
WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL (AUDIT #) Well Tag . A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

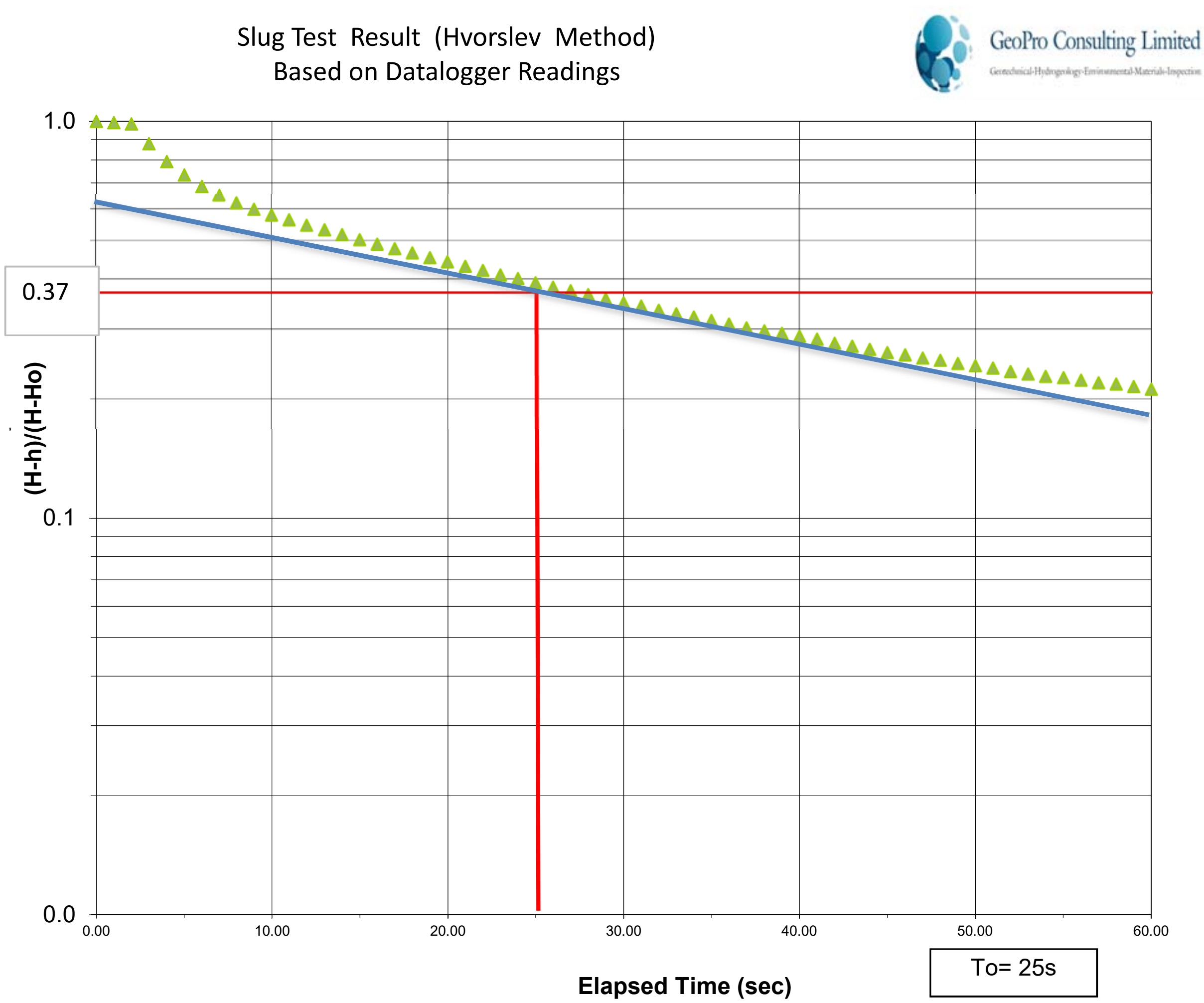
APPENDIX C

Slug Test: BH1

(Based on data from Datalogger - Falling Head Method -December 19, 2017)

Project Location: 1234 Weston Road, Toronto, Ontario

Project No. : 17-2118H		H =	Assumed Initial Water Head	
Conducted by:	Will Sun	Ho =	Water Head at time = 0	
Interpretted by:	Kaiying Qiu	h =	Water Head/Level at time t	
Well Number:	BH1			
Screen Depth (mBGS):	5.1 ~ 6.6			
Well Elevation (mASL):	122.78	L =	150	cm
Well Diameter:	2.0" ID	R =	2.55	cm
Static Water Level (mBGS):	Dry	r =	2.55	cm
Finish Reading (H)	10.086	To =	25	sec
Start Reading (h_0)	11.955	$K = r^2 \ln(L/R)/(2LTo)$ =	**3.5E-03**	cm/s



APPENDIX D

Constant Head Permeameter Test Report	Appendix E
G1	Page 1 of 3

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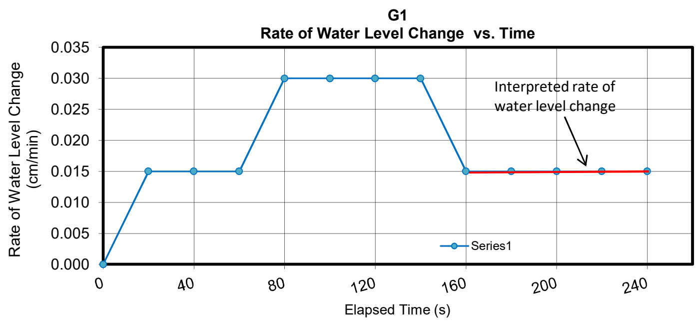
Geotechnical-Hydrogeology-Environmental-Materials-Inspection



Elapsed Time (s)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	10.0	-	-
20.0	10.1	0.1	0.01
40.0	10.2	0.1	0.01
60.0	10.3	0.1	0.02
80.0	10.5	0.2	0.03
100.0	10.7	0.2	0.03
120.0	10.9	0.2	0.03
140.0	11.1	0.2	0.03
160.0	11.2	0.1	0.01
180.0	11.3	0.1	0.02
200.0	11.4	0.1	0.01
220.0	11.5	0.1	0.01
240.0	11.6	0.1	0.01

Combined Reservoir Surface Area =	**35.22**	cm^2
Borehole Depth =	75	cm
Interpreted Rate of Water Level Change (R1) =	**2.5E-04**	**cm/s**
Steady Intake Water Rate (Q_1) =	**5.4E-04**	**cm^3/s**
hole radius (a) =	3	cm
Water column height in hole (H_1) =	5	cm

H1	**5 cm**	**water column height in borehole, first test**
a	3 cm	well radius
α	0.04	slope fitting parameter (estimated based on soil structure)
R1	**2.50E-04 cm/s**	
X	**35.22 cm^2**	**surface area for combined reservoir used**
Y	2.170 cm^2	surface area for inner reservoir used
Q1=X1*R1	**0.009 cm^3/s**	**Flow rate based on combined reservoir area and average rate of infiltration**
Q1=Y1*R1	0.001 cm^3/s	Flow rate based on inner reservoir area and average rate of infiltration
	2	**Shape Factor, where:** 1: compacted, structure-less clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc 2: Soils which are both fine-textured (clayey or silty) and unstructured; may also include some fine sands 3: Structured soils from clays to loams; also incudes unstructured medium and fine sands 4: Coarse and/or gravelly sands; may also include some highly structured soils with large/numerous
C1	**0.84205855**	**Shape factor coefficient**

K_{fs} = 7.67E-06 cm/s

= 4.60E-04 cm/min

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $K_{fs} = G_2 Q_2 - G_1 Q_1$ $G_3 = \frac{(2H_2^2 + a^2 C_2)C_1}{2\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $G_4 = \frac{(2H_1^2 + a^2 C_1)C_2}{2\pi(2H_1 H_2(H_2 - H_1) + a^2(H_1 C_2 - H_2 C_1))}$ $\Phi_m = G_3 Q_1 - G_4 Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

DATE:	2017/12/19	prepared by:	KY
PROJECT:	17-2118H	checked by:	BG

Constant Head Permeameter Test Report

G2

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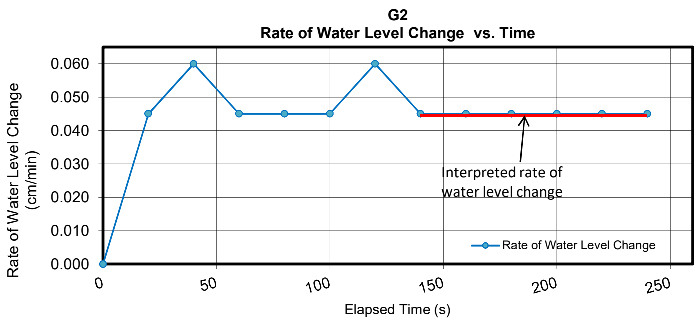
Geotechnical-Hydrogeology-Environmental-Materials-Inspection



Elapsed Time (s)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	22.0	-	-
20.0	22.3	0.3	0.05
40.0	22.7	0.4	0.06
60.0	23.0	0.3	0.05
80.0	23.3	0.3	0.05
100.0	23.6	0.3	0.05
120.0	24.0	0.4	0.06
140.0	24.3	0.3	0.05
160.0	24.6	0.3	0.05
180.0	24.9	0.3	0.04
200.0	25.2	0.3	0.05
220.0	25.5	0.3	0.05
240.0	25.8	0.3	0.05

Combined Reservoir Surface Area =	**35.22**	cm^2
Borehole Depth =	75	cm
Interpreted Rate of Water Level Change (R1) =	**7.5E-04**	**cm/s**
Steady Intake Water Rate (Q_1) =	**1.6E-03**	**cm^3/s**
hole radius (a) =	3	cm
Water column height in hole (H_1) =	10	cm

H1	**10 cm**	**water column height in borehole, first test**
a	3 cm	well radius
α	0.04	slope fitting parameter (estimated based on soil structure)
R1	**7.50E-04 cm/s**	
X	**35.22 cm^2**	**surface area for combined reservior used**
Y	2.170 cm^2	surface area for inner reservoir used
Q1=X1*R1	**0.026 cm^3/s**	**Flow rate based on combined reservoir area and average rate of infiltration**
Q1=Y1*R1	0.002 cm^3/s	Flow rate based on inner reservoir area and average rate of infiltration
	2	**Shape Factor, where:** 1: compacted, structure-less clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc 2: Soils which are both fine-textured (clayey or silty) and unstructured; may also include some fine sands 3: Structured soils from clays to loams; also incudes unstructured medium and fine sands 4: Coarse and/or gravelly sands; may also include some highly structured soils with large/numerous
C1	**1.29023413**	**Shape factor coefficient**

K_{fs} = 1.52E-05 cm/s

= 9.15E-04 cm/min

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi\left(2H_1 H_2 (H_2 - H_1) + a^2 (H_1 C_2 - H_2 C_1)\right)}$ $G_2 = \frac{H_1 C_2}{\pi\left(2H_1 H_2 (H_2 - H_1) + a^2 (H_1 C_2 - H_2 C_1)\right)}$ $K_{fs} = G_2 Q_2 - G_1 Q_1$ $G_3 = \frac{(2H_2^2 + a^2 C_2) C_1}{2\pi\left(2H_1 H_2 (H_2 - H_1) + a^2 (H_1 C_2 - H_2 C_1)\right)}$ $G_4 = \frac{(2H_1^2 + a^2 C_1) C_2}{2\pi\left(2H_1 H_2 (H_2 - H_1) + a^2 (H_1 C_2 - H_2 C_1)\right)}$ $\Phi_m = G_3 Q_1 - G_4 Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

DATE: 2017/12/19 prepared by: KY
PROJECT: 17-2118H checked by: BG

Constant Head Permeameter Test Report

G3

Appendix E

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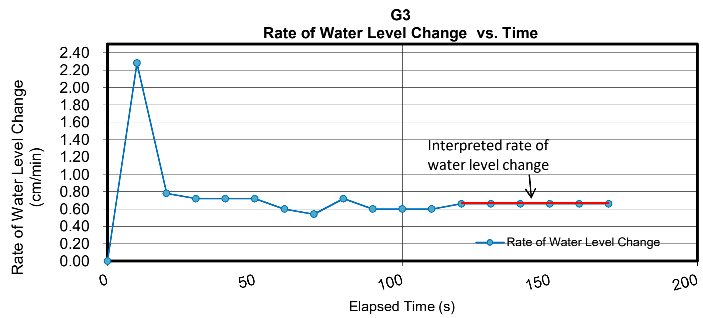
Geotechnical-Hydrogeology-Environmental-Materials-Inspection



Elapsed Time (s)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	34.0	-	-
10.0	37.8	3.8	2.28
20.0	39.1	1.3	0.78
30.0	40.3	1.2	0.72
40.0	41.5	1.2	0.72
50.0	42.7	1.2	0.72
60.0	43.7	1.0	0.60
70.0	44.6	0.9	0.54
80.0	45.8	1.2	0.72
90.0	46.8	1.0	0.60
100.0	47.8	1.0	0.60
110.0	48.8	1.0	0.60
120.0	49.9	1.1	0.66
130.0	51.0	1.1	0.66
140.0	52.1	1.1	0.66
150.0	53.2	1.1	0.66
160.0	54.3	1.1	0.66
170.0	55.4	1.1	0.66

Combined Reservoir Surface Area =	**35.22**	cm^2
Borehole Depth =	95	cm
Interpreted Rate of Water Level Change (R1) =	**1.1E-02**	**cm/s**
Steady Intake Water Rate (Q_1) =	**2.4E-02**	**cm^3/s**
hole radius (a) =	3	cm
Water column height in hole (H_1) =	2	cm

H1	**2 cm**	**water column height in borehole, first test**
a	3 cm	well radius
α	0.04	slope fitting parameter (estimated based on soil structure)
R1	**1.10E-02 cm/s**	
X	**35.22 cm^2**	**surface area for combined reservior used**
Y	2.170 cm^2	surface area for inner reservoir used
Q1=X1*R1	**0.387 cm^3/s**	**Flow rate based on combined reservoir area and average rate of infiltration**
Q1=Y1*R1	0.024 cm^3/s	Flow rate based on inner reservoir area and average rate of infiltration
	2	**Shape Factor, where:** 1: compacted, structure-less clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc 2: Soils which are both fine-textured (clayey or silty) and unstructured; may also include some fine sands 3: Structured soils from clays to loams; also incudes unstructured medium and fine sands 4: Coarse and/or gravelly sands; may also include some highly structured soils with large/numerous
C1	**0.46389125**	**Shape factor coefficient**

K_{fs} = 5.10E-04 cm/s

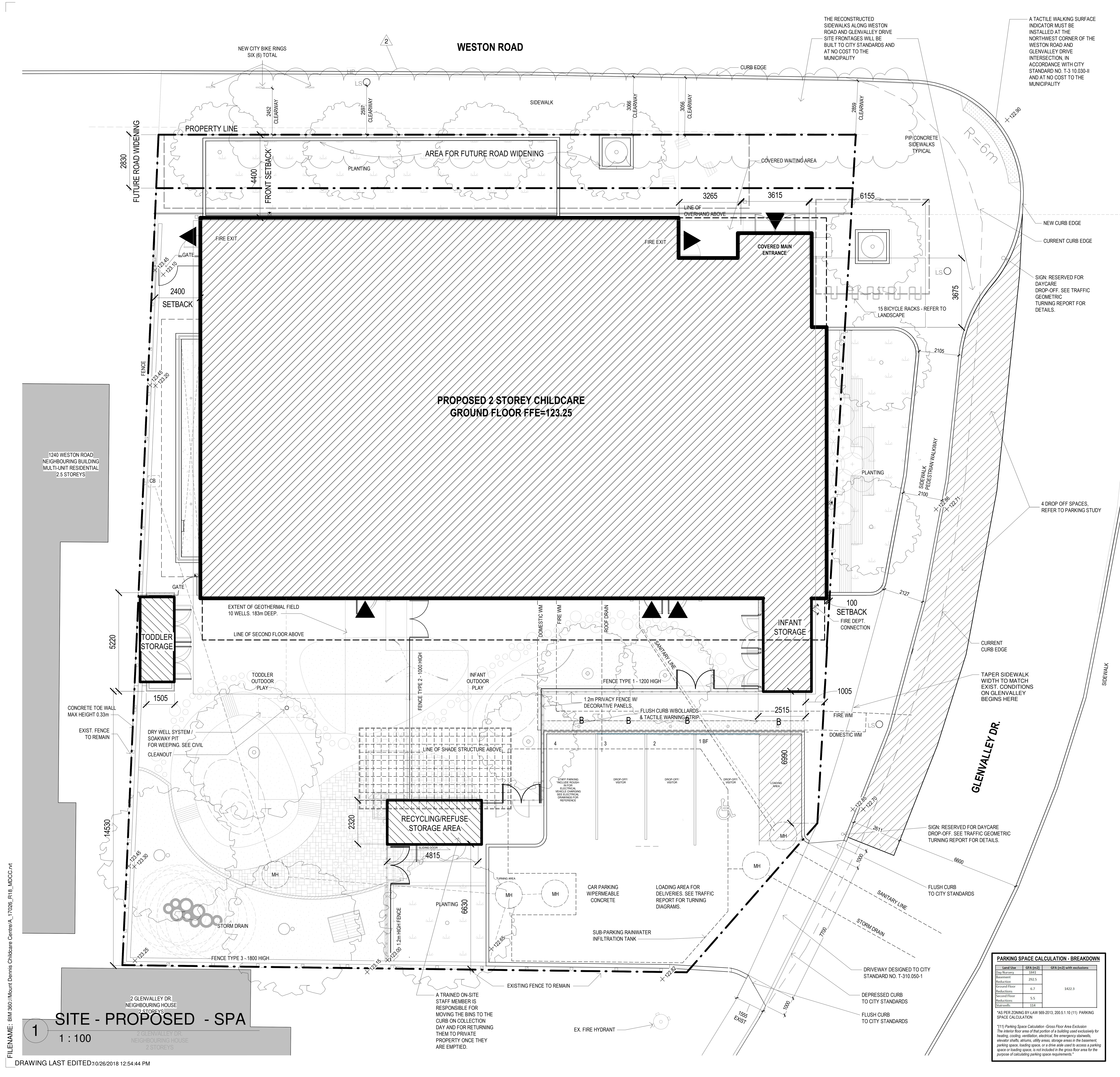
= 3.06E-02 cm/min

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \left(\frac{H_1}{\alpha^*}\right)}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	$\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $G_2 = \frac{H_1 C_2}{\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi\left(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1)\right)}$ $\Phi_m = G_3Q_1 - G_4Q_2$

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

DATE:	2017/12/19	prepared by:	KY
PROJECT:	17-2118H	checked by:	BG

APPENDIX E



PARKING SPACE CALCULATION - BREAKDOWN

Land Use	GFA (m2)	GFA (m2) with exclusions
Day Nursery	1841	1422.3
Basement Reduction	292.5	
Ground Floor Reductions	6.7	
Second Floor Reductions	5.5	
Stairwells	114	

*AS PER ZONING BY-LAW 569-2013, 200.5.1.10 (11) PARKING SPACE CALCULATION

"(11) Parking Space Calculation -Gross Floor Area Exclusion The interior floor area of that portion of a building used exclusively for heating, cooling, ventilation, electrical, fire emergency stairwells, elevator shafts, atriums, utility areas, storage areas in the basement, parking space, loading space, or a drive aisle used to access a parking space or loading space, is not included in the gross floor area for the purpose of calculating parking space requirements."

GENERAL SITE NOTES:

1. REFER TO LANDSCAPE DRAWINGS FOR OVERALL LANDSAPE SITE PLAN, INCLUDING ALL LANDSCAPE WORK
2. GRADES AND ELEVATIONS SHOWN IN METRES. BUIDINGS AND SITE DIMENSIONS SHOWN IN MILLIMETERS
3. FOR SITE GRADING REFER TO CIVIL AND LANDSCAPE DRAWINGS.
4. REFER TO SITE SERVICES DRAWINGS FOR INFORMATION ON PROPOSED SITE SERVICES
5. ALL CONSTRUCTION WORK TO COMPLY WITH STANDARD DRAWINGS AND SPECS OF THE CITY OF TORONTO AND THE ONTARIO PROVINCIAL STANDARDS ASSOCIATION.
6. REFER TO GEOTECHNICAL INVESTIGATIONS FOR SOIL AND HYDROLOGICAL CONDITIONS
7. PROVIDE PARKING LOT LINE PAINTING AS SPECIFIED AND SHOWN ON THE SITE PLAN
8. GENERAL CONTRACTOR TO CO-ORDINATE W/ CITY OF TORONTO AND APPLY FOR AND OBTAIN STREET ALLOWANCE PERMIT FOR ALL SITE SERVICES WORK OUTSIDE OF PROPERTY LINE AND ROAD RESTORATION WORK. STREET ALLOWANCE WORK BY CASH ALLOWANCE.
9. ALL EXTERIOR LIGHTING WILL BE DIRECTED ONTO THE SITE AND WILL NOT INFRINGE UPON ADJACENT PROPERTIES STANDARDS.
10. MAKE GOOD SURFACES AND CONDITIONS ADJACENT TO THE AREAS AFFECTED BY THE WORK OF THIS CONTRACT. MAKE GOOD GRADES, PAVING, CURBS, EDGING, SODDING, AND OTHER SURFACES AFFECTED BY THE WORK, TO MATCH EXISTING, AND TO THE SATISFACTION OF THE OWNER AND AUTHORITIES HAVING JURISDICTION.
11. A POSSIBLE FUTURE PROPERTY LINE RELATED TO A POTENTIAL ROAD WIDENING IS PROPOSED FOR WESTON ROAD BY THE CITY, AND IS AS SHOWN ON THE SITE PLAN. NOTE THAT SITE STATISTICS (UNLESS OTHERWISE NOTED) ARE CALCULATED WITHIN CURRENT PROPERTY LINES.
12. FUTURE PROPERTY LINE TO BE CONVEYED TO THE CITY OF TORONTO AT A LATER DATE, TO ASSIST WITH FUTURE ROAD WIDENING.

SITE STATISTICS

*FOR TGS STATS SEE "A0.20 - OBC MATRIX"

LOT AREA	1594 m²
GROSS FLOOR AREA	1841 m²
BUILDING AREA	731 m²
BASEMENT FLOOR AREA	650 m²
GROUND FLOOR AREA	666 m²
SECOND FLOOR AREA	525 m²
FLOOR SPACE INDEX (CURRENT)	1.155
ACCESSORY BUILDINGS	19.8 m²
SOFT LANDSCAPING	113 m²
SOFT LANDSCAPING - CITY PROPERTY	48 m²
NON-ROOF HARDSCAPING	795 m²
PARKING	168 m²
PARKING SPOTS	4 SPACES
PARKING SUPPLIED WITH EVSE	1 - PARKING SPOT #4
PARKING SPACE CALCULATION - GFA *	1422.3 m²
FRONT SETBACK	4.4 m
REAR SETBACK	16.3 m
WEST SETBACK (MIN.)	2.4 m
EAST SETBACK (MIN.)	0.1 m
BUILDING HEIGHT TO PARAPET	8.977 m
BUILDING HEIGHT TO TOP OF SOLAR PANELS	12.062 m
NUMBER OF BICYCLE PARKING SPACES	21 SHORT & 4 LONG TERM

*AS PER ZONING BY-LAW 569-2013, 200.5.1.10 (11) PARKING SPACE CALCULATION

SITE PLAN LEGEND

CB	PROPOSED CATCH BASIN (REFER TO CIVIL)
MH	PROPOSED MANHOLE (REFER TO CIVIL)
XLS	EXISTING LIGHT STANDARD
XHP	EXISTING HYDRO POLE
123.25	EXISTING ELEVATION
123.25	NEW ELEVATION
	EXISTING FIRE HYDRANT
	FIRE DEPT. SIAMESE CONNECTION
B	BOLLARD
	BUILDING ENTRANCE/EXIT (BARRIER FREE ACCESS)
	CITY STANDARD BICYCLE RACKS
	PROPOSED TREE (REFER TO LANDSCAPE)
	PROPERTY LINE
	PROPOSED BUILDING (MAIN)
	PROPOSED BUILDING (ACCESSORY)
	NEW ASPHALT

CITY OF TORONTO - URBAN DESIGN - GENERAL NOTE:
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CITY OF TORONTO - ENGINEERING AND CONSTRUCTION SERVICES - GENERAL NOTES:

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER — ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF GROUNDWATER INTO THE MUNICIPAL SEWER SYSTEMS AND WATERCOURSES;
2. THE CONTRACTOR IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING THE NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT & CLIMATE CHANGE WITH REGARD TO ANY PROPOSED DEWATERING;
3. PRIOR TO COMMENCING ANY WORK WITHIN THE RIGHT OF WAY, THE CONTRACTOR, DEVELOPER, OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT OF WAY MANAGEMENT UNIT;
4. STAFF HAVE REVIEWED THIS APPLICATION ON THE UNDERSTANDING THAT IT WILL COMPRISE A SINGLE PARCEL OF LAND, UNDER ONE OWNER, UPON COMPLETION. IF ANY PARTY, INCLUDING THE CONTRACTOR OR ANY SUBSEQUENT OWNER, SUBMITS AN APPLICATION FOR SEVERANCE, PART — LOT CONTROL, SUBDIVISION, CONDOMINIUM APPROVAL OR ANY OTHER FORM OF LAND DIVISION FOR THIS DEVELOPMENT NOT IN ACCORDANCE WITH THIS ASSUMPTION, DIFFERENT SERVICING CONNECTIONS, INCLUDING ALL ASSOCIATED STORMWATER MANAGEMENT FACILITIES AND ANY NECESSARY REVISED PLANS AND STUDIES, MAY BE REQUIRED BY THE CITY AT THE SOLE COST TO THAT CONTRACTOR.
5. REFER TO THE ACCEPTED ENGINEERING DRAWINGS FOR THIS SUBJECT SITE, PREPARED BY MASONGSONG ASSOCIATES ENGINEERING LTD. FOR ALL SITE SERVICING AND ABOVE GROUND CONNECTIONS INFORMATION.

Key to Detail Location

NO. — Detail Number
NO. — Drawing Number

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Drawings should not be scaled.

#	Date	Revision/Issued:
1	180801	SPA RE-SUBMISSION
2	181002	ISSUED FOR TRANSPORTATION

consultants

architects	COOLEARTH ARCHITECTURE INC. 386 Pacific Ave. Toronto, ON, M6P 2R1 Phone: 416-868-9774
	CS&P ARCHITECTS INC. 2345 Yonge St., Suite 200 Toronto, ON. M4P 2E5 Phone: 416-482-5002
structural engineer	STEPHENSON ENGINEERING 2550 Victoria Park Ave., Suite 602 Toronto, ON M2J 5A9 Phone: 416-635-9970
mechanical & electrical engineer	R MANCINI AND ASSOCIATES 30 Martha St Suite 203 Bolton, ON L7E 5V1 Phone: 905-951-6292
landscape architect	PMA LANDSCAPE ARCHITECTS LTD. 359 Keele Street Toronto, ON, M6P 2K6 Phone: 416-239-9818
civil engineer	MASONGSONG ASSOCIATES ENGINEERING LTD. 7800 Kennedy Road, S. 201 Markham, ON, L3R 2C7 Phone: 905-944-0162

PROJECT N

ONTARIO ASSOCIATION OF ARCHITECTS
SUSAN SPENCER LEWIN
LICENCE 4482

coolearth architecture inc.

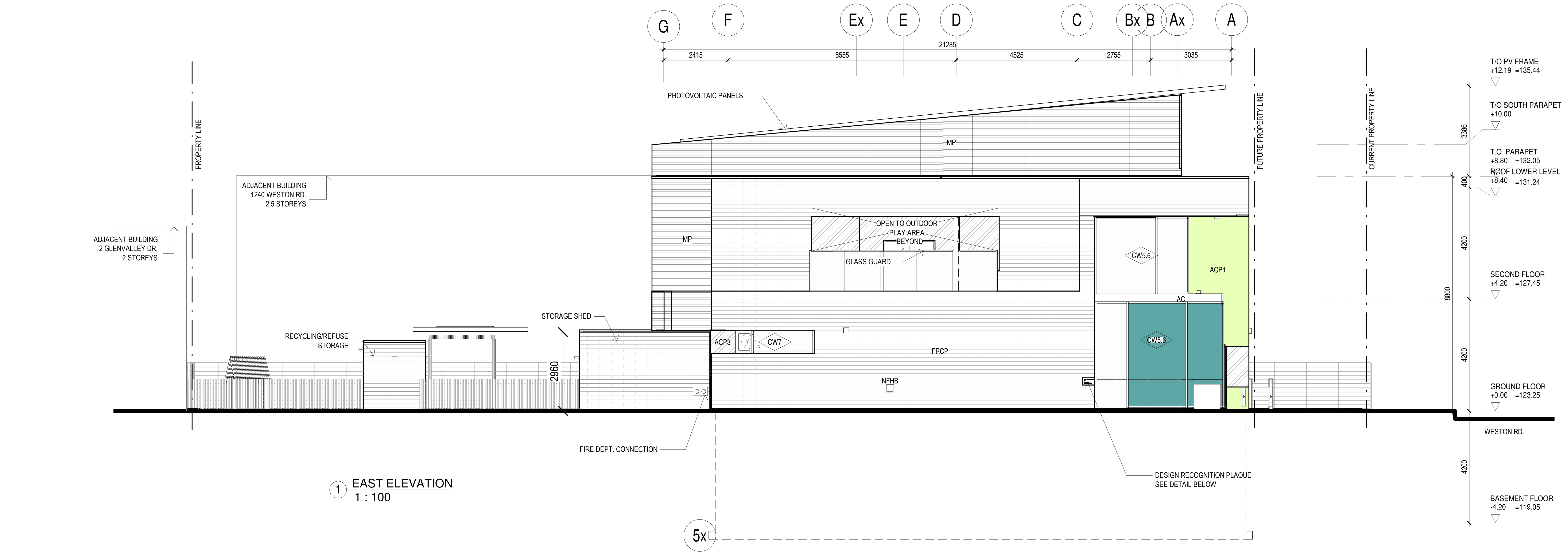
CS&P Architects
2345 Yonge St., Suite 200
Toronto, ON, M4P 2E5
Phone: 416-482-5002

CITY OF TORONTO, MOUNT DENNIS CHILDCARE CENTRE

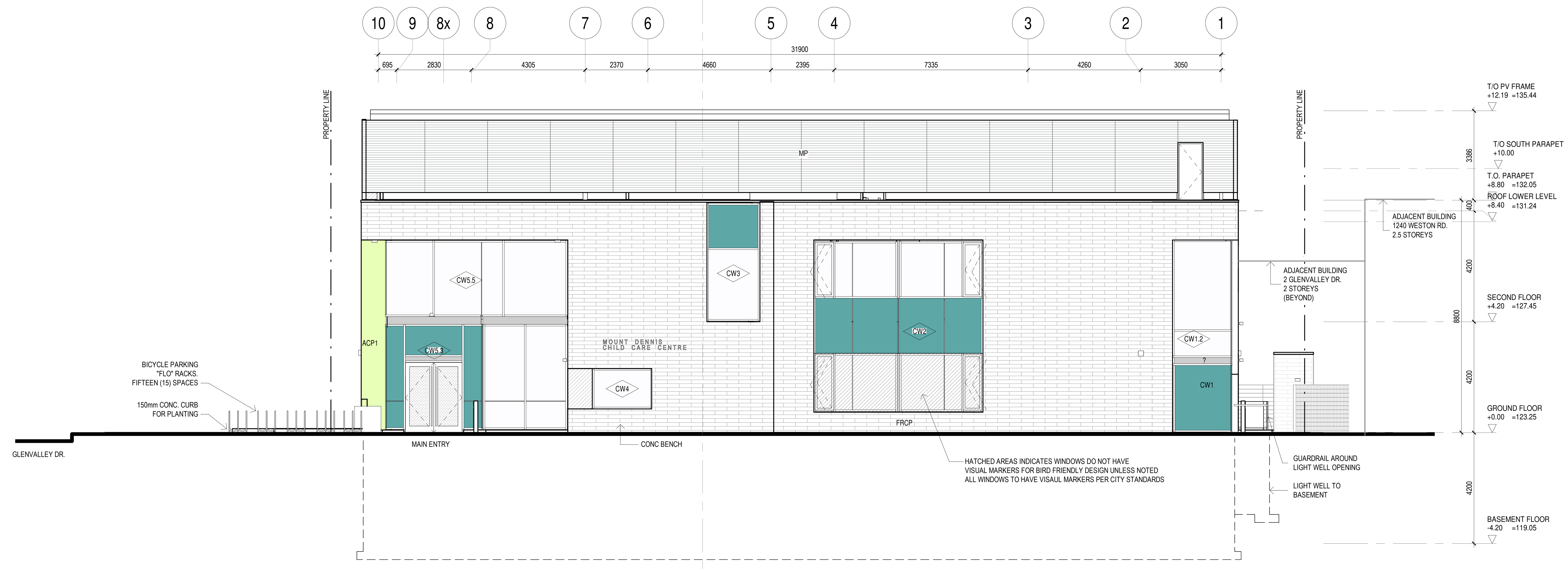
1234 WESTON ROAD, TORONTO, ON M6M 4P8

SITE PLAN

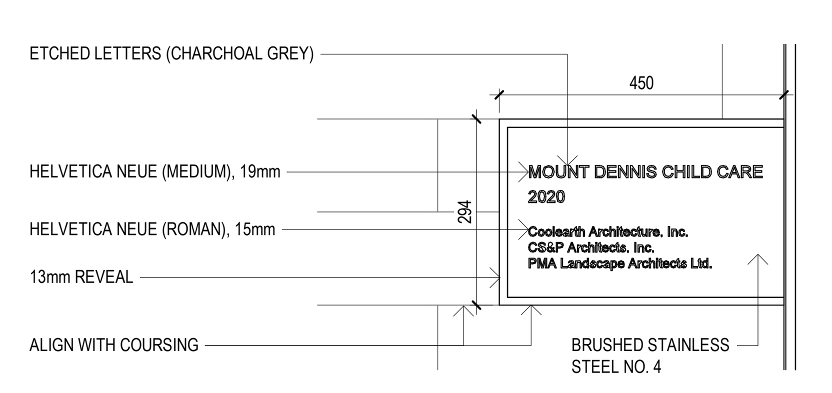
scale:	As indicated
date:	181026
drawn:	CE / CS&P
checked by:	CE / CS&P
project number:	17026
drawing number:	**A1.01 (SPA)



1 EAST ELEVATION
1 : 100



3 NORTH ELEVATION
1 : 100



DESIGN RECOGNITION PLAQUE

CITY OF TORONTO - URBAN DESIGN - GENERAL NOTE:
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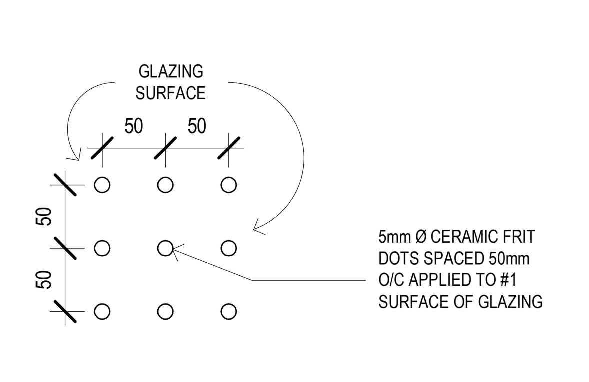
BIRD FRIENDLY CERAMIC FRIT (CF) PATTERN



ELEVATION LEGEND

- FRCP — FIBRE REINFORCED CEMENT PANEL -- OFF-WHITE
- MP — CORRUGATED STEEL CLADDING -- CHARCOAL GREY
- AC — ALUMINUM CLOSURE -- CLEAR ANODIZED
- ALUMINUM CHANNEL -- CHARCOAL GREY
- ACP1 — ALUMINUM COMPOSITE PANEL (TYPE 1) -- GREEN
- ACP2 — ALUMINUM COMPOSITE PANEL (TYPE 2) -- TEAL
- ACP3 — ALUMINUM COMPOSITE PANEL (TYPE 3) -- SILVER
- GL-1 CLEAR INSULATING GLASS UNIT
- GL-2: COLOURED INSULATING GLASS UNIT -- SEMI-TRANSPARENT TEAL
- GL-3 COLOURED INSULATING GLAZING PANEL -- TEAL

EXTERIOR LIGHT FIXTURES

NOTE:
1.) ALL EXTERIOR LIGHT FIXTURES TO BE SHIELDED TO MEET THE IESNA FULL CUTOFF CLASSIFICATION, OR AN UPLIGHT RATING OF 0 AND/OR DARK SKY COMPLIANCE.
2.) ALL ROOFTOP AND FACADE ARCHITECTURAL ILLUMINATION TO BE DIRECTED DOWNWARD AND TURNED OFF BETWEEN THE HOURS OF 11 P.M. AND 6 A.M.

TORONTO

Statistics Template - Toronto Green Standard Version 3.0
Bird Friendly Design

For further information, please visit www.toronto.ca/greendevelopment

Within 12m of Grade

Elevation	Vision Glazing	Low-Reflectance (Opaque Materials)	Visual Markers	Shaded	Total Treated Area (m^2)	Total Treated Area (%)
North	96.9 m^2	-	84.4 m^2	-	84.4 m^2	87%
East	48.1 m^2	-	48.1 m^2	-	48.1 m^2	100%
South	131.3 m^2	-	76.8 m^2	54.5 m^2	131.3 m^2	100%
West	21.4 m^2	-	21.4 m^2	-	21.4 m^2	100%
Totals (m^2)	297.7 m^2	-	230.7 m^2	54.5 m^2	285.2 m^2	95.8%
Totals (%)						

FILENAME: BIM 360://Mount Dennis Childcare Centre/A_17026_R18_MDCC.rvt
DRAWING LAST EDITED 10/11/2018 4:24:26 PM

Key to Detail Location
NO. / NO. — Detail Number / Drawing Number

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Drawings should not be scaled.

#	Date	Revision/Issued:
1	18-04-26	ISSUED FOR SPA
2	18-05-11	ISSSUED FOR DESIGN DEVELOPMENT

consultants

architects	COOLEARTH ARCHITECTURE INC. 386 Pacific Ave. Toronto, ON, M6P 2R1 Phone: 416-868-9774
	CS&P ARCHITECTS INC. 2345 Yonge St., Suite 200 Toronto, ON. M4P 2E5 Phone: 416-482-5002
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ONTARIO ASSOCIATION OF ARCHITECTS
SUSAN SPENCER LEWIN
LICENCE
4482

coolearth architecture inc.
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CS&P Architects
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Toronto, ON. M4P 2E5
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CITY OF TORONTO, MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

BUILDING ELEVATIONS NORTH & EAST

scale:	As indicated
date:	08/10/2018
drawn:	CE / CS&P
checked by:	CE / CS&P
project number:	17026
drawing number:	**A3.10 (SPA)

NOTES:

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- PRIOR TO COMMENCING ANY WORK WITHIN THE RIGHT OF WAY, THE CONTRACTOR, DEVELOPER, OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT OF WAY MANAGEMENT UNIT;
- STAFF HAVE REVIEWED THIS APPLICATION ON THE UNDERSTANDING THAT IT WILL COMPRISE A SINGLE PARCEL OF LAND, UNDER ONE OWNER, UPON COMPLETION. IF ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, SUBMITS AN APPLICATION FOR SEVERANCE, PART – LOT CONTROL, SUBDIVISION, CONDOMINIUM APPROVAL OR ANY OTHER FORM OF LAND DIVISION FOR THIS DEVELOPMENT NOT IN ACCORDANCE WITH THIS ASSUMPTION, DIFFERENT SERVICING CONNECTIONS, INCLUDING ALL ASSOCIATED STORMWATER MANAGEMENT FACILITIES AND ANY NECESSARY REVISED PLANS AND STUDIES, MAY BE REQUIRED BY THE CITY AT THE SOLE COST TO THAT APPLICANT;
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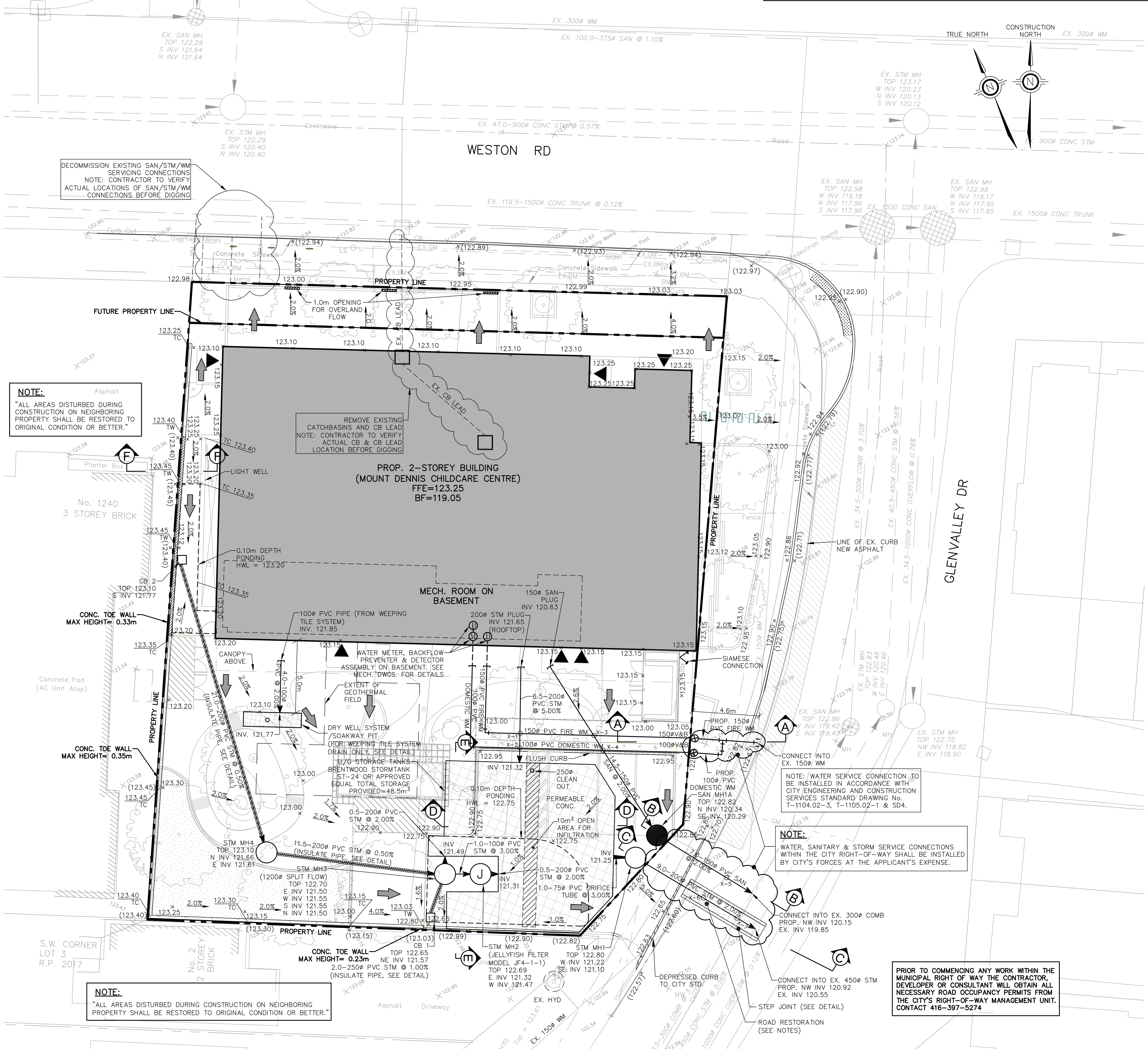
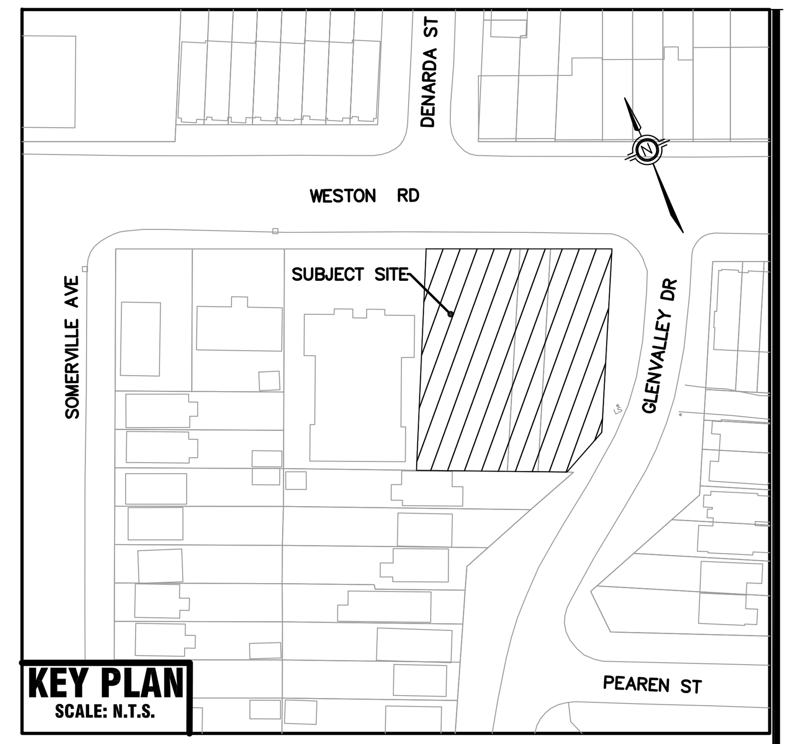


PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL RIGHT OF WAY THE CONTRACTOR, DEVELOPER OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT-OF-WAY MANAGEMENT UNIT. CONTACT 416-397-5274



KEY PLAN
SCALE: N.T.S.

LEGEND :

- LIMIT OF REDEVELOPMENT
- 132.60 — EXISTING ELEVATION
- 132.60 — PROPOSED ELEVATION
- (132.60) — EXISTING ELEVATION TO REMAIN
- 132.60 TW — PROPOSED TOP OF WALL ELEVATION
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN
- DRAINAGE FLOW
- OVERLAND FLOW DIRECTION
- WATER METER LOCATION
- PROPOSED WATER VALVE AND BOX
- EXISTING CATCHBASIN
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING HYDRANT
- EXISTING VALVE & CHAMBER
- —GM— EXISTING GAS MAIN
- —BM— EXISTING BELL

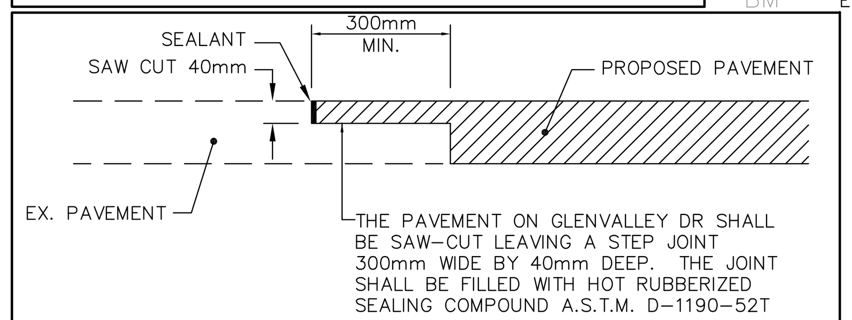
SERVICING CROSSING CHART

X-1	STM INV. WM OBV.	= 121.26 = 120.76	0.50
X-2	STM INV. WM OBV.	= 121.25 = 120.75	0.50
X-3	SAN INV. WM OBV.	= 120.52 = 120.02	0.50
X-4	WM INV. SAN OBV.	= 121.16 = 120.64	0.52
X-5	WM INV. SAN OBV.	= 120.85 = 120.35	0.50
X-6	STM INV. WM OBV.	= 121.00 = 120.50	0.50
X-7	STM INV. SAN OBV.	= 120.92 = 120.22	0.70

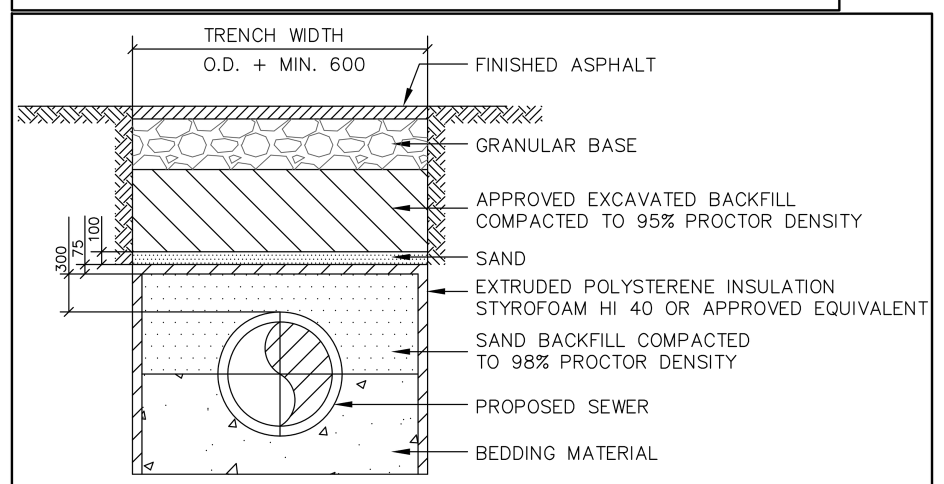
○ DENOTE FOR W/M UNDER STM/SAN PROVIDE A MIN. OF 0.50m VERTICAL SEPARATION

ROAD RESTORATION NOTES:

1. CONTRACTOR TO OBTAIN ROAD OCCUPANCY PERMIT AND MAINTAIN MINIMUM 1-LANE OF TRAFFIC OPEN AT ALL TIMES.
2. ALL TRENCHES WITHIN MUNICIPAL RIGHT OF WAY, TO BE RESTORED WITH NON-SHRINK BACKFILL.
3. EXISTING ASPHALT TO BE MATCHED WITH A 40mm DEPTH STEP JOINT, AND ALL CRACKS TO BE SEALED WITH HOT RUBBERIZED SEALANT.
4. ALL MUNICIPAL BOULEVARDS TO BE RESTORED WITH 200mm TOPSOIL AND No.1 GRADE NURSERY SOD.



STEP JOINT DETAIL
N.T.S



INSULATE PIPE DETAIL
N.T.S.

UTILITY NOTES:

POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWING, AND WHERE SHOWN. THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

BENCHMARK:

SHOWN ON THIS PLAN ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL ELEVATIONS DATUM (1928) AND ARE DERIVED FROM THE VERTICAL CONTROL MONUMENTS LISTED IN THE FOLLOWING TABLE:

MONUMENT	ELEVATION
VCM 12619690203	125.857
VCM 12019630225	125.018

TORONTO ENGINEERING AND CONSTRUCTION SERVICES DIVISION

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS.
THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

ASHRAF HANNA, P.ENG., MANAGER, DEVELOPMENT ENGINEERING

DATE ____________

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NO. — Drawing Number

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No	Date	Revision/Issued
1	APR 13, 2018	ISSUED FOR SPA
2	MAY 11, 2018	ISSUED FOR DESIGN DEVELOPMENT
3	AUG 10, 2018	ISSUED FOR SPA-RESUBMISSION
4	OCT 03, 2018	ISSUED FOR SPA-RESUBMISSION

CONSULTANTS LIST

ARCHITECT	Coolearth Architecture Inc. 386 Pacific Ave. Toronto, ON, M6P 2R1 Phone: 416-868-9774
	CS&P Architects 2345 Yonge St., Suite 200 Toronto, ON, M4P 2E5 Phone: 416-482-5002
STRUCTURAL ENGINEER	Stephenson Engineering 2550 Victoria Park Ave Suite 602 Toronto, ON M2J 5A9 Phone: 416-635-9970
MECHANICAL & ELECTRICAL ENGINEER	R Mancini and Associates 30 Martha St Suite 203 Bolton, ON L7E 5V1 Phone: 905-951-6292
LANDSCAPE ARCHITECT	PMA Landscape Architects Ltd. 359 Keele Street Toronto, ON, M6P 2K6 Phone: 416-239-9818
CIVIL ENGINEER	Masongsong Associates Engineering Ltd. 7800 Kennedy Road, S. 201 Markham, ON, L3R 2C7 Phone: 905-944-0162

PROJECT N

W. C. IP
OCT 03/18
LICENSED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

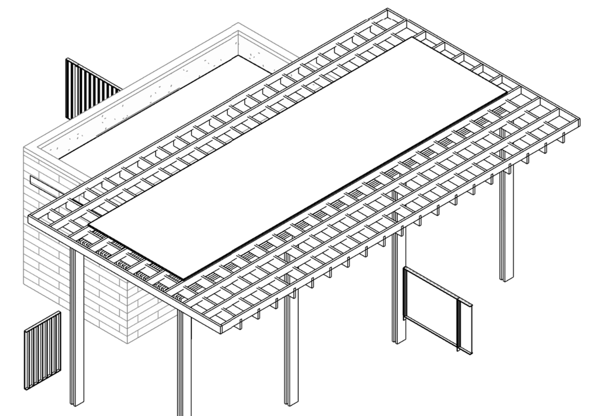
MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T: (905) 944-0162
www.maeng.ca

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

SITE SERVICING & GRADING PLAN

scale:	1:150
date:	04/06/18
drawn:	A.S.C
checked by:	K.L
project number:	17-904
drawing number:	SGR-1

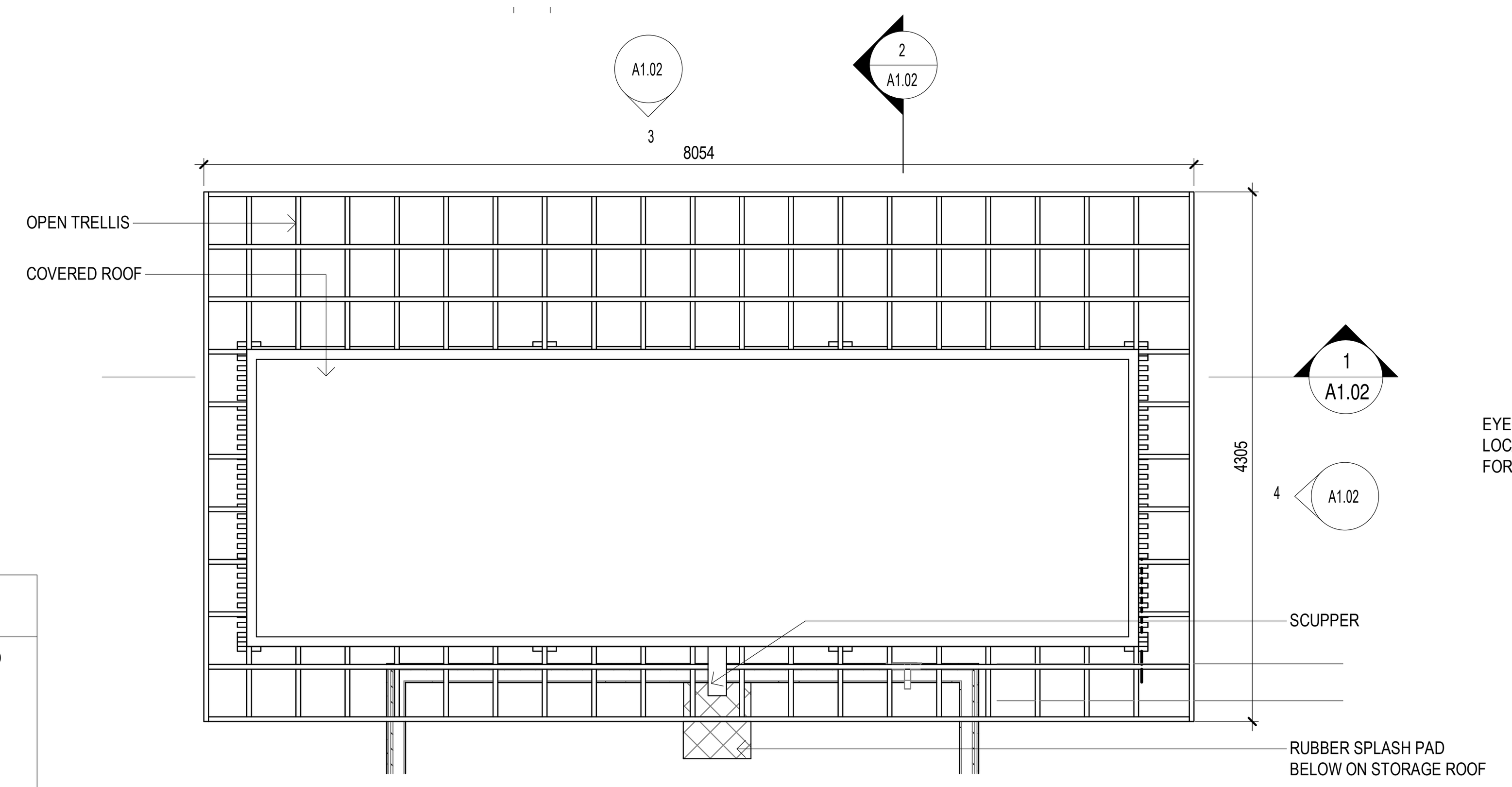
Revision: 1



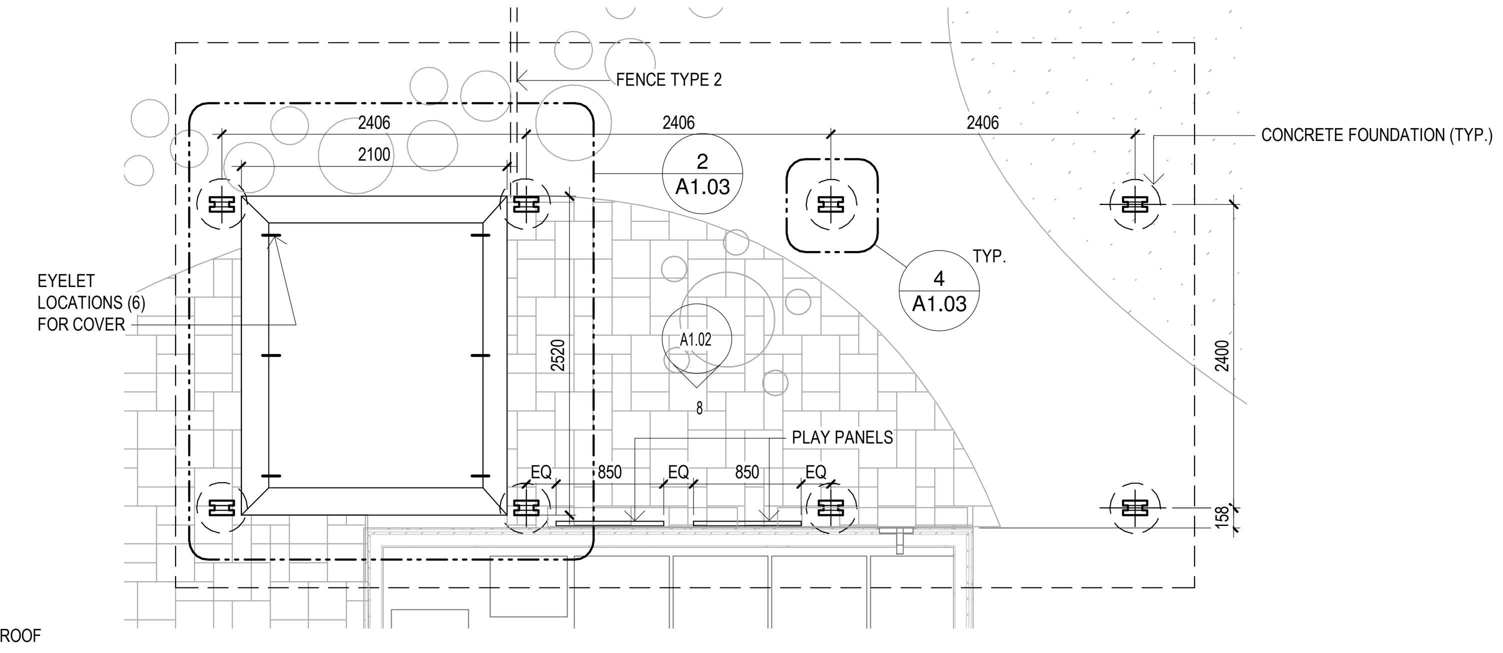
7 SE - TRELLIS

TRELLIS GENERAL NOTES

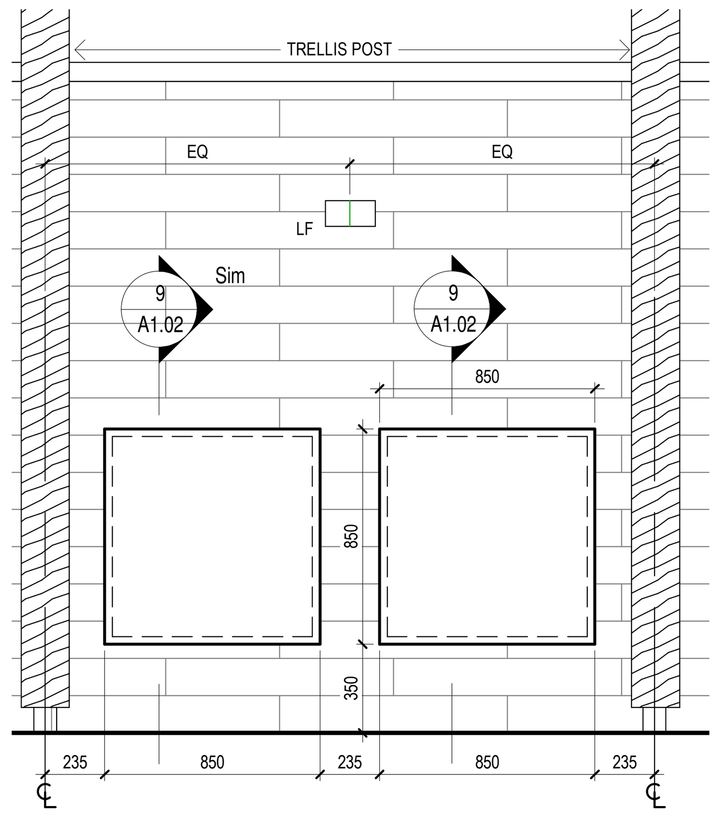
1. SHOP DRAWINGS FOR TRELLIS TO BE ENGINEERED & STAMPED BY A LICENSED ENGINEER IN THE PROVINCE OF ONTARIO.
2. ALL EXPOSED STEEL TO BE HOT DIPPED GALVANIZED.
3. REFER TO DRAWING A1.01 SITE PLAN FOR TRELLIS LOCATION.
4. REFER TO DRAWING A1.03 FOR TRELLIS DETAILS.



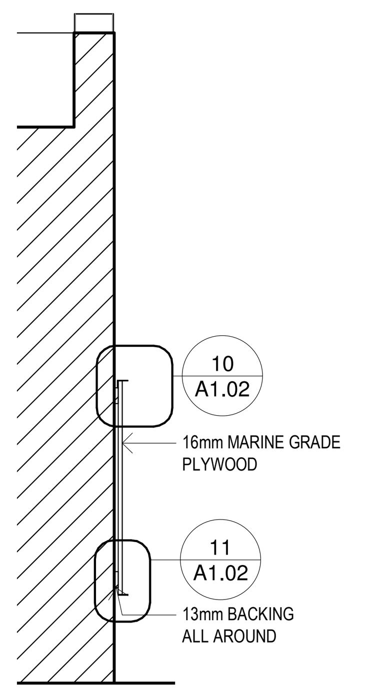
6 TRELLIS ROOF PLAN
1 : 50



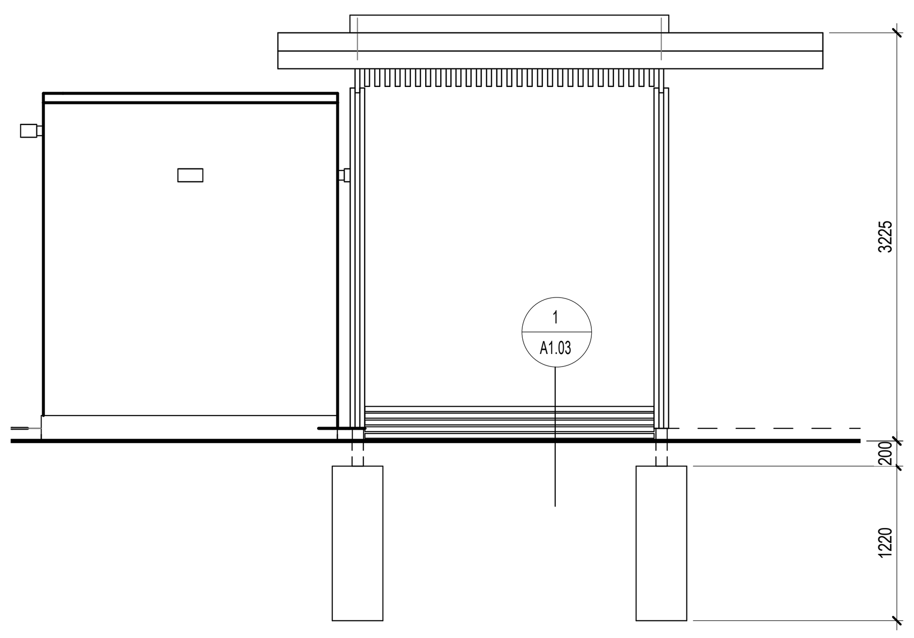
5 TRELLIS AND SANDBOX PLAN
1 : 50



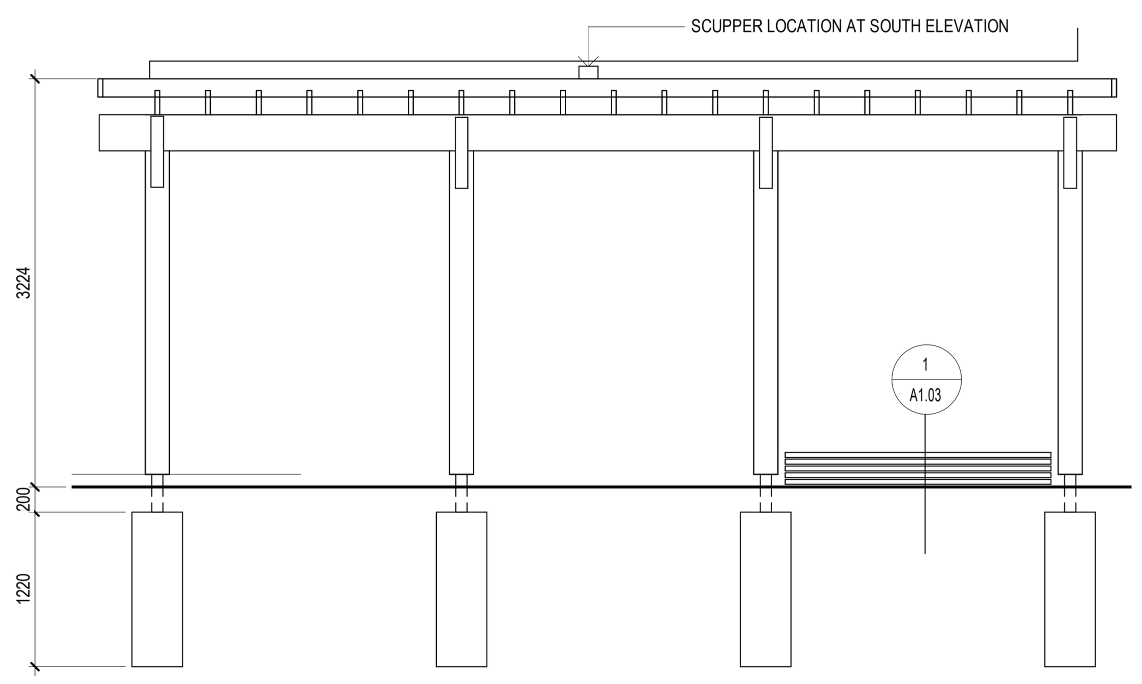
8 PLAY PANEL ELEVATION
1 : 25



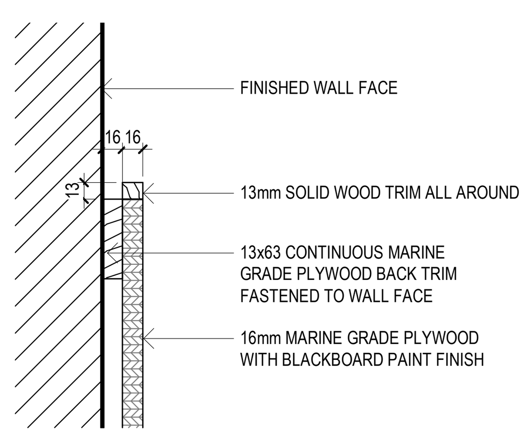
9 PLAY HOUSE SECTION
1 : 25



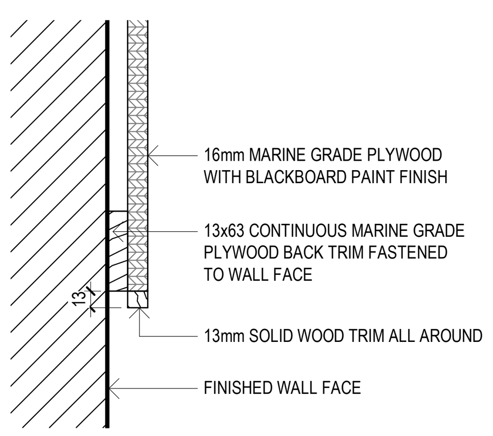
4 TRELLIS ELEVATION EAST
1 : 50



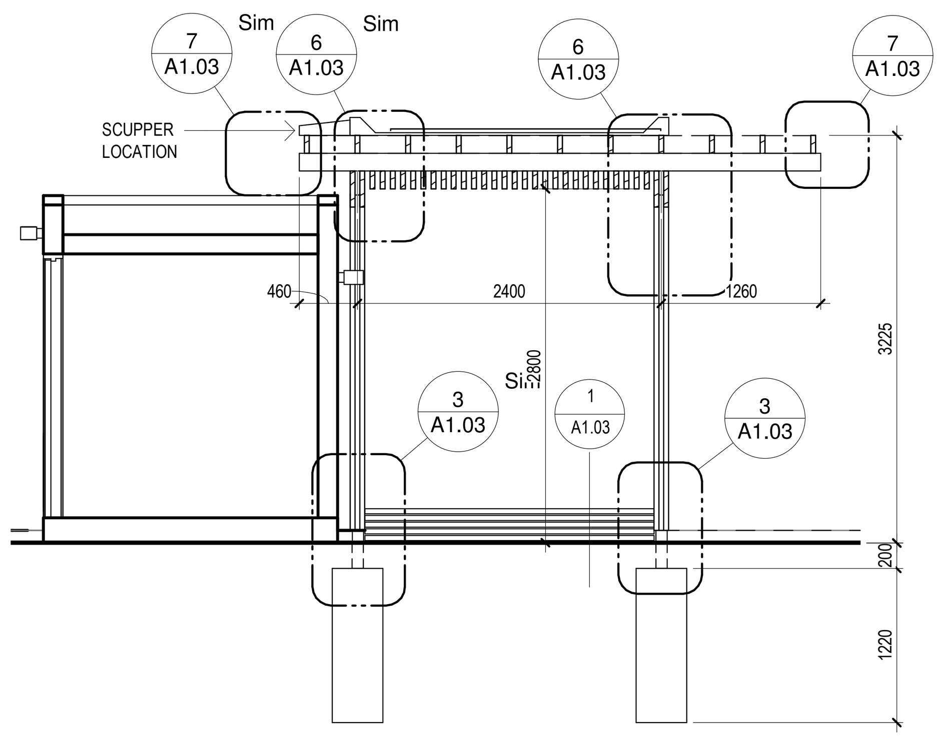
3 TRELLIS NORTH ELEVATION
1 : 50



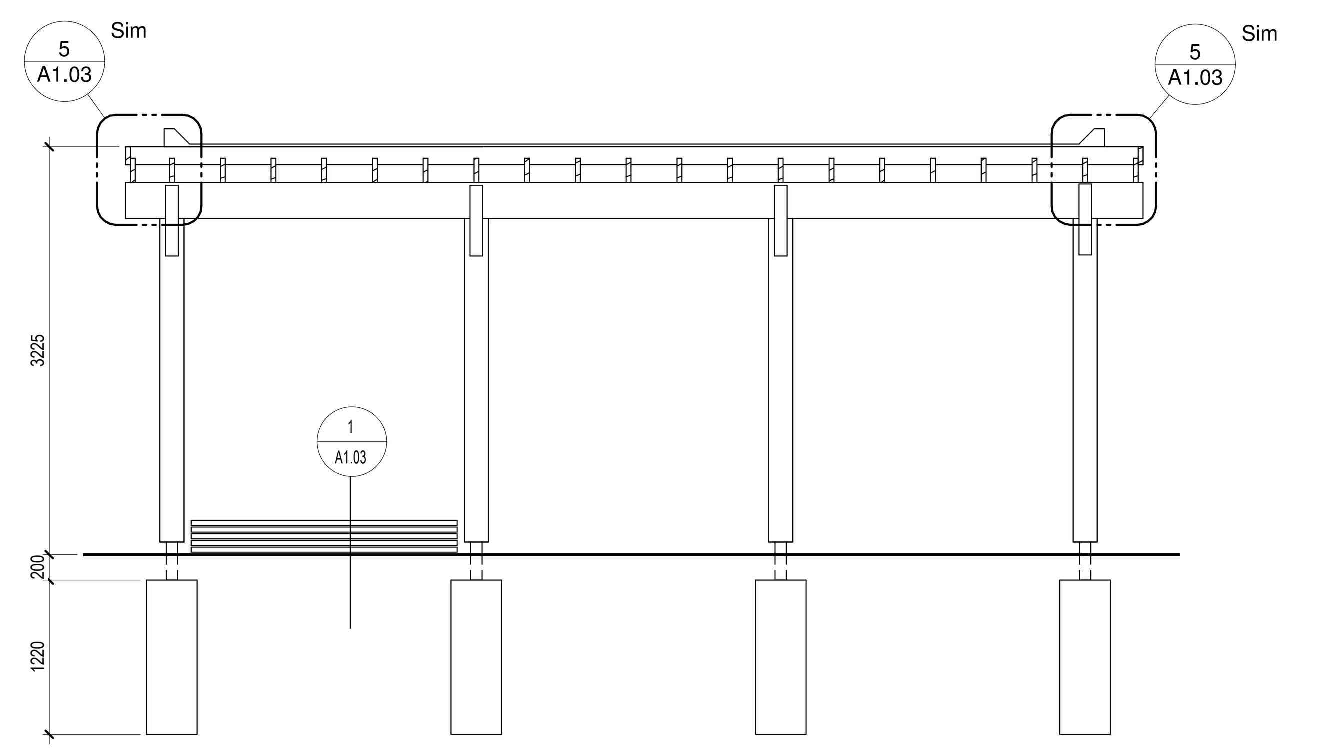
10 PLAY PANEL SECTION DETAIL
1 : 5



11 PLAY HOUSE SECTION DETAIL
1 : 5



2 TRELLIS SECTION
1 : 50



1 TRELLIS SECTION
1 : 50

FILENAME: BIM 360://Mount Dennis Childcare Centre/A_17026_R18_MDCC.rvt

DRAWING LAST EDITED:10/15/2018 4:11:28 PM

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#	Date	Revision/Issued:
1	18-06-29	ISSUED FOR 50% CONTRACT DOCUMENTS
2	18-08-03	ISSUED FOR 75% CONTRACT DOCUMENTS
3	18-09-11	ISSUED FOR 95% COMPLETION
4	18-10-03	ISSUED FOR PERMIT

consultants

architects	COOLEARTH ARCHITECTURE INC. 386 Pacific Ave. Toronto, ON, M6P 2R1 Phone: 416-868-9774
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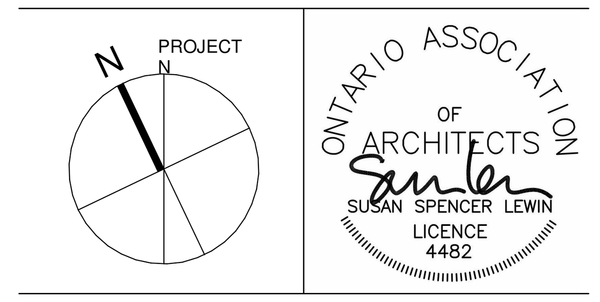

coolearth architecture inc.
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t/ 416 868 9774 f/ 416 868 1026 e/ info@coolearth.ca

CS&P Architects
2345 Yonge St., Suite 200
Toronto, ON. M4P 2E5
Phone: 416-482-5002

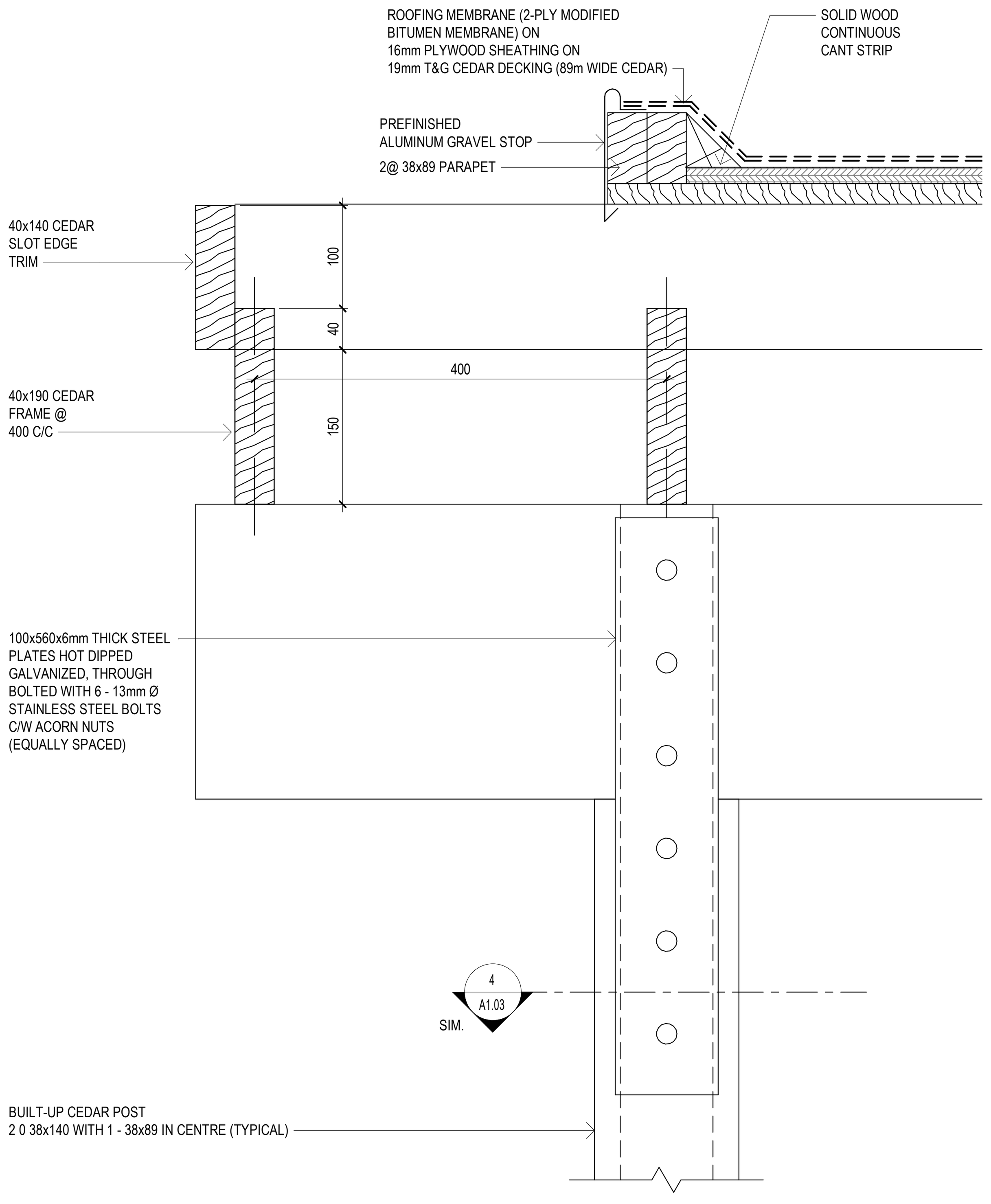
CITY OF TORONTO, MOUNT DENNIS CHILDCARE CENTRE

1234 WESTON ROAD, TORONTO, ON M6M 4P8

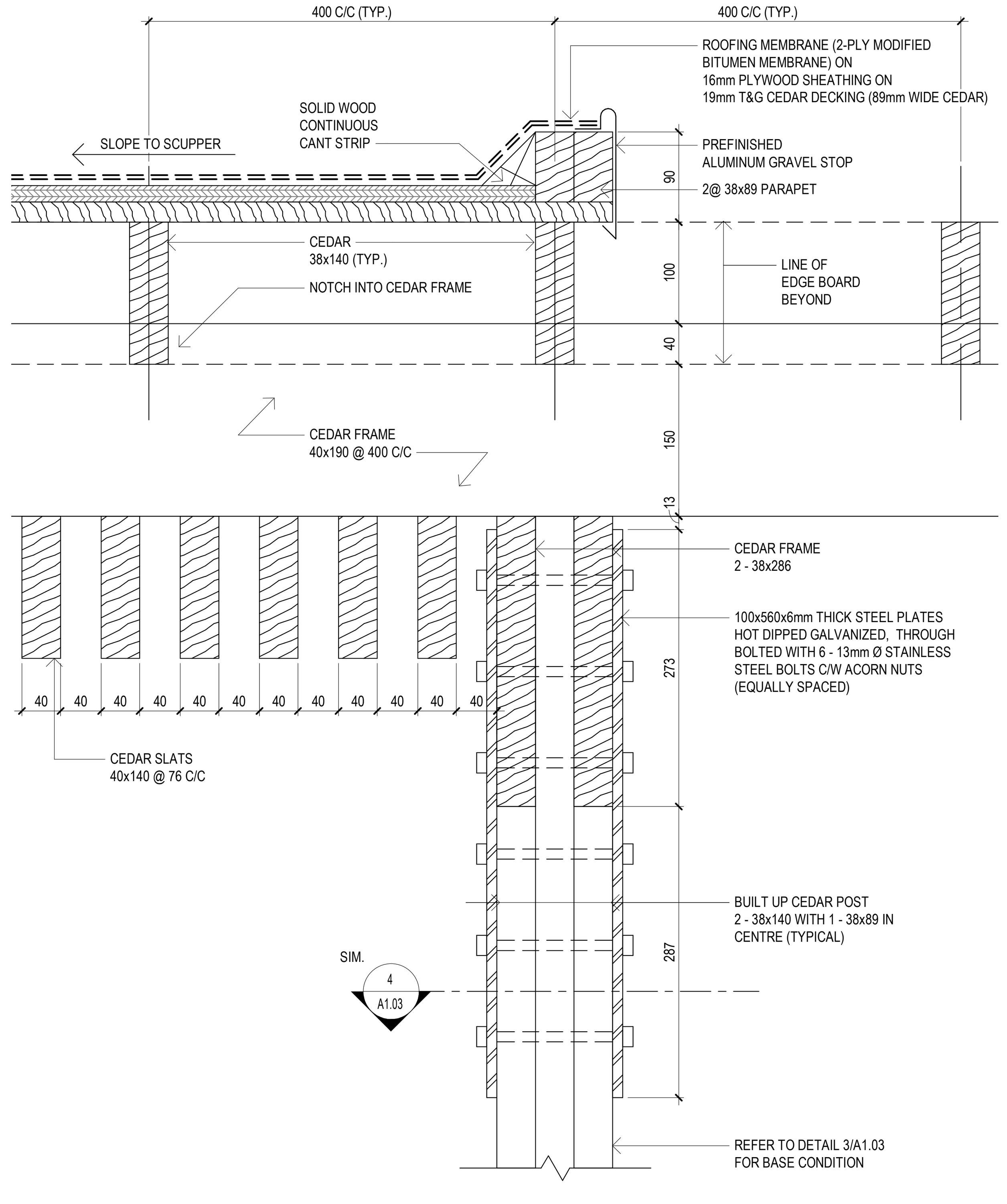
SITE ELEMENTS DETAILS - TRELLIS

scale:	As indicated
date:	06/22/18
drawn:	JK / CS&P
checked by:	SL / CS&P
project number:	17026
drawing number:	A1.02

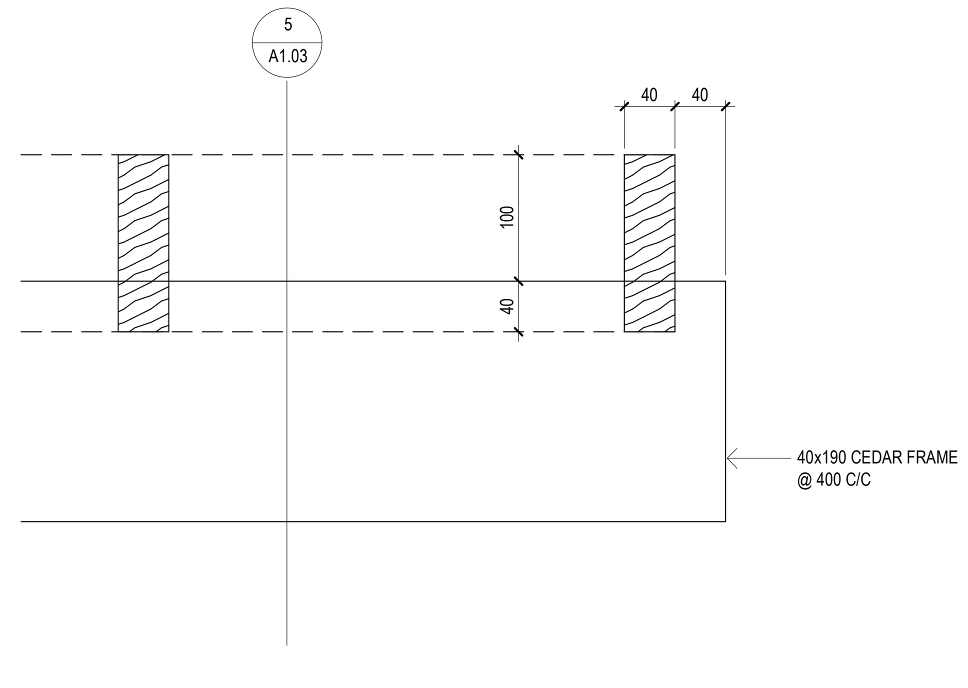
Revision: 4



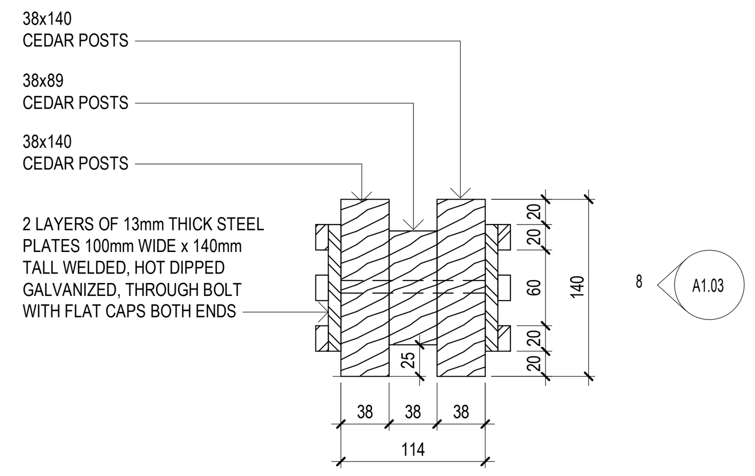
5 TRELLIS SECTION DETAIL PERIMETER
1 : 5



6 TRELLIS SECTION DETAIL
1 : 5

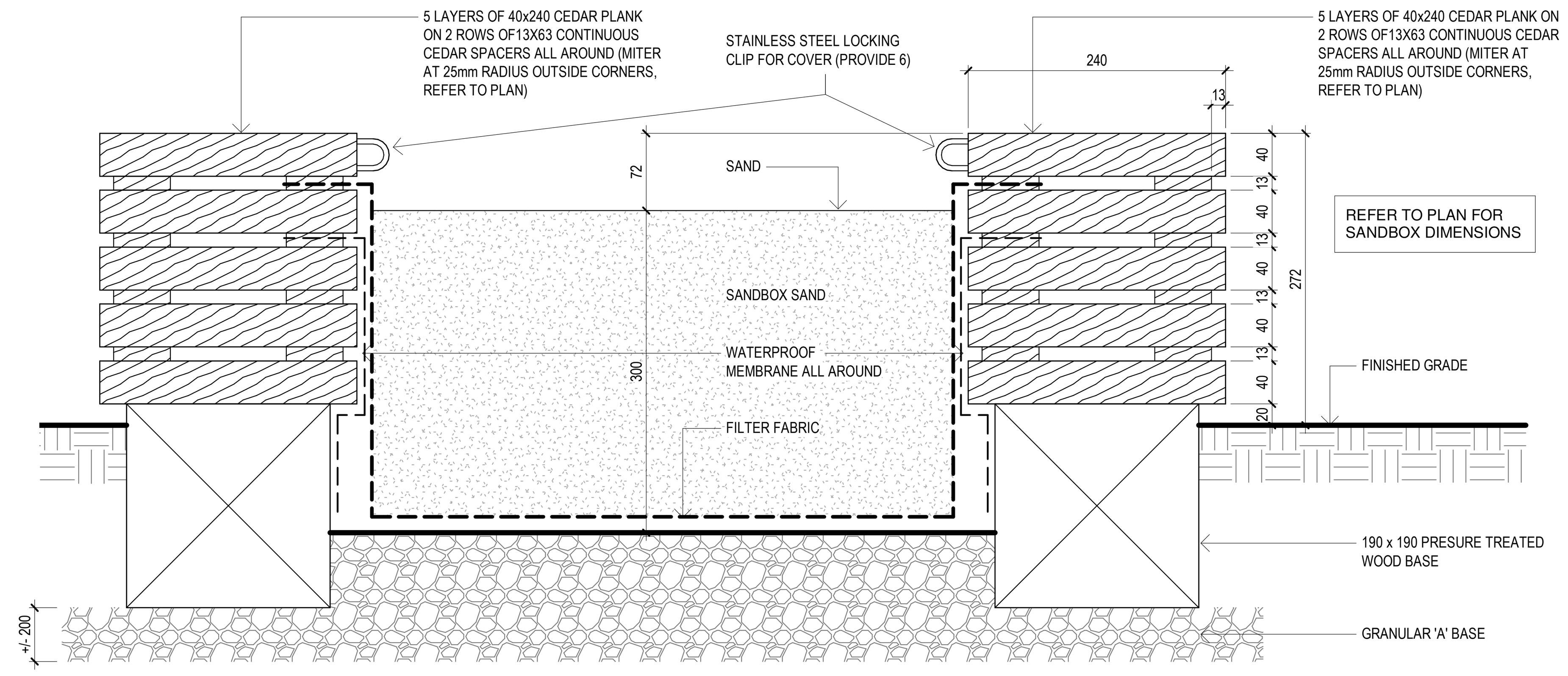


7 TRELLIS EDGE SECTION DETAIL
1 : 5

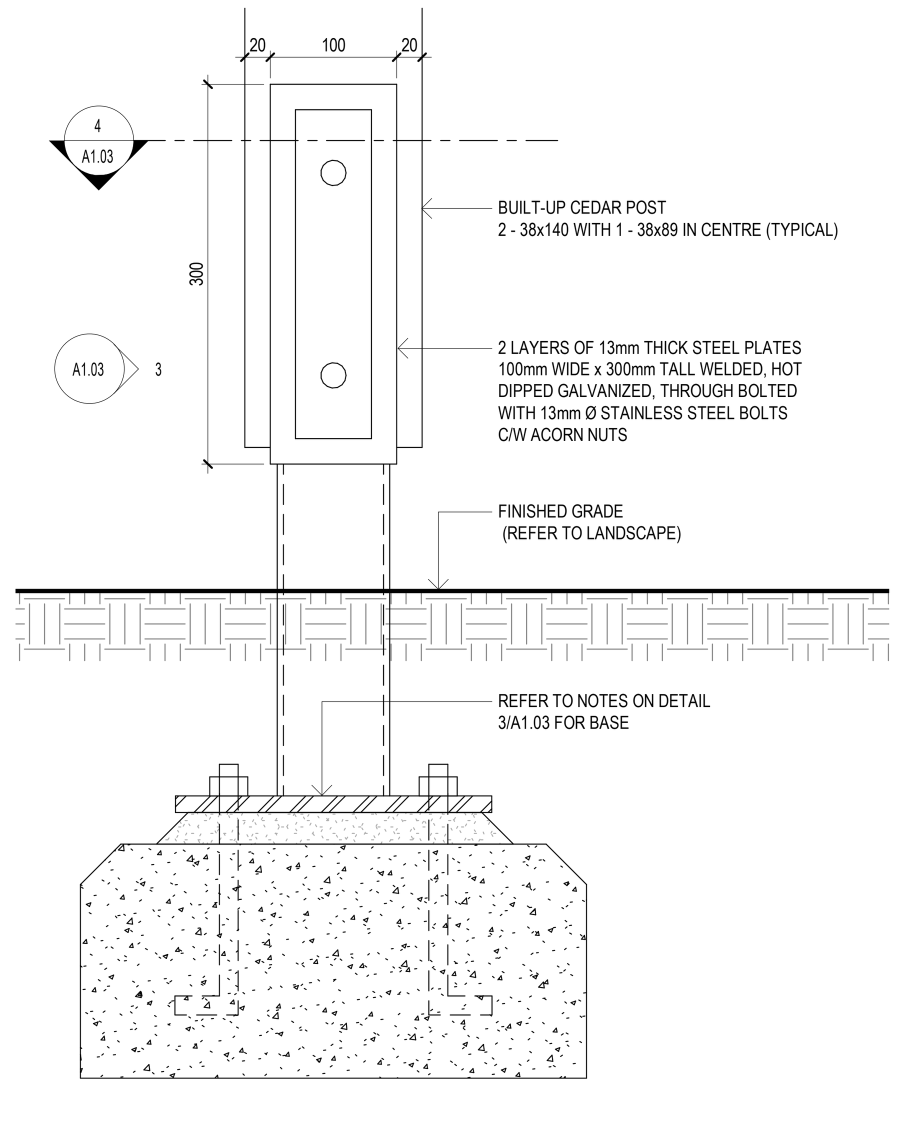


4 TRELLIS VERTICAL POST PLAN DETAIL
1 : 5

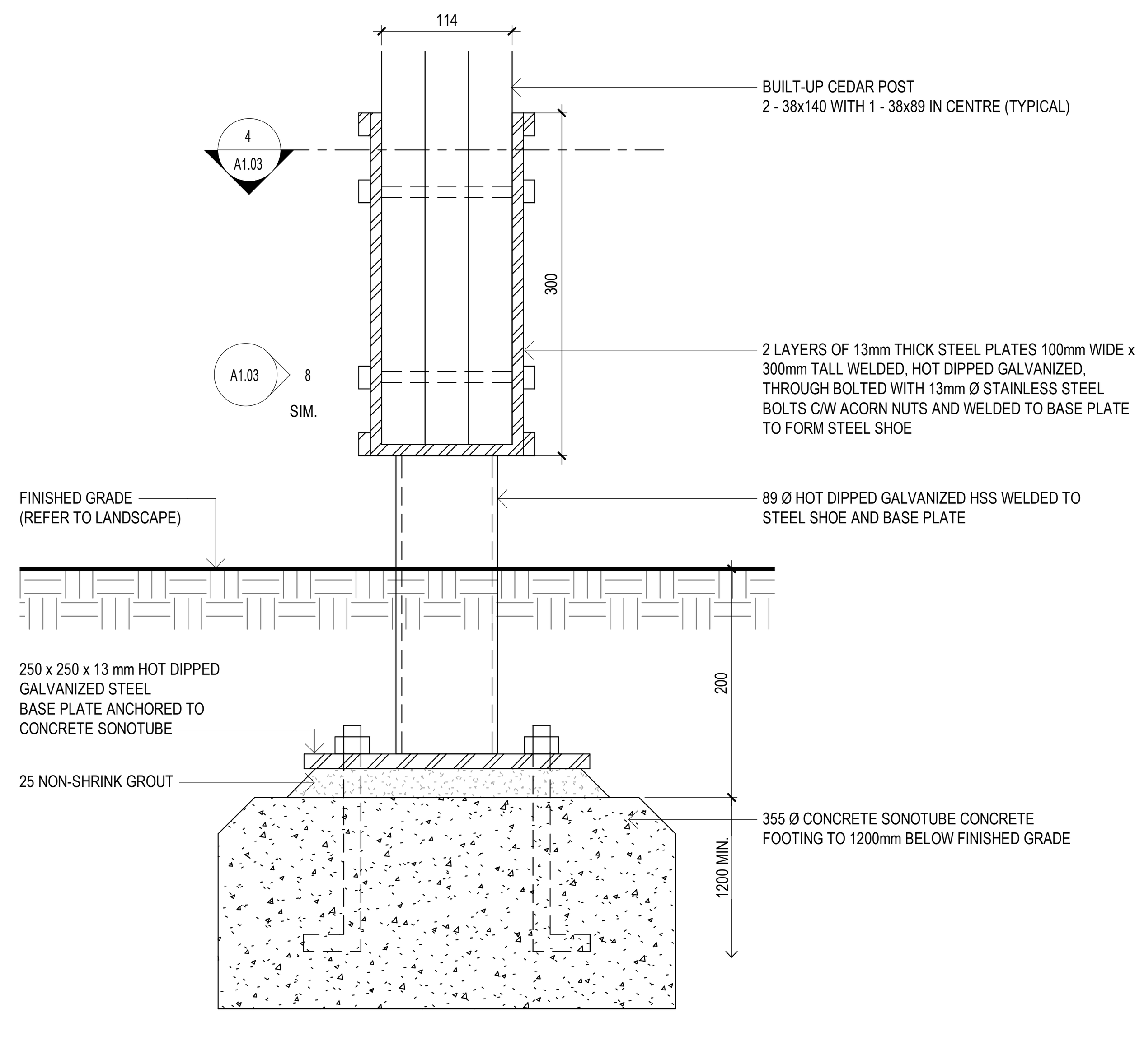
TRELLIS GENERAL NOTES	
1.	SHOP DRAWINGS FOR TRELLIS TO BE ENGINEERED & STAMPED BY A LICENSED ENGINEER IN THE PROVINCE OF ONTARIO.
2.	ALL EXPOSED STEEL TO BE HOT DIPPED GALVANIZED.
3.	REFER TO DRAWING A1.01 SITE PLAN FOR TRELLIS LOCATION.
4.	REFER TO DRAWING A1.03 FOR TRELLIS DETAILS.



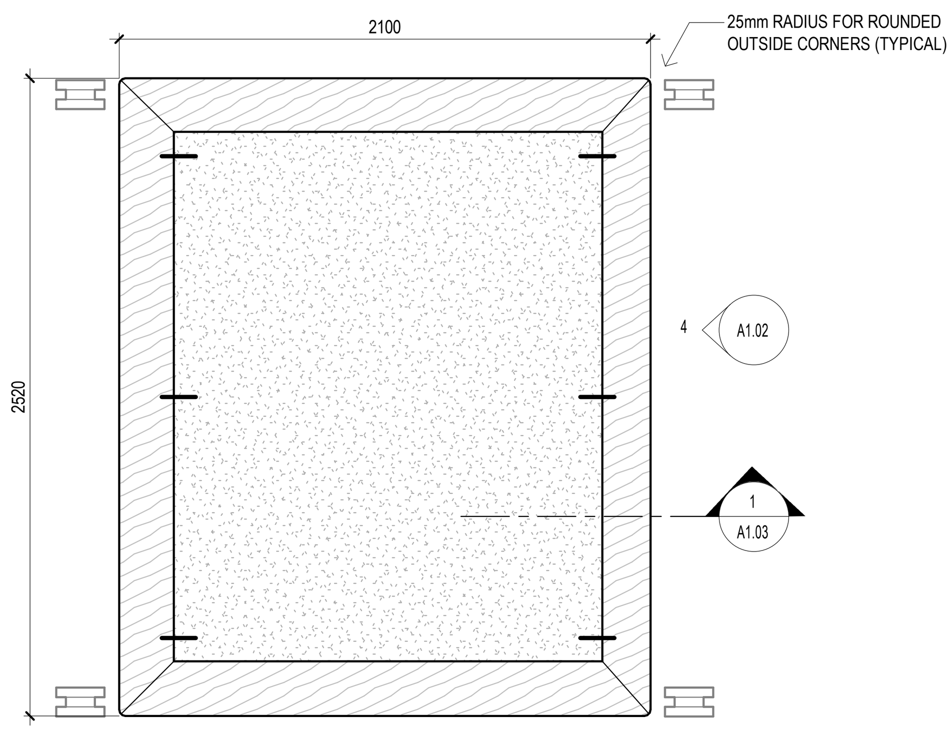
1 SANDBOX SECTION DETAIL
1 : 5



8 TRELLIS POST STEEL PLATE DETAIL
1 : 5



3 TRELLIS BASE DETAIL
1 : 5



2 SANDBOX PLAN DETAIL
1 : 25

FILENAME: BIM 360://Mount Dennis Childcare Centre/A_17026_R18_MDCC.rvt

DRAWING LAST EDITED 10/15/2018 4:11:31 PM

Key to Detail Location

NO. Detail Number
NO. Drawing Number

If this sheet is not 33 1/8" x 23 3/8" (841 x 594 mm) It is a reduced print - Read dwg. accordingly.

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Drawings should not be scaled.

#	Date	Revision/Issued:
1	18-08-03	ISSUED FOR 75% CONTRACT DOCUMENTS
2	18-09-11	ISSUED FOR 95% COMPLETION
3	18-10-03	ISSUED FOR PERMIT

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	CS&P ARCHITECTS INC. 2345 Yonge St., Suite 200 Toronto, ON. M4P 2E5 Phone: 416-482-5002
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mechanical & electrical engineer	R MANCINI AND ASSOCIATES 30 Martha St Suite 203 Bolton, ON L7E 5V1 Phone: 905-951-6292
landscape architect	PMA LANDSCAPE ARCHITECTS LTD. 359 Keele Street Toronto, ON, M6P 2K6 Phone: 416-239-9818
civil engineer	MASONGSONG ASSOCIATES ENGINEERING LTD. 7800 Kennedy Road, S. 201 Markham, ON, L3R 2C7 Phone: 905-944-0162

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SUSAN SPENCER LEWIN
LICENCE 4482

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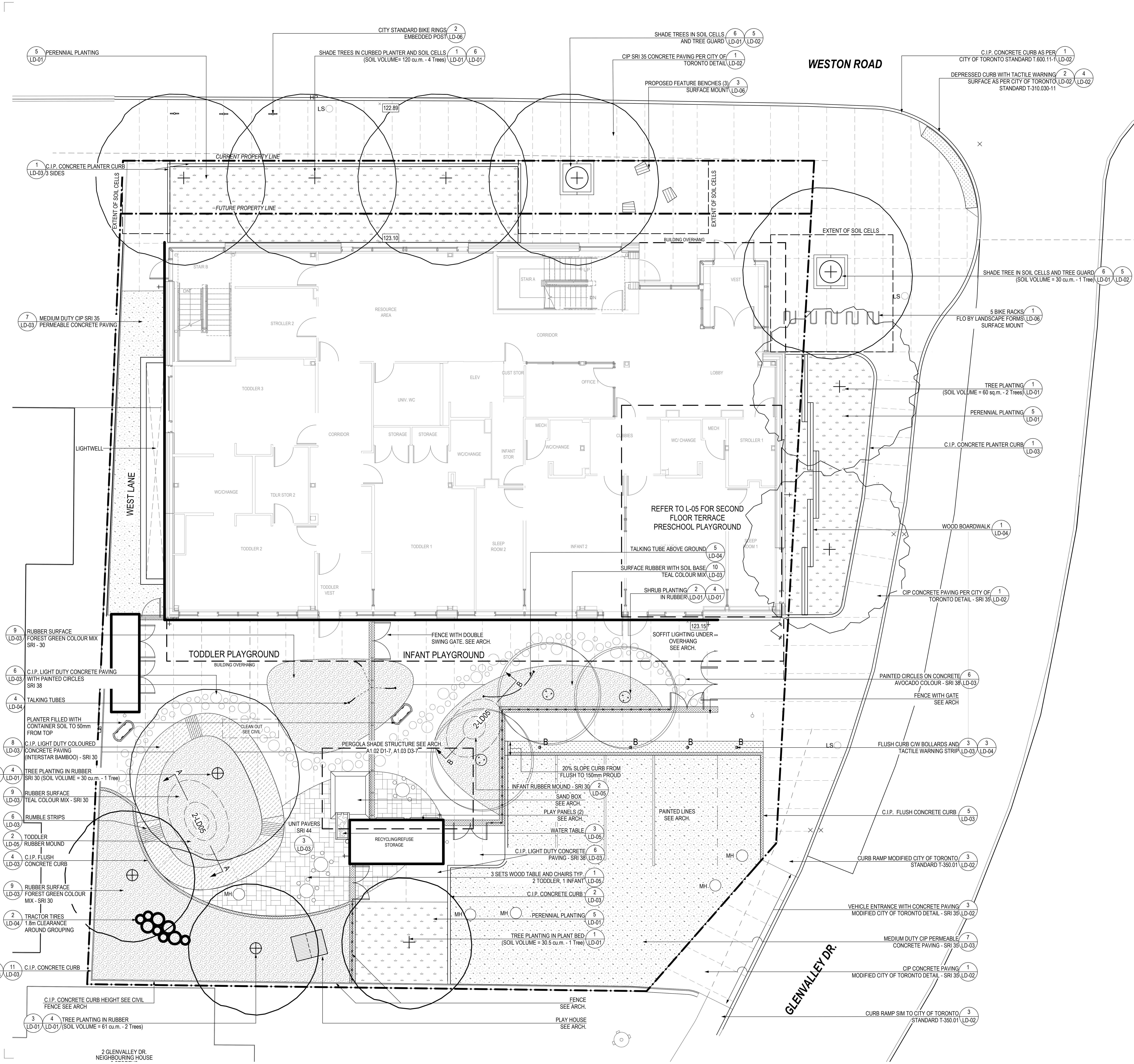
CITY OF TORONTO, MOUNT DENNIS CHILDCARE CENTRE

1234 WESTON ROAD, TORONTO, ON M6M 4P8

SITE ELEMENTS DETAILS - TRELLIS & SANDBOX

scale:	As indicated
date:	07/19/18
drawn:	JK / CS&P
checked by:	SL / CS&P
project number:	17026
drawing number:	A1.03

Revision: 3



NOTES:

- REFER TO CIVIL DRAWINGS FOR ALL PERIMETER CURBS ALONG WESTON RD AND GLENVALLEY DR.

- REFER TO CIVIL DRAWINGS FOR SITE GRADING.

- REFER TO ARCHITECTURE FOR ALL FENCING

- THE RECONSTRUCTED SIDEWALKS ALONG THE WESTON RD. AND GLENVALLEY RD. SITE FRONTAGES WILL BE BUILT TO CITY STANDARDS AND AT NO COST TO THE MUNICIPALITY

-A TACTILE WALKING SURFACE INDICATOR MUST BE INSTALLED AT THE CORNER OF THE WESTON RD. AND GLENVALLEY DRIVE INTERSECTION AS INDICATED, IN ACCORDANCE WITH CITY STANDARD NO.T-310.030-11 AND AT NO COST TO THE MUNICIPALITY

- EXTERIOR LIGHT FIXTURES TO BE SHIELDED TO MEET THE IESNA FULL CUTOFF CLASSIFICATION OR AN UPLIGHT RATING OF 0 AND/OR DARK SKY COMPLIANT. ALSO COMPLY WITH THE ROOFTOP, FACADE AND SHIELDING REQUIREMENTS OF EC 5.2 AND 5.3 OF THE TORONTO GREEN STANDARD

Key to Detail Location

NO. — Detail Number
NO. — Drawing Number

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No	Date	Revision/Issued
1	2018.04.13	ISSUED FOR S.P.A. SUBMISSION
2	2018.05.11	ISSUED FOR DESIGN DEVELOPMENT
3	2018.06.29	ISSUED FOR 50% CD
4	2018.08.10	REISSUED FOR SPA
5	2018.09.11	ISSUED FOR 95% CD
6	2018.10.03	ISSUED FOR PERMIT
7	2018.10.11	REISSUED FOR SPA

LEGEND:

- WALL MOUNT LIGHT
- BOLLARD
- PERMEABLE CONCRETE
- RUBBER SURFACING
- UNILOCK SERIES 'A'
- CIP CONCRETE
- CIP COLOURED CONCRETE
- PLANTING
- CONTROL JOINT
- EXPANSION JOINT
- CIP CURB
- CIP FLUSH CURB
- CITY STANDARD BIKE RACK
- BIKE RACKS
- HOSE BIB- SEE MECHANICAL

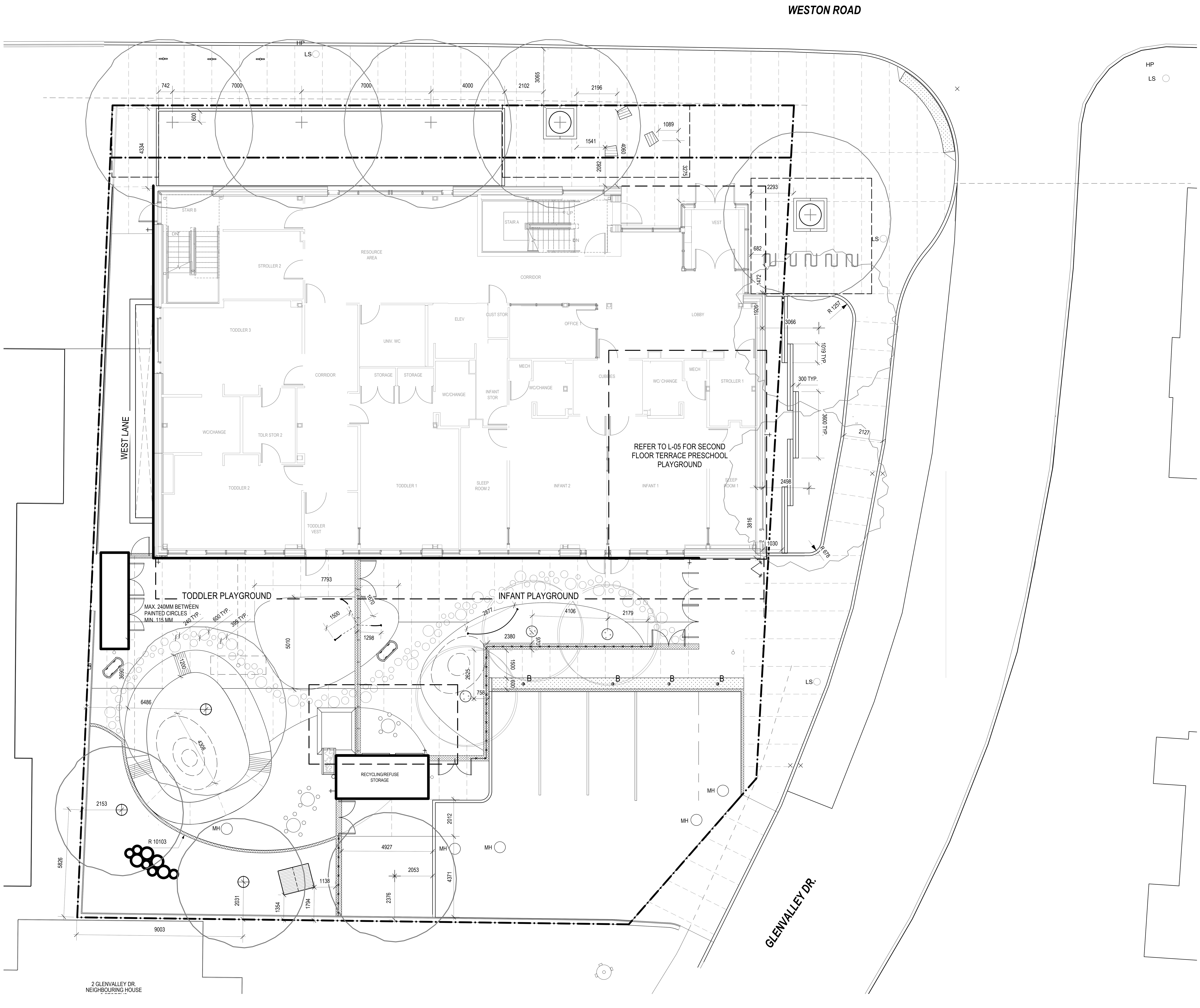
ASSOCIATION OF LANDSCAPE ARCHITECTS FUNG LEE ONTARIO OALA

Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

LANDSCAPE PLAN

scale:	1:100
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	L-01
Revision:	



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6	2018.10.03	ISSUED FOR PERMIT
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LEGEND:

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- BOLLARD
- PERMEABLE CONCRETE
- RUBBER SURFACING
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- CIP CONCRETE
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- CITY STANDARD BIKE RACK
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- HOSE BIB- SEE MECHANICAL

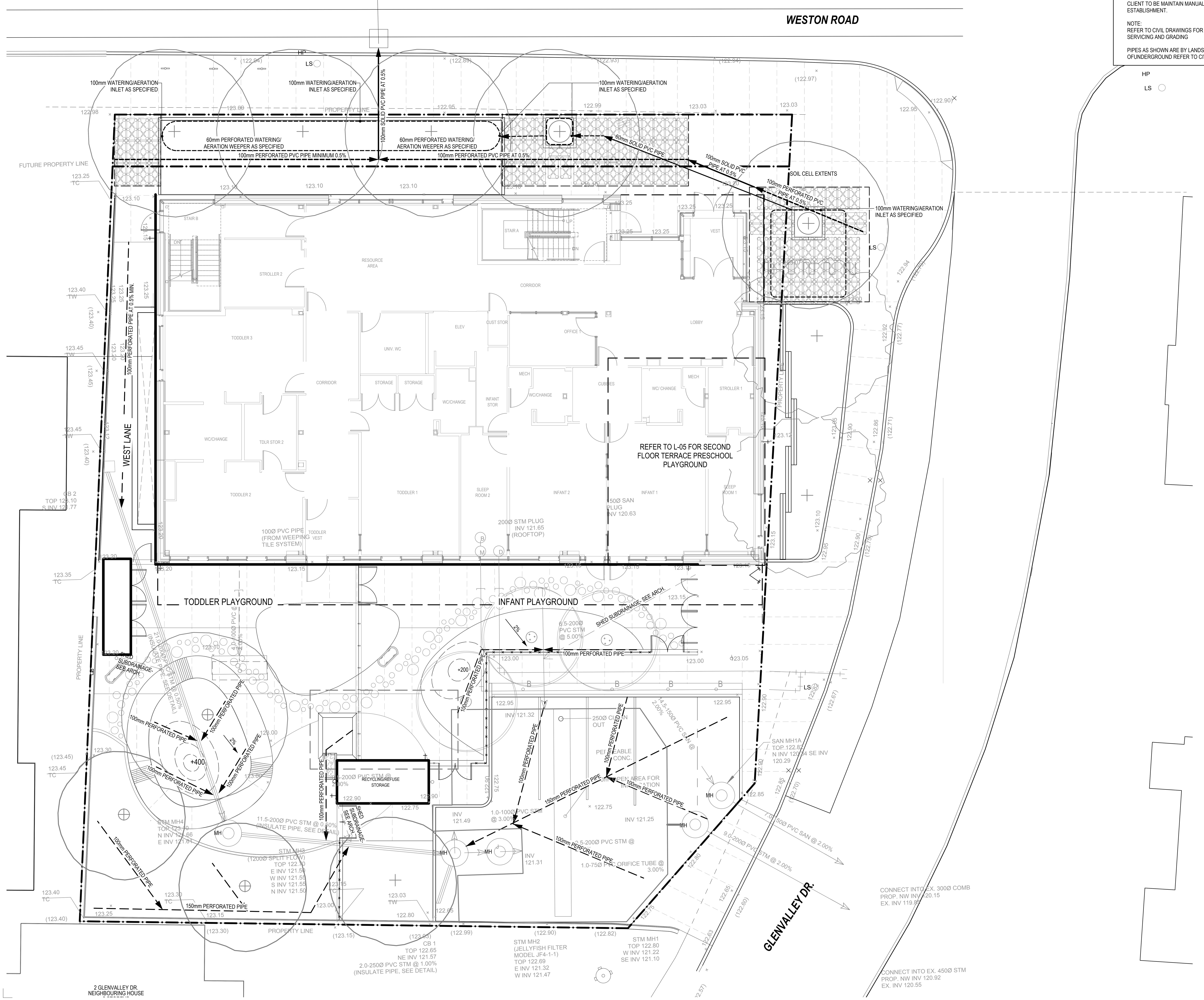
ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS
FUNG LEE
OALA

Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

LAYOUT PLAN

scale:	1:100
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	L-02
Revision:	



IRRIGATION NOTE:
ALL IRRIGATION TO BE DONE MANUALLY BY CONTRATOR FOR DURATION OF ESTABLISHMENT, 2 YEARS.
CLIENT TO BE MAINTAIN MANUAL IRRIGATION AFTER ESTABLISHMENT.

NOTE:
REFER TO CIVIL DRAWINGS FOR UNDERGROUND SERVICING AND GRADING

PIPES AS SHOWN ARE BY LANDSCAPE. FOR BALANCE OFUNDERGROUND REFER TO CIVIL/ ARCHITECTURAL.

Key to Detail Location

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5	2018.09.11	ISSUED FOR 95% CD
6	2018.10.03	ISSUED FOR PERMIT
7	2018.10.11	REISSUED FOR SPA

LEGEND:

- WALL MOUNT LIGHT
- BOLLARD
- PERMEABLE CONCRETE
- RUBBER SURFACING
- UNILOCK SERIES 'A'
- CIP CONCRETE
- CIP COLOURED CONCRETE
- PLANTING
- CONTROL JOINT
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- CIP CURB
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- CITY STANDARD BIKE RACK
- BIKE RACKS
- HOSE BIB- SEE MECHANICAL

ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS
FUNG LEE
OALA
MEMBER

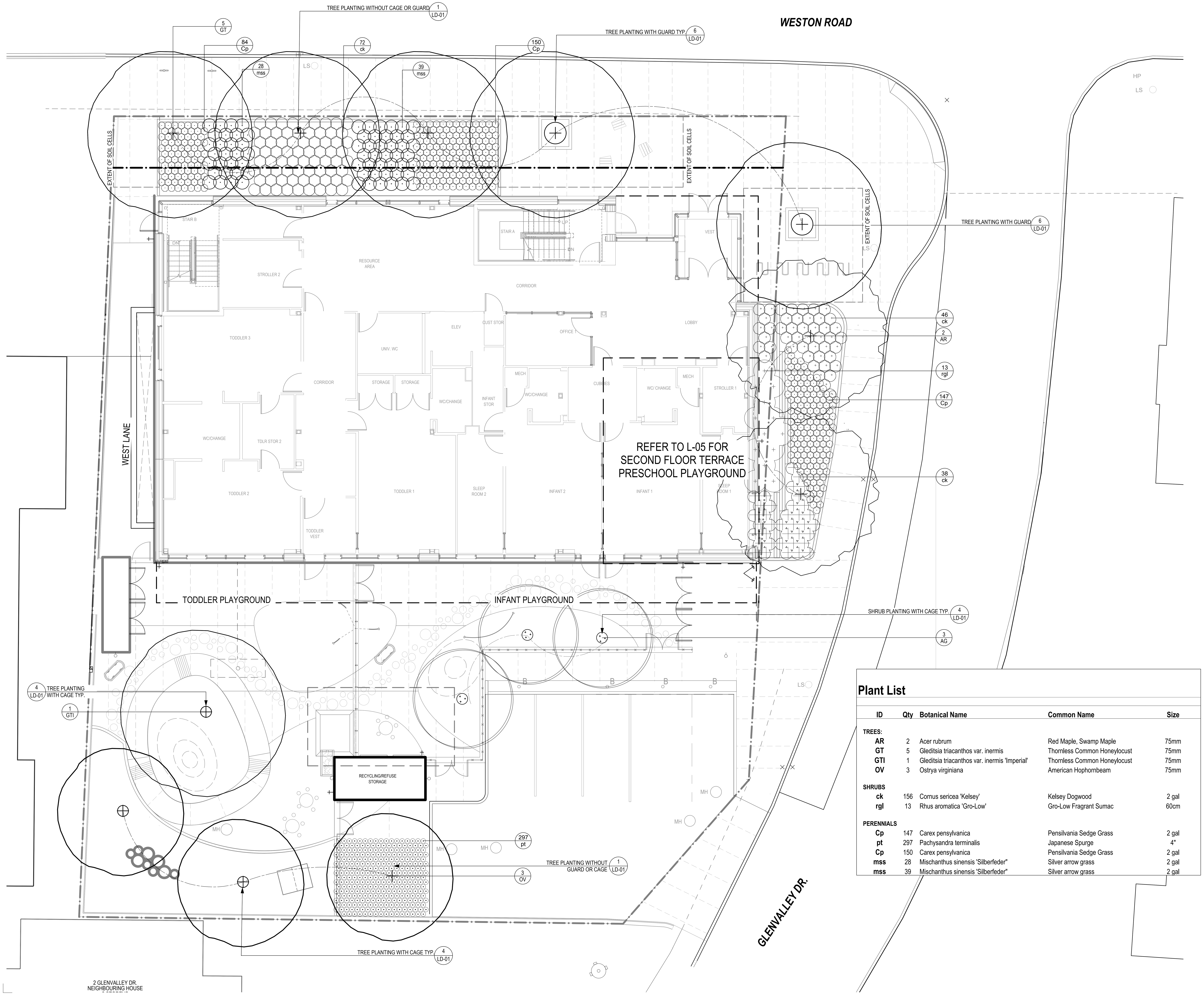
PMA Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

SUBSURFACE PLAN

scale:	1:100
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	L-03

Revision:



Plant List

ID	Qty	Botanical Name	Common Name	Size		
TREES:						
AR	2	Acer rubrum	Red Maple, Swamp Maple	75mm	Native	Drought Tolerant
GT	5	Gleditsia triacanthos var. inermis	Thornless Common Honeylocust	75mm	Native	Drought Tolerant
GTI	1	Gleditsia triacanthos var. inermis 'Imperial'	Thornless Common Honeylocust	75mm	Native	Drought Tolerant
OV	3	Ostrya virginiana	American Hophornbeam	75mm	Native	Drought Tolerant
SHRUBS						
ck	156	Cornus sericea 'Kelsey'	Kelsey Dogwood	2 gal		Drought Tolerant
rgl	13	Rhus aromatica 'Gro-Low'	Gro-Low Fragrant Sumac	60cm	Native	Drought Tolerant
PERENNIALS						
Cp	147	Carex pensylvanica	Pensilvania Sedge Grass	2 gal		Drought Tolerant
pt	297	Pachysandra terminalis	Japanese Spurge	4"		Drought Tolerant
Cp	150	Carex pensylvanica	Pensilvania Sedge Grass	2 gal		Drought Tolerant
mss	28	Mischanthus sinensis 'Silberfeder"	Silver arrow grass	2 gal		Drought Tolerant
mss	39	Mischanthus sinensis 'Silberfeder"	Silver arrow grass	2 gal		Drought Tolerant

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6	2018.10.03	ISSUED FOR PERMIT
7	2018.10.11	REISSUED FOR SPA

LEGEND:

- WALL MOUNT LIGHT
- BOLLARD
- PERMEABLE CONCRETE
- RUBBER SURFACING
- UNILOCK SERIES 'A'
- CIP CONCRETE
- CIP COLOURED CONCRETE
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- HOSE BIB- SEE MECHANICAL

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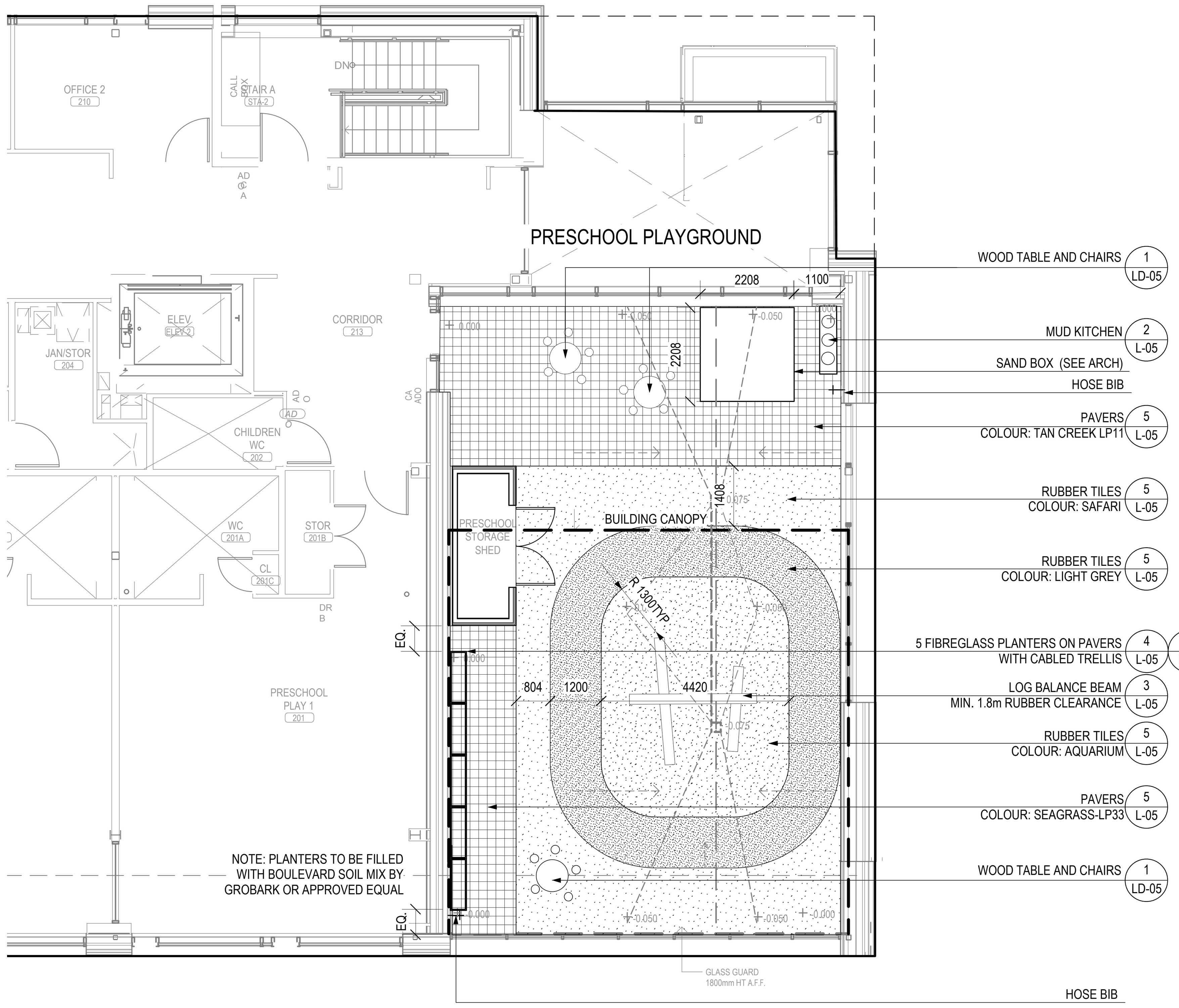
MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

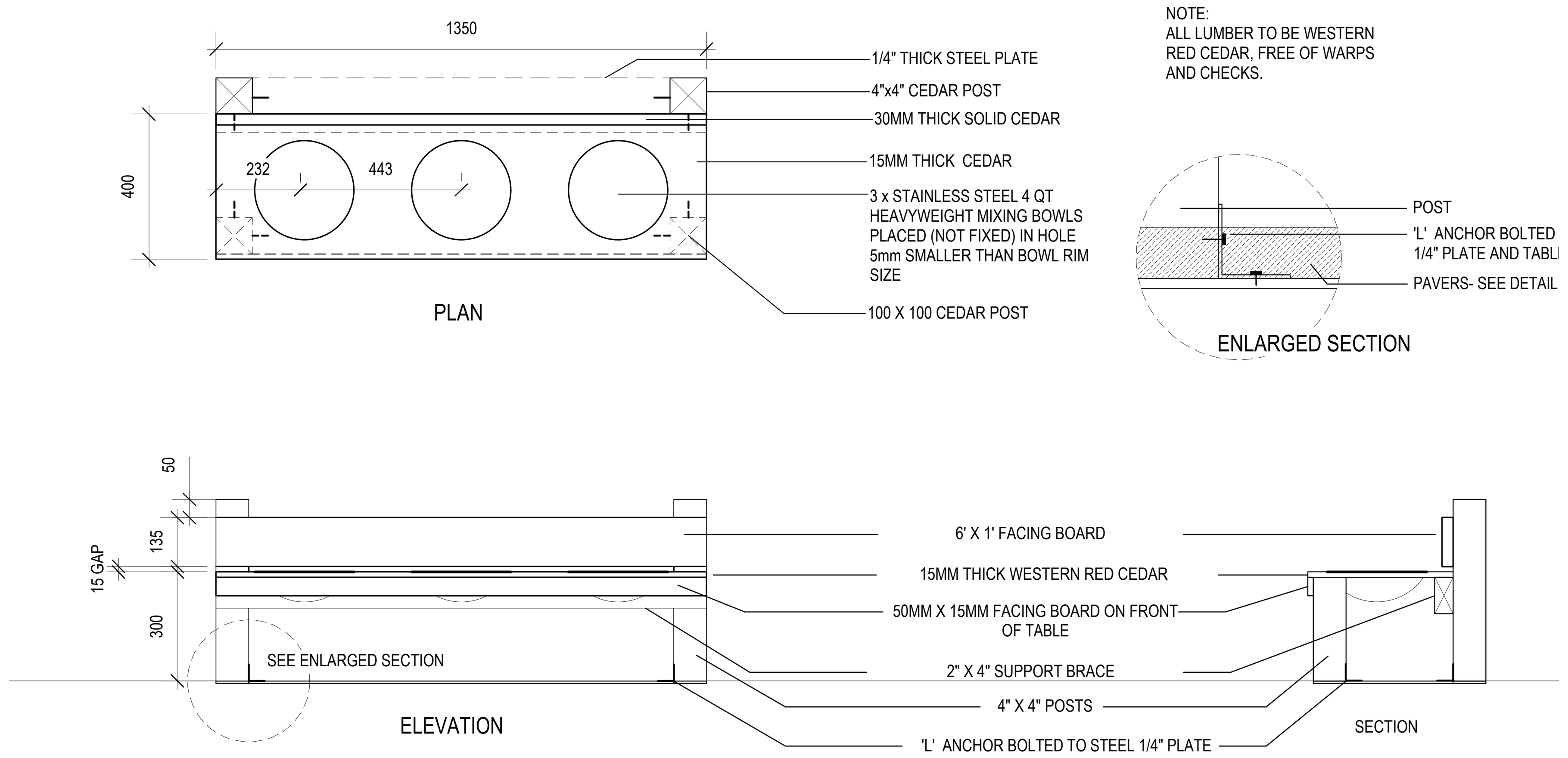
PLANTING PLAN

scale:	1:100
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	L-04

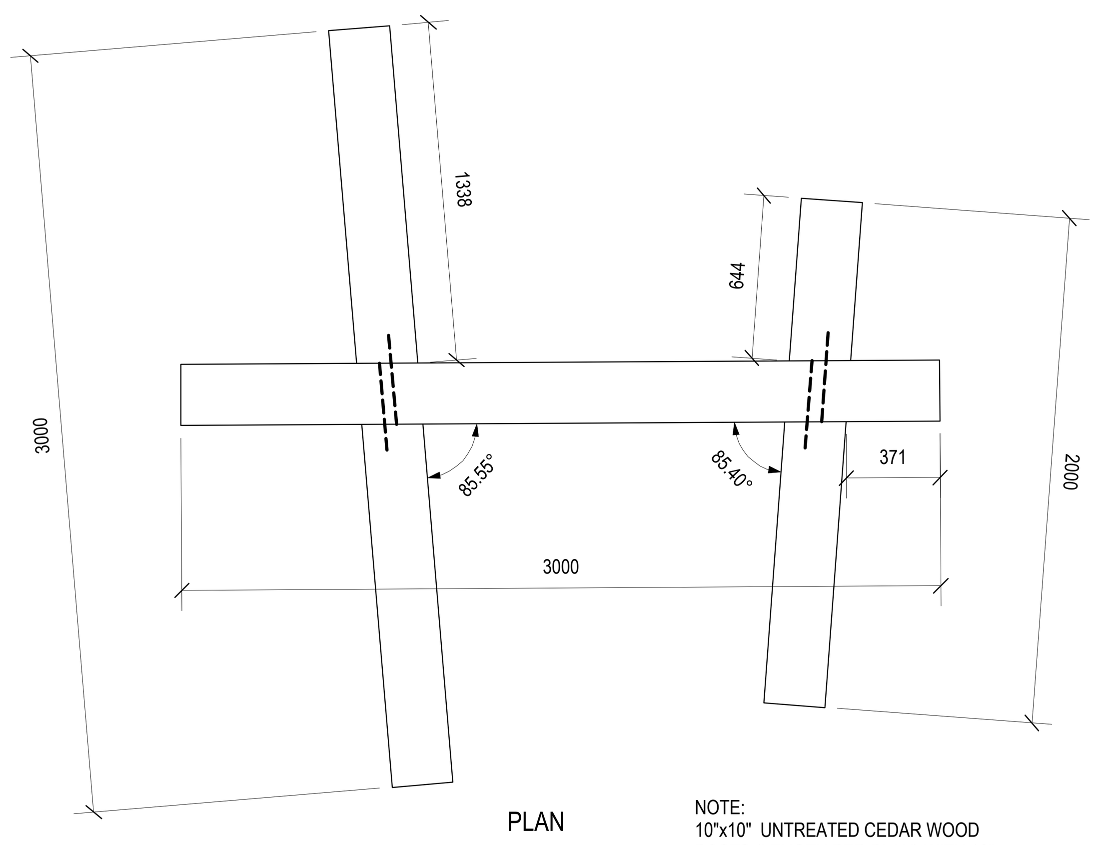
Revision:

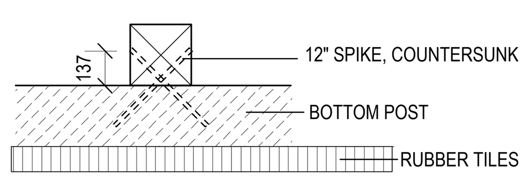


1 L-05 PRESCHOOL SECOND FLOOR PLAYGROUND PLAN
1:100

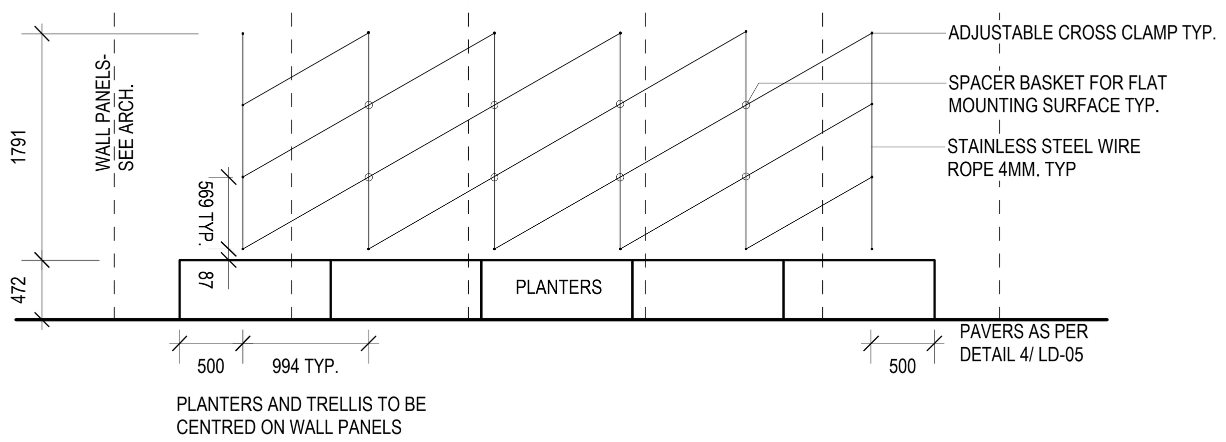


2 L-05 MUD KITCHEN
n.t.s.

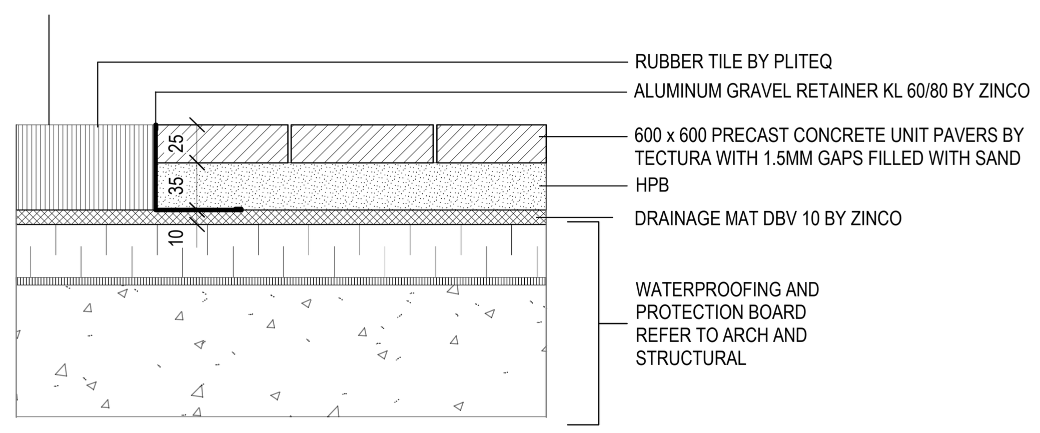




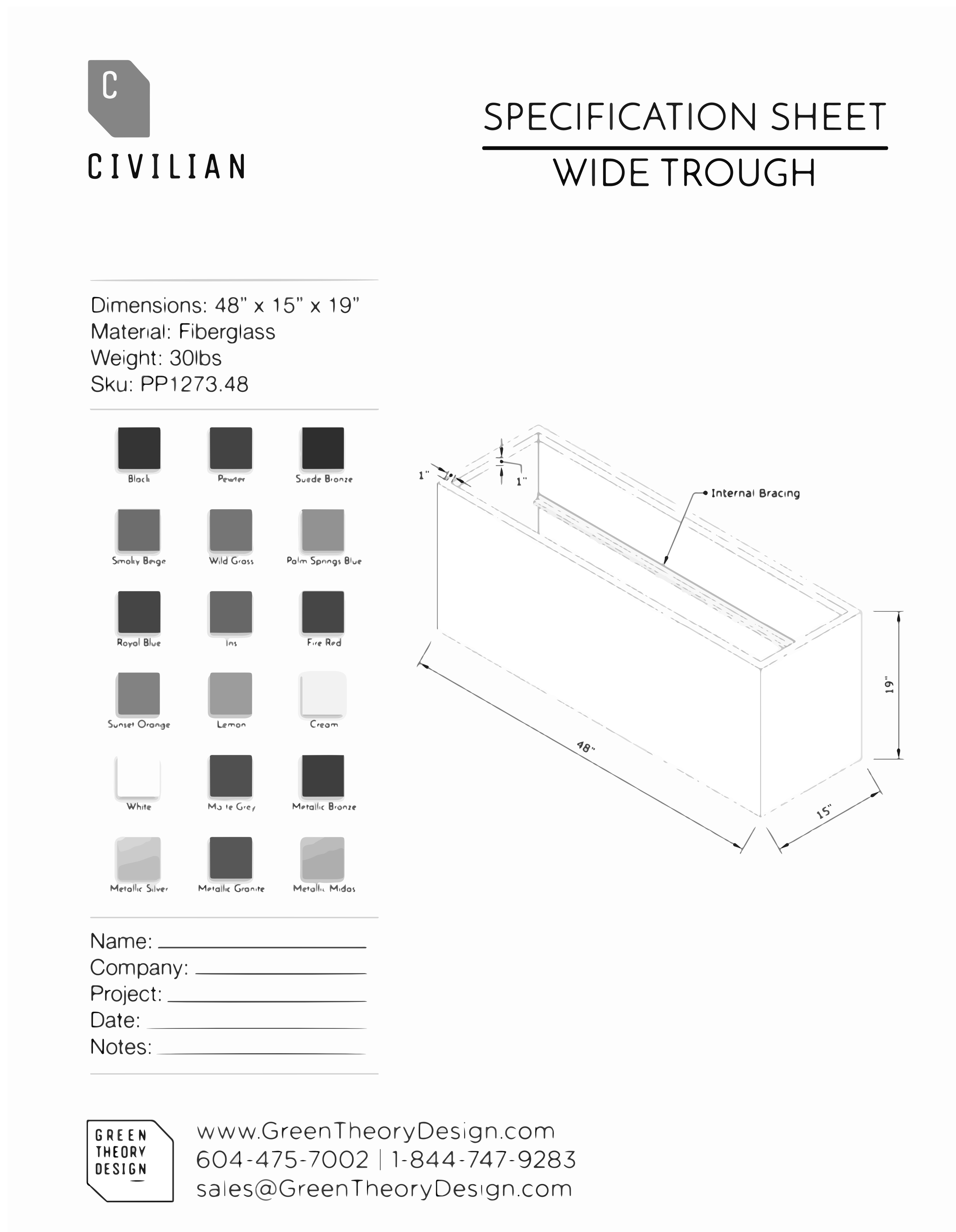
3 L-05 LUMBER BALANCE BEAM
n.t.s.



4 L-05 CABLED TRELLIS
n.t.s.



5 L-05 PAVER AND RUBBER BUILD UP
n.t.s.



6 L-05 PLANTERS
n.t.s.

Key to Detail Location
NO. Detail Number
NO. Drawing Number

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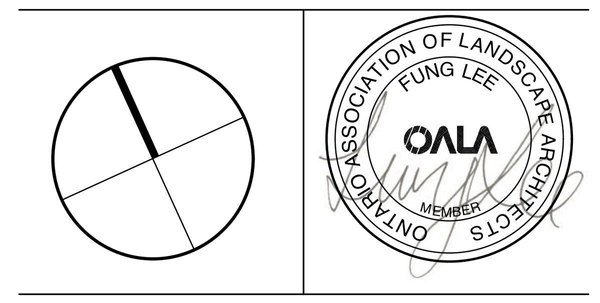
4	2018.08.10	REISSUED FOR SPA
5	2018.09.11	ISSUED FOR 95% CD
6	2018.10.03	ISSUED FOR PERMIT
7	2018.10.11	REISSUED FOR SPA

LEGEND:
PAVERS
RUBBER SURFACING



Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

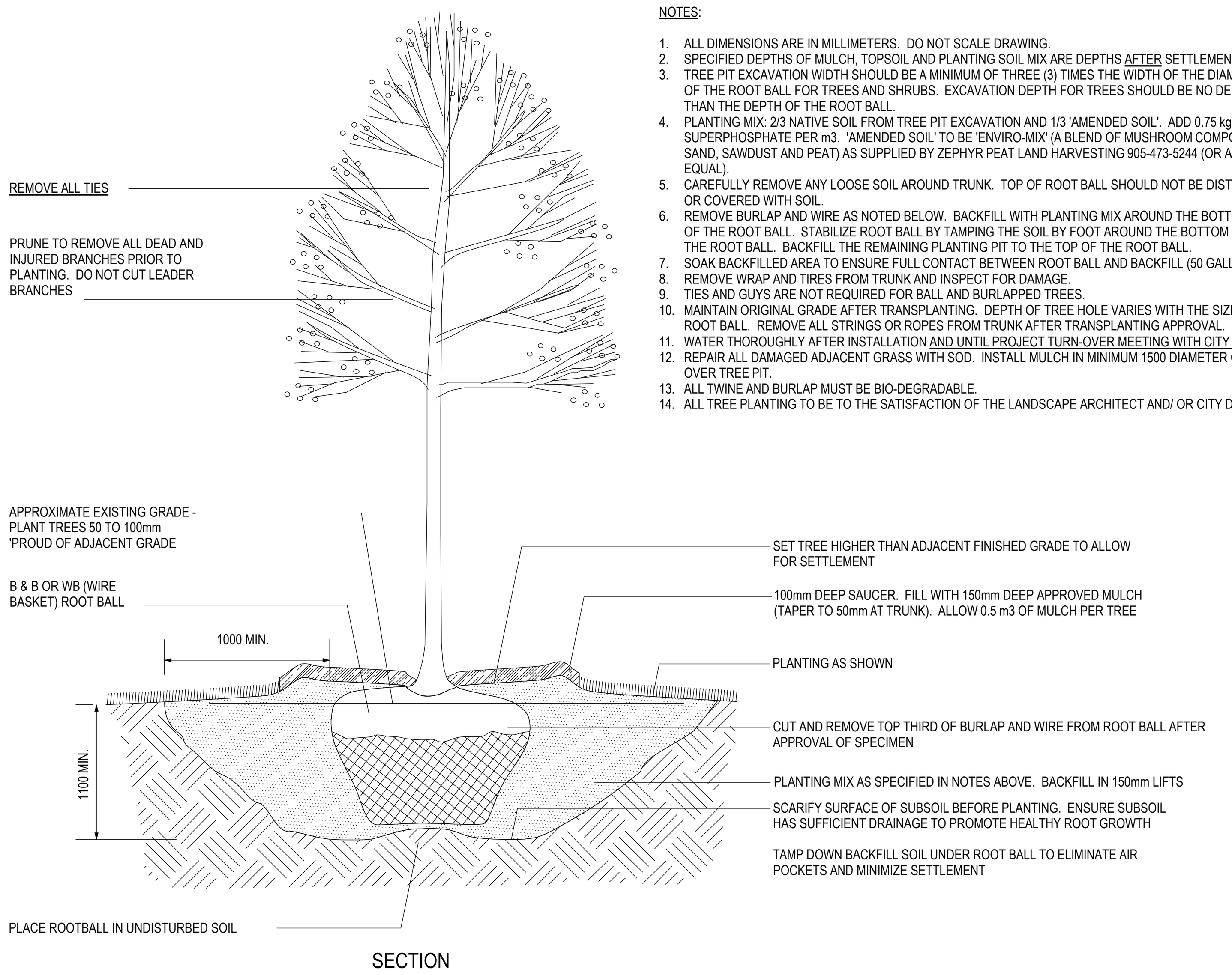
SECOND FLOOR PLAYGROUND

scale:	As indicated
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	L-05

Revision:

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS. DO NOT SCALE DRAWING.
2. SPECIFIED DEPTHS OF MULCH, TOPSOIL AND PLANTING SOIL MIX ARE DEPTHS AFTER SETTLEMENT.
3. TREE PIT EXCAVATION WIDTH SHOULD BE A MINIMUM OF THREE (3) TIMES THE WIDTH OF THE DIAMETER OF THE ROOT BALL FOR TREES AND SHRUBS. EXCAVATION DEPTH FOR TREES SHOULD BE NO DEEPER THAN THE DEPTH OF THE ROOT BALL.
4. PLANTING MIX: 2/3 NATIVE SOIL FROM TREE PIT EXCAVATION AND 1/3 'AMENDED SOIL'. ADD 0.75 kg SUPERPHOSPHATE PER m3. 'AMENDED SOIL' TO BE 'ENVIRO-MIX' (A BLEND OF MUSHROOM COMPOST, SAND, SAWDUST AND PEAT) AS SUPPLIED BY ZEPHYR PEAT LAND HARVESTING 905-473-5244 (OR APPROVED EQUAL).
5. CAREFULLY REMOVE ANY LOOSE SOIL AROUND TRUNK. TOP OF ROOT BALL SHOULD NOT BE DISTURBED OR COVERED WITH SOIL.
6. REMOVE BURLAP AND WIRE AS NOTED BELOW. BACKFILL WITH PLANTING MIX AROUND THE BOTTOM HALF OF THE ROOT BALL. STABILIZE ROOT BALL BY TAMPING THE SOIL BY FOOT AROUND THE BOTTOM HALF OF THE ROOT BALL. BACKFILL THE REMAINING PLANTING PIT TO THE TOP OF THE ROOT BALL.
7. SOAK BACKFILLED AREA TO ENSURE FULL CONTACT BETWEEN ROOT BALL AND BACKFILL (50 GALLONS).
8. REMOVE WRAP AND TIRES FROM TRUNK AND INSPECT FOR DAMAGE.
9. TIES AND GUYS ARE NOT REQUIRED FOR BALL AND BURLAPPED TREES.
10. MAINTAIN ORIGINAL GRADE AFTER TRANSPLANTING. DEPTH OF TREE HOLE VARIES WITH THE SIZE OF THE ROOT BALL. REMOVE ALL STRINGS OR ROPES FROM TRUNK AFTER TRANSPLANTING APPROVAL.
11. WATER THOROUGHLY AFTER INSTALLATION AND UNTIL PROJECT TURN-OVER MEETING WITH CITY STAFF.
12. REPAIR ALL DAMAGED ADJACENT GRASS WITH SOD. INSTALL MULCH IN MINIMUM 1500 DIAMETER CIRCLE OVER TREE PIT.
13. ALL TWINE AND BURLAP MUST BE BIO-DEGRADABLE.
14. ALL TREE PLANTING TO BE TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT AND/ OR CITY DESIGN COOR



SECTION

1 / LD-01 DECIDUOUS TREE PLANTING IN SOFT SURFACE
scale: n.t.s.

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES. DO NOT SCALE DRAWING.
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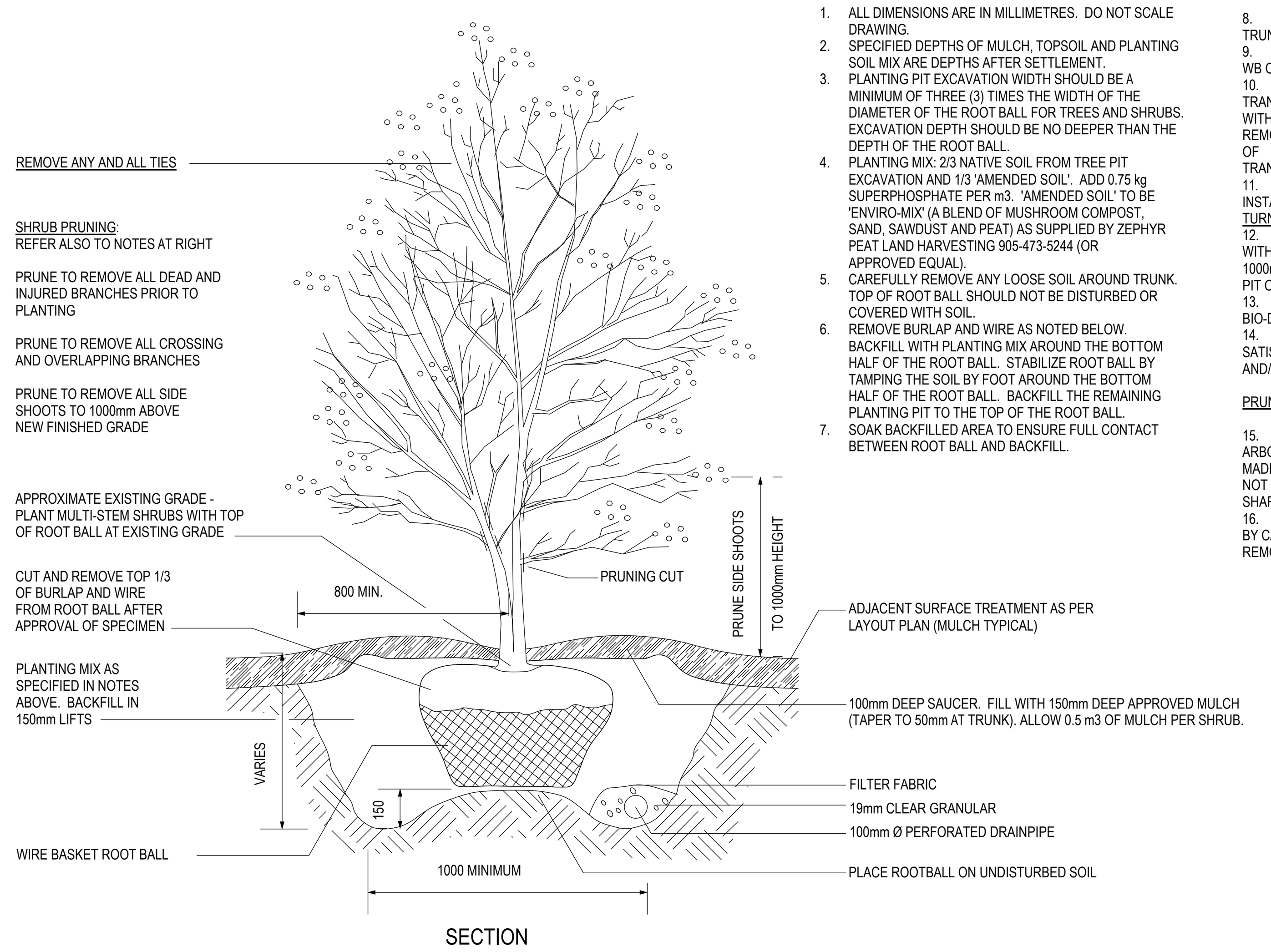
3. PLANTING PIT EXCAVATION WIDTH SHOULD BE A MINIMUM OF THREE (3) TIMES THE WIDTH OF THE DIAMETER OF THE ROOT BALL FOR TREES AND SHRUBS. EXCAVATION DEPTH SHOULD BE NO DEEPER THAN THE DEPTH OF THE ROOT BALL.
4. PLANTING MIX: 2/3 NATIVE SOIL FROM TREE PIT EXCAVATION AND 1/3 'AMENDED SOIL'. ADD 0.75 kg SUPERPHOSPHATE PER m3. 'AMENDED SOIL' TO BE 'ENVIRO-MIX' (A BLEND OF MUSHROOM COMPOST, SAND, SAWDUST AND PEAT) AS SUPPLIED BY ZEPHYR PEAT LAND HARVESTING 905-473-5244 (OR APPROVED EQUAL).
5. CAREFULLY REMOVE ANY LOOSE SOIL AROUND TRUNK. TOP OF ROOT BALL SHOULD NOT BE DISTURBED OR COVERED WITH SOIL.
6. REMOVE BURLAP AND WIRE AS NOTED BELOW. BACKFILL WITH PLANTING MIX AROUND THE BOTTOM HALF OF THE ROOT BALL. STABILIZE ROOT BALL BY TAMPING THE SOIL BY FOOT AROUND THE BOTTOM HALF OF THE ROOT BALL. BACKFILL THE REMAINING PLANTING PIT TO THE TOP OF THE ROOT BALL.
7. SOAK BACKFILLED AREA TO ENSURE FULL CONTACT BETWEEN ROOT BALL AND BACKFILL.
8. REMOVE ANY WRAP AND TIES FROM TRUNKS AND INSPECT FOR DAMAGE.
9. TIES AND GUYS ARE NOT REQUIRED FOR WB OR BALL AND BURLAPPED SHRUBS.
10. MAINTAIN ORIGINAL GRADE AFTER TRANSPLANTING. DEPTH OF HOLE VARIES WITH THE SIZE OF THE ROOT BALL. REMOVE ALL STRINGS OR ROPES FROM TOP OF ROOT BALL AND AROUND TRUNKS AFTER TRANSPLANTING APPROVAL.
11. WATER THOROUGHLY AFTER INSTALLATION AND UNTIL PROJECT TURN-OVER MEETING WITH CITY STAFF.
12. REPAIR ALL DAMAGED ADJACENT GRASS WITH SOD. INSTALL MULCH IN MINIMUM 1000mm DIAMETER CIRCLE OVER PLANTING PIT OR AS SHOWN ON LAYOUT PLAN.
13. ALL TWINE AND BURLAP MUST BE BIO-DEGRADABLE.
14. ALL SHRUB PLANTINGS TO BE TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT AND/ OR CITY DESIGN COORDINATOR.

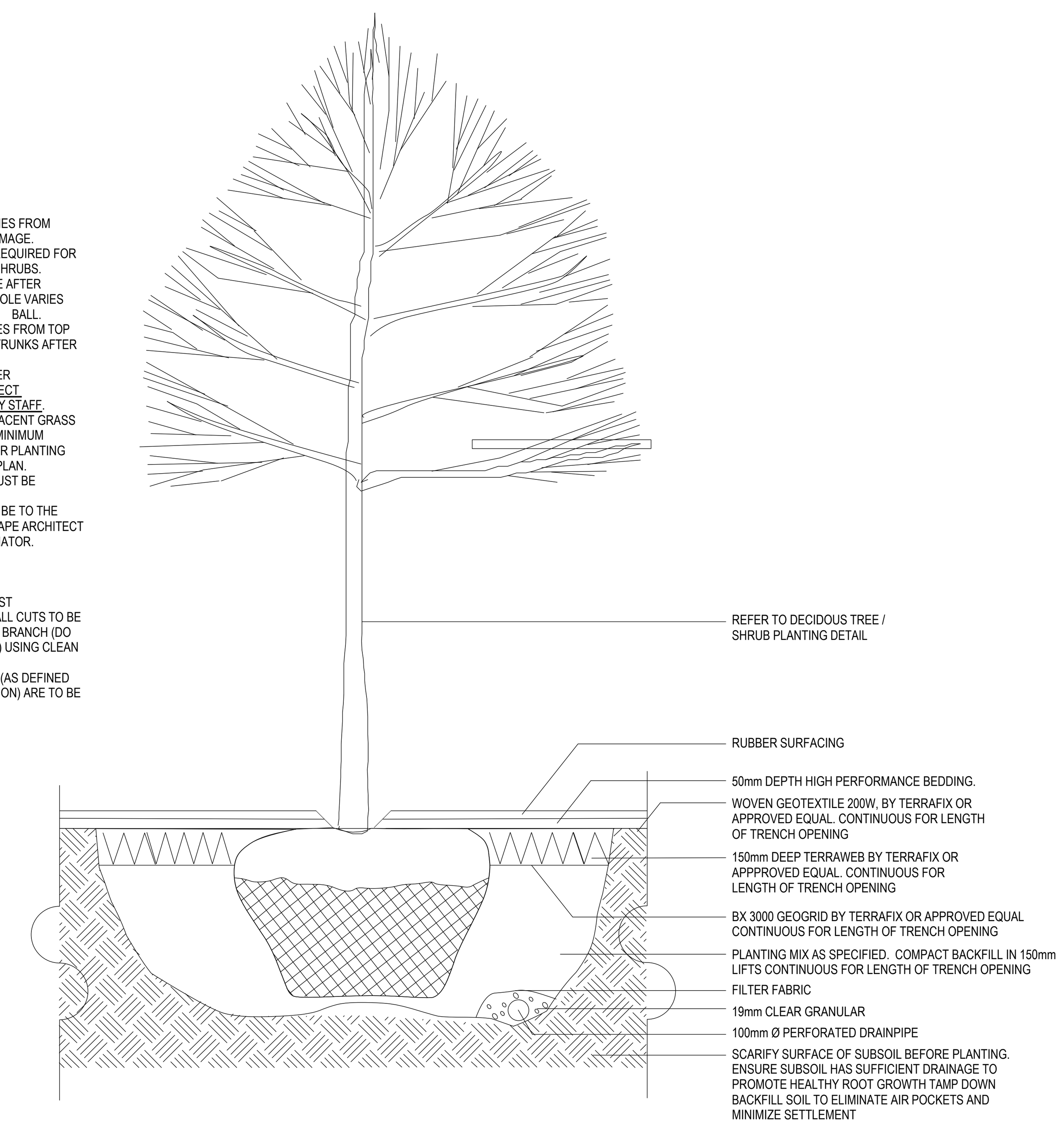
PRUNING:

15. ALL PRUNING TO BE TO BEST ARBORICULTURAL PRACTICE. ALL CUTS TO BE MADE AT NARROWEST PART OF BRANCH (DO NOT DAMAGE BRANCH COLLAR) USING CLEAN SHARP TOOLS.
16. ALL PROTUSION HAZARDS (AS DEFINED BY CAN/ CSA-Z614 LATEST EDITION) ARE TO BE REMOVED.



SECTION

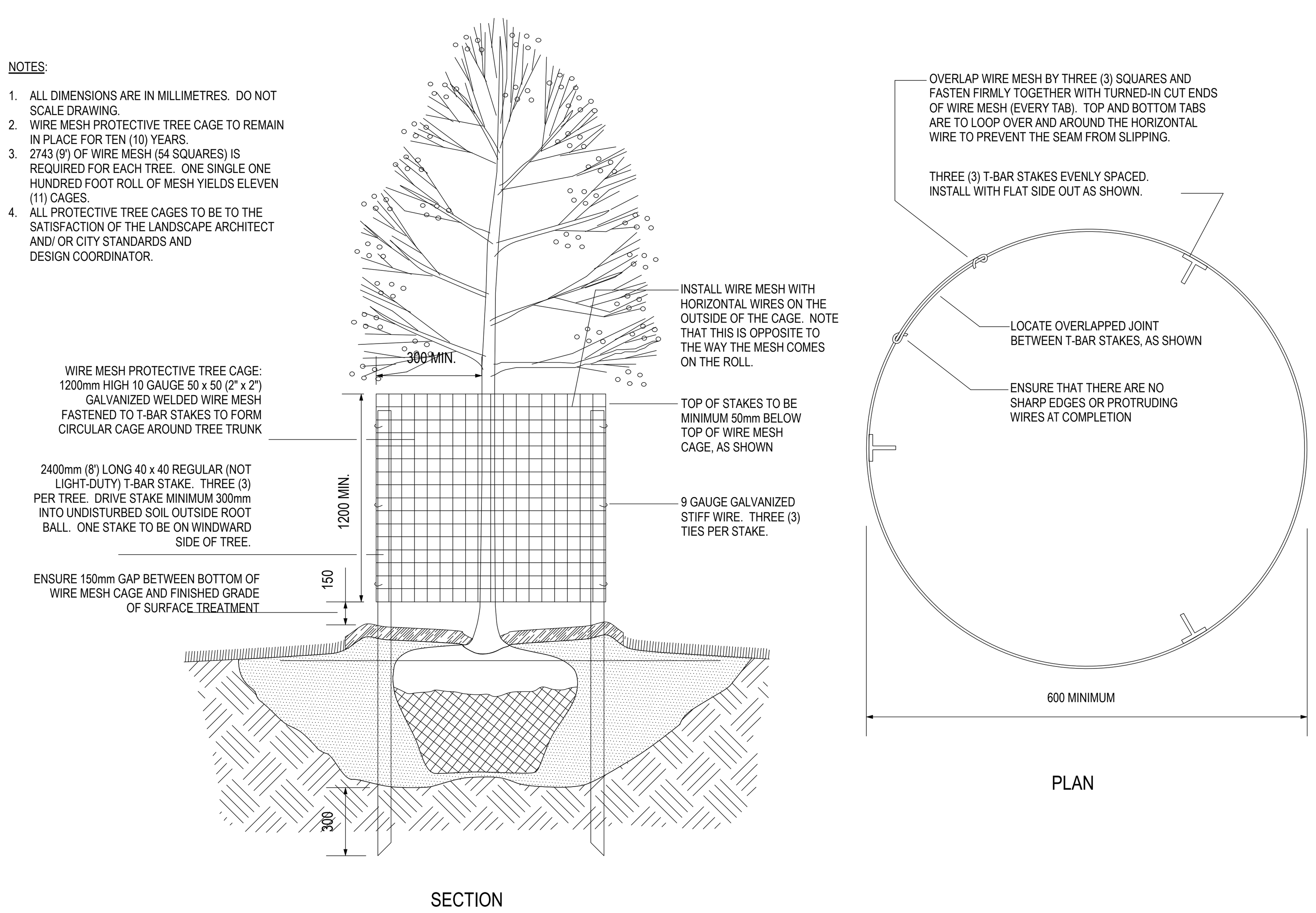
2 / LD-01 SHRUB PLANTING & PRUNING
scale: n.t.s.



3 / LD-01 DECIDUOUS TREE AND SHRUB PLANTING ON RUBBER SURFACE
scale: n.t.s.

NOTES:

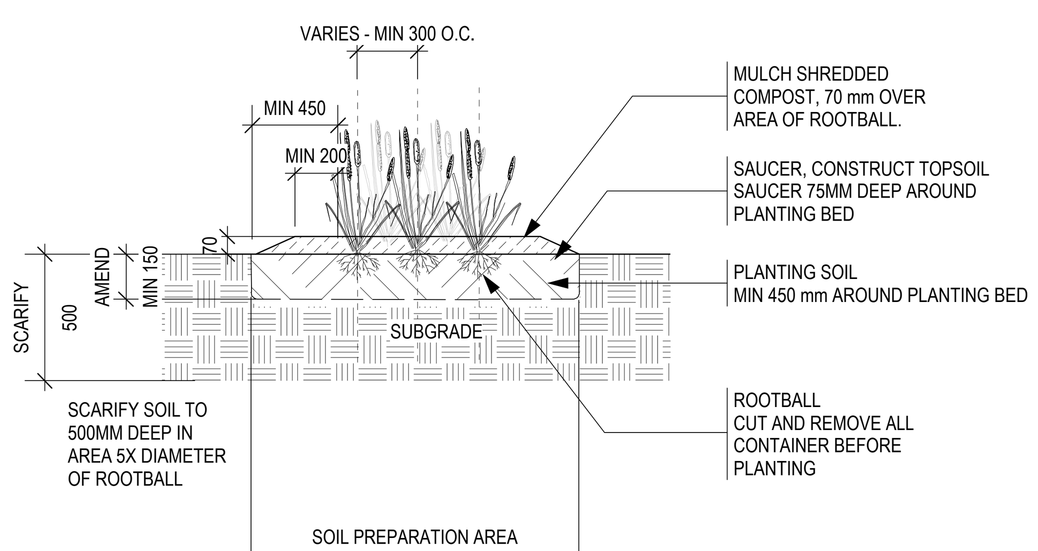
1. ALL DIMENSIONS ARE IN MILLIMETRES. DO NOT SCALE DRAWING.
2. WIRE MESH PROTECTIVE TREE CAGE TO REMAIN IN PLACE FOR TEN (10) YEARS.
3. 2743 (9') OF WIRE MESH (54 SQUARES) IS REQUIRED FOR EACH TREE. ONE SINGLE ONE HUNDRED FOOT ROLL OF MESH YIELDS ELEVEN (11) CAGES.
4. ALL PROTECTIVE TREE CAGES TO BE TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT AND/ OR CITY STANDARDS AND DESIGN COORDINATOR.



4 / LD-01 TREE AND SHRUB PROTECTIVE CAGE
scale: n.t.s.

NOTES:

- AMEND SOIL TO 150MM DEEP WITH ADDITIVES AND MIX THOROUGHLY AND UNIFORMLY OVER ENTIRE PLANTING AREA TAMP AND WATER WHILE BACKFILLING TO ELIMINATE AIR POCKETS.
- PLANT PERENNIALS AND GRASSES IN ZIG-ZAG ORDER UNLESS NOTED OTHERWISE WITH EQUAL GEOMETRIC SPACING (MIN 300 mm) FOR EACH SPECIES



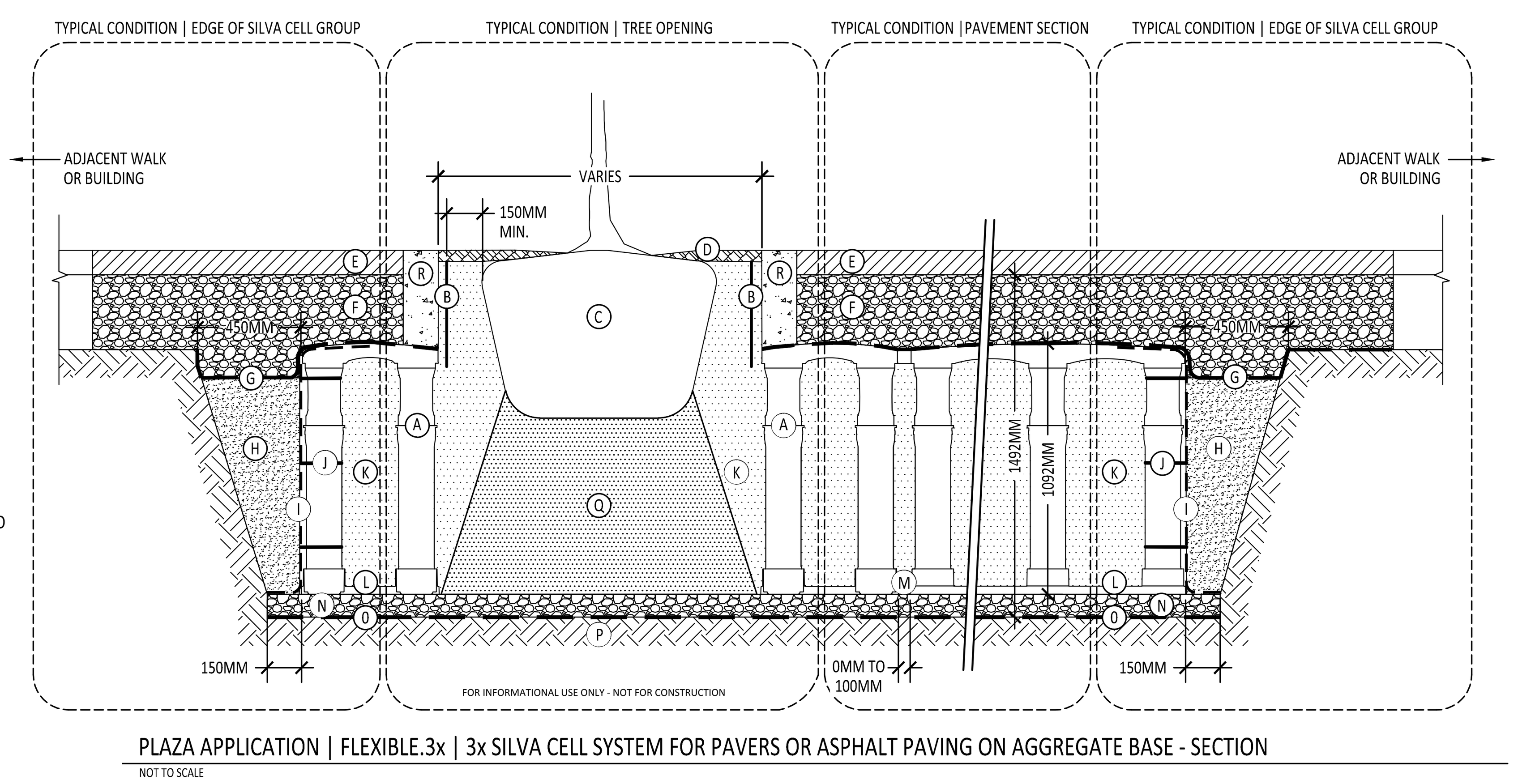
5 / LD-01 PERENNIAL PLANTING DETAIL
scale: n.t.s.

KEY PLAN

- (A) SILVA CELL SYSTEM (DECK, BASE, AND POSTS)
- (B) DEEPROOT UB18-2 ROOT BARRIER. INSTALL DIRECTLY ADJACENT TO CONCRETE EDGE RESTRAINT
- (C) TREE ROOT PACKAGE, SIZE VARIES
- (D) 25-50MM MULCH, PLACED IN TREE OPENING
- (E) PAVERS OR ASPHALT PER PROJECT
- (F) 300MM MIN. AGGREGATE BASE COURSE
- (G) GEOTEXTILE TO EDGE OF EXCAVATION
- (H) BACKFILL, TO WITHIN 100-150MM BELOW TOP OF SILVA CELL DECKS. INSTALL IN 200MM LIFTS, EACH COMPACTED TO 95% PROCTOR.
- (I) GEOGRID TO LINE PERIMETER OF SYSTEM WITH 150MM TOE (OUTWARD FROM BASE) AND 300MM EXCESS (OVER TOP OF DECK)
- (J) 5MMx350MM ZIP TIES, SECURING GEOGRID TO SILVA CELLS
- (K) PLANTING SOIL. INSTALL IN 300MM LIFTS, EACH COMPACTED TO 70-80% PROCTOR
- (L) SILVA CELL BASE SLOPE, 5% MAX
- (M) 0-100MM SPACING BETWEEN SILVA CELLS AT BASE
- (N) 100MM MIN. AGGREGATE SUB BASE, COMPACTED TO 95% PROCTOR.
- (O) GEOTEXTILE FABRIC, PLACED BELOW AGGREGATE SUB BASE
- (P) SUBGRADE, COMPACTED TO 95% PROCTOR
- (Q) PLANTING SOIL BELOW TREE ROOT PACKAGE, COMPACTED TO 85-90% PROCTOR
- (R) CONCRETE EDGE RESTRAINT BETWEEN AGGREGATE BASE COURSE AND TREE OPENING

NOTES

1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS
2. DO NOT SCALE DRAWINGS
3. PROVIDE SUPPLEMENTAL IRRIGATION FOR SEASONAL DROUGHT SUPPORT OF TREES & SOIL



PLAZA APPLICATION | FLEXIBLE.3x | 3x SILVA CELL SYSTEM FOR PAVERS OR ASPHALT PAVING ON AGGREGATE BASE - SECTION
NOT TO SCALE

6 / LD-01 PLAZA SOIL CELL DETAIL
scale: n.t.s.

Key to Detail Location

NO. / NO. — Detail Number / Drawing Number

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5	2018.09.11	ISSUED FOR 95% CD
6	2018.10.03	ISSUED FOR PERMIT
7	2018.10.11	REISSUED FOR SPA

ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS
FUNG LEE
OALA
MEMBER

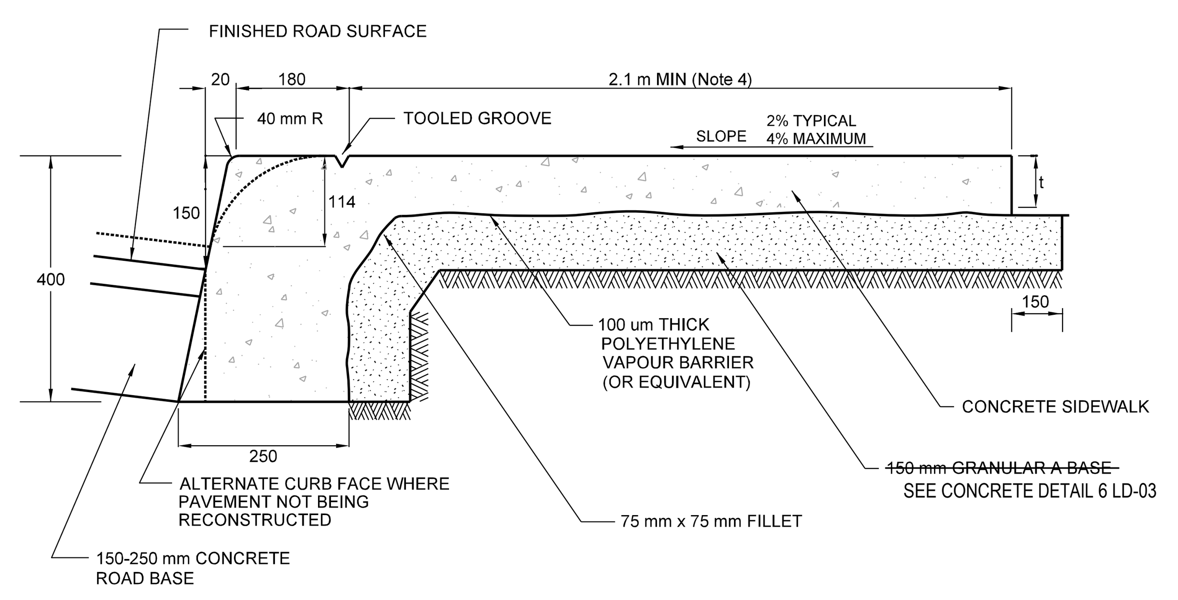
Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

LANDSCAPE DETAILS

scale:	As indicated
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	LD-01

Revision:

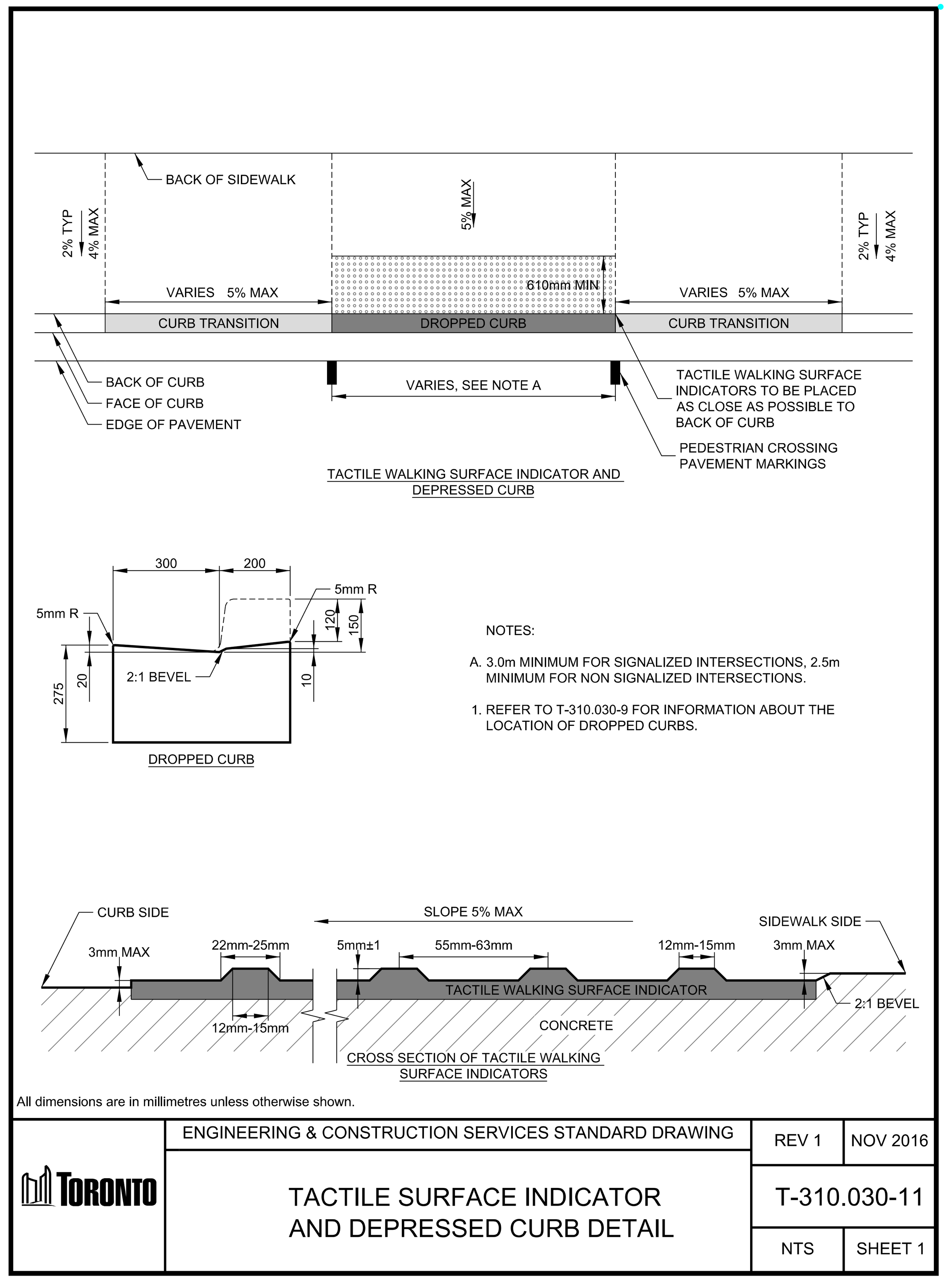


NOTES:

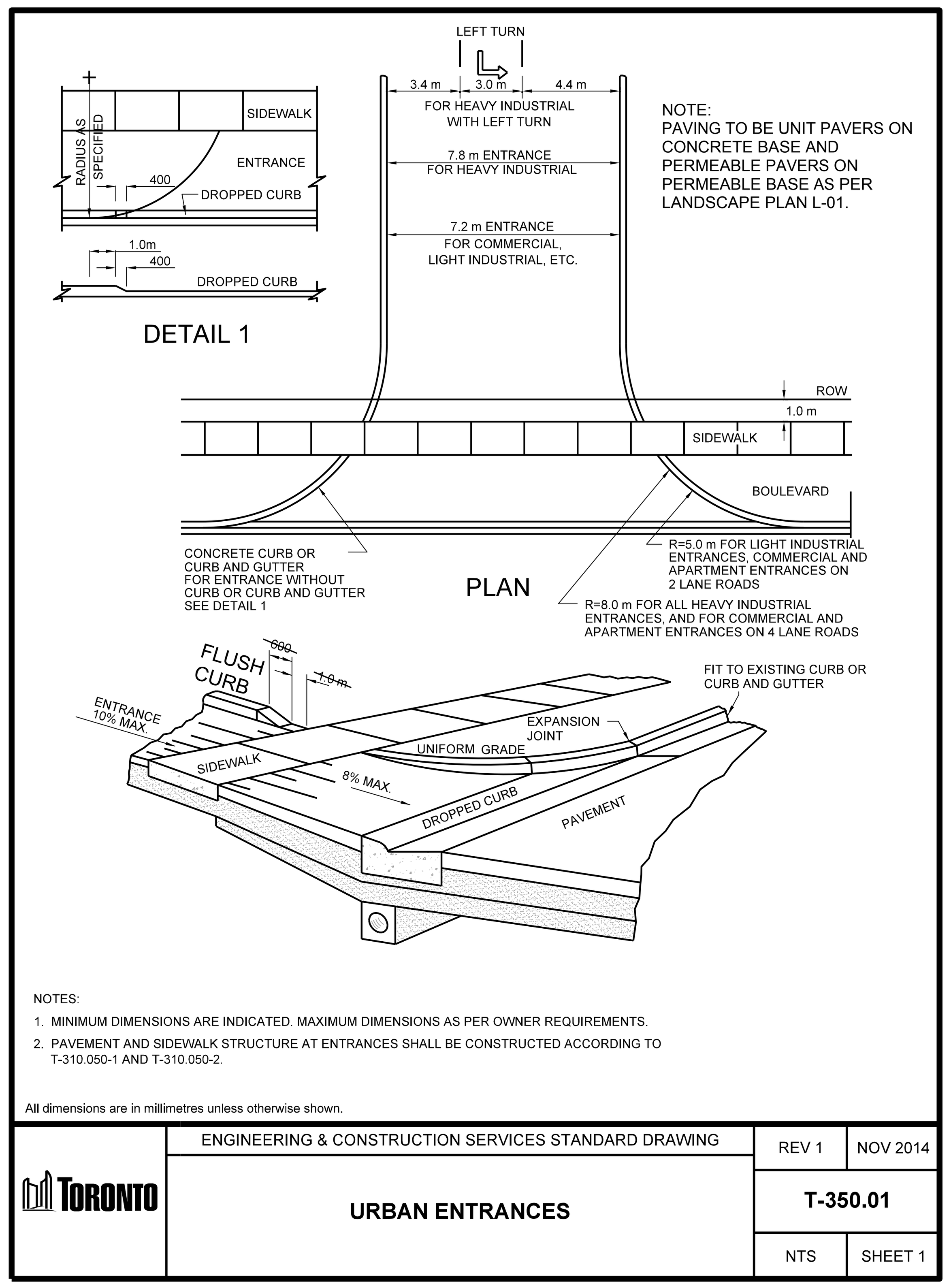
1. t = THICKNESS OF SIDEWALK.
2. SIDEWALK THICKNESS 150 mm EXCEPT ACROSS COMMERCIAL, INDUSTRIAL AND HIGH DENSITY RESIDENTIAL DRIVEWAY WHERE IT SHALL BE 180 mm.
3. JOINTS SHALL BE ACCORDING TO T-310.010-1.
4. ON LOCAL ROADS, THE MINIMUM SIDEWALK WIDTH CAN BE REDUCED TO 1.8M EXCEPT FOR NEW DEVELOPMENTS, WHICH MUST ADHERE TO THE TORONTO GREEN STANDARDS AND DIPS.

All dimensions are in millimetres unless otherwise shown.

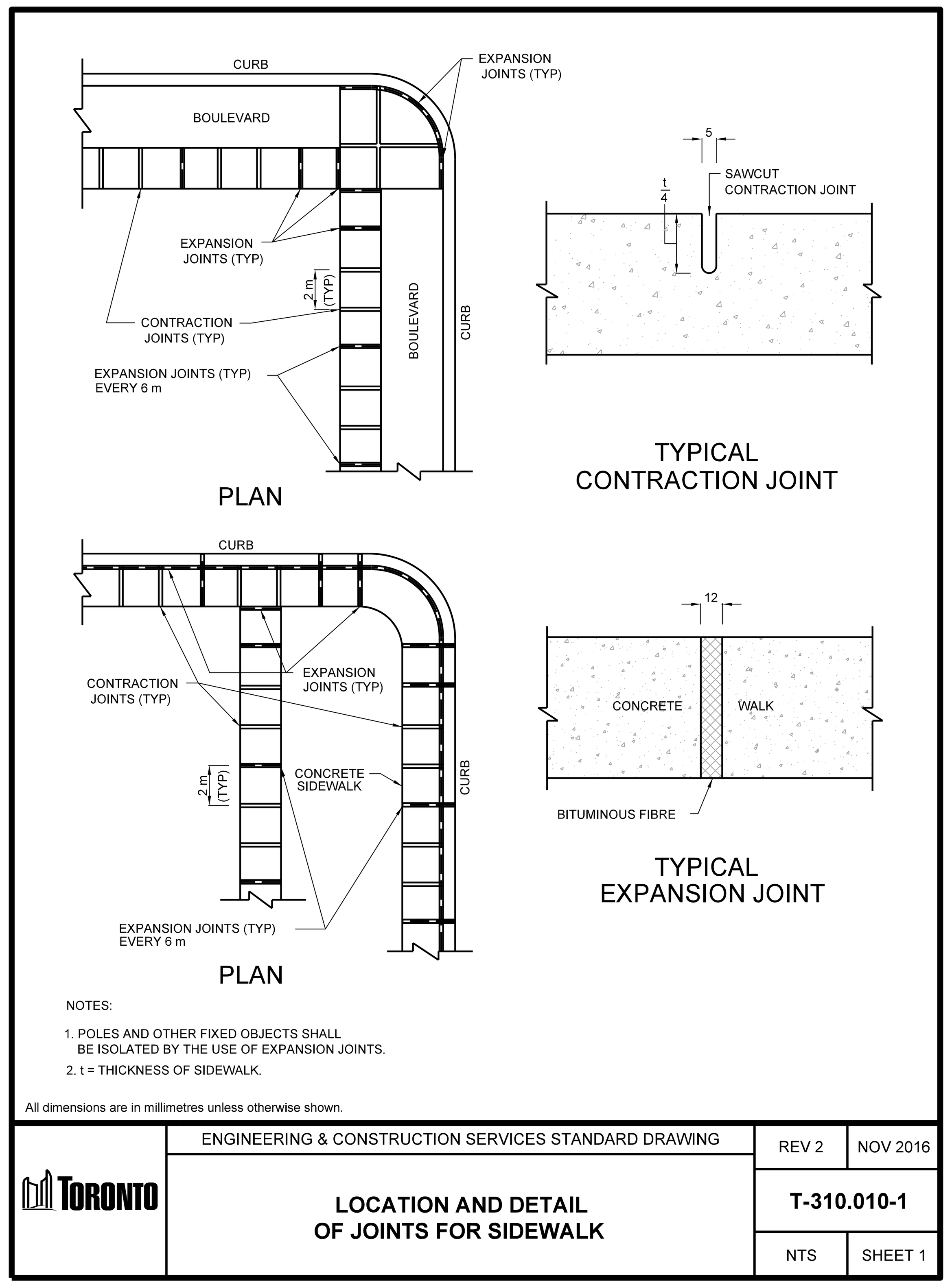
1 / LD-02 COMBINED CONCRETE SIDEWALK AND CURB- MODIFIED CITY OF TORONTO DETAIL T-310.010-4
scale: n.t.s.



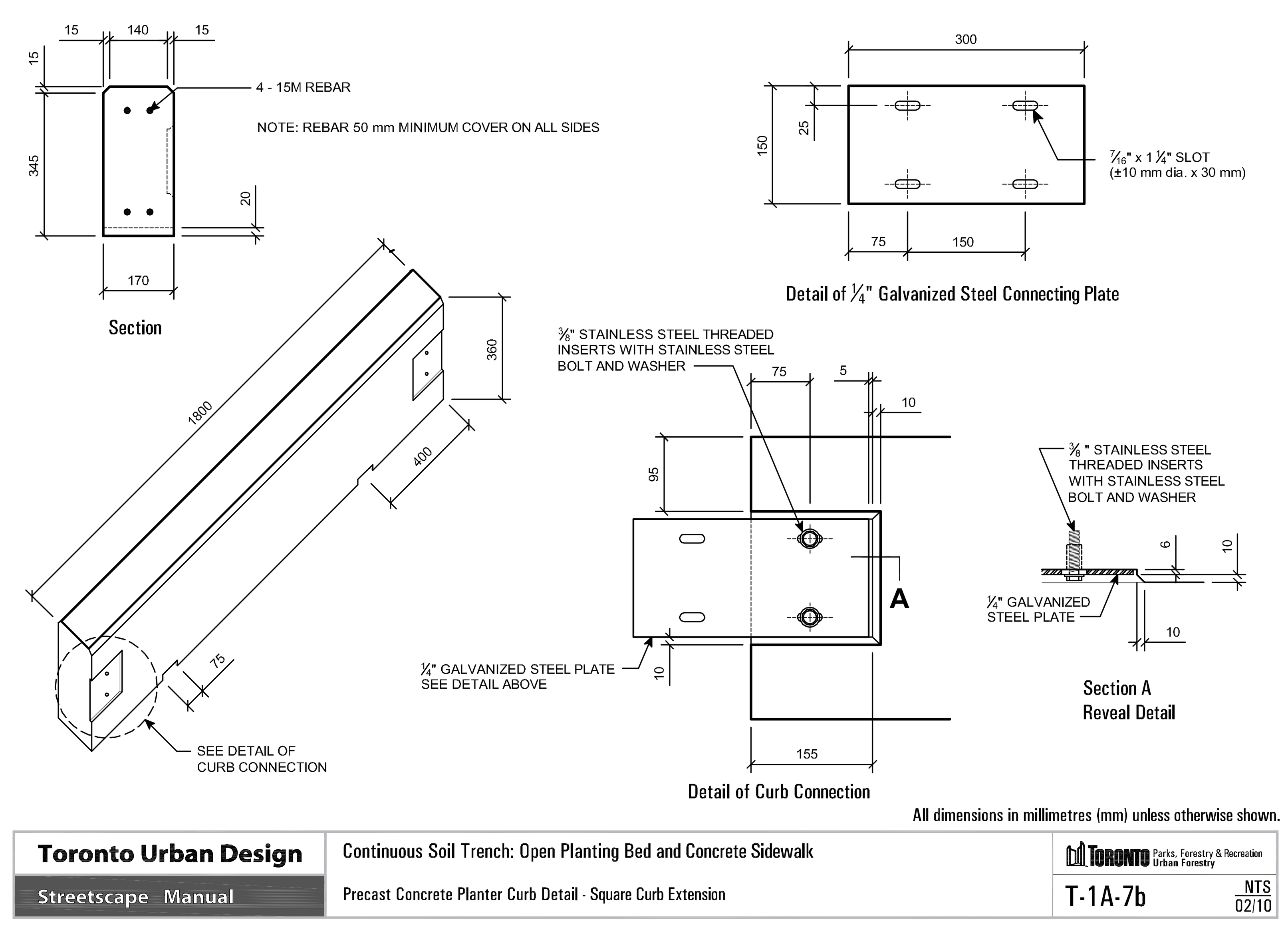
2 / LD-02 TACTILE SURFACE INDICATOR AND DEPRESSED CURB DETAIL
scale: n.t.s.



3 / LD-02 DRIVEWAY CROSSING
scale: n.t.s.



4 / LD-02 JOINTS FOR SIDEWALK DETAIL
scale: n.t.s.



5 / LD-02 STREET TREE CURB (NOT PLANTER)
scale: n.t.s.

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ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS — FUNG LEE — OALA — MEMBER

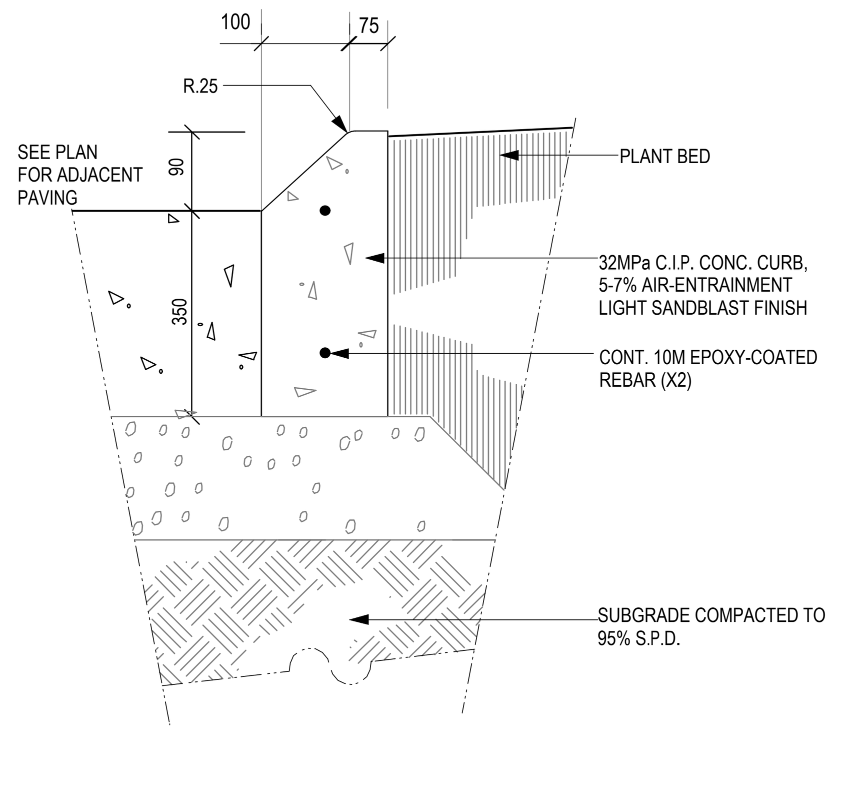
PMA Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

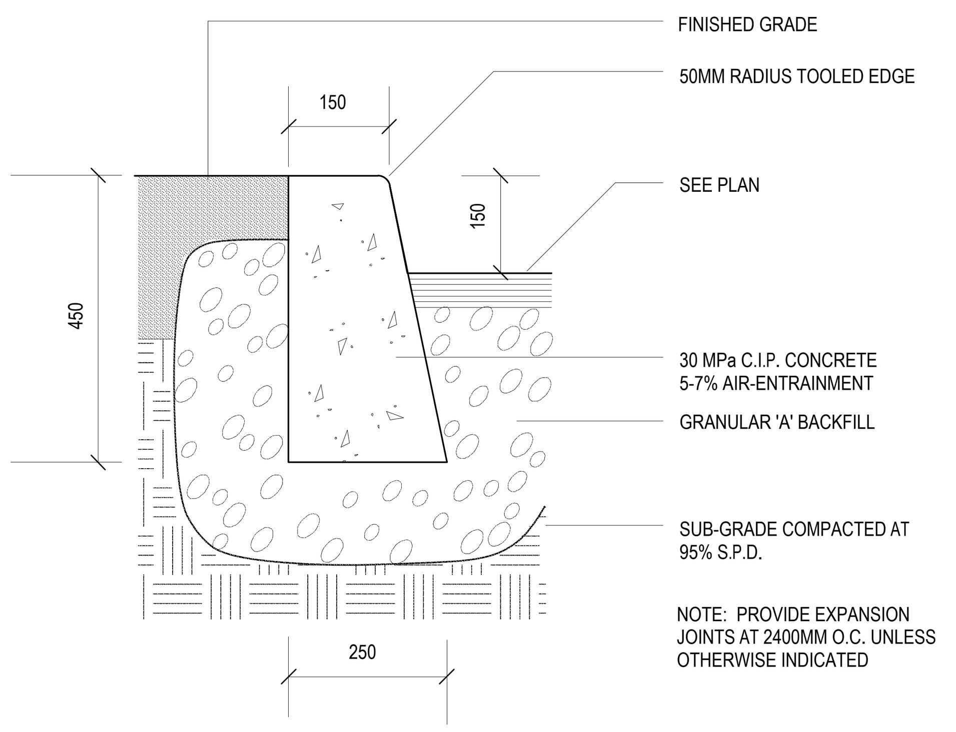
LANDSCAPE DETAILS

scale:	As indicated
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	LD-02

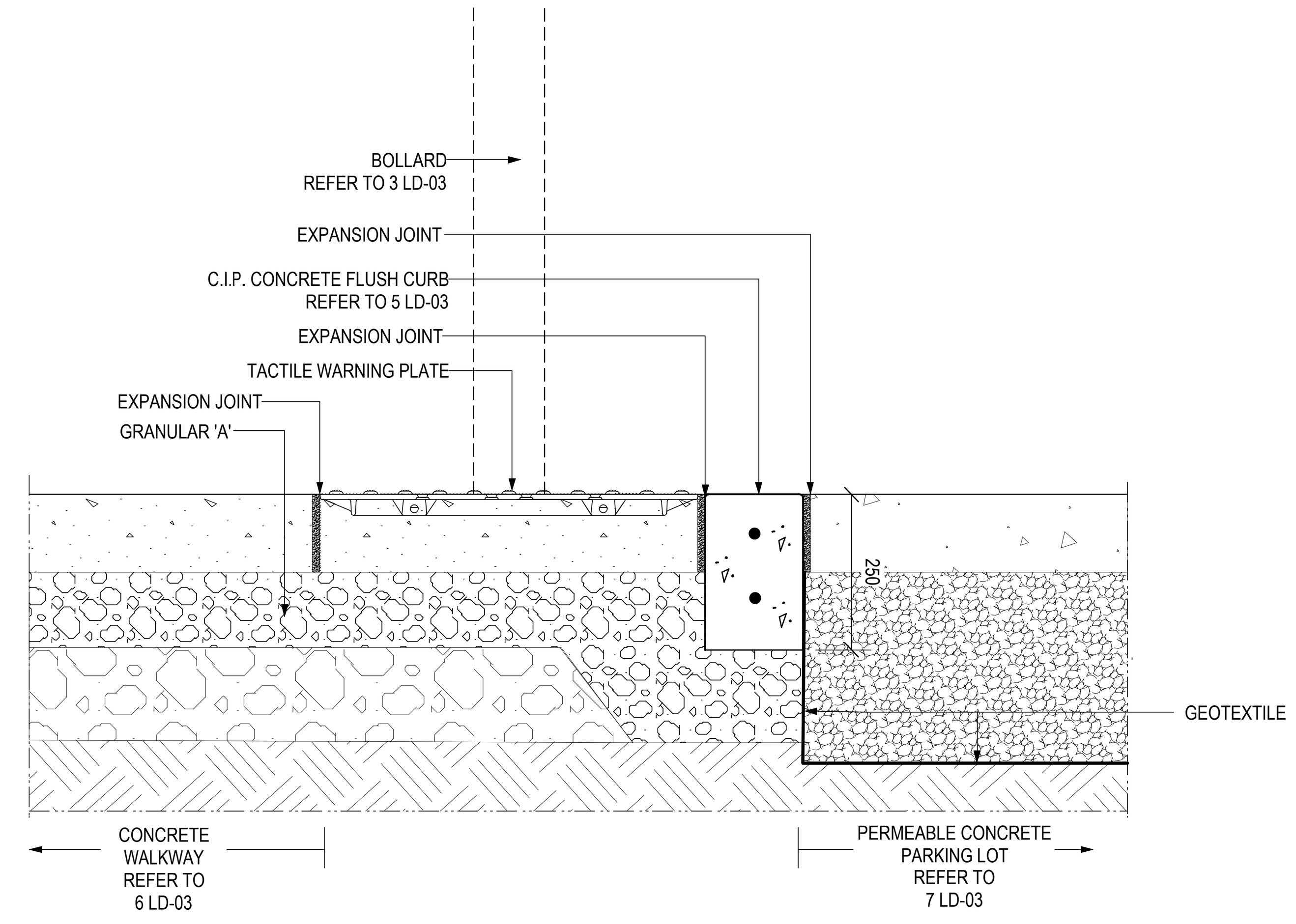
Revision:



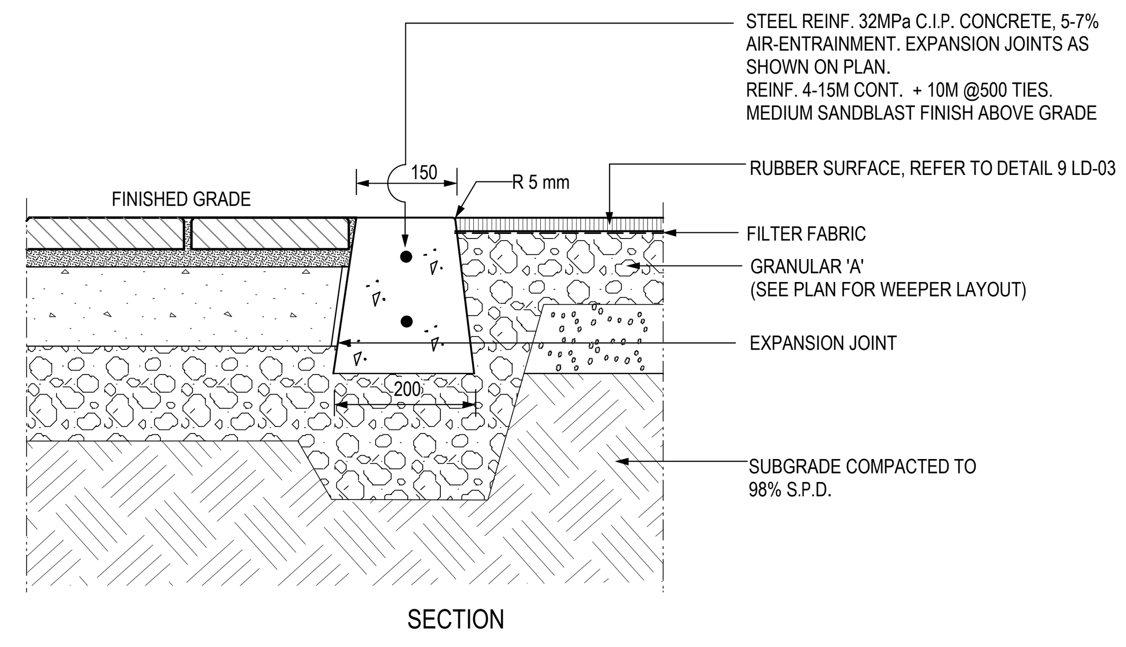
1 LD-03 C.I.P. CONCRETE PLANTER CURB DETAIL
scale: n.t.s.



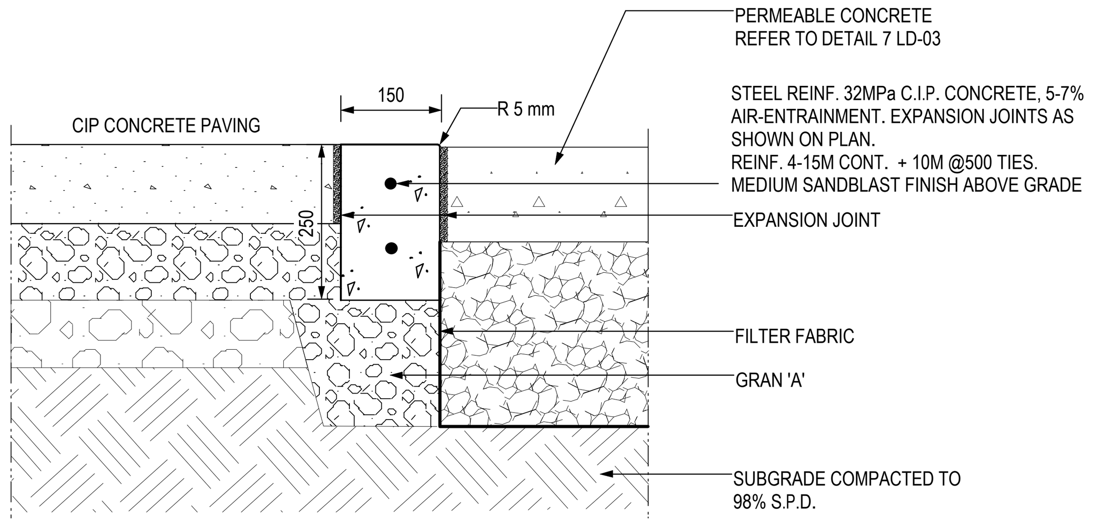
2 LD-03 C.I.P. CONCRETE CURB
n.t.s



3 LD-03 FLUSH CURB AND TACTILE WARNING STRIP
scale: 1:10



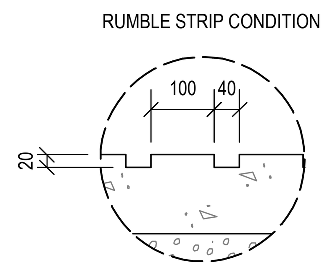
4 LD-03 UNIT PAVER TO RUBBER SURFACE WITH FLUSH CURB
scale 1:10

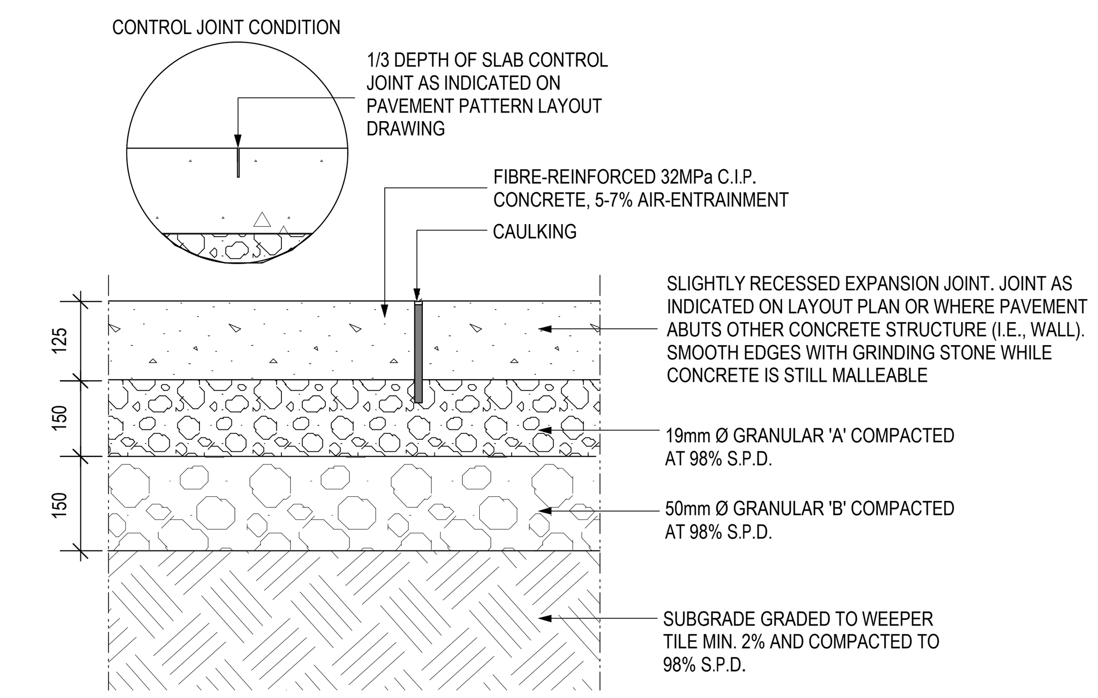


5 LD-03 FLUSH CURB WITH CONCRETE AND PERMEABLE CONCRETE
n.t.s.

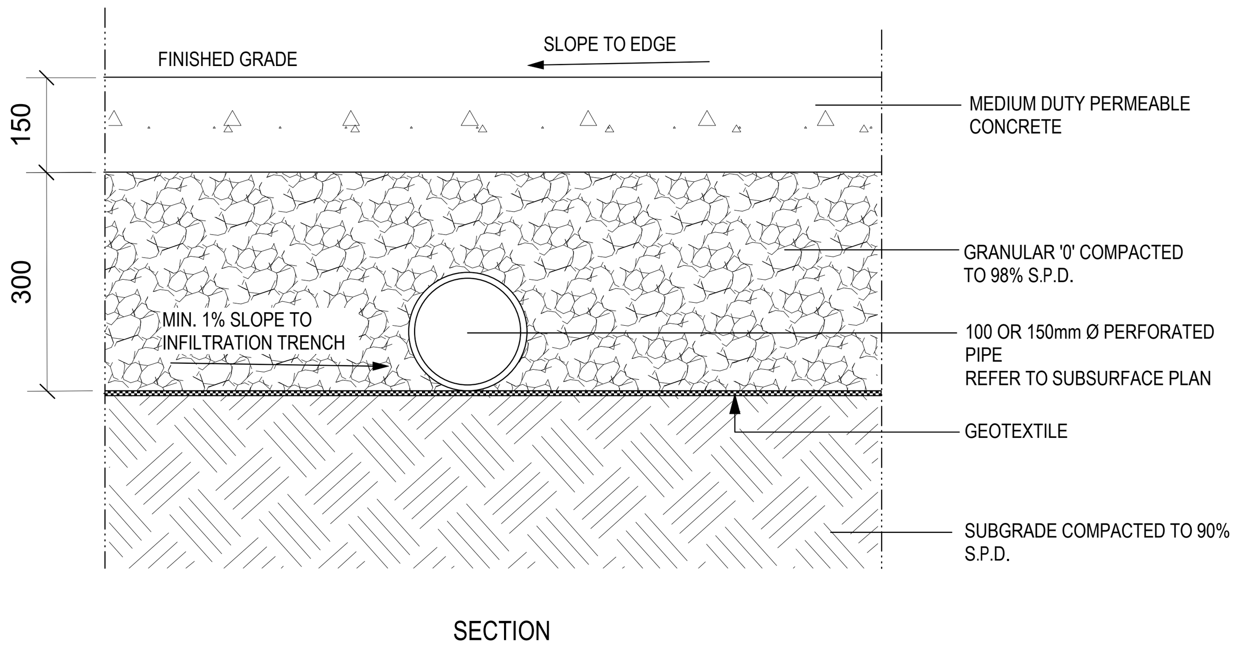
NOTES:

1. FINISH TO BE MEDIUM SANDBLAST, NATURAL COLOUR UNLESS OTHERWISE NOTED (SEE TRIKE TRACK).
2. ALL EXPANSION JOINTS TO BE SEALED WITH SNAP-CAP BY W.R. MEADOWS AND CAULKING. COLOUR TO MATCH.
3. NO TROWELED EDGES.
4. 2% CROSS SLOPE ON SIDEWALKS.





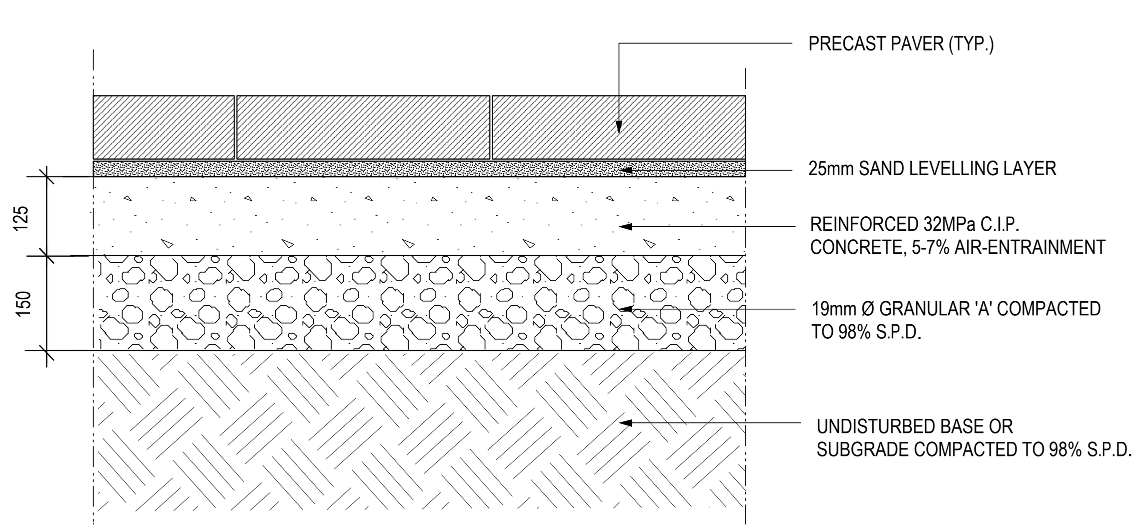
6 LD-03 C.I.P. PEDESTRIAN CONCRETE PAVING
scale 1:10



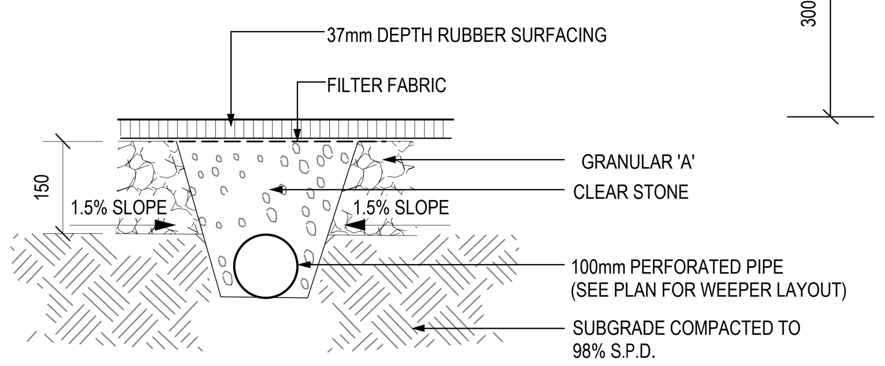
7 LD-03 PERMEABLE CIP SRI 35 CONCRETE PAVING/PARKING
scale 1:10

NOTES:

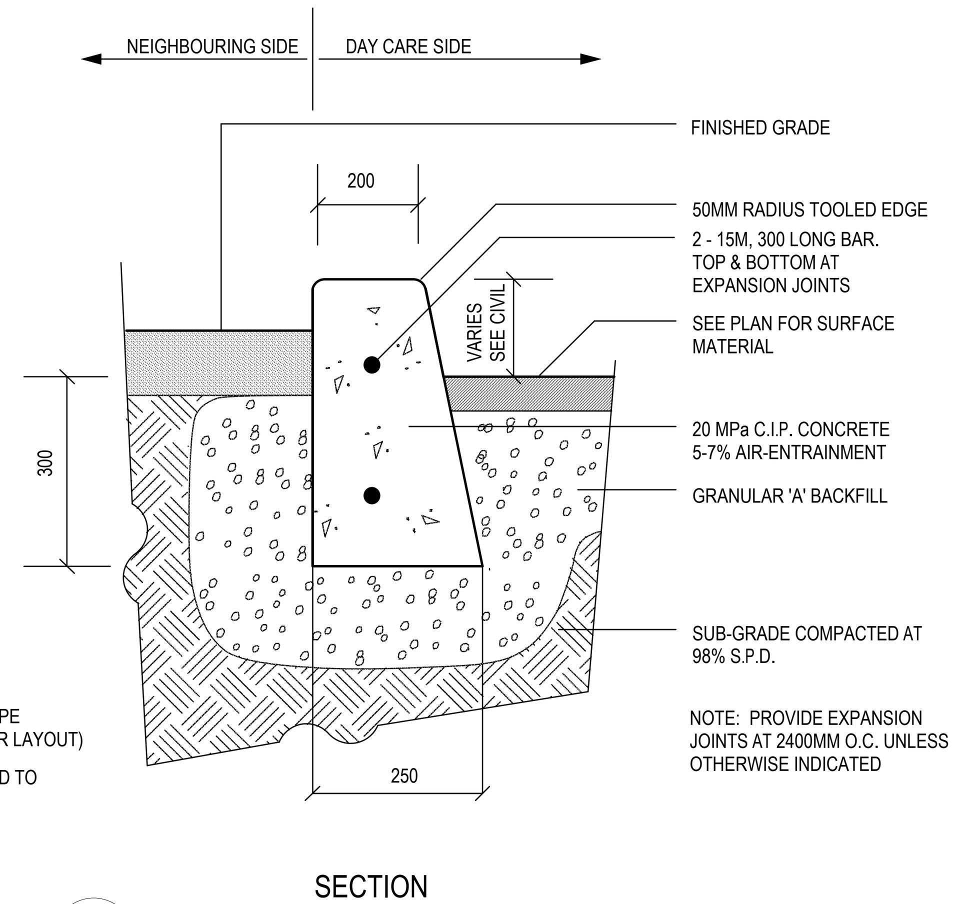
- MECHANICALLY TAMP PAVERS UNTIL FLUSH WITH EACH OTHER AND SECURELY INTACT. FILL JOINTS WITH SAND



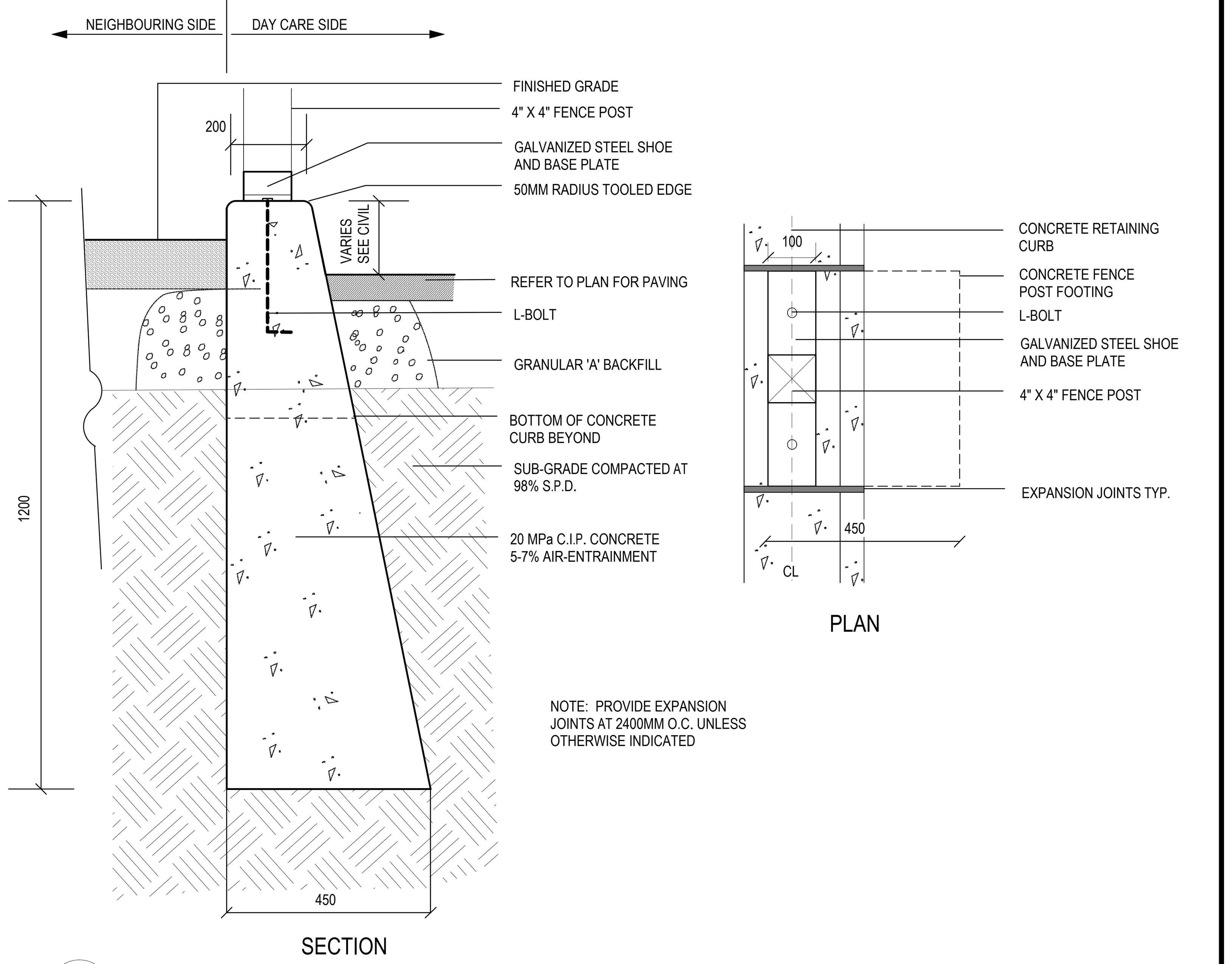
8 LD-03 UNIT PAVERS ON CONCRETE BASE DETAIL
scale: 1:10



9 LD-03 RUBBER SKIM SURFACING, BUILD-UP AND DRAINAGE
scale: n.t.s.



10 LD-03 CIP CONCRETE RETAINING CURB
scale: n.t.s.



11 LD-03 FENCE FOOTING
scale: n.t.s.

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ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS — FUNG LEE — OALA — MEMBER

Landscape Architects

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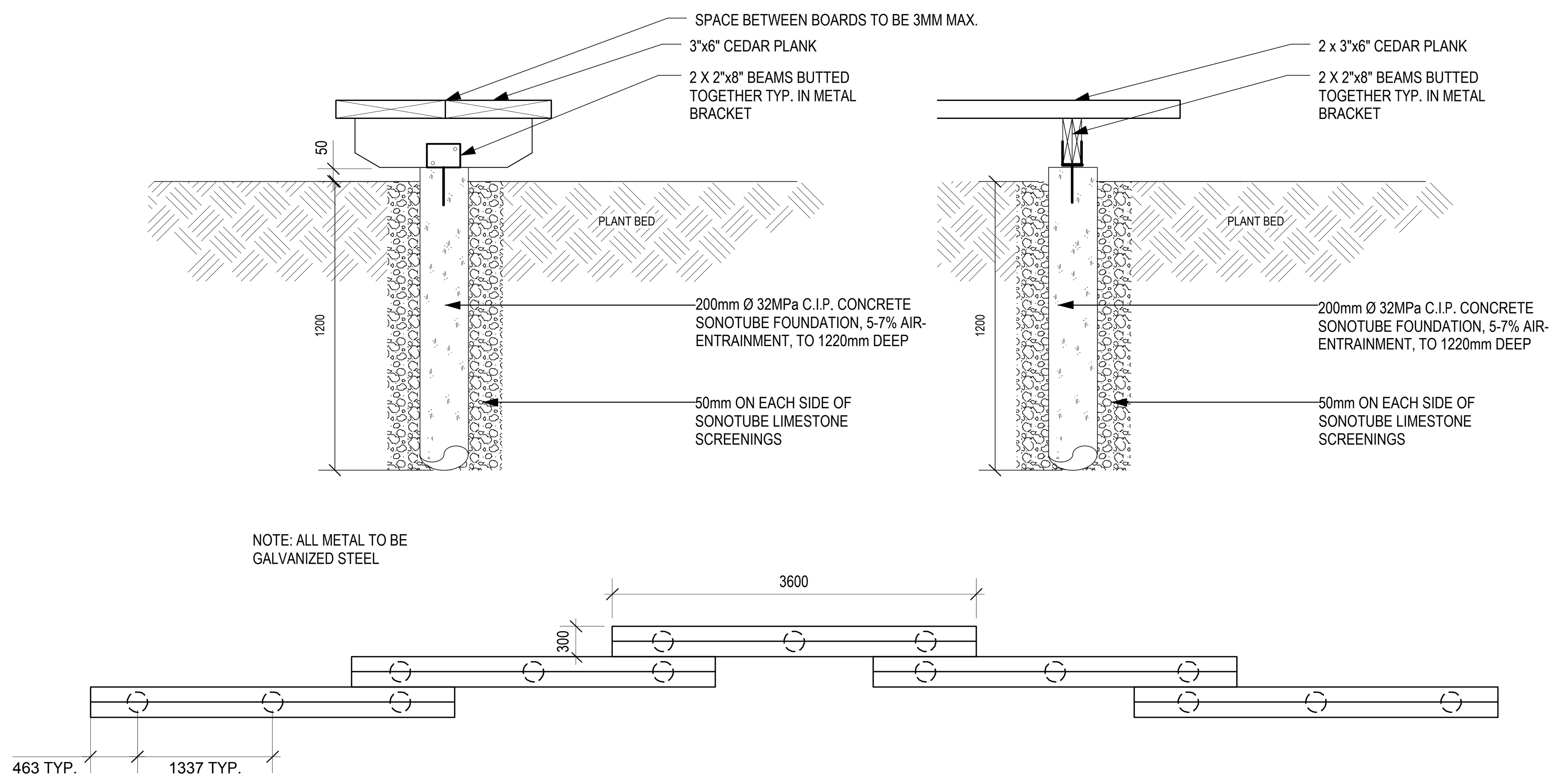
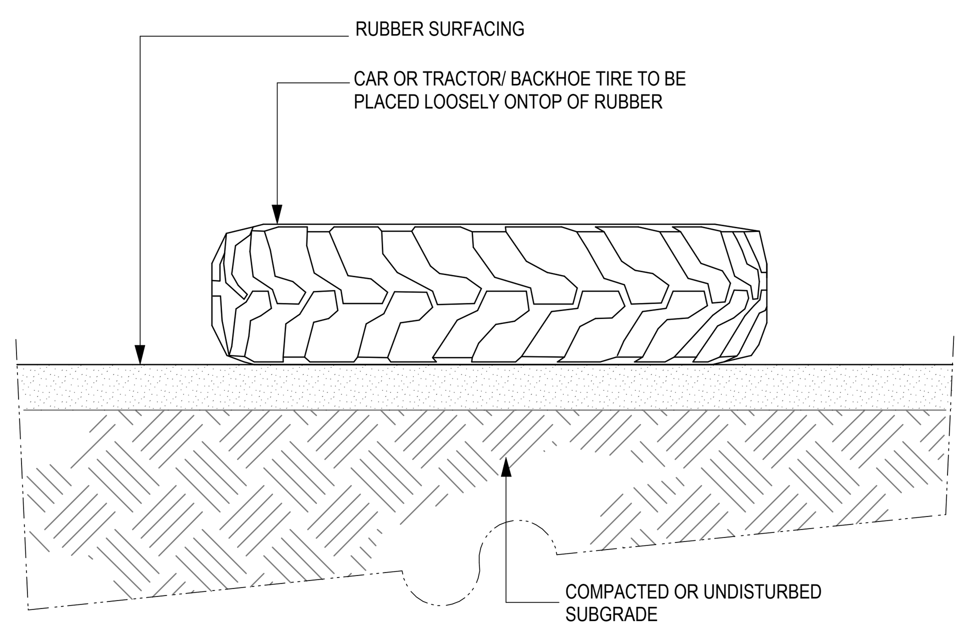
1234 WESTON ROAD, TORONTO, ON M6M 4P8

LANDSCAPE DETAILS

scale: As indicated
date: 10/23/17
drawn: KC
checked by: HC
project number: 17022
drawing number: LD-03
Revision:



1 LD-04 BOARDWALK DETAIL
scale: n.t.s.

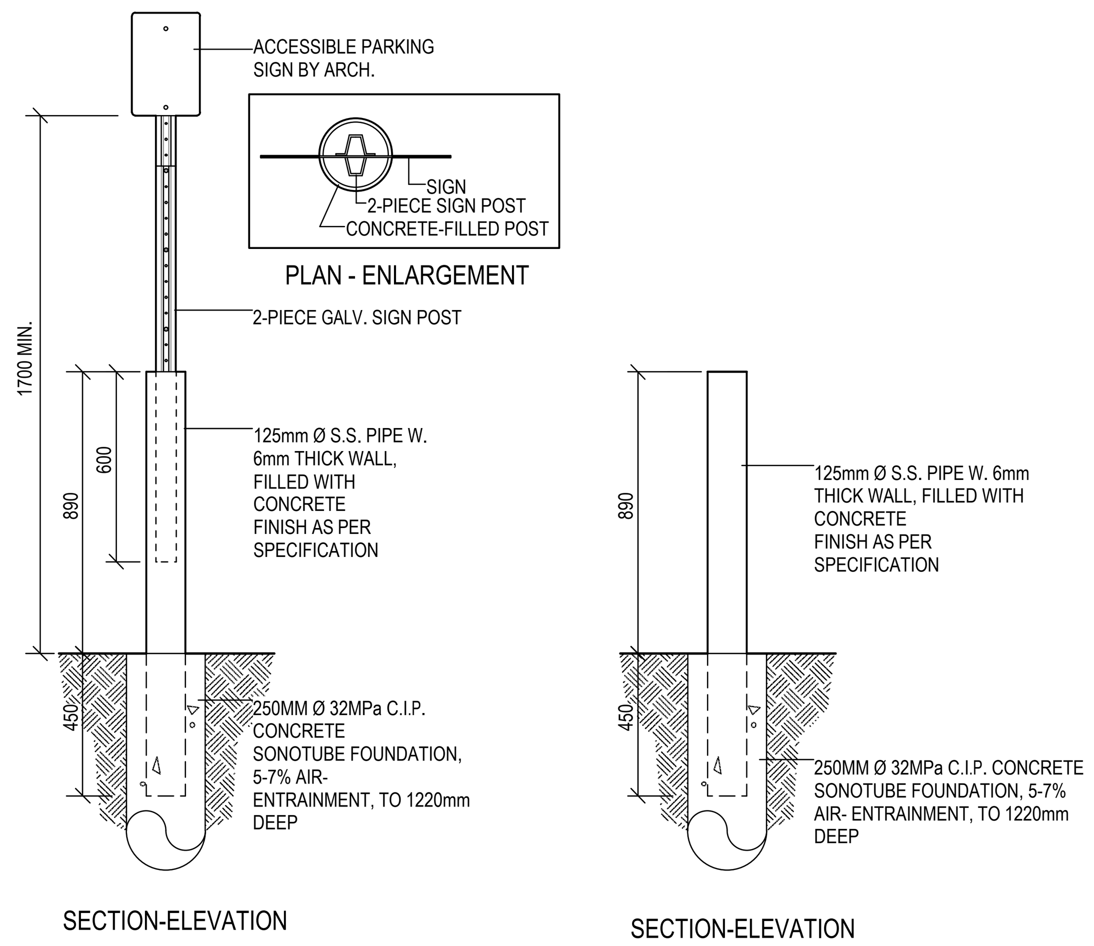


NOTE:

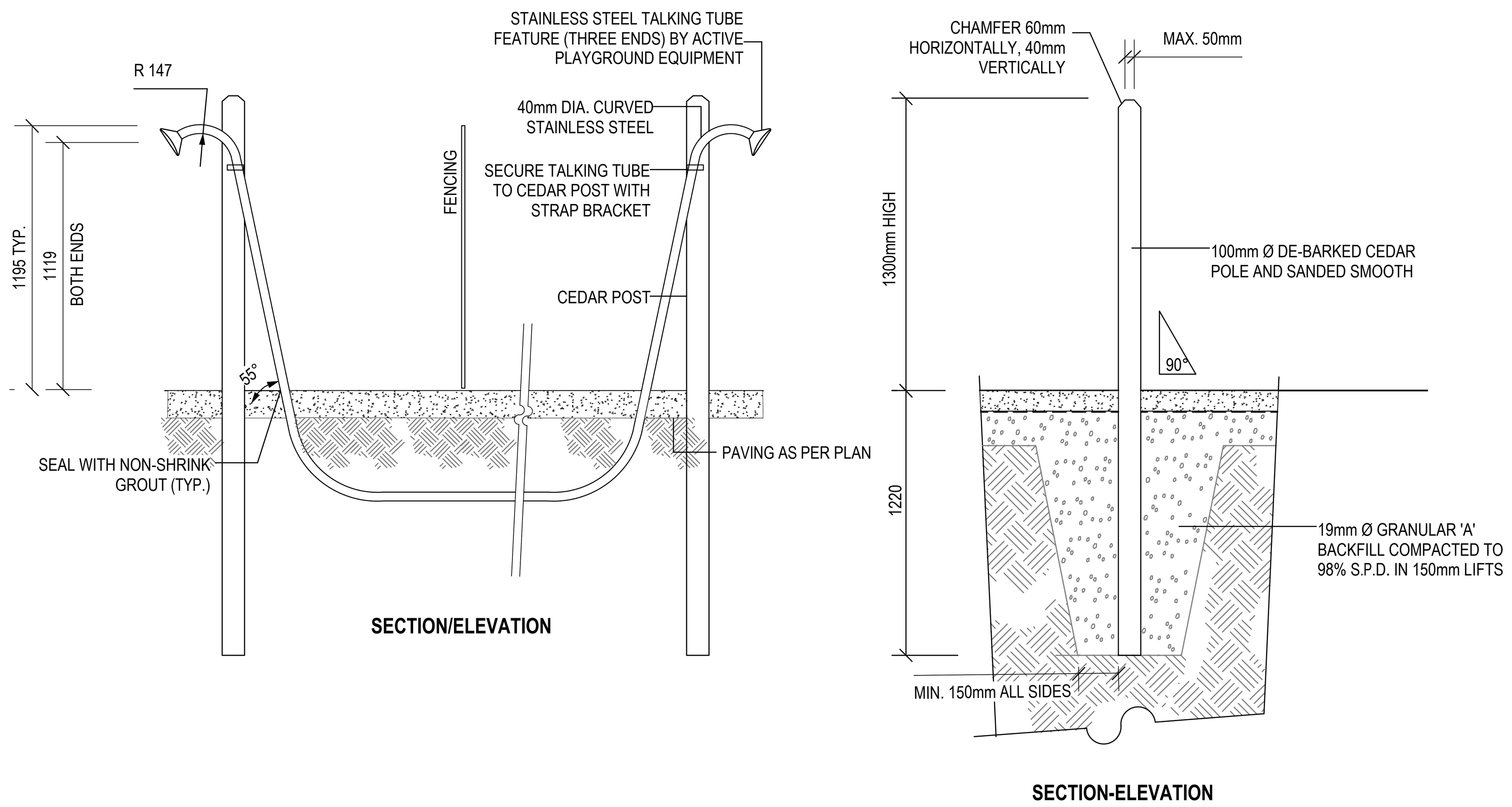
- TIRES CAN BE WORN BUT MUST HAVE NO PUNCTURES OR EXPOSED STEEL BELTS
- TOP OF TIRES SHOULD BE INSTALLED LEVEL

SECTION - ELEVATION

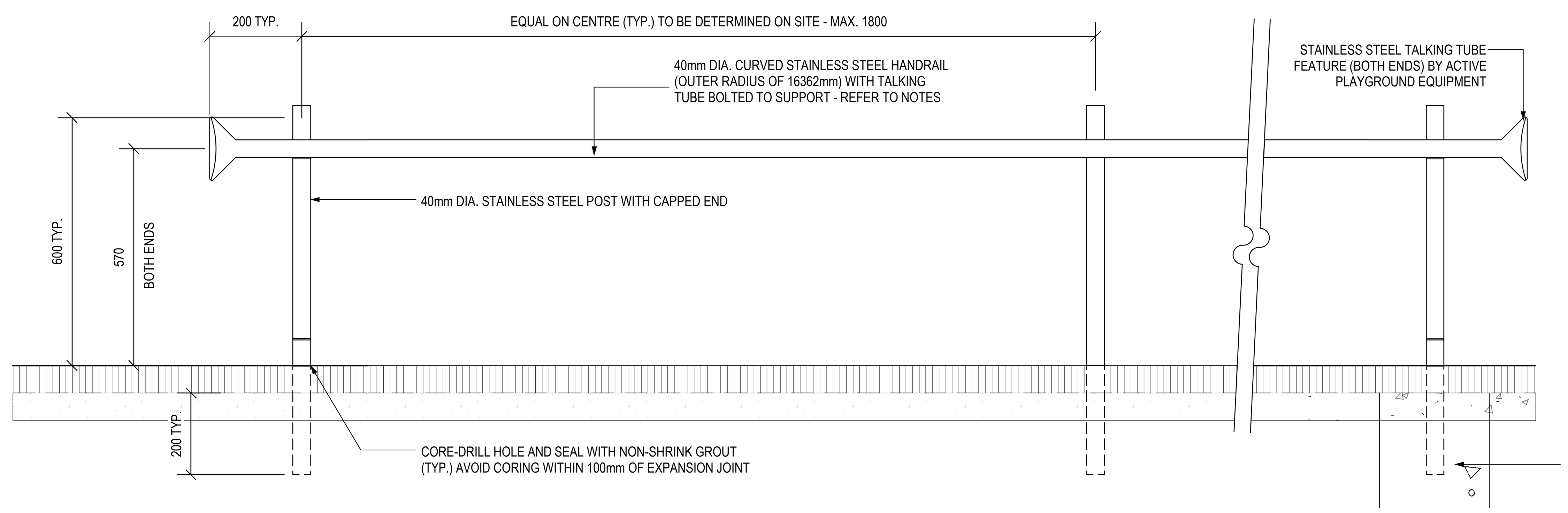
2 LD-04 TRACTOR TIRE INSTALLATION DETAIL
scale: 1:10



3 LD-04 BOLLARD DETAIL
n.t.s.



4 LD-04 TALKING TUBE DETAIL
scale: n.t.s.



5 LD-04 WALKING AND TALKING TUBE RAILING DETAIL
scale: n.t.s.

Key to Detail Location
NO. Detail Number
NO. Drawing Number

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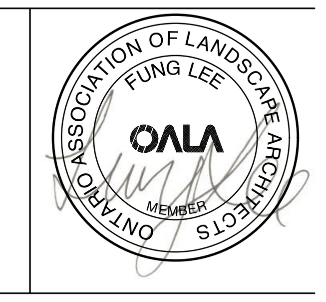

PMA Landscape Architects

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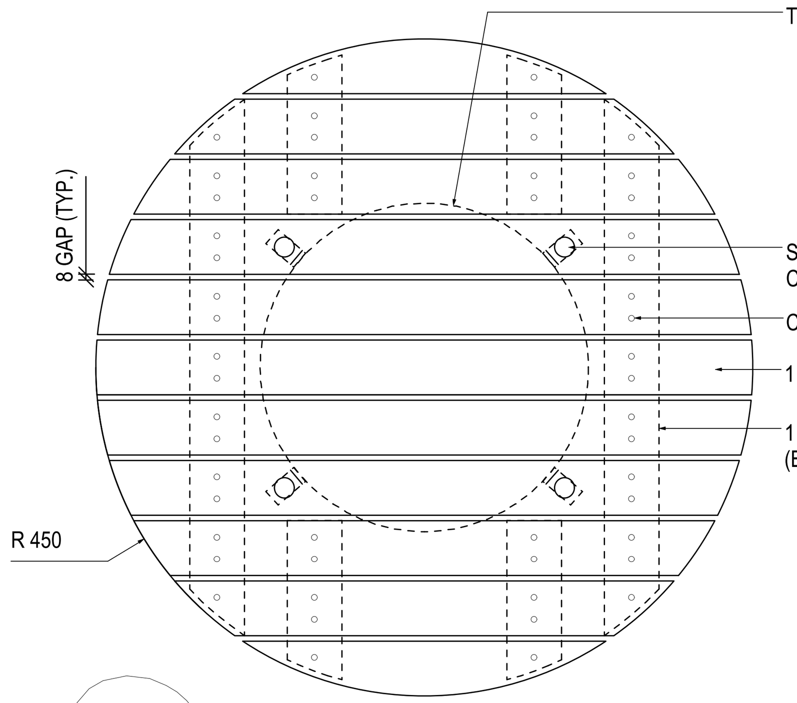
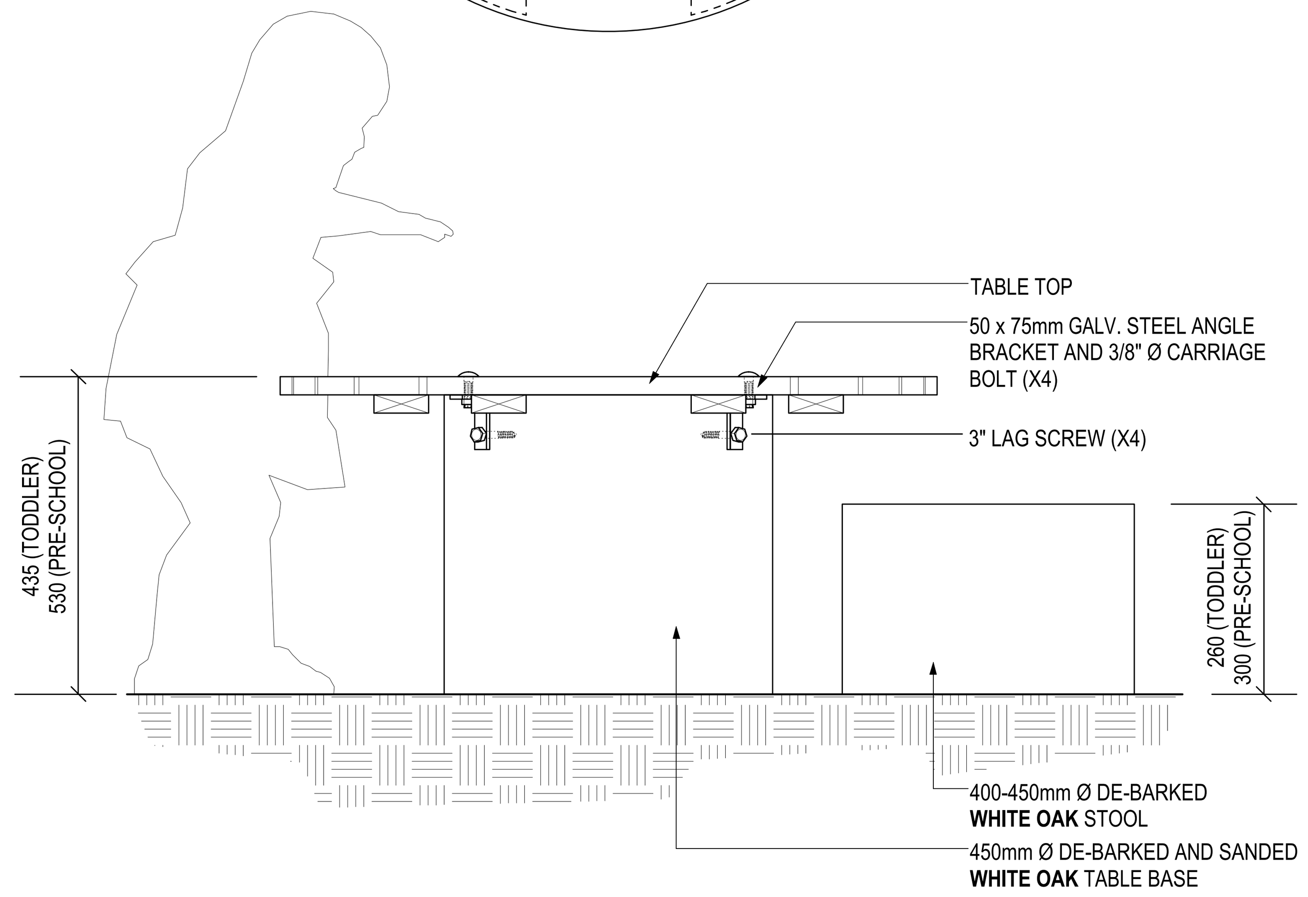
LANDSCAPE DETAILS

scale: As indicated
date: 10/23/17
drawn: KC
checked by: HC
project number: 17022
drawing number: LD-04
Revision:

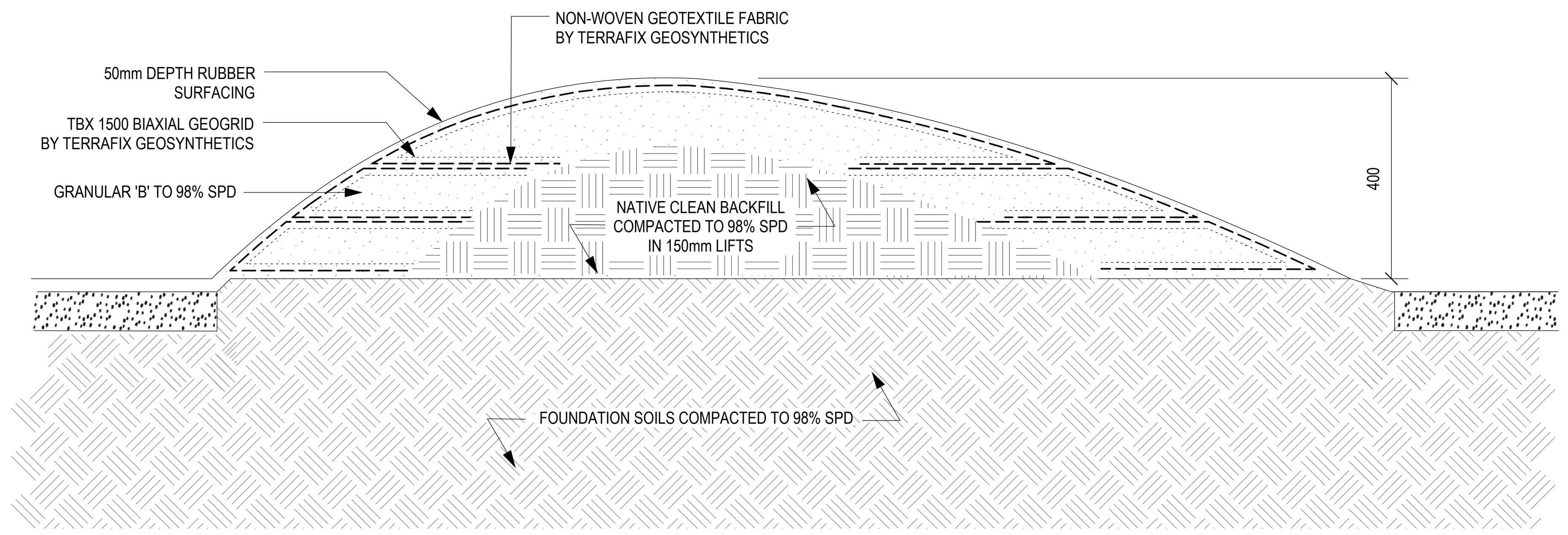
NOTES:

- PROVIDE FIVE STOOLS PER TABLE
- ALL FASTENERS TO BE GALVANIZED OR AS AVAILABLE WITH ADDITIONAL CORROSION RESISTANCE
- ALL SLATS AND BRACES TO BE FREE OF CRACKS, CHECKS AND WARPS
- PAINT SLATS AND BRACES WITH TWO COATS OF CLEAR SEALER
- TABLE BASE AND STOOLS TO BE WHITE OAK DEBARKED AND SANDED

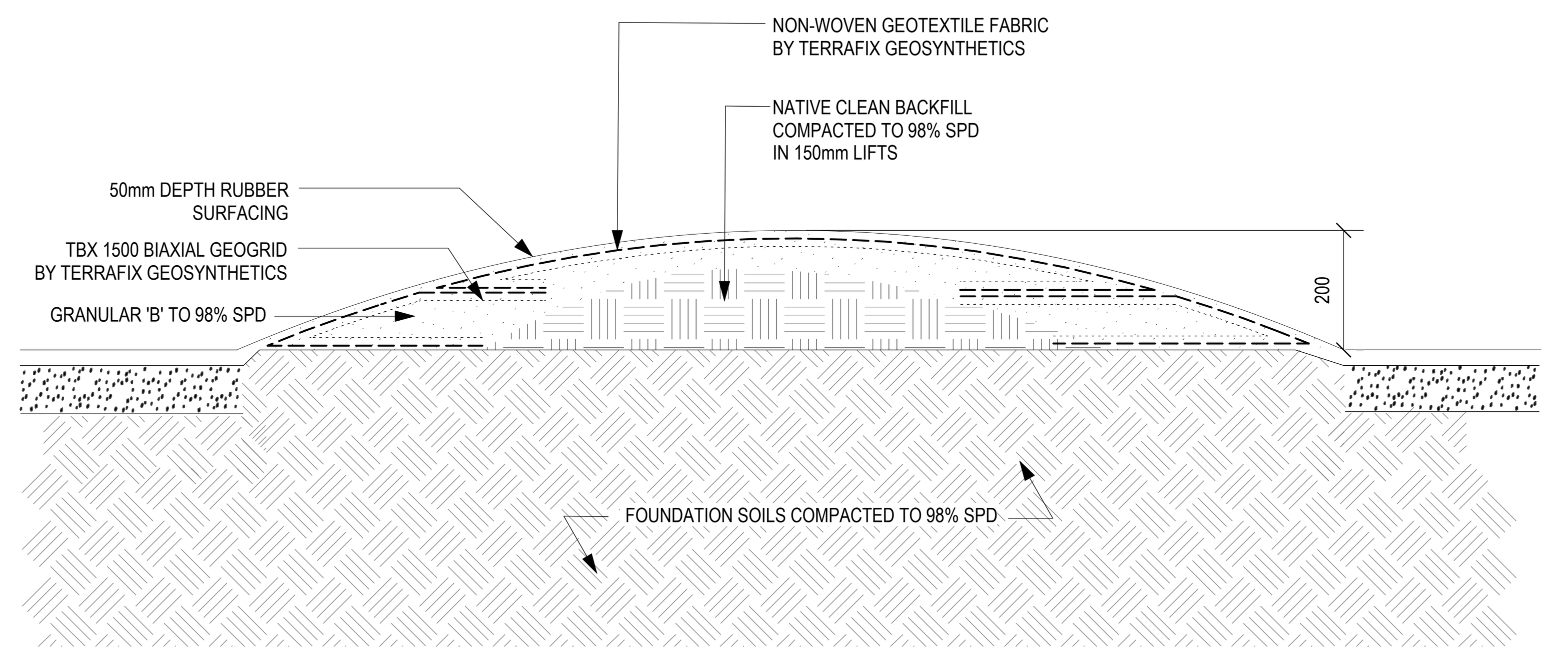




1 LD-05 **WOOD TABLE AND STOOLS**
scale: n.t.s.

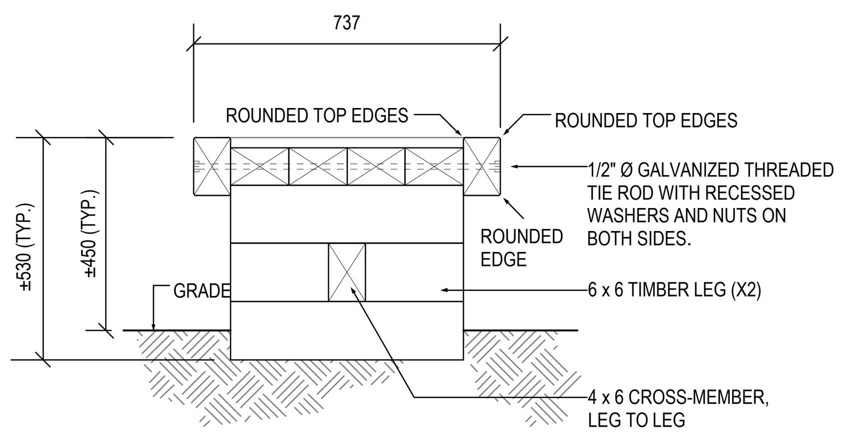


SECTION A-A
TODDLER PLAYGROUND



SECTION B-B
INFANT PLAYGROUND

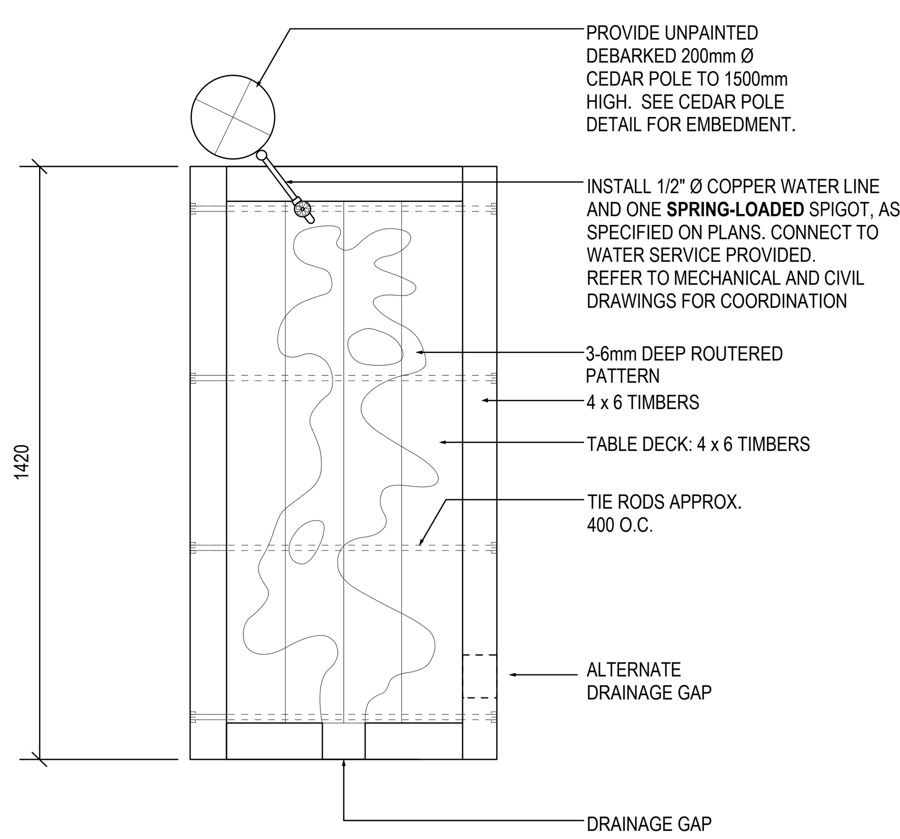
2 LD-05 **RUBBER MOUNDS**
scale: n.t.s.

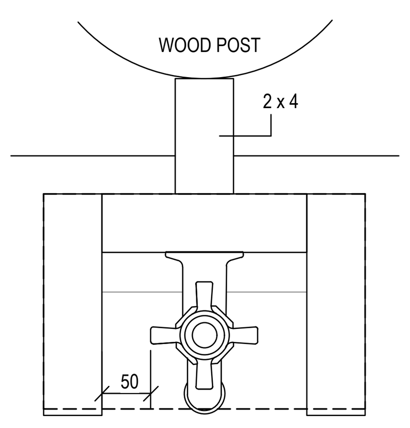


NOTE:

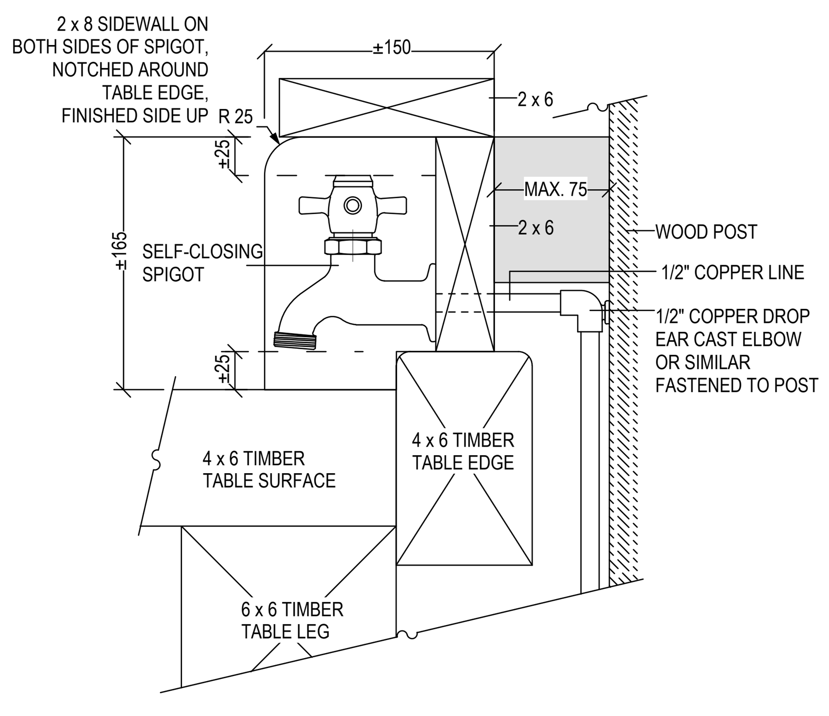
- ALL WOOD TO BE WESTERN RED CEDAR FREE OF CRACKS, CHECKS AND WARPS.
- ALL FASTENERS TO BE GALVANIZED OR AS AVAILABLE WITH ADDITIONAL CORROSION PROTECTION.
- CEDAR WOOD TO RECEIVE TWO COATS OF CLEAR SEALER.

CONCEPT IMAGE/ DESIGN INTENT

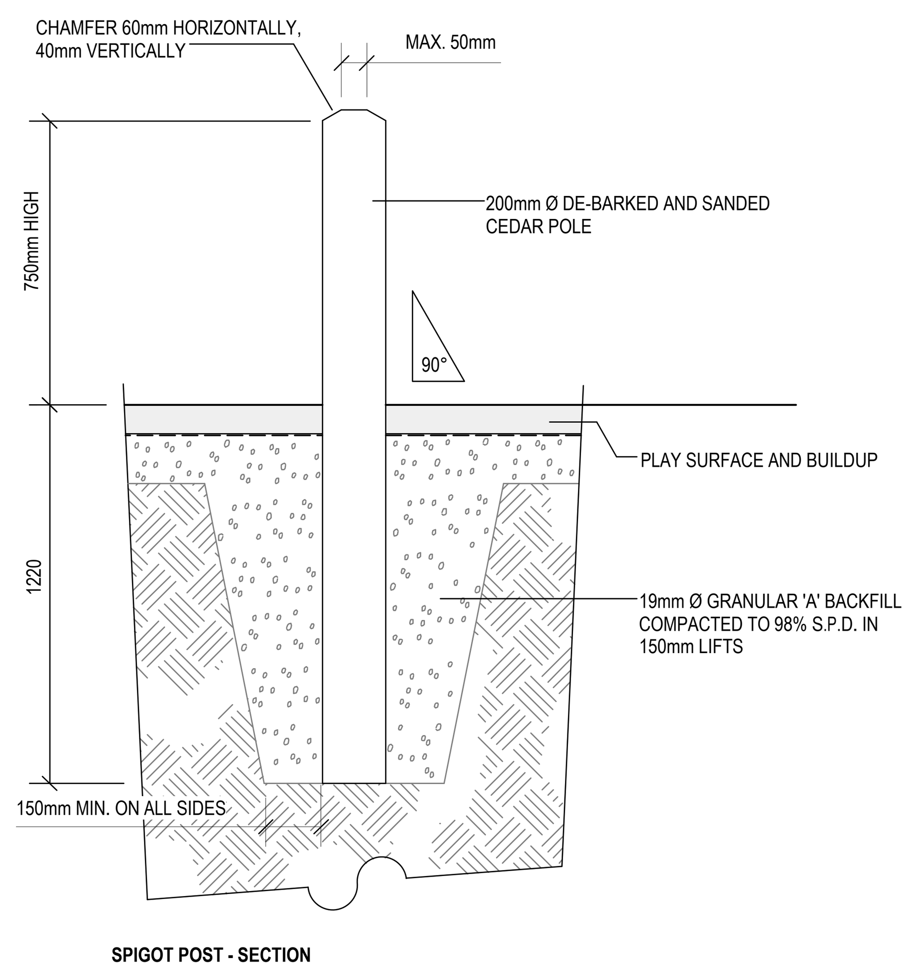




SPIGOT - ENLARGEMENT PLAN



SPIGOT - SECTION



SPIGOT POST - SECTION

3 LD-05 **WATER TABLE**
scale: n.t.s.

Key to Detail Location

NO. Detail Number
NO. Drawing Number

If this sheet is not 33 1/8" x 23 3/8" (841 x 594 mm) It is a reduced print - Read dwg. accordingly.

Contractors must check and verify all dimensions on the job and report any discrepancies to the Architect before proceeding with the work.

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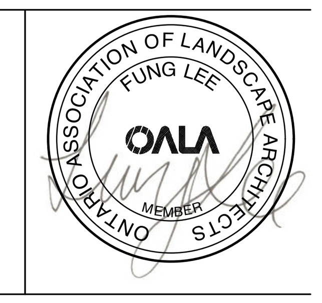
Building permit issuance shall be subject to the building permit drawings not being in contravention with these approved plans and drawings including, but not limited to, the exterior design of the building and exterior building materials.

No	Date	Revision/Issued
1	2018.04.13	ISSUED FOR S.P.A. SUBMISSION
2	2018.05.11	ISSUED FOR DESIGN DEVELOPMENT
3	2018.06.29	ISSUED FOR 50% CD
4	2018.08.10	REISSUED FOR SPA
5	2018.09.11	ISSUED FOR 95% CD
6	2018.10.03	ISSUED FOR PERMIT
7	2018.10.11	REISSUED FOR SPA



Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

LANDSCAPE DETAILS

scale:	As indicated
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	LD-05

Revision:

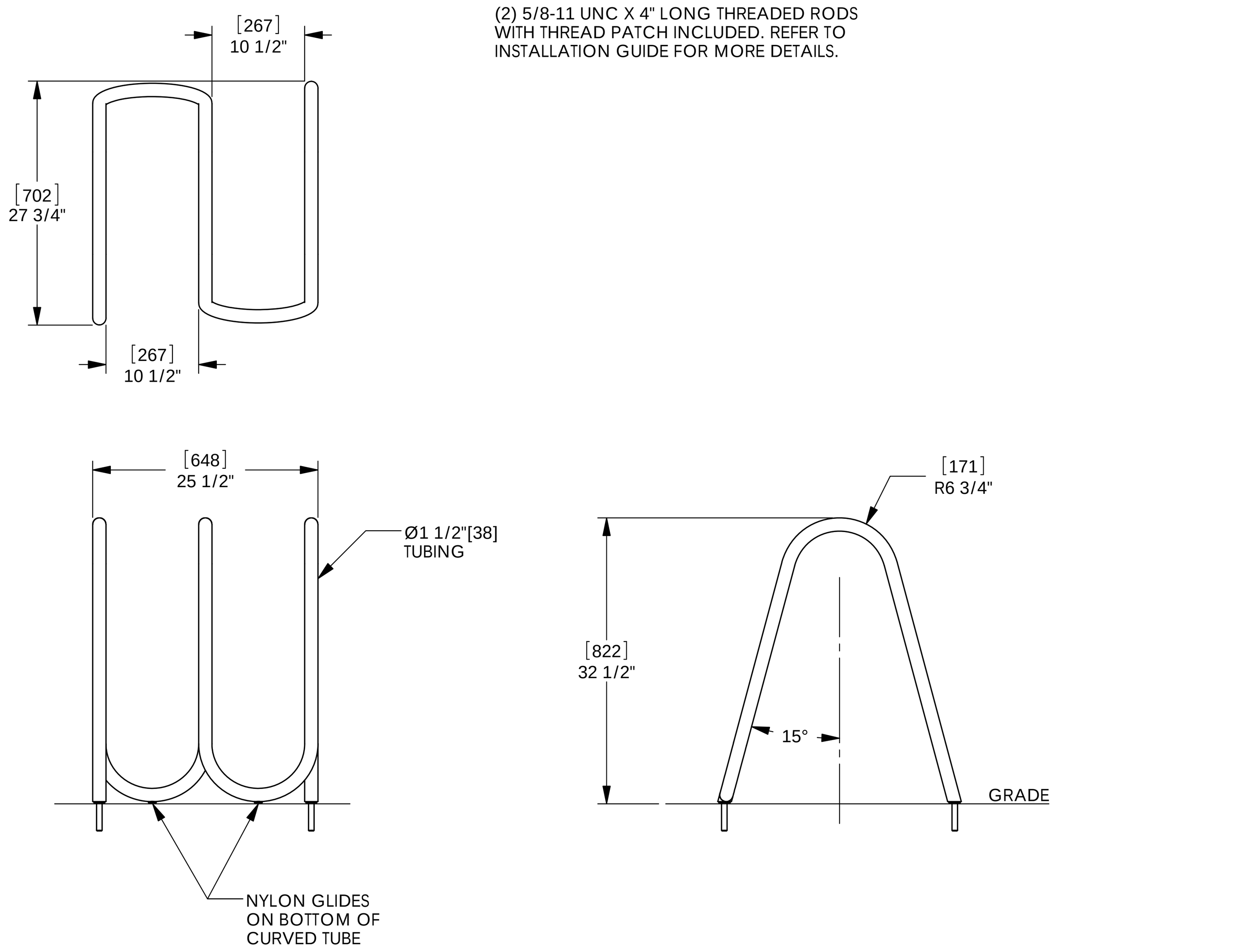
Flo Bike Rack, Embedded, Stainless Steel

Product Drawing

Date: 11/18/2014

www.landscapeforms.com Ph: 800.521.2546

(2) 5/8-11 UNC X 4" LONG THREADED RODS WITH THREAD PATCH INCLUDED. REFER TO INSTALLATION GUIDE FOR MORE DETAILS.



landscapeforms®

Drawing: FL662-01-SSTL
Dimensions are in inches [mm]
U.S. Patent No.: D529,433

1 / LD-06 **ENTRY BIKE RACK**
scale: n.t.s.

Equiparc

EP 1051 Seat

SPECIFICATIONS

Frame :	10mm (3/8") aluminum components
Finish :	Polyester powder coated
Slats :	51mm X 152mm (2" X 6")
Fasteners :	Stainless steel

COVERINGS

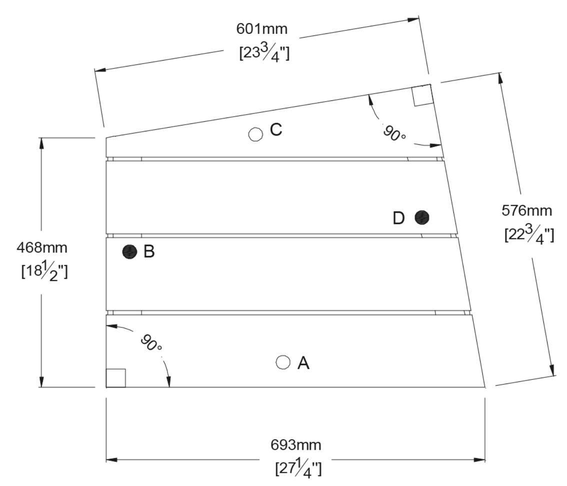
DFP	Select Douglas fir
JAT	Jatoba
IPE	Ipe
HWA	Select hardwood

Depth : 567mm (22 1/4")	Length : 692mm (27 1/4")	Height : 450mm (17 3/4")	Weight : 44 kg (97 lbs)
A: 693mm (27 1/4")	B: 468mm (18 1/2")	C: 601mm (23 3/4")	D: 576mm (22 3/4")

This bench must be anchored. Make sure there is a 10mm (3/8") gap between each pieces of furniture. Our warranty applies when our product is properly assembled and anchored.

CONCRETE SLABS AND ANCHORS

7005	1 slab 610mm X 610mm X 152mm (24" X 24" X 6")
QS	4 stainless steel kwik bolts
QAV	4 drop-in anchors with stainless steel theftproof bolts



○ Sides A and C : empty profiles

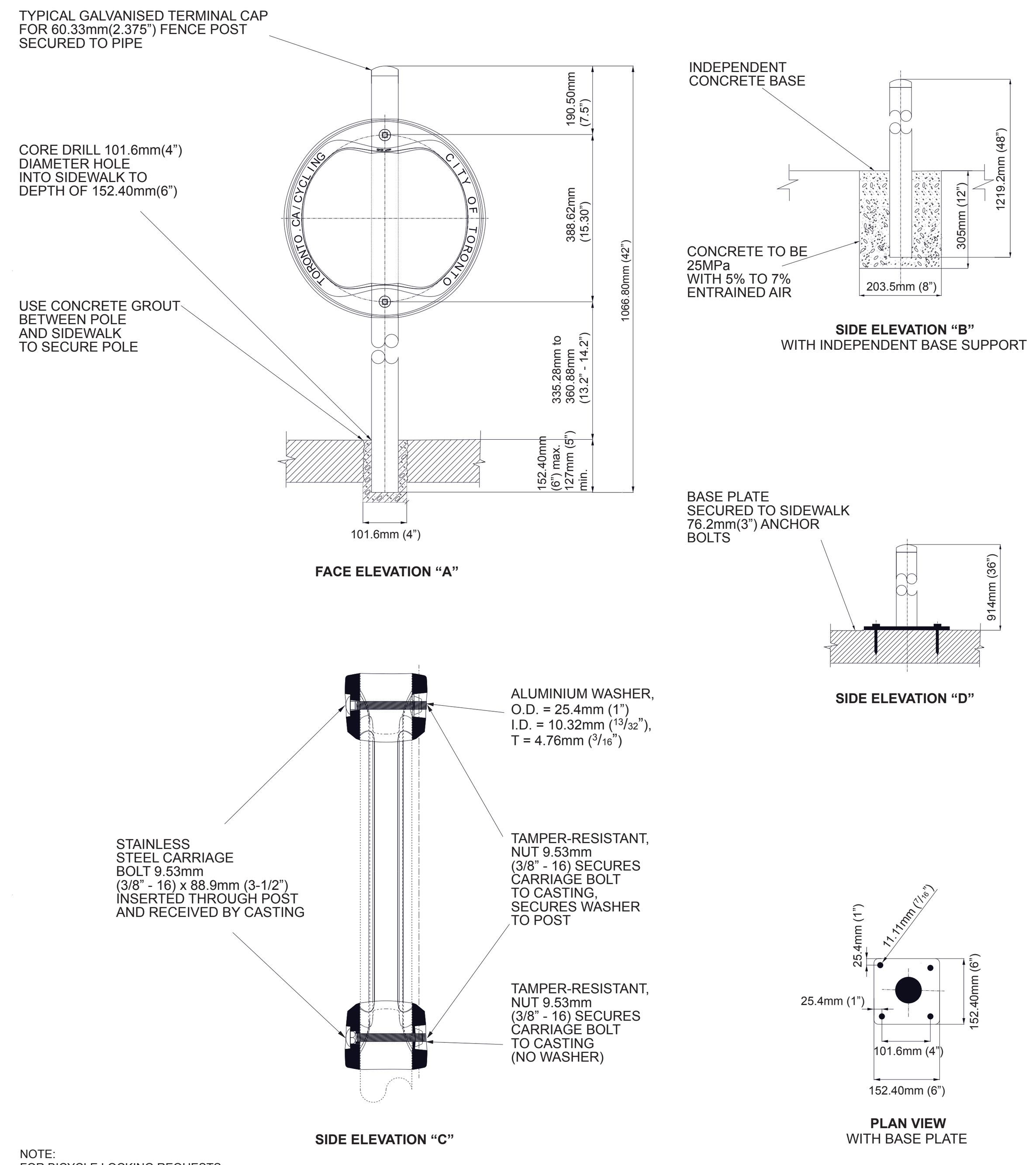
● Sides B and D : full metal profiles

T: 1 800 363.9264
F: 1 866 346.2538
www.equiparc.com
info@equiparc.com
1001, rue James-Brodie
Saint-Jean-sur-Richelieu, QC Canada J2X 0C1

1/3

3 / LD-06 **ENTRY BENCH**
scale: n.t.s.

• FURNITURE •



NOTE:
FOR BICYCLE LOCKING REQUESTS
PLEASE CONTACT
streetfurniture@toronto.ca

SOURCE: TRANSPORTATION SERVICES
DWG. NO. T346

Toronto Urban Design / Streetscape Manual	Post and Ring Bicycle Stand	TORONTO F-7-1 NTS 05/16

2 / LD-06 **STREETSCAPE BIKE RACK**
scale: n.t.s.

Key to Detail Location

NO. / NO. — Detail Number / Drawing Number

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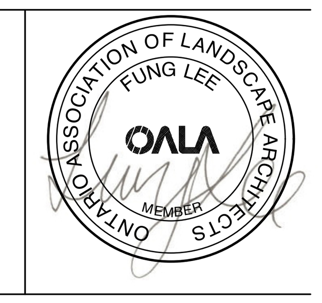

PMA Landscape Architects

MOUNT DENNIS CHILDCARE CENTRE
1234 WESTON ROAD, TORONTO, ON M6M 4P8

LANDSCAPE DETAILS

scale:	As indicated
date:	10/23/17
drawn:	KC
checked by:	HC
project number:	17022
drawing number:	LD-06

Revision:

LIMITATIONS TO THE REPORT

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. Subsurface and groundwater conditions between and beyond the test holes and test pit may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GeoPro Consulting Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

Hydrological Review Summary

TORONTO

August 2018

HYDROLOGICAL REVIEW SUMMARY

The form is to be completed by the Professional that prepared the Hydrological Review.
Use of the form by the City of Toronto is not to be construed as verification of engineering/hydrological content.

Refer to the Terms of Reference, Hydrological Review:
[Link to Terms of Reference Hydrological Review]

For City Staff Use Only:	
Name of ECS Case Manager (Please print)	
Date Review Summary provided to to TW, EM&P	

IF ANY OF THE REQUIREMENTS LISTED BELOW HAVE NOT BEEN INLCUDED IN THE HYDROLOGICAL REVIEW, THE REVIEW WILL BE CONSIDERED INCOMPLETE.
THE GREY SHADED BOXES WILL REQUIRE A CONSISTANCY CHECK BY THE ECS CASE MANAGER.

Summary of Key Information:

SITE INFORMATION		**Page # & Section # of Review**	**Review Includes this Information City Staff (Check)**
Site Address	1234 Weston Road, Toronto, Ontario	Cover page	
Postal Code	M6M4P8	Cover page	
Property Owner (on request for comments memo)	City of Toronto Children Services	Cover page	
Proposed description of the project (if applicable) (point towers, number of podiums)	Two story childcare centre	Cover page	
Land Use (ex. commercial, residential, mixed, institutional, industrial)	Garden with play facilities	Page 1	
Number of below grade levels for the proposed structure	One level of basement	Page 1	
HYDROLOGICAL REVIEW INFORMATION			
Date Hydrological Review was prepared:	November 30, 2018	Cover page	
Who Performed the Hydrological Review (Consulting Firm)	GeoPro Consulting Limited	Cover page	
Name of Author of Hydrological Review	David Liu	Cover page	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Check the directories on the website for Professional Geoscientists and/or Professional Engineers of Ontario been checked to ensure that the Hydrological Report has been prepared by a qualified person who is a licensed Professional Geoscientist as set out in the Professional Geoscientist Act of Ontario or a Professional Engineer? PEO: Professional Engineers of Ontario APGO: Association of Professional Geoscientists of Ontario	Yes	N/A	
Has the Hydrological Review been prepared in accordance with all the following: • Ontario Water Resources Act • Ontario Regulation 387/04 • Toronto Municipal Code Chapter 681-Sewers	Yes		
		Page # & Section # of every occurrence in the Review	Review Includes this Information City Staff (Check)

TORONTO

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) **with safety factor included**	What safety factor was used? Short term groundwater dewatering is not required	Page 7	
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) **without safety factor included**	Short term groundwater dewatering is not required	Page 7	
Total Volume (L/day) Long Term drainage of groundwater (from foundation drainage, weeping tiles, sub slab drainage) **with safety factor included** If the development is part of a multiple tower complex, include total volume for each separate tower	What safety factor was used? Long term groundwater dewatering is not required	Page 7	
List the nearest surface water (river, creek, lake)	Silver creek	Page 3	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Lowest basement elevation	119.05 meter above sea level	Page 7	
Foundation elevation	118.55 meter above seal level	Page 7	
Ground elevation	123.25 meter above seal level	Page 7	
STUDY AREA MAP		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
Study area map(s) have been included in the report.	**Yes**	Drawing 1	N/A
Study area map(s) been prepared according to the Hydrological Review Terms of Reference.	**Yes**		N/A
WATER LEVEL AND WELLS		**Page # & Section # of every occurrence**	**Review Includes this Information (City Staff Initial)**

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
		in the Review	
The groundwater level has been monitored using all wells located on site (within property boundary).	The groundwater levels were monitored with wells used on site for geotechnical investigation and Phase II ESA	Page 2, 5	
The static water level measurements have been monitored at all monitoring wells for a minimum of 3 months with samples taken every 2 weeks for a minimum of 6 samples. The intent is for the qualified professional to use professional judgement to estimate the seasonally high groundwater level.	Groundwater data from geotechnical wells and Phase II ESA wells were used to do the hydrogeological evaluation. See section 4.0 for the rationale of using the available data to evaluate dewatering need	Page 2, 5	
All water levels in the wells have been measured with respect to masl.	Yes	Page 2, 5	
A table of geology/soil stratigraphy for the property has been included.	Yes	Appendix A	
GEOLOGY AND PHYSICAL HYDROLOGY		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information (City Staff Initial)**
The review has made reference to the soil materials including thickness, composition and texture, and bedrock environments.	Yes	Appendix A	
Key aquifers and the site's proximity to nearby surface water has been identified.	**Yes**	Appendix A	N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
PUMP TEST/SLUG TEST/DRAWDOWN ANALYSIS		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
A summary of the pumping test data and analysis is included in the review.	No		
The pump test been carried out for at least 24 hours if possible. If not, has a slug test been conducted?	No		
Have the monitoring well(s) have been monitored using digital devices? If yes how frequently?	No		
If a slug or pump test has been conducted has the static groundwater level been monitored at all monitoring well(s) multiple times to measure recovery? -prior to the slug or pumping test(s)? -post slug or pumping test(s)?	Yes Falling head slug test was conducted	Page 6	N/A
The above noted slug or pump tests have been included in the report.	Yes	Appendix C	
WATER QUALITY		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**

TORONTO

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
The report includes baseline water quality samples from a laboratory. The water quality must be analyzed for all parameters listed in Tables 1 and 2 of Chapter 681 Sewers of the Toronto Municipal Code (found in Appendix A) and the samples must have to be taken unfiltered within 9 months of the date of submission.	Water quality data from Phase II ESA (dated Sept, 2017) was used to evaluate groundwater quality	Page 1, 6	
The water quality data templates in Appendix A have been completed for each sample taken for both sanitary/combined and storm sewer limits.	For sanitary discharge- See the sanitary/combined sewer parameter limit template. For storm discharge- See the storm sewerparameter limit template (No dewatering is needed, so discharge into sewer system is not anticipated)	Page 7	
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the sanitary/combined Bylaw limits **If there are any sample parameter Exceedances the groundwater can't be discharged as is.**	(No dewatering is needed, so discharge into sewer system is not anticipated)	Page 7	
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the storm Bylaw limits. **If there are any sample parameter exceedances the groundwater can't be discharged as is.**	(No dewatering is needed, so discharge into sewer system is not anticipated)	Page 7	
The water quality samples have been analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and/or Canadian Association for Laboratory Accreditation.	**Yes**		N/A

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
List of Canadian accredited laboratories: Standards Council of Canada			
A chain of custody record for the samples is included with the report.	Phase II ESA report has the chain of custody		
Has the chain of custody reference any filtered sample? If yes, the report has to be amended and re-submitted to include only non-filtered samples.	Not applicable		
List any of the sample parameters that exceed the Bylaw limits with the reporting detection limit (RDL) included.	Not applicable		
A true copy of the Certificate of Analysis report, is included with the report.	Phase II ESA report has the Certificate of Analysis report		
EVALUATION OF IMPACT		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
Does the report recommend a back-up system or relief safety valve(s)? Does the associated Geotechnical report recommend a back-up system or relief safety valve(s)?	◯ Yes ◯ No ◯ Yes ◯ No No impact is anticipated because no groundwater dewatering is required	Section 5.0	
The taking and discharging of groundwater on site has been analyzed to ensure that no negative	● Yes	Section 4.0	N/A

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
impacts will occur to: the City sewage works in terms of quality and quantity (including existing infrastructure), the natural environment, and settlement issues.			
Has it been determined that there will be a negative impact to the natural environment, City sewage works, or surrounding properties has the study identified the following: the extent of the negative impact, the detail of the precondition state of all the infrastructure, City sewage works, and natural environment within the effected zone and the proposed remediation and monitoring plan?	◯ **Yes** **If yes, identify impact:** ◉ **No**	Section 5.0	N/A

Summary of Additional Information and Key Items (if applicable):

Appendix A:

SANITARY/COMBINED **Sample Location:**

Inorganics		**Sample Result**	**Sample Result with upper RDL included**	
Parameter	**mg/L**			**ug/L**
BOD	300			300,000
Fluoride	10			10,000
TKN	100			100,000
pH	6.0 - 11.5			6.0 - 11.5
Phenolics 4AAP	1			1,000
TSS	350			350,000
Total Cyanide	2			2,000
Metals				
Chromium Hexavalent	2			2,000
Mercury	0.01			10
Total Aluminum	50			50,000
Total Antimony	5			5,000
Total Arsenic	1			1,000
Total Cadmium	0.7			700
Total Chromium	4			4,000
Total Cobalt	5			5,000
Total Copper	2			2,000
Total Lead	1			1,000
Total Manganese	5			5,000
Total Molybdenum	5			5,000
Total Nickel	2			2,000
Total Phosphorus	10			10,000
Total Selenium	1			1,000
Total Silver	5			5,000
Total Tin	5			5,000
Total Titanium	5			5,000
Total Zinc	2			2,000
Petroleum Hydrocarbons				
Animal/Vegetable Oil & Grease	150			150,000
Mineral/Synthetic Oil & Grease	15			15,000

August 2018

HYDROLOGICAL REVIEW SUMMARY

Volatile Organics		**Sample Result**	**Sample Result with upper RDL included**	
Parameter	**mg/L**			**ug/L**
Benzene	0.01			10
Chloroform	0.04			40
1,2-Dichlorobenzene	0.05			50
1,4-Dichlorobenzene	0.08			80
Cis-1,2-Dichloroethylene	4			4,000
Trans-1,3-Dichloropropylene	0.14			140
Ethyl Benzene	0.16			160
Methylene Chloride	2			2,000
1,1,2,2-Tetrachloroethane	1.4			1,400
Tetrachloroethylene	1			1,000
Toluene	0.016			16
Trichloroethylene	0.4			400
Total Xylenes	1.4			1,400
Semi-Volatile **Organics**				
Di-n-butyl Phthalate	0.08			80
Bis (2-ethylhexyl) Phthalate	0.012			12
3,3'-Dichlorobenzidine	0.002			2
Pentachlorophenol	0.005			5
Total PAHs	0.005			5
Misc **Parameters**				
Nonylphenols	0.02			20
Nonylphenol Ethoxylates	0.2			200

Sample Collected:
Temperature:

August 2018

HYDROLOGICAL REVIEW SUMMARY

STORM **Sample Location:**

Inorganics		**Sample Result**	**Sample Result with upper RDL included**	
Parameter	**mg/L**			**ug/L**
pH	6.0 - 9.5			
BOD	15			15,000
Phenolics 4AAP	0.008			8
TSS	15			15,000
Total Cyanide	0.02			20
Metals				
Total Arsenic	0.02			20
Total Cadmium	0.008			8
Total Chromium	0.08			80
Chromium Hexavalent	0.04			40
Total Copper	0.04			40
Total Lead	0.12			120
Total Manganese	0.05			50
Total Mercury	0.0004			0.4
Total Nickel	0.08			80
Total Phosphorus	0.4			400
Total Selenium	0.02			20
Total Silver	0.12			120
Total Zinc	0.04			40
Microbiology				
E.coli	200			200,000
Volatile Organics				
Parameter	**mg/L**			**ug/L**
Benzene	0.002			2
Chloroform	0.002			2
1,2-Dichlorobenzene	0.0056			6
1,4-Dichlorobenzene	0.0068			7
Cis-1,2-Dichloroethylene	0.0056			6
Trans-1,3-Dichloropropylene	0.0056			6
Ethyl Benzene	0.002			2
Methylene Chloride	0.0052			5
1,1,2,2-Tetrachloroethane	0.017			17
Tetrachloroethylene	0.0044			4
Toluene	0.002			2
Trichloroethylene	0.0076			8
Total Xylenes	0.0044			4

August 2018

HYDROLOGICAL REVIEW SUMMARY

Semi-Volatile Organics		Sample Result	Sample Result with upper RDL included	
Di-n-butyl Phthalate	0.015			5
Bis (2-ethylhexyl) Phthalate	0.0088			8.8
3,3'-Dichlorobenzidine	0.0008			0.8
Pentachlorophenol	0.002			2
Total PAHs	0.002			2
PCBs	0.0004			0.4
Misc Parameters				
Nonylphenols	0.001			1
Nonylphenol Ethoxylates	0.01			10

Sample Collected:
Temperature:

Consulting Firm that prepared Hydrological Report: GeoPro Consulting Limited

Qualified Professional who completed the report summary: David Liu
Print Name

Qualified Professional who completed the report summary: David B. Liu December 04, 2018
Signature Date & Stamp

Response to Peer Review Comments

November 9, 2018

17M-01905-32

Ms. Janice Green
Senior Environmental Project Manager
City of Toronto, Facilities Management
Metro Hall, 2nd Floor
55 John Street
Toronto, ON M5V 3C6

Dear Ms. Green:

Subject: WSP Response to Peer Review Comments - 1234 Weston Road, Toronto, Ontario

WSP Canada Group Limited (WSP) is pleased to provide the City of Toronto (the "City") with our response to peer review comments issued by Terrapex Environmental Limited (Terrapex) regarding our Environmental Site Assessment (ESA), Risk Assessment, and Soil Vapour Investigation reports for 1234 Weston Road in Toronto, Ontario (the "Site").

Terrapex's Peer Review focused on the lands at the northern portion of the Site where a 2.83 m road widening is being proposed. The comments from Terrapex, dated October 15, 2018, are presented below. Our responses are shown beneath each comment.

RESPONSE TO PEER REVIEW COMMENTS

1. The Phase One ESA report prepared by AMEC and the Phase Two ESA report prepared by Coffey are generally in accordance with the requirements of O.Reg. 153/04 in form and content. These reports were previously reviewed by WSP, who provided comments to the City in their letters of January 11, 2016.

Terrapex agrees with the comments provided by WSP, and we also agree that the comments are predominately administrative in nature and would not materially affect the conclusions or recommendations in the original reports, particularly as they pertain to the land to be transferred.

WSP Response: No response required.

2. In addition to the comments provided by WSP, we note that the AMEC Phase One ESA identified soil and groundwater to be potentially impacted media in each of five APECs identified on the Site. However, neither the Coffey Phase Two ESA nor the supplementary Phase II ESA conducted by WSP addressed groundwater on the eastern property boundary (part of APEC #3) and no investigation was conducted on or near APEC #4 (the western property boundary). While these apparent deficiencies may affect the conclusions of the reports as they pertain to the Site as a whole, they are not expected to materially affect the conclusions as they pertain to the land to be transferred.

WSP Response: Two monitoring wells were installed within approximately 7 meters of the eastern (MW105) and western (BH2) property lines. MW 105 was near or within the Area of Potential Environmental Concern (APEC) 3 and five additional groundwater monitoring wells were placed near or within APEC 3, although not at the eastern boundary. We further understand that the closest dry cleaner east of the Site (an off-site Potentially Contaminating Activity (PCA) associated with APEC 3) is more than 80 m away and cross-gradient in relation to the groundwater flow direction. It is WSP's opinion that this off-site PCA does not represent a significant risk to soil and groundwater conditions at the Site.

Monitoring wells were not able to be installed within APEC 4 due to interference from a hydro line and a water main in this area (and the former daycare building to the south of the utility corridor at the time of the ESAs). It is understood that APEC 4 is related to the adjacent apartment building that was registered as a generator of light fuel waste from 2002 to 2004. The waste generator number (ON9299442) was likely obtained to facilitate the off-site disposal of light fuel waste as this building is likely heated by natural gas. No spills were reported at this property and it is unlikely that the past and current operations at the apartment building represent a source of fuel contamination to the Site.

In conclusion, it is the opinion of WSP that existing wells near the east and west property lines are sufficient to assess the potential off-site concerns and, therefore, meet the objective of the due-diligence ESA program. In addition, WSP agrees with Terrapex that the lack of monitoring closer to the property lines is not expected to materially affect the conclusions as they pertain to the land to be transferred.

3. *On pages 12 and 15 of the Phase Two ESA report, Coffey states no free product or sheen was observed during groundwater purging, sampling or monitoring at the Site. However, on pages 17 and 26 of the report, Coffey states "<u>During groundwater purging and sampling, a slight sheen was observed at monitoring well BH1</u>." This is particularly noteworthy given that according to the borehole log for BH1 included in Appendix C of the report, the well is constructed with the screen below the water table.*

Section 49(1) of O. Reg. 153/04 states that a property does not meet the applicable SCS in relation to PHC unless a qualified person has determined that there is no evidence of free product, <u>including but not limited to, any visible petroleum hydrocarbon film or sheen present in the groundwater</u>" (emphasis added).

WSP installed two additional monitoring wells in the vicinity of BH1 (MW101 and MW102), but makes no comment in its report with respect to the presence or absence of sheen on the groundwater at those wells. Furthermore, both of those wells also appear to be constructed with the screened interval below the water table. WSP (as both the former peer reviewer and the current consultant of record for the Site) should be requested to provide comment on this issue.

WSP Response: WSP acknowledges that the groundwater level was above the screens in the monitoring wells noted above; however, MW101 was intended to be a deeper well for delineation. It is noted that groundwater intersected the well screen at MW103 (approx. 10 m from BH1). Furthermore, a soil sample submitted for lab analysis from BH1 by Coffey at a depth intersecting the groundwater table was reported to contain non-detectable concentrations of volatile organic compounds (VOCs) and petroleum hydrocarbons (PHCs).

There was no evidence of staining or odours during the drilling activities completed by WSP and there was no evidence of product or sheen during groundwater sampling at the five wells monitored by WSP in 2017, including MW101 to MW105. It is possible that the sheen reported by Coffey in 2013 was either localized, or has dissipated since 2013. The multiple lines of evidence presented above support a conclusion that free product was not present at the Site at the time of the Supplemental Investigation in 2017.

Section 3.2.2 of our Supplemental Phase II ESA report dated September 5, 2017 stated "*No odour or evidence of free product was detected in any of the wells monitored as part of this investigation*". For clarity, WSP has updated that section of the report to document that no "sheen" was observed.

4. It is unclear to what extent, if any, the subsurface investigations conducted by Coffey and subsequently by WSP were located on the land to be transferred. However, six of the 10 boreholes advanced (and six of the eight monitoring wells installed) at the Site are located at the north end of the Site, close to or on the land to be transferred, and therefore it is reasonable to assume the information obtained at these locations is generally representative of the subsurface conditions on the land to be transferred.

WSP Response: No response required.

5. As noted by WSP in its peer review, Coffey incorrectly considered the use of the Site as a day care facility to be a commercial land use. Section 1 (3) of O.Reg. 153/04 specifically defines the use of a property as a day-care centre to be an institutional land use. When compared to the Table 3 SCS for RPI land use, two soil samples from BH1 and one soil sample from BH2 had SAR values exceeding the SCS. While this error does not materially change the conclusions of Coffey's report, as they pertain to the land to be transferred, it does indicate that the SAR impact is more widespread than reported by Coffey.

WSP states, in both the supplementary Phase Two ESA and MGRA reports, that in its Phase Two ESA report Coffey concluded the elevated SAR values were not considered to be contamination under O. Reg. 153/04. While Coffey did conclude the SAR was likely a result of de-icing salt, it did not provide an opinion that it is not a contaminant. In fact, on page 27 of the Phase Two ESA report, Coffey indicates that Table 6 presents the concentrations of contaminants that remain on the Phase Two property for SAR, which suggests that Coffey did, in fact, consider SAR to be a contaminant.

It is therefore recommended that WSP (as the consultant of record for the Site) be requested to provide an opinion with respect to SAR in soil at the Site in the context of Section 48(3) of O. Reg. 153/04.

WSP Response: It is WSP's opinion that the exemption in Section 48 (3) applies since the sodium adsorption ratio (SAR) impacts are suspected to be from de-icing salt and the impacted locations are less than 5 m from the road allowance. Therefore, it is concluded that SAR should not be considered to be a contaminant.

WSP has update the Executive Summary and Section 1.3 of the Supplemental Phase Two ESA report to better document this conclusion.

6. The plume of chlorinated hydrocarbons in groundwater on the Site at concentrations exceeding the applicable Table 3 SCS has not been delineated either horizontally (specifically southeast from BH 1) or vertically, and therefore the existing data set does not meet the requirements of O. Reg. 153/04. We recognize that an RSC is not required for this Site, however in the absence of delineation WSP should be requested to provide rationale for the assumption that the reported concentrations reflect the worst-case conditions on the Site.

WSP Response: WSP acknowledges that the VOC plume was not fully delineated, particularly to the southeast. It is our opinion that sufficient sampling was completed to identify a reasonable estimate of the maximum concentrations of VOCs in groundwater. We have identified the following lines of evidence to support this opinion:

- The apparent sources of VOCs identified in the Phase One ESA were off-site and to the north. The PCA to the east (i.e., dry cleaner more than 80 m away) is cross-gradient to groundwater flow. The groundwater sampling conducted in 2013 and 2017 consistently identified the maximum concentration of VOCs at the upgradient or the north property line, with low to non-detectable concentrations in groundwater further south.
- Six groundwater monitoring wells were installed across the 40 m width of the north property line. The well spacing provided data every 7 to 8 m along this northern property line.
- The deeper monitoring well (MW101) installed within 2 m of the Coffey well that originally exhibited the highest measured VOC concentration (BH1), indicates that the concentration of VOCs are similar (same order of magnitude) at depth.
- Groundwater was sampled on two occasions; by Coffey in 2013 and by WSP in 2017. The results of the sampling in 2017 did not reveal a significant increase in VOCs over these four years.

7. The Executive Summary of the MGRA report incorrectly states that the Coffey Phase Two ESA identified one soil sample location with an SAR value exceeding the Table 3 SCS for RPI land use and that Coffey concluded the SAR in soil is not considered to be contamination under O. Reg. 153/04. WSP should be requested to revise the MGRA report accordingly.

WSP Response: Terrapex is correct. There were three soil samples with SAR values exceeding the Table 3 SCS for RPI land use (one sample exceeded the Table 3 ICC SCS). As the sampling locations were located within 5 m of the road allowance, WSP concluded that SAR should not be considered to be a contaminant using the exemption in Section 48 (3) of O. Reg. 153/04.
The Executive Summary of the MGRA report will be updated accordingly.

8. Page 1 of the MGRA report states "The human receptors potentially exposed to the COCs include day care occupants (toddlers and teachers) and site visitors" but does not mention subsurface construction workers. Page 2 states that groundwater at the Site is too deep to be contacted by a subsurface worker during excavation for utility maintenance, and therefore the pathways of incidental ingestion of, or dermal contact with groundwater are considered incomplete. However, there is no mention of the pathway of inhalation of vapours from groundwater by subsurface workers. Figures 3 and 4 indicate this is a complete pathway in the human health conceptual model both without and with risk management measures.

The MGRA model does not assess explicitly the risk to construction workers during ground intrusive investigations from inhalation of vapours in an excavation trench sourced from groundwater. In cases where this receptor scenario may be a concern, separate qualitative or quantitative assessment is required. Given that the land to be transferred currently has utilities running through it, and the proposed day care will likely require new servicing, WSP should be requested to revise the MGRA report to address this receptor scenario.

WSP Response: Terrapex is correct that the Modified Generic Risk Assessment (MGRA) model does not explicitly evaluate the risk to trench workers from inhalation of vapours arising from groundwater in an excavation trench.

The proposed Property Specific Standards (PSSs) for 1,1-dichloroethylene (5.5 µg/L) and trichloroethylene (7.9 µg/L) are much lower than the GW2 industrial components (66 µg/L and 64 µg/L, respectively, for 1,1-dichloroethylene and trichloroethylene assuming a groundwater depth of 970 cm and no risk management measures), which is applicable to the adjacent roadway (industrial/ commercial/ community or ICC land use). No risk management measures are required for a trench worker responsible for utility installation, maintenance and repair.

The Executive Summary of the MGRA report and Section 4 of the MGRA has been updated to include this finding.

9. The soil vapour investigation conducted by WSP included two rounds of vapour sampling at two soil vapour probes. However, only one of the probes (VP-01) was located within the apparent extent of the VOC plume in groundwater. Furthermore, neither probe is located in the land to be transferred. Given that the plume is not delineated, two data points from a single location does not seem sufficient to confirm that worst-case conditions have been assessed, particularly in light of the fact that detectable concentrations of the groundwater COCs were not detected in the soil vapour samples, but concentrations of other chlorinated *hydrocarbons were.*

WSP should be requested to provide commentary with respect to the sufficiency of the data set to support its conclusions with respect to risks to human health receptors.

WSP Response: The purpose of the sampling was to assess soil vapour conditions under the footprint of the new proposed daycare facility. In our opinion, this sampling is also sufficient to assess worst-case conditions, explained as follows:

- One of the two vapour probes (VP-01) was installed at a location representative of the maximum VOC concentration in groundwater. This probe was located under the northwest portion of the proposed new daycare facility and less than 5 m from the proposed road widening lands. The other probe was installed under the southeast portion of the proposed new daycare facility to ensure spatial coverage across the building footprint.
- Two rounds of sampling were completed to assess for temporal variability. One of the sampling events was completed when the ground appeared to be frozen, when worst-case conditions are anticipated for soil vapour.
- Given that VOCs in groundwater were consistent in concentration (same order of magnitude), soil gas concentrations are not expected to vary significantly across the plume.
- The concentration of 1,4-dichlorobenzene was more than six times lower than the MECP soil vapour criteria applicable to the new daycare facility and all measurable VOC concentrations for other parameters were lower than the MECP criteria by a factor of 300.

Based on the evidence presented above, it is WSP's opinion that the data set is sufficient to support a conclusion that a significant risk to human health receptors is not present.

10. Page 3 of the Soil Vapour Investigation report states "The [soil vapour analytical] data ... <u>did not identify any exceedances of the applicable MOECC criteria in any of the soil vapour samples</u>." Although noted in a footnote to Table 1, the text of the report does not mention that the laboratory reporting limit for 1 ,2-dibromoethane (EDB) and 1,1,2,2-tetrachloroethane (1,1,2,2-PCA) exceeded the corresponding HBIAC and therefore the data do not confirm the absence of concentrations exceeding the HBIAC.

Normally, since neither EDB nor 1,1,2,2-PCA was a COC in groundwater at the Site, they would not be considered likely to represent a risk. However, given that positive detections of other chlorinated hydrocarbon compounds that were not COCs in groundwater were identified, WSP should be requested to address this issue. It is possible that the issue could be addressed by requesting the analytical laboratory to review the chromatograms for the soil vapour samples and provide a qualitative opinion confirming the absence of detection of these *parameters. Alternatively, additional soil vapour samples could be collected for analyses, first ensuring that the analytical laboratory can achieve the requisite reporting limits.*

<u>WSP Response</u>: WSP contacted ALS and they re-confirmed that the MECP criteria can not be achieved

by available analytical methods. ALS stated "*The MECP is aware that the Trigger Levels for these two compounds are not readily achievable by commercial laboratories and raised reporting limits do not indicate an exceedance of the Standard.*"

The Laboratory Results section of the report has been updated to document this conclusion.

11. The Soil Vapour Investigation report concludes that subsurface conditions are not suspected to result in unacceptable risks for human health receptors resulting from inhalation of indoor air in an enclosed building. Subject to resolution of the previous comments, WSP should be requested also to provide a conclusion with respect to risks for subsurface construction workers, specifically workers in trenches for utility installation, maintenance and repair.

<u>WSP Response</u>: The RPI scenario evaluated by WSP in the Soil Vapour Investigation report is considered to more sensitive than an ICC scenario (which would apply to trench workers). Therefore, it can be extrapolated that unacceptable risks to trench workers from inhalation of potential VOC vapours arising from groundwater are not present.

The Conclusions section of the report has been updated.

CLOSING

We trust that our responses meet the City's environmental requirements under this Peer Review. Please do not hesitate to contact the undersigned at (905) 882-1100 if you have any further comments, questions, or concerns.

Yours truly,

WSP CANADA GROUP LIMITED

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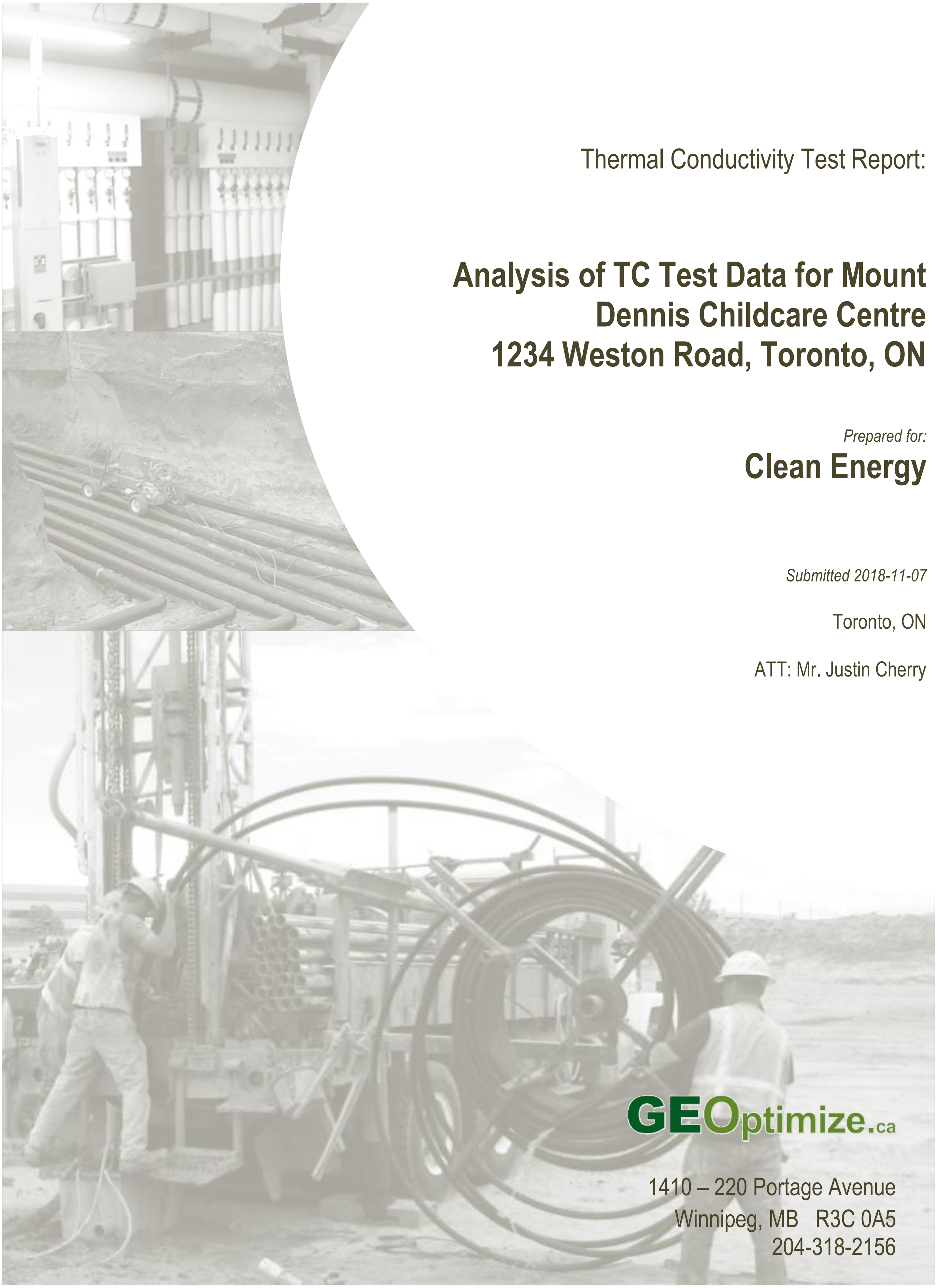
Thermal Conductivity Test Report



Thermal Conductivity Test Report:

Analysis of TC Test Data for Mount Dennis Childcare Centre 1234 Weston Road, Toronto, ON

Prepared for:

Clean Energy

Submitted 2018-11-07

Toronto, ON

ATT: Mr. Justin Cherry

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Executive Summary

A test borehole was drilled to a depth of 600’ by Desrosiers Drilling at 1234 Weston Road for the Mount Dennis Childcare Centre. A thermal conductivity test was conducted on the borehole on November 2-4, 2018. **GE**Optimize Inc. was contracted by to review and analyse the results of the thermal conductivity test based on the data logs provided by Clean Energy.

Based on the data logs provided, the results of the thermal conductivity test are shown in Table 1.

	Metric	Imperial
Borehole depth	183 m	600’
Borehole diameter	119 mm	4.5”
U-tube pipe size	1.25”	1.25”
U-tube pipe specifications	HDPE 4710 SDR11	HDPE 4710 SDR11
Test duration	55 hours	55 hours
Calculation interval	12-55 hours	12-55 hours
Average flow rate	0.726 l/s	11.51 gpm
Ambient ground temperature	**10.6°C**	**51.0°F**
Thermal conductivity (calculated)	**2.20 W / (m * °K)**	**1.27 Btu/hr * foot * °F**
Thermal diffusivity (estimated)	**0.084 m^2 / day**	**0.90 $feet^2$ / day**

Table 1: Summary of thermal conductivity test calculations

1. Introduction

Desrosiers Drilling was contracted to drill a test borehole for the Mount Dennis Childcare Centre located at 1234 Weston Road, Toronto, ON. The borehole was drilled October 18 to 19, 2018. Figure 1 indicates the location of the test borehole relative to the proposed building and the additional boreholes for the required ground heat exchanger (GHX). A drilling report drilling log and pressure test report was provided by the drilling contractor.

The thermal conductivity and diffusivity of the borehole was estimated based on the weighted average of the stratigraphy indicated in the borehole log.

A thermal conductivity test was conducted November 2-4, 2018.

GEOptimize Inc was contracted by Clean Energy to review and analyse the results of the thermal conductivity test.

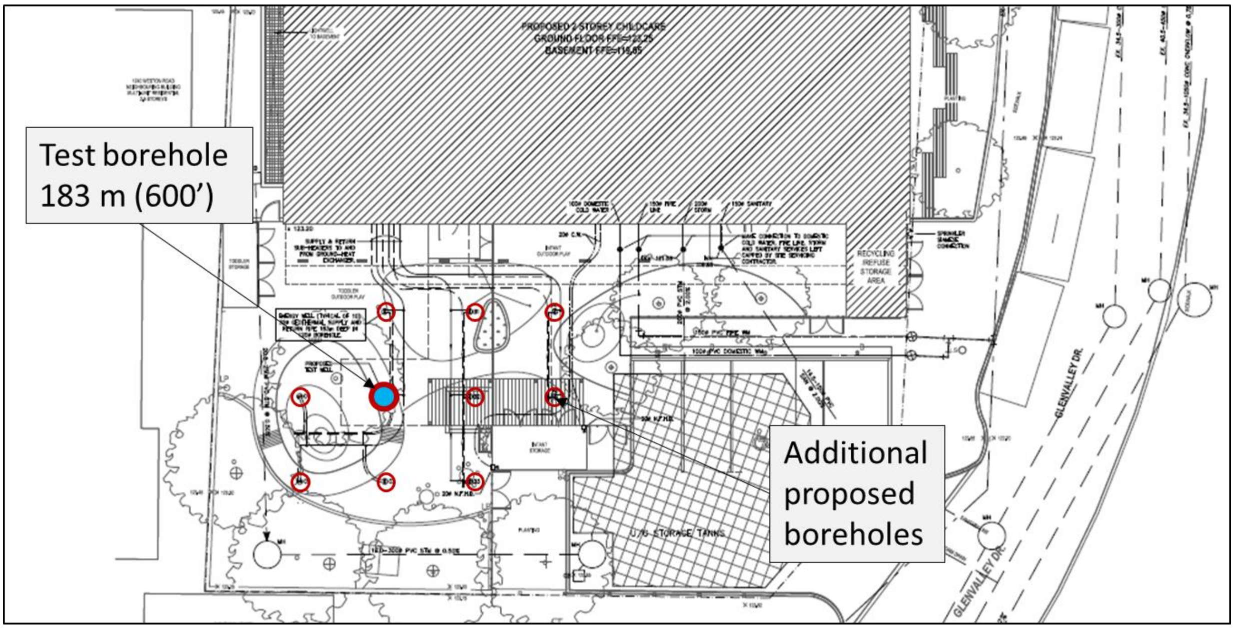

Figure 1: Borehole location and location of additional 9 proposed boreholes.

2. Borehole design

The test borehole was drilled to 183 m (600'). The borehole log provided by the drilling contractor indicated 45 m (147') of overburden comprised of layers of clay, sand and silt. The drilling report indicated bedrock was encountered at 40 m (130') and the steel casing was installed to a depth of 45 m (147').

The inside diameter of the casing is 127 mm (5"). The drilling report does not indicate if the casing was removed or the material of the casing (plastic or steel). The open borehole below the casing is 114 mm (4.5"). The drill log indicates layers of shale and limestone below 45 m (147').

A U-tube constructed of 1.25" high-density polyethylene PE4710 SDR11 pipe was inserted into the borehole to 183 m (600').

3. Thermal conductivity test

The 1.25" (32mm) SDR11 HDPE U-tube in the test borehole was connected to a TC testing unit. A schematic of the test borehole with connections to the TC Testing unit and generator power supply is shown in Figure 2.

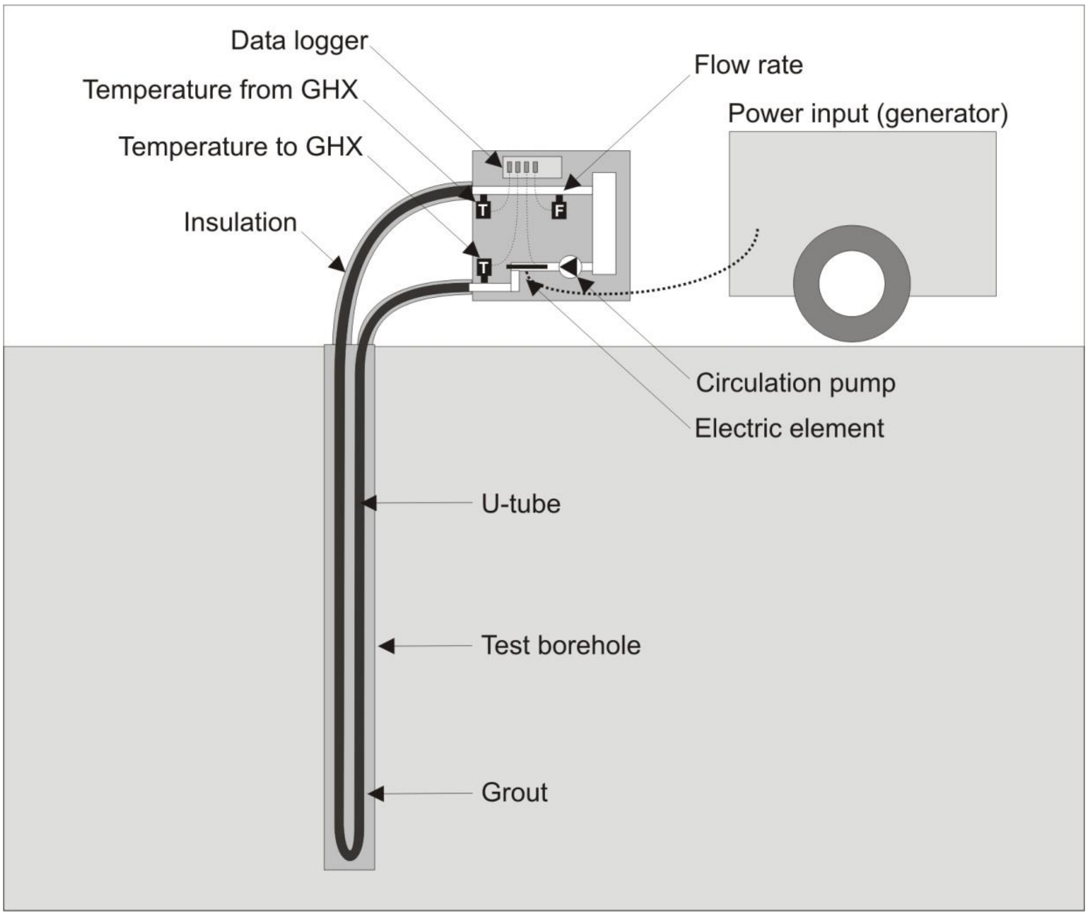

Figure 2: Thermal conductivity testing unit connected to U-tube in test borehole.

Table 2 summarizes the statistics from the test based on the information provided.

Start date / time	2018-11-02 7:58
Finish date / time	2018-11-04 15:19
Duration of test	3,322 minutes (55 hours 22 minutes)
Logging interval	1:00 minutes
Minimum input voltage	238.8 Volts
Maximum input voltage	240.7 Volts
Average input voltage	239.1 Volts
Minimum input amperage	44.70 Amps
Maximum input amperage	45.08 Amps
Average input amperage	44.85 Amps
Minimum kW input	10.67 kW
Maximum kW input	10.85 kW
Average kW input	10.72 kW
Power input per m (ft)	58.7 W / meter (17.9 W / foot)
Average flow rate	0.726 l/s (11.51 gpm) NOTE: Flow estimated, data not recorded
Borehole depth	183 m (600’)

Table 2: Summary of thermal conductivity test data statistics.

4. Test results

A TC Test measures the temperature of fluid entering and leaving the test borehole, the flow rate through the borehole and the power input into the borehole at regular intervals. For this project the data was logged at 1-minute intervals.

From the data, the average thermal conductivity of the borehole can be calculated, and the ambient deep earth temperature can be measured.

The thermal diffusivity of the formation is estimated based on the geological information available in the drilling log.

4.1. Ambient ground temperature

The deep earth ambient temperature has an impact on the design of the ground heat exchanger. The temperature is measured during the first few minutes of the test and is indicated in Figure 3. Based in the logged temperatures the ambient earth temperature is 10.6°C (51.0°F)

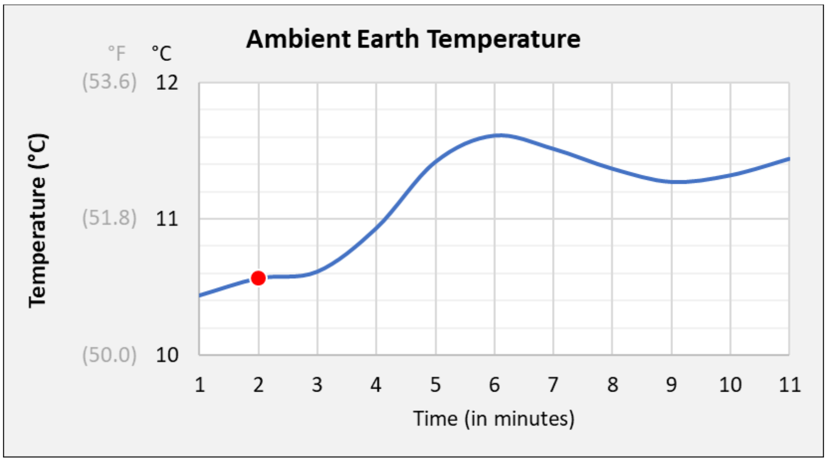

Figure 3: Based on the logged temperatures the ambient earth temperature is 10.6°C (51.0°F)

4.2. Thermal conductivity

Thermal conductivity is a measure of the quantity of heat that can be transferred through the material in which the borehole is drilled. It is measured in W / (m * °K), or Btu / (hr * foot * °F)

The data from the TC Test was analyzed by graphing the temperature data collected during the test and calculating the slope of the temperature trend line. This was calculated using the following formula:

$$k \quad = \quad P\,(Btu/hr) \,/\, \; 4\pi L \; * \quad Slope\;(T_{avg}\;versus\;ln\;(time))$$

A graph showing the average temperature of the water entering and leaving the U-tube in the test borehole is shown in Figure 4. The first 10 to 15 hours show a very rapid increase in temperature of the water circulated through the U-tube. This indicates the time required for the increasing temperature of the fluid to begin dissipating to the actual geological formation in which the borehole has been drilled and is affected by the construction of the test borehole.

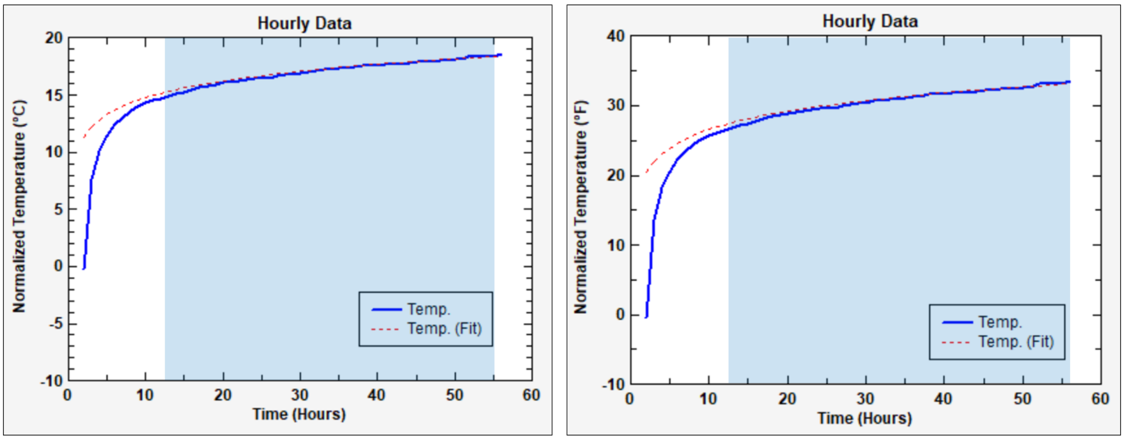

Figure 4: The temperature increase from the start to end of the test (°C and °F)

Figure 5 graphs the average temperature of the fluid circulating through the U-tube versus the natural log of time. The slope of this line is used to calculate the average thermal conductivity (k) of the formation the test borehole is drilled in.

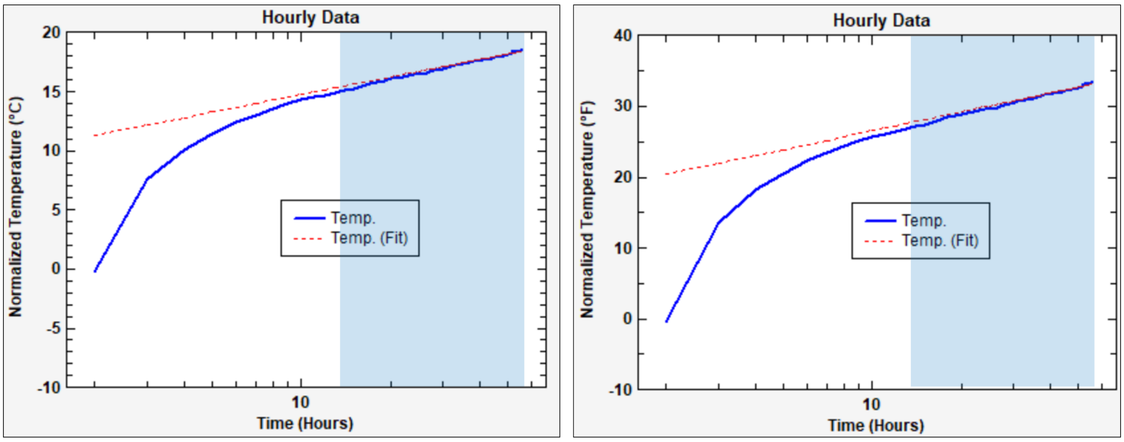

Figure 5: Graphs the fluid temperature versus the natural log of time. The slope of the line is used to calculate the average thermal conductivity of the borehole.

Based on the data log provided the thermal conductivity calculated for the test borehole is:

- 2.20 W / (m * °K)
- 1.27 Btu / (hr * foot * °F)

4.3. Thermal Diffusivity

The thermal diffusivity is a measure of the speed at which heat moves away from a borehole. It is measured in or m^2 / day (or ft^2 / day)

The average thermal diffusivity of a borehole cannot be measured. Thermal diffusivity of materials can be measured, and tables of the diffusivity of soil and rock are available and is included in Table 3. Thermal diffusivity is estimated from the properties of the soil and rock in which the borehole is drilled. An estimate of the average thermal diffusivity of a borehole can be determined by calculating a weighted average of the diffusivity of the formation encountered by the driller when the test borehole was drilled.

Based on the drill log provided the thermal diffusivity of the formation surrounding the test borehole is estimated at 0.084 m^2 / day (0.90 ft^2 / day)

Soil Type	Dry Density lb/ft³	5% Moist		10% Moist		15% Moist		20% Moist	
		k (Btu/hr*ft*°F)	α ft²/day	k Btu/hr*ft*°F)	α ft²/day	k Btu/hr*ft*°F)	α ft²/day	k Btu/hr*ft*°F)	α ft²/day
Coarse 100% Sand	120	1.2-1.9	0.96-1.5	1.4-2.0	0.93-1.3	1.6-2.2	0.91-1.2	-	-
	100	0.8-1.4	0.77-1.3	1.2-1.5	0.96-1.2	1.3-1.6	0.89-1.1	1.4-1.7	0.84-1.0
	80	0.5-1.1	0.60-1.3	0.6-1.1	0.60-1.1	0.6-1.2	0.51-1.0	0.7-1.2	0.52-0.90
Fine Grain 100% Clay	120	0.6-0.8	0.48-0.64	0.6-0.8	0.4-0.53	0.8-1.1	0.46-0.63	-	-
	100	0.5-0.6	0.48-0.58	0.5-0.6	0.4-0.48	0.6-0.7	0.37-0.48	0.6-0.8	0.41-0.55
	80	0.3-0.5	0.36-0.6	0.35-0.5	0.35-0.5	0.4-0.55	0.34-0.47	0.4-0.6	0.30-0.45

Rock Type	k - All** *Thermal Conductivity* Btu/hr*ft*°F)	k - 80%*** *Thermal Conductivity* Btu/hr*ft*°F)	c p *Specific Heat* Btu/lb*°F)	*Density* lb/ft³	α (k/ρc_p) *Thermal Diffusivity* ft²/day
Granite (10% Quartz)	1.1-3.0	1.3-1.9	0.21	165	0.9-1.3
Granite (25% Quartz)		1.5-2.1			1.0-1.4
Amphibolite	1.1-2.7	1.5-2.2		175-195	
Andesite	0.8-2.8	0.9-1.4	0.12	160	1.1-1.7
Basalt	1.2-1.4		0.17-0.21	180	0.7-0.9
Gabbro (US Cen. Plains)	0.9-1.6		0.18	185	0.65-1.15
Gabbro (US Rocky Mtns)	1.2-2.1				0.85-1.5
Diorites	1.2-1.9	1.2-1.7	0.22	180	0.7-1.0
Grandiorites	1.2-2.0		0.21	170	0.8-1.3
Claystone	1.1-1.7				
Dolomite	0.9-3.6	1.6-3.6	0.21	170-175	1.1-2.3
Limestone	0.8-3.6	1.4-2.2	0.22	150-175	1.0-1.4
Rock Salt	3.7		0.20	130-135	
Sandstone	1.7	1.2-2.0		0.24	160-170
Siltstone	0.8-1.4				
Wet Shale (25% Quartz)	0.6-2.3	1.0-1.8	0.21	130-165	0.9-1.2
Wet Shale (No Quartz)		0.6-0.9			0.5-0.6
Dry Shale (25% Quartz)		0.8-1.4			0.7-1.0
Dry Shale (No Quartz)		0.5-0.8			0.45-0.55
Gneiss	1.0-3.3	2.3-3.5	1.3-2.0	0.22	160-175
Marble	0.9	1.2-3.2	1.2-1.9	0.22	170
Quartzite		3.0-4.0		0.20	160
Schist	5.1	1.2-2.6	1.4-2.2		170-200
Slate		0.9-1.5		0.22	170-175

Table 3: Thermal diffusivity estimated based on drilling log information[1] *Highlighted cells indicate the type of rock and soil shown in the drill log.*

[1] *Unconsolidated soils table:* O.T. Farouki, "Evaluation of Methods for Calculating Soil Thermal Conductivity," U.S. Army Cold Regions Research and Engineering Laboratory Report 82-8, Hanover, NH, 1982. *Rock table:* S.P. Kavenaugh, "Simulation of Ground-Coupled Heat Pumps with an Analytical Solution," Proceedings of the ASME International Solar Energy Conference. New York: American Society of Mechanical Engineers, 1992.

4.4. Borehole thermal resistance

Borehole design affects how quickly heat can be transferred between the earth and the fluid circulating through the GHX piping. This is referred to as borehole thermal resistance. It is affected by:

- U-tube pipe diameter
- U-tube pipe wall thickness
- Material U-tube pipe is constructed of
- Placement of the U-tube piping in the borehole
- Diameter of the borehole
- Thermal conductivity of the material (grout) between the U-tube piping and the borehole wall

As the borehole thermal resistance increases the length of time required for the heat transfer between the borehole and the earth increases. For this TC test, the stability of the temperature stabilized after approximately 12 hours. The test data used to calculate the thermal conductivity of the formation was between 12 and 55 hours.

Reducing borehole thermal resistance does not change thermal properties of the soil or rock around the borehole. Reducing borehole thermal resistance allows the borehole to transfer heat more quickly from the heat transfer fluid to or from the formation. During peak cooling loads heat will transfer to the formation more quickly when the borehole thermal resistance is reduced and fluid temperatures to the heat pumps will be reduced.

Based on the logged data provided the borehole thermal resistance of the U-tube in the test borehole is 0.24 (h * ft * °F / Btu.

4.5. Comparison to estimated thermal properties

Comparing the estimated thermal conductivity of the formation against the measured thermal conductivity provides a check for the calculations.

Based on the drill log, the thermal conductivity of the borehole is estimated at 2.20 W / (m * K) (1.27 Btu / (hr * ft * °F) and thermal diffusivity at 0.084 m^2 / day (0.90 ft^2 / day) as shown in the table in Figure 6. The drill log provided does not show a detailed description of the drill cuttings from the borehole.

The calculated borehole thermal resistance based on the diameter of the borehole, the type of grout installed in the borehole, the diameter and type of U-tube installed and the estimated placement of the pipe in the borehole is 1.21 m * °K / W (0.209 h * ft * °F / Btu).

Note that the estimate indicates the estimated high and low ranges for the conductivity and diffusivity for the formation noted in the drill log.

Mount Dennis Childcare Centre - Test Borehole Project Location: 1234 Weston Road, Toronto, ON																
Depth		Layer	Lithology	Conductivity			Diffusivity			Weighted TC			Weighted TD			
Start	End			Low	Avg	High	Low	Avg	High	Low	Avg	High	Low	Avg	High	
0	147	147	Silty clay 10%	0.60	0.70	0.80	0.50	0.70	0.90	0.15	0.17	0.20	0.12	0.17	0.22	
147	110	201	Wet shale (no quartz)	0.50	0.95	1.40	0.50	0.55	0.60	0.17	0.32	0.47	0.17	0.18	0.20	
110	268	158	Wet shale (no quartz)	0.50	0.95	1.40	0.50	0.55	0.60	0.13	0.25	0.37	0.13	0.14	0.16	
268	335	67	Wet shale (no quartz)	0.50	0.95	1.40	0.50	0.55	0.60	0.06	0.11	0.16	0.06	0.06	0.07	
335	402	67	Wet shale (no quartz)	0.50	0.95	1.40	0.50	0.55	0.60	0.06	0.11	0.16	0.06	0.06	0.07	
402	469	67	Wet shale (no quartz)	0.50	0.95	1.40	0.50	0.55	0.60	0.06	0.11	0.16	0.06	0.06	0.07	
469	536	67	Wet shale (no quartz)	0.50	0.95	1.40	0.50	0.55	0.60	0.06	0.11	0.16	0.06	0.06	0.07	
536	600	64	Wet shale (no quartz)	0.50	0.95	1.40	0.50	0.55	0.60	0.05	0.10	0.15	0.05	0.06	0.06	
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Depth	**600**	**Average Estimated Thermal Conductivity & Diffusivity of Borehole**								0.72	**1.27**	1.81	0.70	**0.80**	0.91	

Figure 6: Estimated thermal conductivity and diffusivity based on weighted average of materials described in drilling log.

5. Closure

Please do not hesitate to contact the undersigned if you have questions or if the information provided herein requires clarification.

Yours truly,
GEOptimize Inc.

Ed Lohrenz, B.E.S., CGD

City of Toronto
Cabling and Security Information

Cabling Standard

TORONTO
CORPORATE SERVICES
INFORMATION & TECHNOLOGY

STANDARDS AND PROCEDURES

Cabling Standard

Issued by:
IT
Network Services
Version 4.4 – Jul, 4, 2018

Revision History

Date of this revision	Author
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Nov 4, 2004	Mark LaFleche
Oct 2, 2007	Mark LaFleche
Jan 28, 2009	Mark LaFleche
Jan 28, 2010	Mark LaFleche
Jul 4, 2018	David Gilkes

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2.0	May 13, 2002	Update doc and format	Format changed to standard
3.0	Sep 26, 2003	Update specification for corporate cabling standards and cabinets	
3.1	April 1, 2004	Added Voice exceptions at the introduction, update cabinet and electrical specifications.	
3.2	Nov 4, 2004	Added some room details and updated some cabinet details	
4.0	Oct 2. 2007	Add more details relating to process, cable installation and times lines and appendices.	
4.1	Jan 28, 2009	Changed some typos, added details regarding transition to new VOR.	
4.2	Jan 28, 2010	Added in section 3.0 Updated 1.2.1 to 1.2.6	
4.3	March 19 2014	Updating sections	
4.4	Jul 4, 2018	Added Section 1.2.18, 1.4.19. Updated 1.4.11 -1.4.17	

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Introduction

This document addresses the cabling design specifications of data cabling within the City of Toronto controlled buildings or leased spaces, where the network is controlled by IT-Network Services. This document should be considered a guideline, consideration for some of the content should be reviewed before placing this into a tender document, specifically extra costs and Bell standard pricing.

Though every attempt is made to cover unforeseen issues, every building and project has its own issues, therefore IT - Network services and Telecommunication services should be included right at beginning of the project and the communication specs must be reviewed and approved by these groups within the City of Toronto.

Cabling Agreement

Effective January 10, 2010 the City of Toronto has entered a multiyear Voice and Data cabling agreement with Bell Canada. Bell Canada is to be used for all Data and Voice cabling for all owned and leased City of Toronto buildings

A pricing table of services with this agreement with unit costing is available from IT with permission to authorized recipients.

When the agreement is replaced or renewed the, current cabling vendor of record (VOR) should be used. The cable VOR should be verified by IT network Services at time of proposed work or RFP.

When a new VOR is selected, some changes may occur to some of the site specific details, standard and non-standard work in this document.

Voice Cabling

As Part of the ITI agreement Unified Communications (UC) Devices are now deployed. Also known as VOIP. Where it is cost effective and proper planning and acceptance has been completed UC phones that plug into the data network will be utilized.

It is the responsibility of the voice applications group, (telecommunication) to direct if the location will be Centrex or UC. If the location is Centrex or undetermined, then cat3 cable should be installed to every phone location as well as 1 data.

The typical user workstation is for one Data jack Cat5e or Cat 6 that will support the phone plugged into the jack and the user's computer plugged into the phone. Any other special requirements must be identified by the client.

For Analog Devices such as Fax's, POS (Dialup), modems and other specialized monitoring lines, are considered to be using Centrex, but is prudent to also supply a data cat5e/6 cable for future use and conversion.

The voice cabling system for Centrex will be supplied and installed by Bell as part of an agreement between Bell and the City of Toronto. Bell will have ownership of the voice cabling system. The system will be based on Category 3 wiring and will be provided in accordance with

Bell's specifications. There is no cost to the contractor from Bell for this service. The cost will occur when the line is energized with service

All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Telecommunications contractor as detailed in this document.

Also review business requirements with both Voice Infrastructure Group and network groups to ensure the appropriate technology is used in the locations.

Please contact IT-Telecommunications Services, voice infrastructure group for more details.

Commercial Building Wiring Standard

In Canada this is the CSA T529-95 standard “Telecommunications Cabling Systems in Commercial Buildings”, which adopts the American ANSI/TIA/EIA-568-A standard “Commercial Building Telecommunications Cabling Standard”. This standard covers the following:

- Horizontal cabling
- Backbone cabling
- Telecommunications Closets
- Equipment rooms
- Entrance facilities
- Cable standards

Other cabling system standards and recognized telecommunications industry standards. Are incorporated for reference:

- ANSI/TIA/EIA-568-B.1 and its addendum
- ANSI/TIA/EIA-568-B.2 and its addendum
- ANSI/TIA/EIA-568-B.3 and its addendum
- ANSI/TIA/EIA-568-B.2-1 (category 6 addenda)
- ANSI/TIA/EIA-569-A and its addendum
- ANSI/TIA/EIA-606-A
- ANSI/TIA/EIA-J-STD-607
- ANSI/ICEA S-90-661
- ANSI/ICEA S-80-576
- ANSI/ICEA S-83-596
- ANSI/ICEA S-83-640
- ANSI/EIA/TIA-492AAAA
- ANSI/TIA/EIA-472CAAA
- ANSI/TIA/EIA-472DAAA
- ANSI/TIA/EIA-598
- ANSI/TIA/EIA-455
- ANSI/TIA/EIA-604
- ISO/IEC 11801 2nd edition
- CENELEC EN50173
- IEC 603-7

Commercial Building Standard for Telecommunications Pathways and Spaces

This is the American ANSI/EIA/TIA-569 standard that specifies the architectural requirements that support and enable the Commercial Building Wiring Standard.

Intelligent Building Distribution Network

Originally developed by Nortel, but now owned by Belden, the IBDN standard is a commercial implementation of the ANSI/CSA cabling specifications.

1.0 Building Area Network

1.1 Cabling Standards

These standards address specifications that comply with the conventions established by CCITT, IEEE, ISO, BICSI or other organizations with responsibilities for setting international standards. The City of Toronto has, where possible, selected international standards for the implementation of CITYNET. Building cabling must conform to the Intelligent Building Distribution Network (IBDN) standard which is, in turn, compliant with the Electronics Industry Association / Telecommunications Industry Association (EIA/TIA) Commercial Building Wiring Standard. The IBDN standard specifies the configuration of the cable distribution and termination within the building from the outlet in each office to the exit point from the building to the external carrier system.

1.1.1 Where fiber is being used within buildings to support 10basefFL 100BaseFX or Gigabit Ethernet and/or any other LAN technology,

a. Always determine with IT Network Services Fiber and type as part of the design. But the guidelines below can followed.
b. In existing buildings new fiber should be OM3 unless otherwise specified. All terminated in Patch panel with LC terminations. Patch cables are determined by what network equipment will terminate on the fiber.
c. In new buildings where installing new fiber, OM3 multimode fiber cable will be used with LC terminations on the fiber patch panels. OM4 Considered in computer room type applications or core locations.
d. Where there is a mixture of old and new terminations, the cable connectors and patch panels should be replaced with current standard at the time of major reconstruction.
e. Relocation of the fiber termination point, must include updating connectors and fiber patch panels.
f. Where a pathway is open or harsh environment armored cable should be used or conduit installed.

1.1.2 Unshielded Twisted Pair used between the workstations and the Hub Room or for vertical Hub Room to Hub Room service must be 4 pair unshielded twisted pair enclosed in Plenum rated jacket with a minimum of EIA/TIA Category 5E performance with RJ45 terminations. If there is category 6 existing in the renovated space, then the location must use the same rating or higher rating and must be the same series of cable i.e. Belden/CDT 2400 series or 4800 Series.

a. The UTP-based cabling system shall have minimum a 160 MHz Channel Bandwidth over a maximum distance of 100m (328 ft.) and a positive channel Power Sum Attenuation-to-Crosstalk Ratio (PSACR) at 160 MHz.
b. The UTP-based cabling system shall use matched components from a single manufacturer, and the cabling system shall be certified to deliver system

performance over the lifetime of the applications for which the cabling system was originally designed to support.

c. All components used in the UTP-based cabling system shall be warranted for a period of 25 years from date of installation against defects in materials and/or workmanship.

d. The UTP-based cabling system shall comply with the following standards:
Minimum Enhanced Category 5 – ANSI/TIA/EIA-568-B.1
Class D ISO/IEC 11801 2nd edition
Class D - CENELEC EN50173

e. The UTP-based cabling system shall be capable of supporting the following applications:
Gigabit Ethernet (1000BASE-T)
Power over Ethernet (POE) 802.3af standard minimum
Fast Ethernet (100BASE-TX, 100BASE-T4)
Voice

IBDN System 1200 Parameters (cat 5e)

Parameters	Frequency	Standards*	IBDN Performance
PSNEXT	100 MHz 155 MHz 160 MHz	27.1 dB	32.7 dB 29.6 dB 29.4 dB
Attenuation	100 MHz 155 MHz 160 MHz	24.0 dB	22.3 dB 28.6 dB 29.1 dB
PSACR	100 MHz 155 MHz 160 MHz	3.1 dB	10.4 dB 1.0 dB 0.3 dB**
PSELFEXT	100 MHz 155 MHz 160 MHz	14.4 dB	20.0 dB 16.2 dB 15.9 dB
Return Loss	100 MHz 155 MHz 160 MHz	10.0 dB	12.0 dB 10.1 dB 10.0 dB
Propagation Delay		555 ns	490 ns
Delay Skew		50 ns	25 ns
Available Bandwidth		100 MHz	160 MHz

Worst case scenario for four-connector topology

*Based on ANSI/TIA/EIA-568-B.1 (May 2002)
ISO/IEC 11801 2nd edition (September 2002)

** Positive PSACR @ 160 MHz

1.1.3 In large campus environments such as civic centers and Metro Hall, connections from hub room to hub room or vertical riser's connection should use fiber, unless otherwise stated by IT – Network Services.

1.1.4 100BaseTX and 1000baset switches are used in each hub room or communications room. Cat5E / Cat6 patch cables are used to connect the switches to the building cabling system between the hub room and the servers / end user workstations. At the server/workstation, the appropriate Network Interface Cards (NICs) are incorporated in the workstations.

1.1.5 Servers in the main computer room will be connected to Cat6 patch panels within the cabinet. Cat6 cables will be run from these patch panels to patch panels specified by IT – Network Services Group or Gigabix Frame.

a. Any new server cabling put should be located on a directly installed patch panel within the cabinet of the server.
b. New Cabling infrastructure for computer room environment or where GigE is required Cat 6 utilizing 4800LX series Belden cable should be considered mandatory, decision should be decided with direction from IT-network services.

1.1.6 Workstations in office areas will be connected to Cat5E/Cat6 wall jacks or to Cat5E/Cat6 jacks incorporated into modular furniture.
a. If the location is new, or a fully renovated floor or location Cat6 cable should be used

1.1.7 Data Jacks are to be identified with a separate colour, by default black for voice, white or blue for data, unless a different scheme is used at the location, or aesthetic reasons the jack is in furniture and is limited available colours. Any differences should be approved by IT - Network Services,

1.1.8 Every effort should be used to support the Belden IBDN product line, this will keep the parts standardized and are readily available to the current cabling supplier used by the City of Toronto. Any changes should be a provided by IT -Network Services. Also a proper end to end solution for Cat5e / Cat6 will be certified by one vendor using all the same components from one vendor.

1.2 Cabling Standards (COT – Information Technology (IT))

Corporate standards address the design aspects of CITYNET that comply with industry practices but may be unique to the corporation. These specifications deal with the current environment and the variety of methods used to accommodate the varied computing platforms of the corporation.

There are a variety of methods used to cable LAN's and terminal equipment. The City has adopted the following corporate standards that address the methods for the implementation of cabling to serve a variety of equipment:

1.2.1 A central hub room for each Civic location for the city of Toronto shall be established. This must be located within the City of Toronto space and should be monitored by Corporate security. Access arrangements through Corporate Security for IT must be available 7x24. If any location through this central hub room is monitored by security or any department use is required beyond normal business hours.

1.2.2 A main secure hub room will be established on each floor, this must be located in the City of Toronto Space, all voice and data cabling should terminate here. **This is important for UC environment and -911 Enhanced service.** For Small locations, the equipment will generate some heat and noise. The main hub room should not be in an office where people are occupying.

1.2.3 Where the floor area is extensive, multiple hub rooms will be created

1.2.4 All hub rooms to house voice connections, network patch panels, Network equipment, terminal servers and all other network termination equipment. All units will be rack mounted. Rack mounted shelves can be used for equipment that does not provide rack mounts. (For Rack details please see section 1.3.0 Cabinet / Rack Standards) See Appendix A for examples of configurations.

1.2.5 All hub rooms should connect back to the central hub room via a **direct** back bone fibre and/or Copper multi pair riser cable. If security requirements are required, then all backbone cabling shall be placed in conduit. No Daisy chaining fiber cables from floor to floor.

1.2.6 The room should be located in an area that is not obtrusive to staff and sufficient room to house the shelf or rack.

1.2.7 Hub rooms are for Voice/network and communications and related computer equipment only and should **not** be used for storage space. Especially chemicals for cleaning etc.

1.2.8 Floors should not be carpeted; a sealed concrete or vinyl floor is acceptable, anti-static flooring is preferred.

1.2.9 There must be sufficient room in the hub room to allow access around all the racks installed in the room. 10 Feet by 10feet minimum in room containing only one rack

1.2.10 Sufficient cooling / ventilation should be provided into the hub room for the expected equipment to be installed and also have room for adequate growth.

1.2.11 Water Valves or water dripping hazards etc. should not be above equipment.

1.2.12 Enough electrical should be installed to service the rack(s) power strip(s) as well as additional equipment required by the client (local servers – not sanctioned by Network services, expected to follow IT server standards)

1.2.13 Plywood for any other communications should be fire rated or painted with fire retardant paint.

1.2.14 If systems, terminals, printers, etc. require special cable an exception from standard must be requested before installation.

1.2.15 The unshielded twisted pair will be terminated on RJ45 Cat5e/Cat6 patch panels. The four pair cables will be terminated (ISDN format) on the patch panels, all excess will be trimmed and cables will be tied back appropriately. Cables will then be labeled on the cable at the connection point on the back of the patch panel and on the front of the patch panel above each port.

1.2.16 Patch cables running from the patch panel to the network equipment will adhere to the same UTP standard as above and will be labeled before installation.

1.2.17 Patch panel ports will be labeled following the corporate standard see section 1.4.0 Cabling Procedures (COT-IT)

1.2.18 All Hub room doors within Civic Centers or City owned Buildings should include an access card reader which will be controlled by City of Toronto Corp Security Division.

1.3 Cabinet / Rack Standards (COT-IT)

This standard specifies installation of racks and cabinets in the various buildings throughout the city. Each location has its uniqueness therefore local knowledge should be part of the design process for the layout of the cabinet and/or rack. Also larger locations or locations with a proper raised floor computer room environment have different standards than most other buildings. Most wiring locations, racks are adequate, but some locations, such raised floors areas and proper computer rooms should contain cabinets.

1.3.1 All racks and cabinet Z-rails, must have threaded holes for 10/32 screws, no punch rails with separate bolt inserts.

1.3.2 All racks should have a 2 vertical cable managers at least 5" Wide and the height of the rack and should be attached to each side of the rack, the manger should be metal and have a hinged cover. If only one side can be attached or where two racks a placed in a row a 9" wide cable manger should be used.

1.3.3 All racks should be mounted securely to the floor.

1.3.4 Each rack should have a power strip (12 pos) attached to the side of the rack, with a minimum of a 15 foot cord attached to the strip, terminated with standard 125V 15A blade connector or Twist lock, this should be verified with IT – Network Services. If the cabinet is going on a raised floor. The power bar should have a twist lock on the end of the cable with the appropriate rated connector.

1.3.5 For some small wiring closets where there is no room for a rack or growth is not expected to be more than 24 ports, a wall mount 19" frame (11 RU) can be used in place of a rack. The frame should have a 2 RU metal hinged horizontal cable manager installed under the patch panel and room for at minimum 2RU switch and one shelf to hold non-rack mountable equipment and a 19" rack mountable 6 pos power bar. This rack should be installed at 48 – 60 inches above the floor so that it is accessible without a use of a ladder. IT staff are not certified via health and safety to be on ladders.

1.3.6 A duplex 125V 15A electrical outlet on an independent circuit should be installed within 10 feet of the rack, so that the power cord from the power strip will not cross any open areas. For the wall mounted racks the duplex outlet should be installed in the cabinet. For computer rooms in a raised floor environment a twist lock connector should be provided under the raised floor for the cabinet. Ensure the rating matches the power bar/strip. Within the city, currently there 15A 125V twist locks and 20A 125V twist Locks on cabinets. All power for cabinets and equipment should be verified in computer room environments with IT - Network Services.

1.3.7 If emergency power is available at the location then power for network equipment should be on the emergency power.

1.3.8 UPS requirements are based on the client's requirements. Not IT Network Services. Unless specified.

1.3.9 When a cabinet is used, the cabinet type and style should be specified by IT - Network Services, each location is different.

1.3.10 In general for cabinets the should be 30" wide cabinets with 19" Z rails front and back to allow for 19" rack mounted equipment. But should be confirmed depending on the location.

1.3.11 For cabinets, vertical cable managers should be used at the front corners, for every 48 patch ports a 2 RU horizontal cable manager should be used. All cable managers should be metal with hinged doors.

1.3.12 In the cabinets a 19" front mounted shelf should be installed in every cabinet.

1.3.13 For cabinets the patch panel layouts and locations must be approved by IT - Network Services.

1.3.14 For cabinets electrical requirements are specific to the location and equipment within the cabinets and should be specified by IT - Network Services.

1.4 Cabling Procedures (COT-IT)

These procedures will provide a common implementation method for all LAN installations and the appropriate relativity to the Cable/Configuration management system.

In an effort to have common cabling practices across CITYNET the following procedures have been developed to detail exact cable placement and installation procedures:

1.4.1 Cables will be labeled using the corporate standard. For horizontal data cables use Dxxxyyy. Where xxx is the building floor number and yyy is the cable number on that floor. For example cable 17 on floor 12 would be D012017. Where there is more than one Hub Room on a floor a direction indicator will be used (i.e. N, E, W, and S). For example, the first cable on the 3rd floor terminated in the north Hub Room will be labeled D03N001. If an existing cabling scheme exists, that is different, continue to follow the existing cabling scheme or contact IT -Network Services for clarification. Computer room wiring labeling should always be confirmed with IT - Network Services. Be aware of older exiting cabling and wire scheme so that numbering is not overlapped. If this occurs and is difficult to continue, then wiring can continue from next hundred higher , for example if the wires end at D021162 then continue d021200

1.4.2 The patch panel's ports will be labeled with the above standard numbering system.

1.4.3 For non- standard office devices on utilizing IP and cat5/6 cabling, patch panels should be grouped for services separately and identified jacks such as IP security cameras or intercom systems etc. Enough room should be allocated for expansion and layout of all patch panels included regular office jacks should be documented in a design and approved by IT - network services.

1.4.4 All cables should be terminated on the patch Panel then Patch cables will be utilized to connect into the switch, unless a Gigabix IDC type solution is used, Then Pigtails from the switch to the IDC Block is acceptable.

1.4.5 Cables from the office terminated on the patch panel should be attached to the outside rear of the cable manager, not run inside the cable manager.

1.4.6 Any vertical backbone copper cables will be labeled aaa-bbb where aaa is the destination floor and bbb is a consecutive number within the group running to a given floor. For example, if you are looking at the patch panel on the 12th floor, the first vertical cable running to the 11th floor will be labeled 11-1 the second 11-2, the first cable running to the 13th floor will be labeled 13-1 and so on.

1.4.7 When there are more than 24 cables on the floor, additional patch panels will be added and manufacture's port numbering will begin again at 1 and continue consecutively. City standard labeling of these ports will continue consecutively from the panel above. For example port 4 on the second patch panel will have a cable number of D12028 and on the third patch panel port 3 will be cable number D12051. Always use the Dxxxyyy designation when referring to a port, or contact COR I&T – Network Services for clarification

1.4.8 Patch cables will be labeled numbering from 1 to 999 within a single hub room. Straight through cables will have grey jacket colour.

1.4.9 Patch cables must be plugged to the patch panel port within the relative numbering system above. For example cable 9 in port 9 of the first patch panel, cable 34 in port 10 of the second patch panel, cable 55 in port 7 of the third patch panel etc.

1.4.10 Patch cables will be run through vertical and horizontal cable trays where available. Otherwise patch cables will be gathered in groups of 12 at the patch panel and tie wrapped, pulling the cables horizontally across the panel to clear the view of port numbers. Cables 1 through 12 will be gathered, tied and pulled to the left, then tie wrapped again to the rack. Cables 25 through 36 will be gathered, tied and pulled to the right then tie wrapped again to the rack.

1.4.11 Patch cables that are run vertically between patch panels and Network equipment, without cable management trays, will be grouped as above and tie wrapped periodically along the outside of the rack, neatly with sufficient tension to form a straight line of cable down the side of the rack.

1.4.12 Clusters of switches will be connected to a master switch. The master switch will be connected to the backbone network.

1.4.13 When daisy chaining is required, use the first port(s) of the master switch to connect to the other switches. Be sure to set the MDI/MDIX switch to MDI or use a cross over cable. Cross over cables will have orange or red jacket colour or proprietary stack cable can be used.

1.4.14 Complete all connectivity cabling of routers, connections between groups of Network equipment/switches, etc. before beginning the user equipment cabling.

1.4.15 All cables will be connected to the switches in order. For example patch cable 1 in the first available user port of first switch followed by cable 2 and so on.

1.4.16 Where cable mgt. trays are not used, cables will run down both sides of the cabinet or relay rack and Network equipment will be mounted directly below the patch panels. All cables must be connected to the Network equipment in order working from the left plugging the cables running down the left side of the rack ending at the middle of the Network equipment. Cables running down the right side of the rack will begin in the center port and plug across to the right of the concentrator. This process will be repeated on consecutive concentrators until all connections are completed.

1.4.17 All cables at the switches must be pulled and tied to provide a clear view of the port numbers on the switches.

1.4.18 Patch cable lengths,

1.4.19 For wall mount racks used in small site 2ft patch cord should be used.

1.4.20 For standard 2 post racks default should be 7ft. but should be verified with IT-network services staff assigned to project.

1.4.21 Other configuration should be designed as part of the project.

1.4.22 Cable tray should be utilized within all hub rooms when possible or required, Basket type cable tray should be used along with waterfalls.

2.1 Installation Procedures and Prerequisites.

Data cabling requests and services should be issued from an authorized person within the client department (preferred Telecom Coordinator or IT staff) or the project leader from Facilities and real estate, with the cost centre and site contact or alternative contact and/or numbers.

For Bell services for network connectivity to new locations, the call should be initiated from an authorized person from the client department to the IT Service desk.

This section for planning, please ensure that information is review before placing in a tender document.

2.2 Internal cabling.

2.2.1 The cable vendor (Currently Bell Canada under communications Tender ITI Agreement) should be a good standing member in BICSI. The product managers should be accredited RCDD, the technicians installing the cable should have training credits pertaining the product they are installing.

2.2.2 Current base costs of the cabling are for different types of buildings. Bell must follow the standard city pricing where applicable. This is based that all pathways are in place. For example Zone Conduit from the hub room and box and conduit on the wall from the ceiling space. Ceiling height is nominal 10ft.

2.2.3 Extra costs per tech/hr could be incurred for work not covered under the contract. All time and material work details have to be reviewed by network services, approval request from the account holder (i.e. department supervisor or telecom coordinator.

2.2.4 Extra high ceilings must be taken into special considerations for workplace safety reason, extra equipment such as sky lifts must be brought for the cable to be installed properly and provide a safe work area for the contractors. All this will cost will be funded from the department requesting the work.

2.2.5 Pathways **must be provided for the cable contractor** unless request for cable contractor to install /create the pathways. Extra charges will apply for this work. All conduits must have proper bend radius for type of cable used in the conduit, special consideration for fiber. Pull boxes should be placed after two 90 degree bends. No LB joints to be used. Pathways should be designed for installation of network cable standards.

2.2.6 For open areas, where there are no conduits, Cable tray should be utilized to allow installation of the cable and pathway back to the hub room.

2.2.7 Any Conduits from wall boxes, must extend up to the ceiling and flow into a cable tray.

2.2.8 Extensive pathways floor ducts should have pull strings and old cabling should be removed. Access points and pull boxes should accessible to ease in the installation, should not covered up with carpet and/or furniture. This will incur extra costs.

2.2.9 For general work on buildings the following practices must be used, or verified with the building supervisor.

All wiring to be installed in conduit 90 degrees to building grid fastened to the upper slab.

No free run wiring greater than 10' (should the free run be in a space deemed a plenum, the wiring shall be appropriately fire rated FT6).

All wiring made obsolete/ non-functional shall be removed as part of the installation process.

Cable tray systems can be used if appropriately sized & fire rated cabling is used, these are not preferred since they can eventually overflow and become unmanageable.

J-hooks can be used under the direction of the building supervisor and installation of the system recommended of the manufacturer and approved by IT-network services. Cable Tray is preferred.

2.2.10 Attachment to existing sprinklers, or duct work is not permitted.

2.2.11 Loop extra slack should be built in for relocation or re-termination of the cable.

2.2.12 Major renovations cabling should be brought up to current standard, it is easier to remove all the old cable and pull in new cable. Rerouting large quantities of existing cables and installing around existing cable can cause damage to the existing cable. Some locations are still at category/level 3 or level 4 communications cable.

2.2.13 Old cables that do not meet current standard and are removed should be removed back to the patch panel.

2.2.14 New cables should be terminated on patch panels, that are current cat 5e/Cat6 standard and match the current IBDN system in place (currently Belden IBDN)

2.2.15 System furniture where the data jack is integrated, if the jack cannot be placed in securely and reliably than a surface mount jack should be used secured on the surface in the furniture. The contractor is expected to replace this, if this identified as deficiency. Also is should also be confirmed the requirements with designer what is preferred.

2.2.16 Installation for Wall Jacks

a. If system furniture is being placed, then jacks are to be wired into the system furniture, walls jacks must not be covered up.
b. Any special requirements for the systems furniture jacks should be identified by the manufacturer/Furniture re back to the cable contractor.
c. For wall mount jacks the height of Voice/Data Jacks should be placed for accessible standards, such that a person in a wheel chair can access the phones. Must be verified by the client and/or Public Health or accessibility standards
d. All wall plates should have a covered plate with the Jack installed, if a UC phone is to be placed on this jack then a secure wall mount bracket with Key lock must be placed around this jack. Likewise for any other specialized device such as intercoms and wall clocks etc. Should also be identified any special mounting during the design and marked on the drawings.

2.2.17 Installation of Jacks for specialized devices

a. Wireless Access points Jacks should be install so that they can be moved in both directions to adjust the wireless access point

b. Wireless access point should be mounted on the T-Bar ceiling with approved hardware If not T-Bar then approved method must be agreed with IT Network Services.
c. Other Devices, such as time clocks security cameras must be identified on any drawings and mounting must be agreed and to the manufacturers standards and department standards (i.e. Corporate Security or Toronto Water etc.)

2.3 External Cabling for Bell Services

2.3.1 For current data services via ITI/Bell Canada allow Minimum 45 to 85 business days for installation. Determine by presales check. Any escalation will result in extra fees

2.3.2 The move in date should be planned for 1 week after the Bell due date to ensure any issues with installation are accounted for.

2.3.3 All pathways from the street line must be provided by the City of Toronto (Department requesting the work) or General Contractor associated with the project with adequate space for the cabling required for the services and growth. Follows the same requirements as internal cable. If this is not provided extra fees could be charged.

2.3.4 For services required far from the main DMARC of the building extra charges may apply. This cannot be determined until after the order is places and Bell performs site visits from the BND (Building Network Design) and access networks groups.

2.3.5 In order for data service to be on time and reduce billing charges due to an early installation. The custom must provide a date they want the activation of the service to happen. Otherwise the order will be placed and bell will provide due date. Please allow minimum times.

2.3.6 Under certain circumstances where a delay will be longer than anticipated, the install can be placed on hold, but will require at least 2 to 3 weeks to continue and reschedule the installation.

2.3.7 Any moves of an existing service within the building may be subject to a moving charge.

2.3.8 Any relocation of services from outside the build, charges may apply.

2.3.9 For extended runs of cable inside a building any outdoor cable that is not fire rated must be placed in conduit of fire rated inner duct.

2.3.10 Bell owns the cable to the DMARC point and must be Bell Canada owned fibre pulled in by their contractor (separate from local Voice and Data Contractor) Usually done by Expertech, Aecon and internal Cable Ready etc, but arranged by Bell Access networks. **Warning: These contractors attend unannounced before the due date. They may require clean dust free environment to complete fiber splicing reliably. Therefore trades may have to work somewhere else. The impact of not allowing them when the show up is that the installation of the service will more than likely be delay.**

2.4 External Cabling - Private Cable and Property

2.4.1 Cabling between buildings on City of Toronto property where there are no issues with right of way crossing of streets etc. This is private cable that the City of Toronto owns and will and the department that requests will be responsible for all installations and future repair costs not associated with warranty on materials or workmanship. There are no guaranteed service levels for repair of this cable and is best effort.

2.4.2 All pathways must be defined, either Conduit underground, trenching or above ground on along a series of poles.

2.4.3 Similar rules for pathways for section 2.2 and 2.1 apply, Pathways can be supplied by outside source which is preferred, otherwise cable installers will have additional costs and subject to review by IT network services against the cabling agreement.

2.4.4 Safety devices utilized for environmental protections such as lightening should be used.

2.4.5 Tracing wire must be placed for cables installed in the ground.

2.4.6 For aerial cable ensure the height is adequate for any vehicles traveling below the cable.

3.0 Working with GC/Landlords and Clarification of Projects and Timelines.

3.1 Summary.

3.1.1 City current standard is cat 5e based on Belden 1200 series cable and former CDT/NORDX IBDN standards

3.1.2 Current the cabling Vendor of record is to be used for Voice and Data cabling and associated racks, contact to be provided by IT Voice or Data group.

3.1.3 All pathways are to be provided for communication services and voice and data cabling.

a. These are considered construction expect to be completed, by Facilities or the landlord, or the department. The cabling vendor of record can do these as requested, but this should follow standard purchasing polices, since conduit work and electrical work is not included in the ITI agreement.

3.1.4 For orders as part of tenders/landlord agreements, a scope of work/requirements (SOW) must to be stated clearly to the cabling vendor, this should include in the front any cabling specification, and/or indicated clearly in the drawings the expectations from the cabling vendor. A sign-off of the SOW between the GC/Landlord and cabling vendor of record must be included in the response package.

3.1.5 For service installations, voice or data, the department is responsible for this cost, the order must be placed though COT- Information technology (IT) processes and procedures.

Clarification and permissions can be exempted, but must be approved at supervisor level in IT. Cabling infrastructure for these services required to be installed in parallel with the construction, since the cabling is a service, the installation is the responsibility of the vendor, but all pathways as per the service provider specification must be provided by COT, GC/Landlord contracted to do this.

3.1.6 Service orders, especially for data services can be a lengthy process, since outside infrastructure may require building. For typical office buildings where there are tenants, a minimum of 8 weeks sis required and should be sufficient, where the locations are new city property or city leased property in obscure areas, longer timelines may be required for the fibre build. This is can only be determined at the time of order.

3.1.7 GC/Landlords must allow access for service providers and COT- IT Staff during the construction phase to implement the service for time of completion as requested by the department. A local contact/Supervisor cell phone and email must be provided. City IT staff and the service provider are expected to follow health and safety requirements and direction from the GC/Landlord during the construction.

3.2 Project related scheduling.

3.2.1 A GANTT chart or time line must be provided and update accordingly, This must be provided and reviewed by IT Voice and Data groups to ensure the site is prepared for the service provider implementation and IT change management processed to interface to the new location.

3.2.2 Certain milestones are require for the service provider to implement service on time as required by the client and/or COT (i.e. security). This includes the communications racks and associated power.

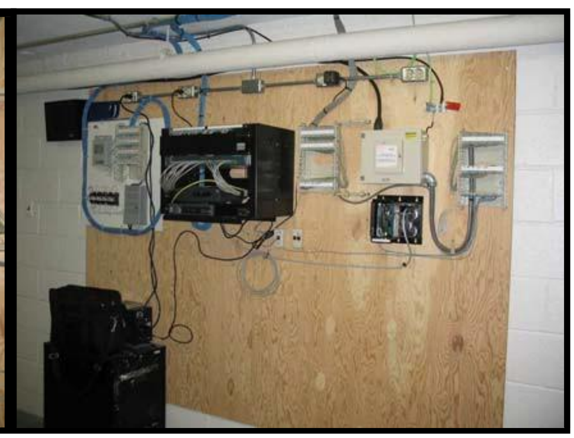
3.2.3 Site meetings, the IT Voice and Data rep should receive minutes of the site meetings and be allowed to attend when required pertaining any issues to IT communication requirements. All communication for changes and issues should be communicated through the COT project manager assign to this project through Facilities Management.

Appendix A

Examples of rack configurations

Small Locations with HDSL

Currently the HDSL was not moved over from other location. This is the High Park supervisor's house. Issue here, rack was larger than expected by the client, so it should have been placed in the basement out of the way. That is why the closet now has doors. Rack is 11U Rack. There is about 12 connections in Total.



The HDSL circuit installed in this rack at the Fire Hall, 280 Burnhamthorpe. This is a little smaller than above. Only issue Patch cords should have been smaller, 2ft to hide in the cable manager. Almost 22 Connections. This room has enough space for a 2-post rack if required.

Larger sites

Typically Fibre locations, where there is more than 1 switch or multiple buildings connecting into the main building.

Below is new location Public Health 44 Victoria, with a 2 post rack, to vertical cable managers and 12 port power strip. Total 3 switches, Issues with this is the room, it was nice size but the air conditioning unit took up more space than anticipated. Therefore only room for growth is the one rack. This floor is at maximum capacity. The rack can be passed to maintain the AC unit.

Security System Information

City of Toronto Corporate Security Security Schedules, Drawing Typicals

City of Toronto Corporate Security Security Schedules Drawing Typicals

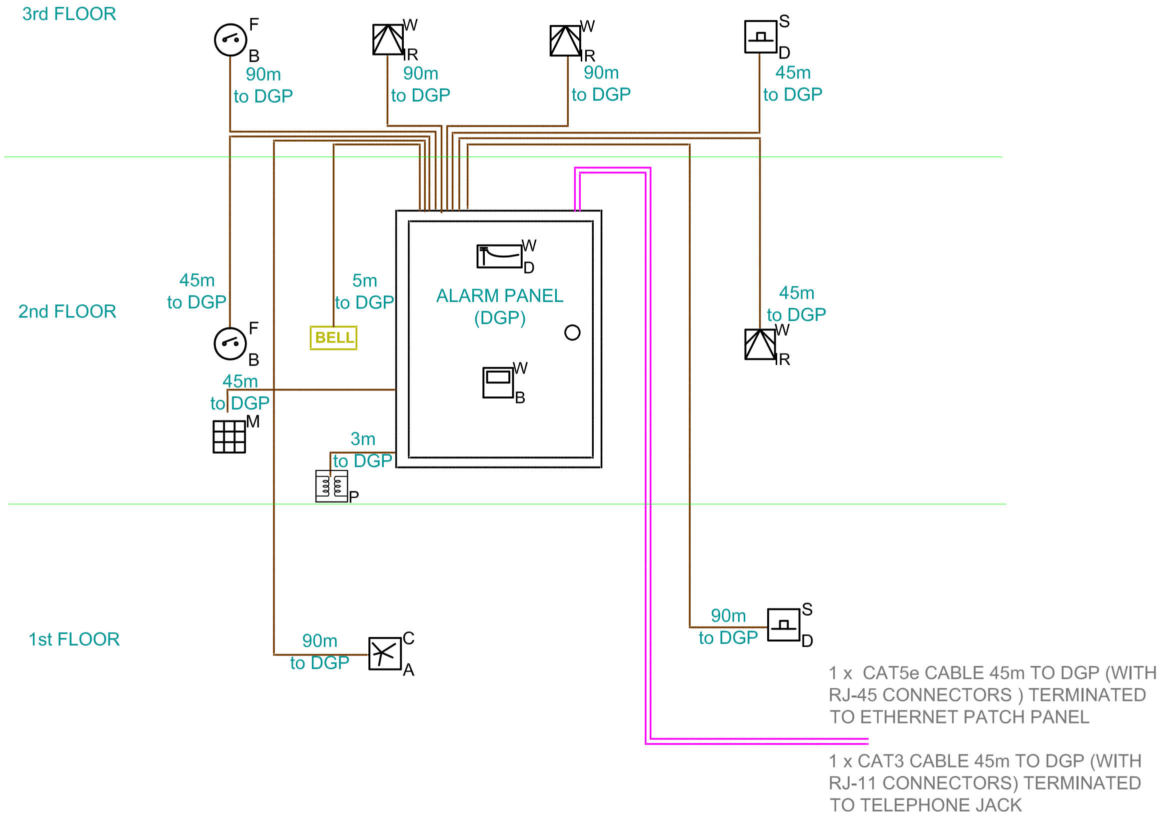
Revision 1.6

City of Toronto
12/21/2009

LEGEND

SYMBOL	DESCRIPTION
BELL	BELL / HORN

See SIA/IAPSC CAD for Security Symbols



NOTE:

1. ALL CABLE TO BE HOME RUN FROM DEVICE MOUNTING LOCATION TO CONTROL PANEL
2. ALL CABLE TO BE IN EMT CONDUIT FROM EACH DEVICE AND FROM JB TO DGP
3. ALL CABLE TO BE IN PLENUM RATED IF NOT IN CONDUIT, UNLESS OTHERWISE NOTED.
4. ALL CABLE TO BE INDIVIDUALLY LABELLED
5. ALL CONDUIT AND JB TO BE SIZED ACCORDINGLY (MIN 21mm TO CONTROL PANEL, 12mm CONDUIT OK FROM JB TO DEVICE.
6. ALL CONDUIT TO BE ON THE SECURE SIDE OF DOOR AND JB TO BE LOCATED ABOVE DOOR
7. ALL DEVICES TO BE MOUNTED ON SGL-GANG BACKBOX AND WILL BE TERMINATED BY OTHERS (SECURITY CONTRACTOR), UNLESS OTHERWISE NOTED.
8. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
17. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

1 X BELDEN #8444 CABLE FOR EACH DEVICE

1 X BELDEN #8461 CABLE FOR CONTROL PANEL POWER

BURGLAR ALARM Typical's

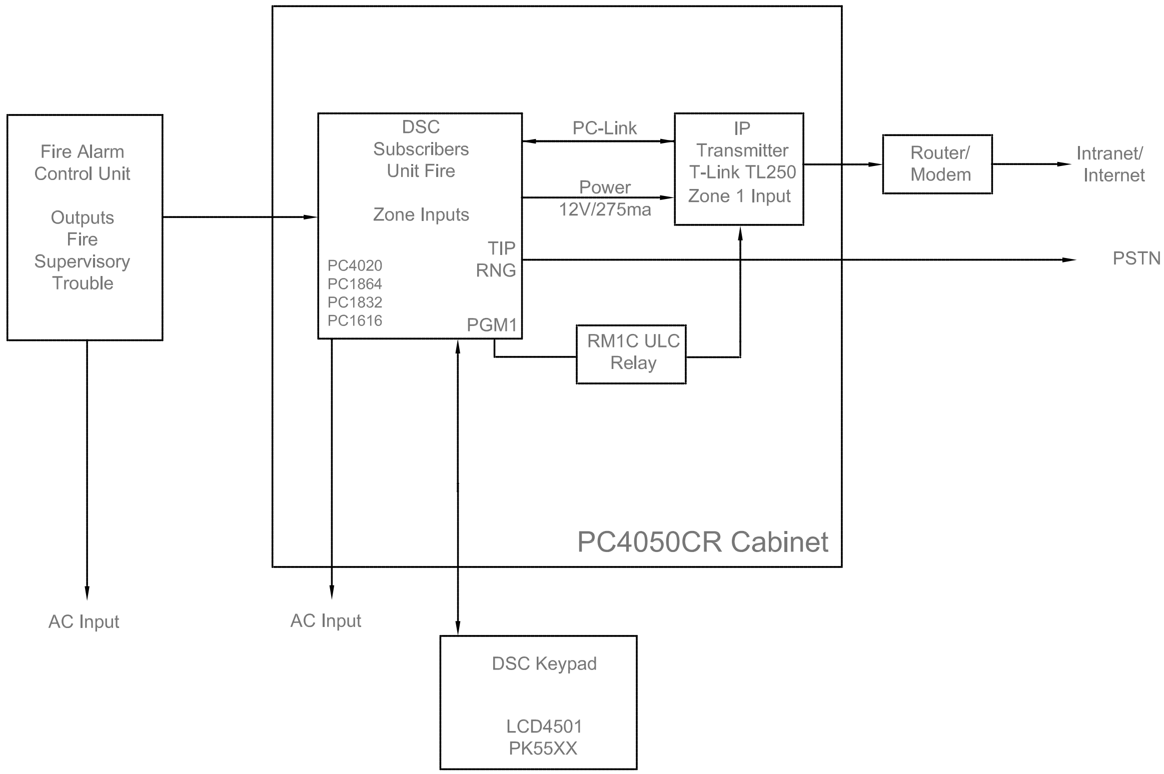
INTRUSION SYSTEM

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-ALRM-0001					1 of 1
CHECK:	Walter Chan, CPP, CSPM							



NOTE:
1. ALL WIRING CONNECTIONS SHALL BE RUN IN MECHANICALLY PROTECTIVE CONDUIT.
2. PHONE 1 PROGRAM FOR T-LINK *([301] SET AS DCAA).*
3. PHONE 3 PROGRAM IN [303] AND SET AS BACK-UP TO PHONE 1 *([380] OPTION 5 **ON**, 6 **OFF**).*
4. PHONE 2 PROGRAM IN [302] THE SAME AS PHONE 3.
5. T-LINK SUPERVISION ENABLED *(SECTION [851]. OPTION [023] SET TO 01)*
6. PHONE LINE MONITORING (TLM) SHALL BE ENABLED.
7. PGM1 PROGRAMMED AS SYSTEM TROUBLE *(SECTION [009] PROGRAM AS TYPE 09; SECTION [501] TLM OPTION 3 **ON**).*
8. T-LINK TL250 ZONE 1 PROGRAM AS TYPE 21 IN SECTION [036] AND USE REPORTING CODE 99 IN SECTION [050].
9. 24H TEST TRANSMISSION OVER PHONE LINE 1 AND 2 MUST BE ENABLED *(SECTION [376] SET OPTIONS 1 AND 2 **ON**).*
10. FIRE ALARMS SHALL BE SENT OVER BOTH CHANNELS *(SECTION [351] SET OPTIONS 1 AND 2 ON).*
11. DRY CONTACT OUTPUTS FROM ULC LISTED FIRE ALARM CONTROL UNIT SHALL BE CONNECTED TO ZONE INPUTS ON THE ULC LISTED DSC SUBSCRIBERS' UNIT FIRE.
17. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.
18. INSTALLATION SHALL BE IN ACCORDANCE WITH CAN/ULC-S302, "INSTALLATION AND CLASSIFICATION OF BURGLAR ALARM SYSTEMS FOR FINANCIAL AND COMMERCIAL PREMISES, SAFES AND VAULTS." AND WITH CAN/ULC-S561-2003, "CENTRAL STATION FIRE PROTECTIVE SIGNALING SYSTEMS AND SERVICES."

BURGLAR ALARM Typical's

DSC Subscribers' Unit Fire and IP Transmitter (Passive Communications System)

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

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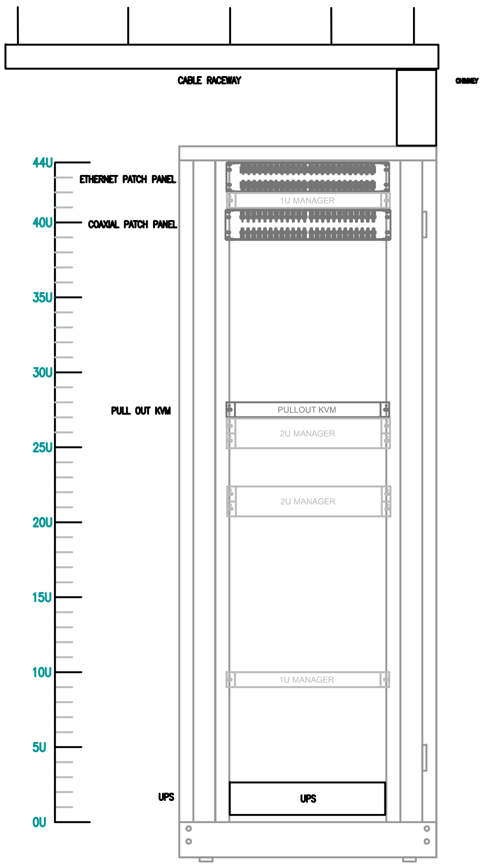
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-ALRM-0002			SHEET No.	1 of 1
CHECK:	Walter Chan, CPP, CSPM						

NOTE:
1. SUPPLY INSTALL COMPLETE CABINET, INCLUDING PATCH PANELS AND UPS. SEE PARTS LIST
2. INCLUDE THE SUPPLY AND INSTALLATION OF CABLE RACEWAY AND CABINET CHIMNEY



CABINET

NETVERSITY SOLUTIONS CABINET		
PART NO.	DESCRIPTION	QTY
103210	MOUNTING ANGLES, 30" CABINET, CAGE NUTS INCLUDED	1
103200	10/32 CAGE NUTS, 100 PK	1
103576	VERTICAL CABLE MANAGER, WITH DOOR	2
103326	1U HORIZONTAL CABLE MANAGER	2
103174	2U HORIZONTAL CABLE MANAGER	2
103221	12 OUTLET, 15AMP, VERTICAL POWER BAR, 6' CORD	2
103572	30"W LEXAN/WINDOW DOOR	1
103573	30:W SOLID DOOR	1
103622	2 POSITION FAN ASSEMBLY W/2FANS, 2 FAN GUARDS, 1 POWER CORD	1
103692	CABINET LABEL ANGLE	1
104373	FAN COVER	2

EQUIPMENT		
PART NO.	DESCRIPTION	QTY
PANDUIT	ETHERNET PATCH PANELS 48 PORT COMPLETE WITH INSERTS	1
PANDUIT	COAXIAL PATCH PANELS 48 PORT COMPLETE WITH BNC INSERTS	1
APC Smart-UPS 1500VA	APC UNINTERRUPTIBLE POWER SUPPLY - RACKMOUNT	1

CABINET Typical's
EQUIPMENT CABINET

Toronto Corporate Security

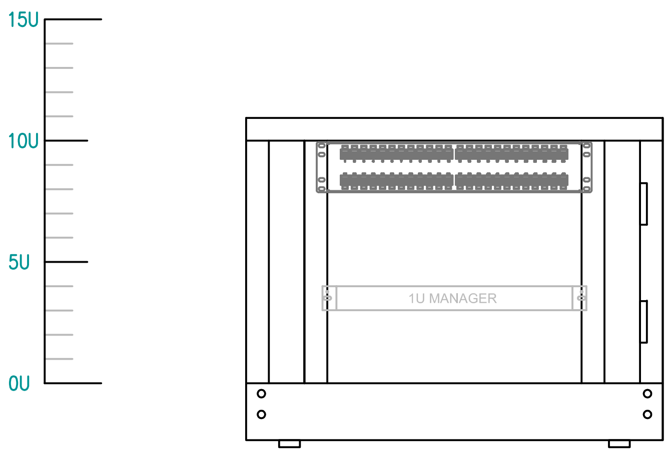
FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-CABN-0001					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

NOTE:
1. SUPPLY INSTALL COMPLETE CABINET, INCLUDING PATCH PANEL.
2. SEE PARTS LIST.

EQUIPMENT		
PART NO.	DESCRIPTION	QTY
NETVERSITY SOLUTIONS 104218	9u "SWING-OUT" WALL MOUNT CABINET, WITH PLEXI FRONT DOOR	1
NETVERSITY SOLUTIONS 103326	1U HORIZONTAL CABLE MANAGER	1
PANDUIT	ETHERNET PATCH PANELS 48 PORT COMPLETE WITH INSERTS	1



CABINET Typical's
EQUIPMENT CABINET

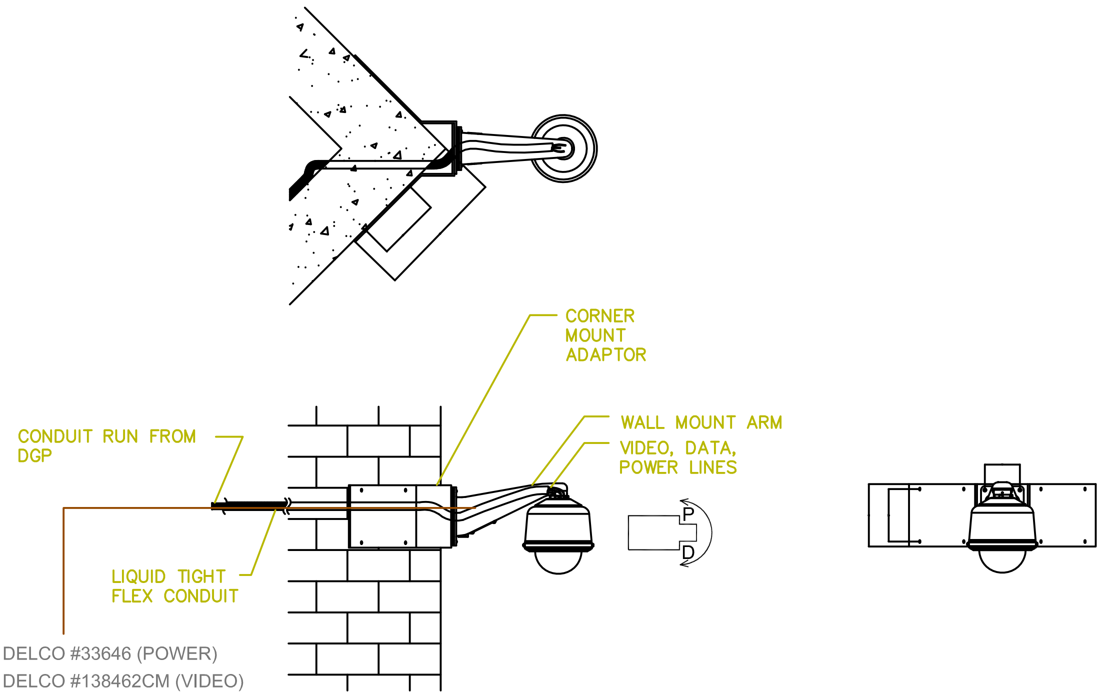
Corporate Security
FACILITIES & REAL ESTATE
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-CABN-0002					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



1 X DELCO #33646 (POWER)
1 X DELCO #138462CM (VIDEO)
1 x DELCO #33673 (DATA)
TO DATA GATHERING PANEL
VIDEO RACK PATCH PANEL TOTAL DISTANCE OF 180m

POWER SUPPLY DISTANCE OF 10m

NOTE:

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2. ALL CABLE TO BE IN EMT CONDUIT FROM EACH DEVICE TO DGP
3. ALL CABLE TO BE IN PLENUM RATED IF NOT IN CONDUIT, UNLESS OTHERWISE NOTED.
4. ALL CABLE TO BE INDIVIDUALLY LABELLED
5. ALL CONDUIT AND JB TO BE SIZED ACCORDINGLY (MIN 21mm TO CONTROL PANEL, 12mm CONDUIT OK FROM JB TO DEVICE.
6. ALL DEVICES TO BE MOUNTED ON SGL-GANG BACKBOX AND WILL BE TERMINATED BY OTHERS (SECURITY CONTRACTOR), UNLESS OTHERWISE NOTED.
7. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
8. EQUIPMENT SUCH AS CAMERAS, HOUSINGS AND MOUNTS SUPPLIED AND INSTALLED BY OTHERS
9. CAMERA POWER SUPPLIES ARE TO BE SUPPLIED BY OTHERS
10. CAMERA POWER SUPPLIES TO BE INSTALLED BY STRUCTURED CABLING CONTRACTOR
11. INCLUDE CUSTOM NPT PENDENT PIPE, FLANGE AND BACKBOX FOR CAMERA
17. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

CCTV Typical's

CORNER MOUNT

Toronto Corporate Security

FACILITIES & REAL ESTATE

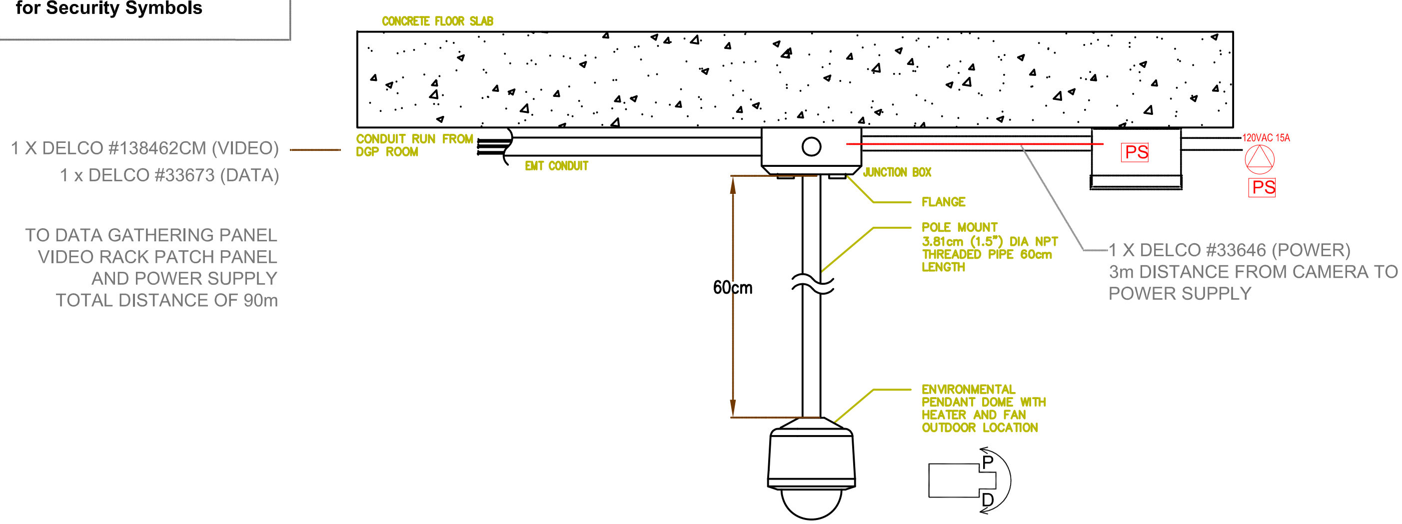
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-CCTV-0001			SHEET No.	1 of 1
CHECK:	Walter Chan, CPP, CSPM						

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



NOTE:

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CCTV Typical's
PENDANT MOUNT

Toronto Corporate Security

FACILITIES & REAL ESTATE

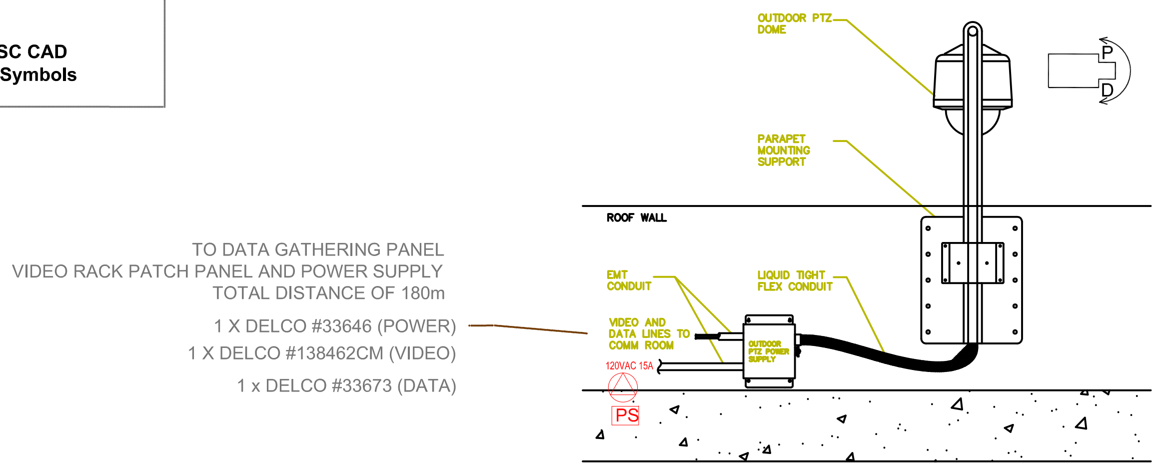
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-CCTV-0002					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



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17. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

CCTV Typical's
PARAPET MOUNT

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE: NTS	DATE: April 23, 2009	CONTRACT No. N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-CCTV-0003		1 of 1
CHECK:	Walter Chan, CPP, CSPM				

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
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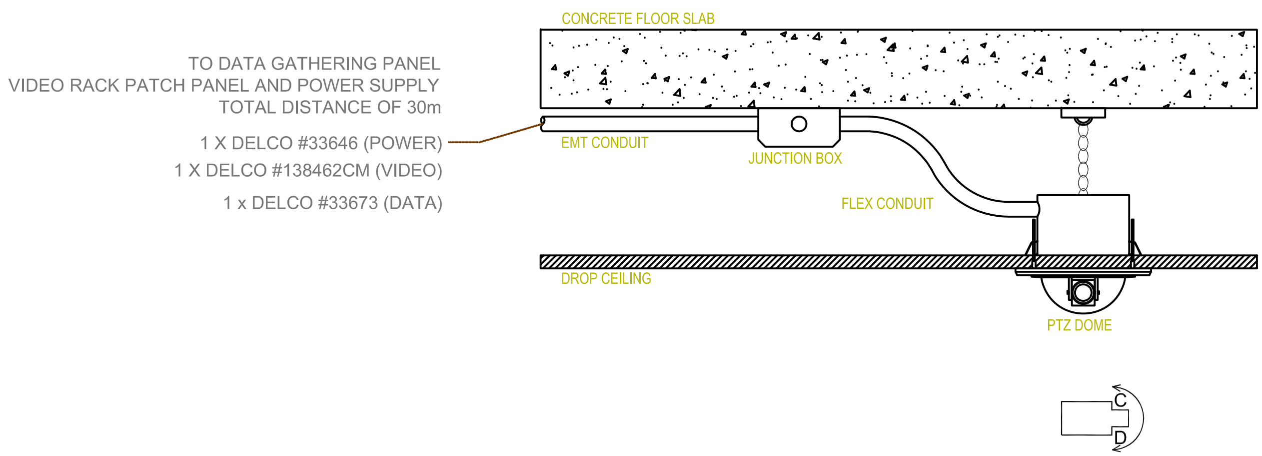


NOTE:

1. ALL CABLE TO BE HOME RUN FROM DEVICE MOUNTING LOCATION TO DGP
2. ALL CABLE TO BE IN EMT CONDUIT FROM EACH DEVICE TO DGP
3. ALL CABLE TO BE IN PLENUM RATED IF NOT IN CONDUIT, UNLESS OTHERWISE NOTED.
4. ALL CABLE TO BE INDIVIDUALLY LABELLED
5. ALL CONDUIT AND JB TO BE SIZED ACCORDINGLY (MIN 21mm TO CONTROL PANEL, 12mm CONDUIT OK FROM JB TO DEVICE.
6. ALL DEVICES TO BE MOUNTED ON SGL-GANG BACKBOX AND WILL BE TERMINATED BY OTHERS (SECURITY CONTRACTOR), UNLESS OTHERWISE NOTED.
7. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
8. EQUIPMENT SUCH AS CAMERAS, HOUSINGS AND MOUNTS SUPPLIED AND INSTALLED BY OTHERS
9. CAMERA POWER SUPPLIES ARE TO BE SUPPLIED BY OTHERS
10. CAMERA POWER SUPPLIES TO BE INSTALLED BY STRUCTURED CABLING CONTRACTOR
17. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

CCTV Typical's

CEILING MOUNT

Toronto Corporate Security

FACILITIES & REAL ESTATE

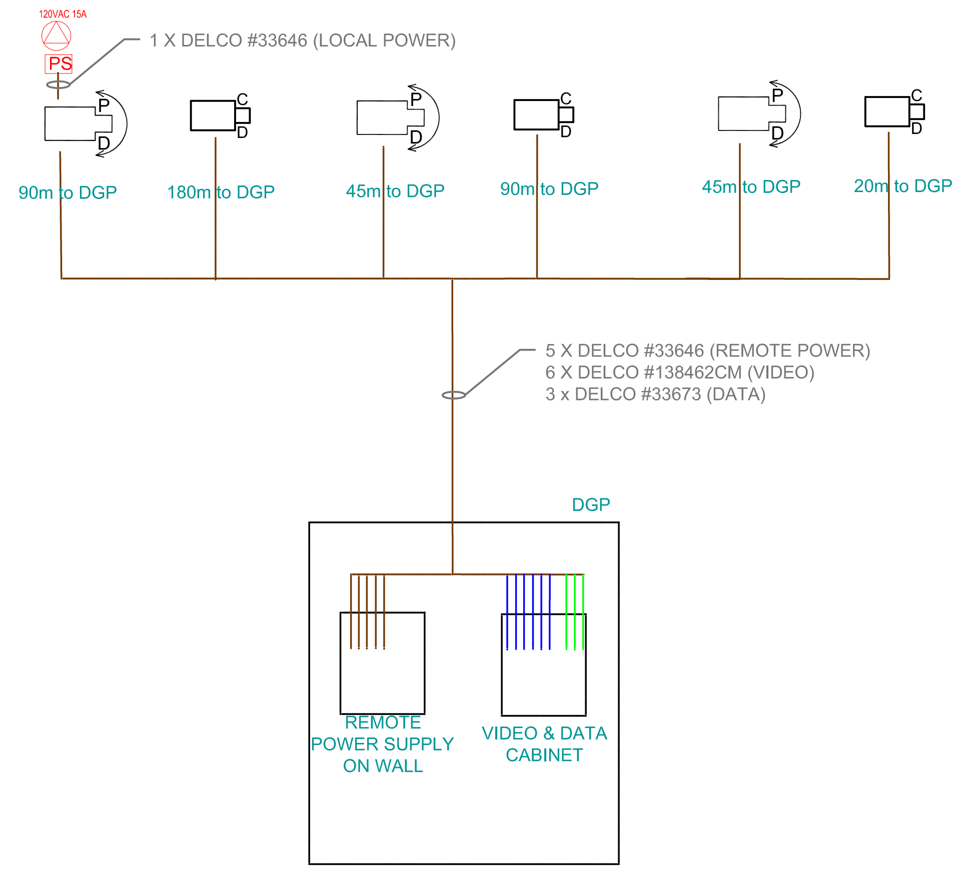
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-CCTV-0004					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



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CCTV Typical's

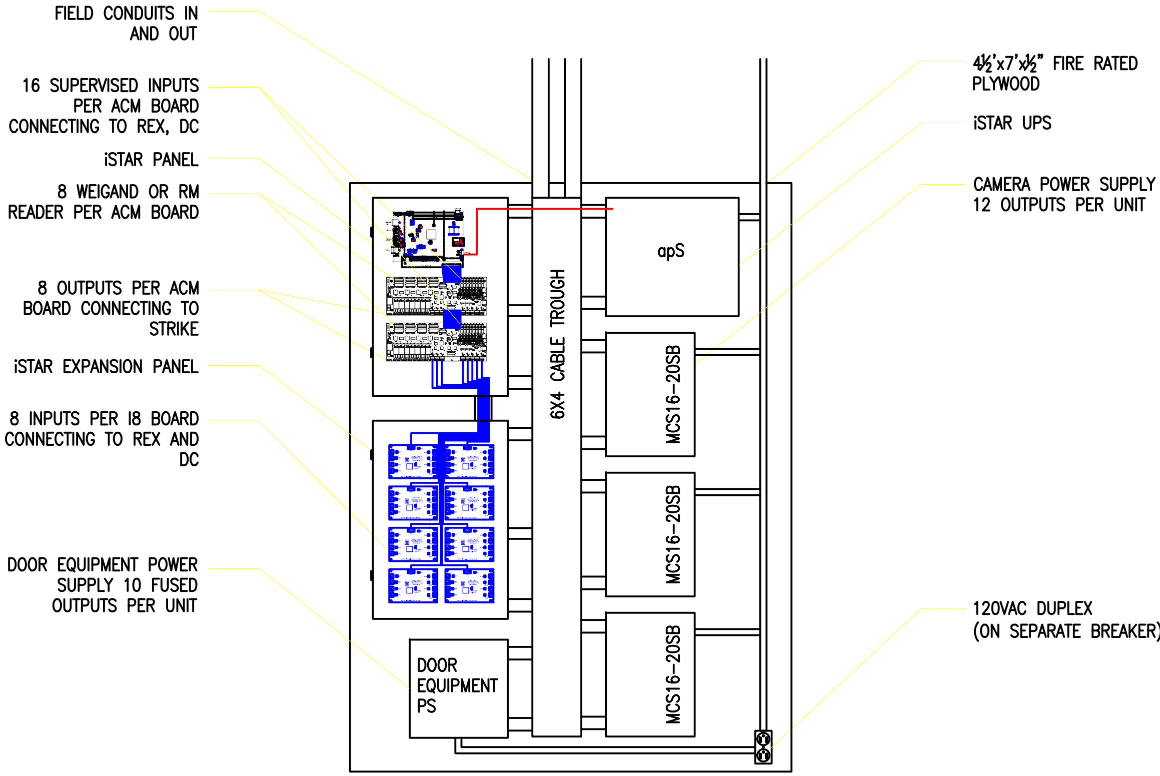
MULTIPLE CAMERAS

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE: NTS	DATE: April 23, 2009	CONTRACT No. N/A	SHEET No. 1 of 1
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-CCTV-0005		
CHECK:	Walter Chan, CPP, CSPM				



ACCESS CONTROL WALL PANEL

NOTE:

1. ALL CABLE TO BE HOME RUN FROM DEVICE MOUNTING LOCATION TO CONTROL PANELS IN DGP
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6. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
7. INCLUDE THE SUPPLY AND INSTALLATION OF FIRE RATED PLYWOOD
8. INCLUDE THE MOUNTING OF ALL EQUIPMENT AND POWER SUPPLIES
9. ACCESS CONTROL AND CCTV EQUIPMENT PROVIDED BUY OTHERS,

DGP Typical's

ACCESS CONTROL WALL PANEL WITH CCTV POWER SUPPLIES

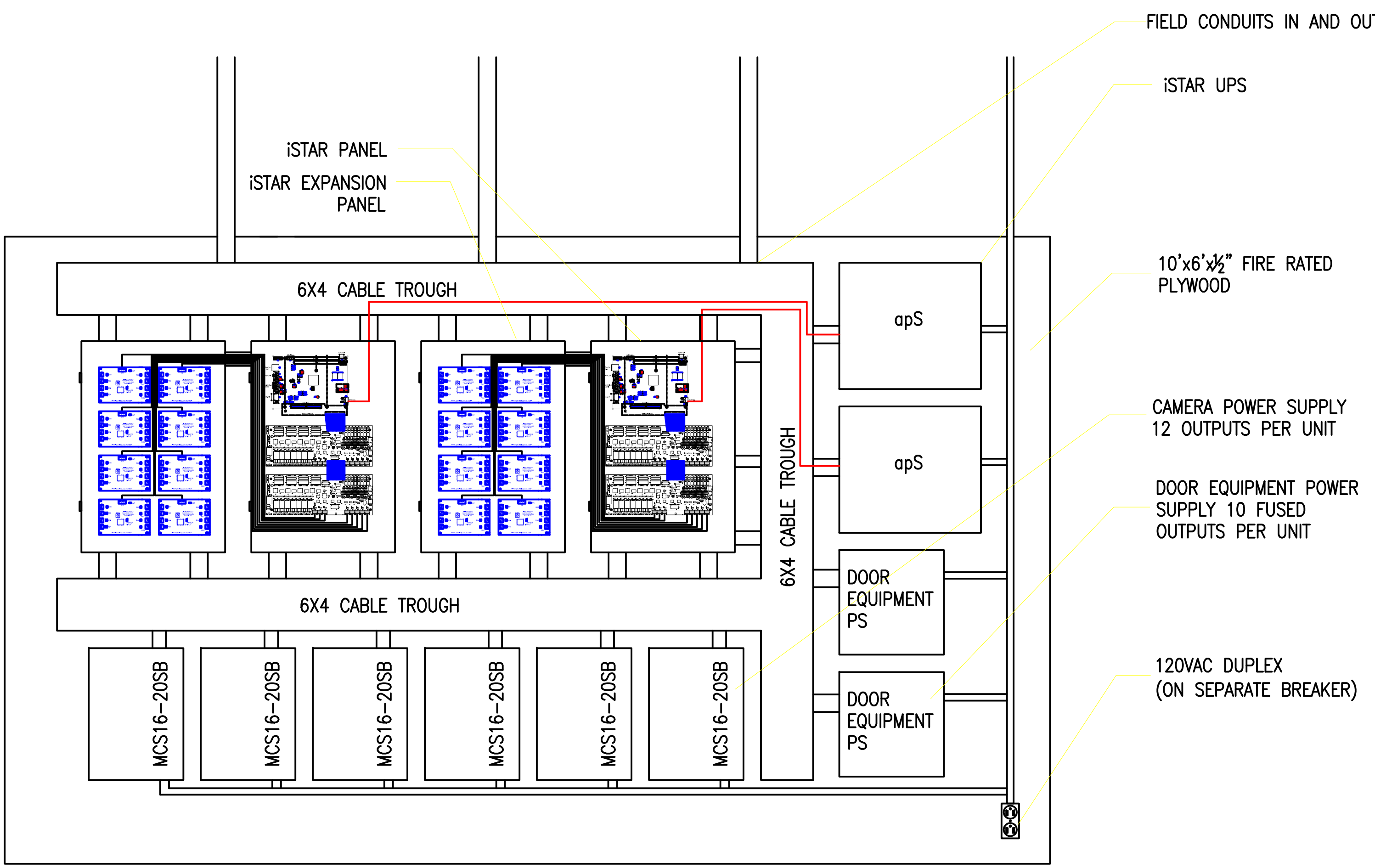
Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DGP-0001				
CHECK:	Walter Chan, CPP, CSPM						

SHEET No.
1 of 1



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DGP Typical's

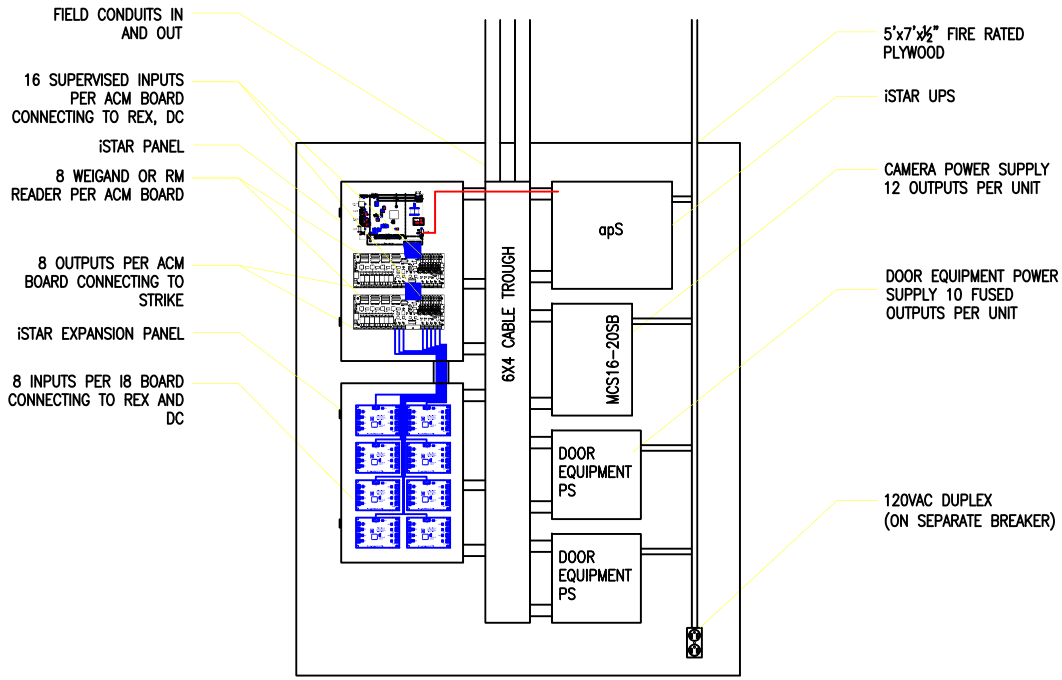
ACCESS CONTROL WALL PANEL WITH CCTV POWER SUPPLIES

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DGP-0002					1 of 1
CHECK:	Walter Chan, CPP, CSPM							



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DGP Typical's

ACCESS CONTROL WALL PANEL WITH CCTV POWER SUPPLIES

Toronto Corporate Security

FACILITIES & REAL ESTATE

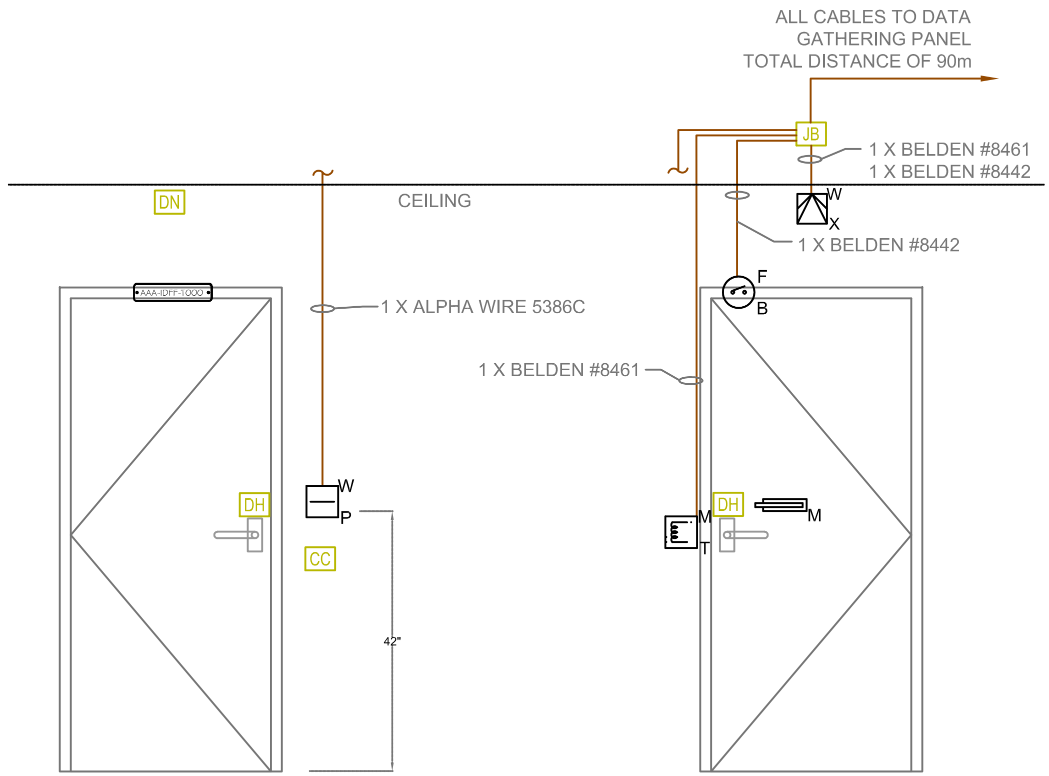
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DGP-0003					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



NON SECURE

SECURE

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Door Typical's

SINGLE DOOR COMPLETE WITH PROXIMITY CARD READER AND ELECTRIC STRIKE

Toronto Corporate Security

FACILITIES & REAL ESTATE

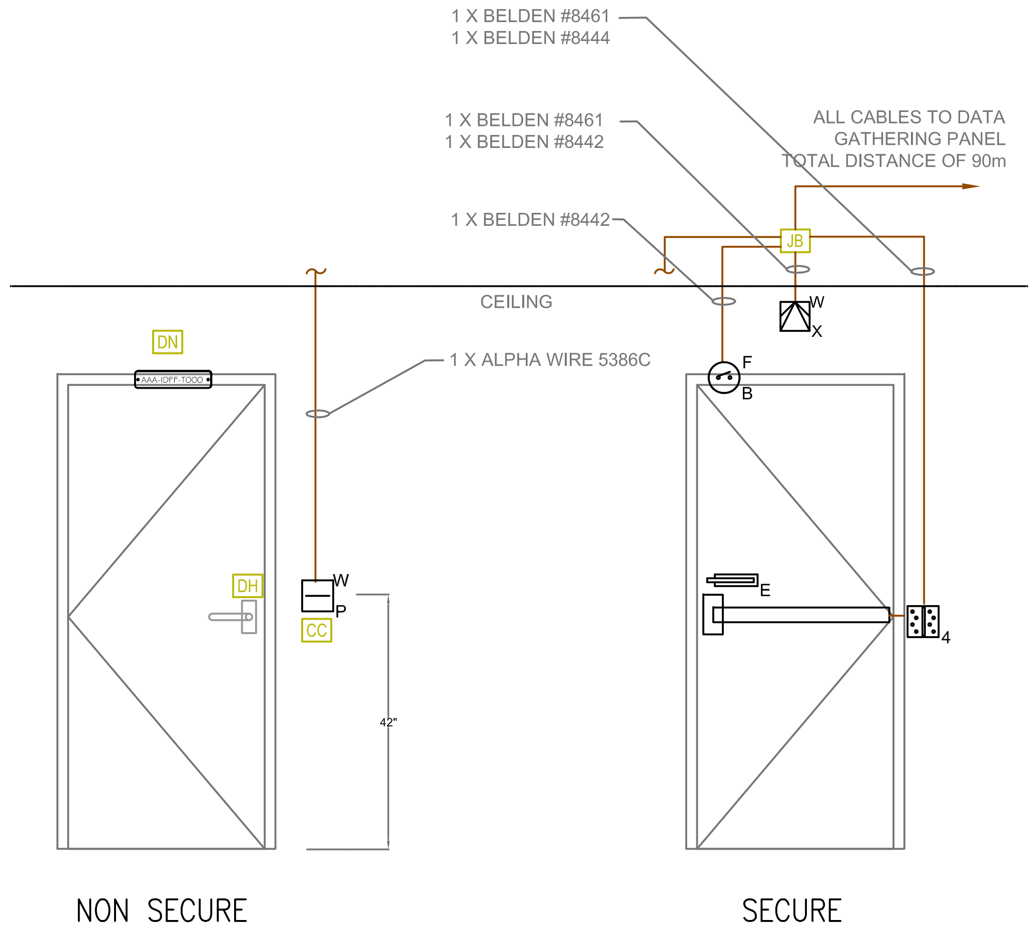
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	**CS-ACS-DOOR-0001**					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



NOTE:

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Door Typical's

SINGLE DOOR COMPLETE WITH ELECTRIC CRASH BAR, PROXIMITY CARD READER

Toronto Corporate Security

FACILITIES & REAL ESTATE

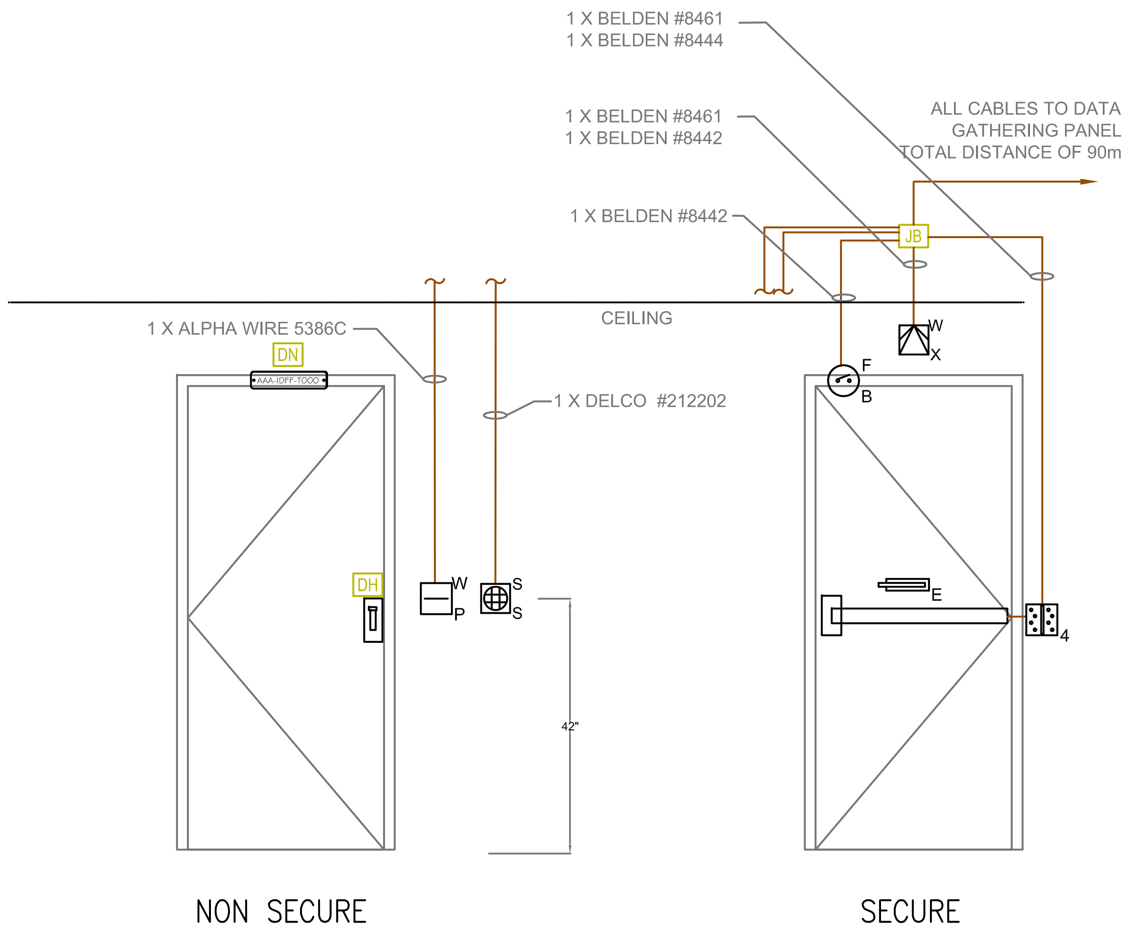
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0002			SHEET No.	1 of 1
CHECK:	Walter Chan, CPP, CSPM						

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



NOTE:

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Door Typical's

SINGLE DOOR COMPLETE WITH ELECTRIC CRASH BAR AND INTERCOM

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:		CS-ACS-DOOR-0003				1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
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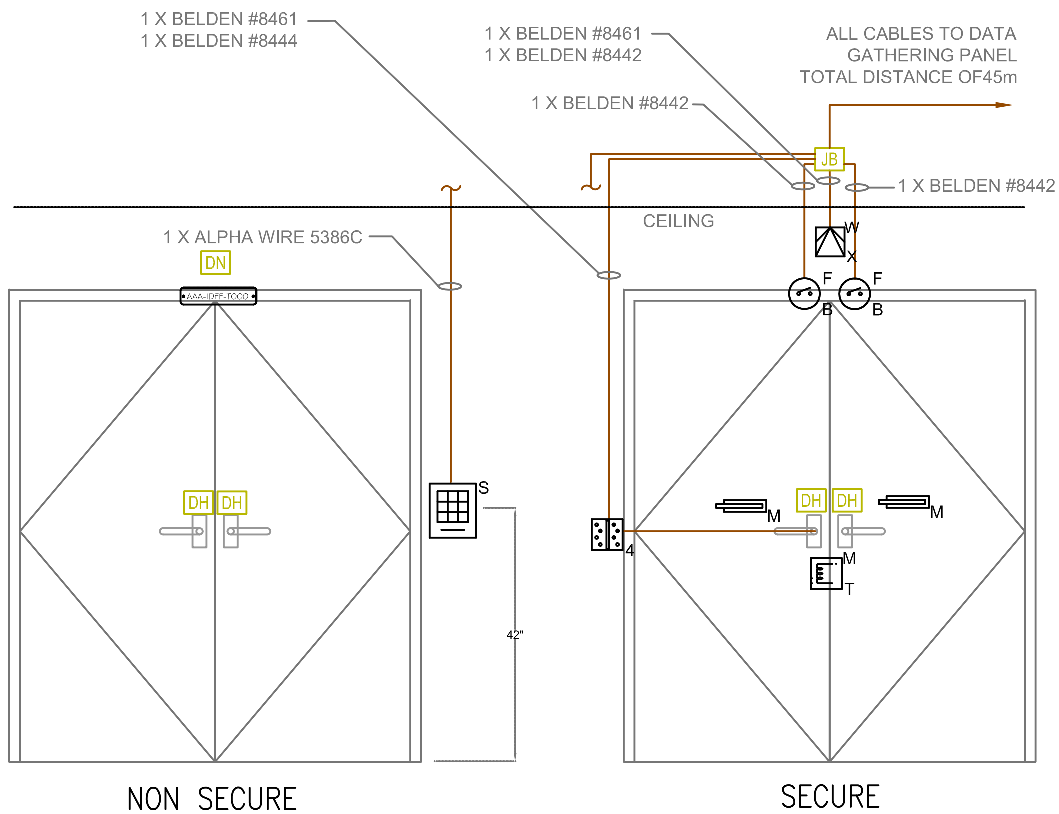
See SIA/IAPSC CAD for Security Symbols



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Door Typical's

DOUBLE DOOR WITH PROXIMITY CARD READER AND KEY PAD FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0004					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
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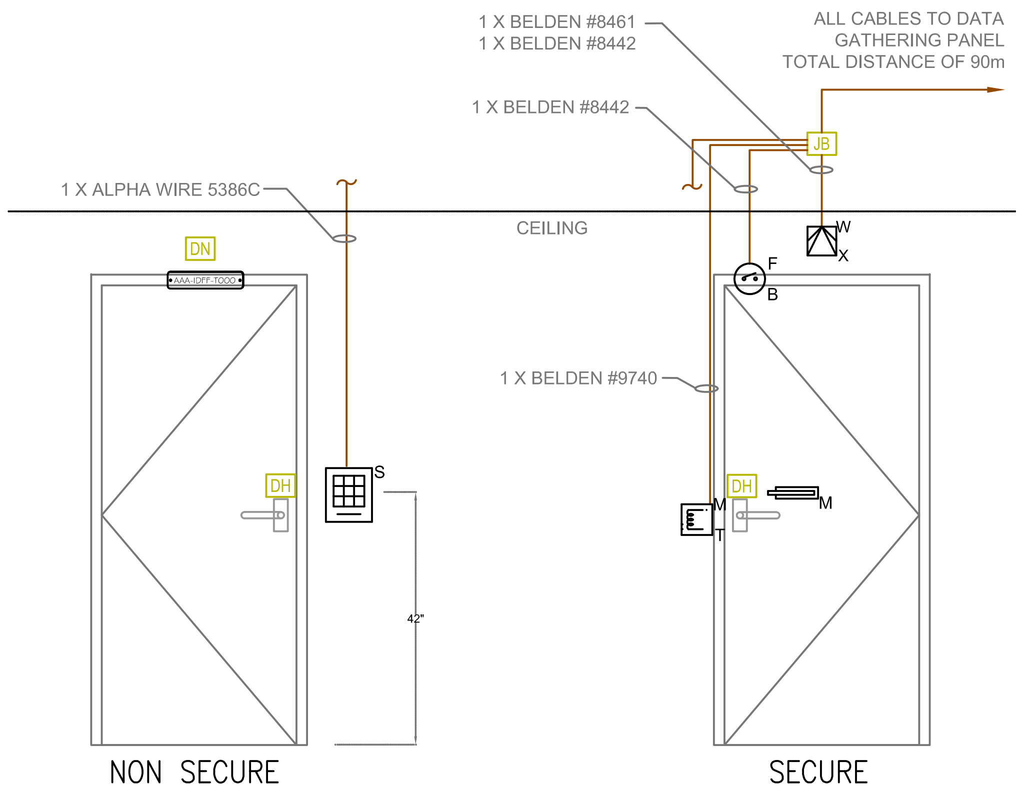

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Door Typical's

SINGLE DOOR WITH PROXIMITY CARD READER AND KEY PAD DOOR ARM/DISARM FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0005					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
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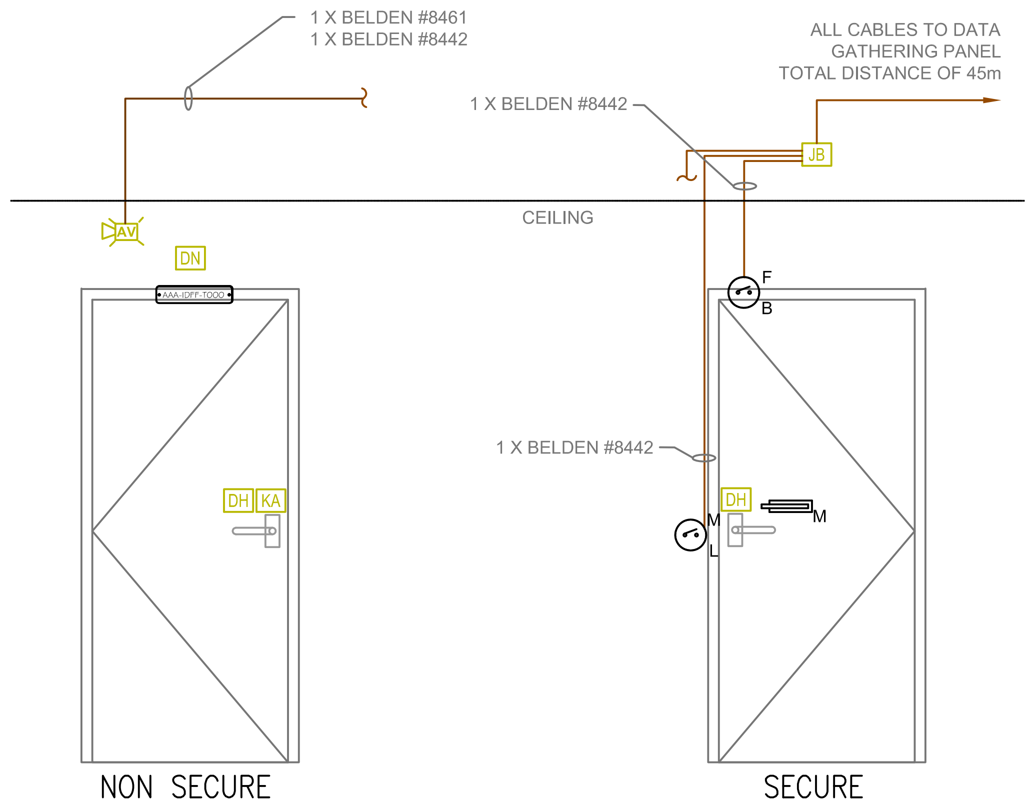
See SIA/IAPSC CAD for Security Symbols



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10. DOOR CONTACT REQUIRES 25mm (1") DIAM. HOLE PREPPED 100mm - 150mm (4"-6") FROM EDGE OF DOOR FRAME.
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Door Typical's

SINGLE DOOR WITH LOCK SENSOR FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

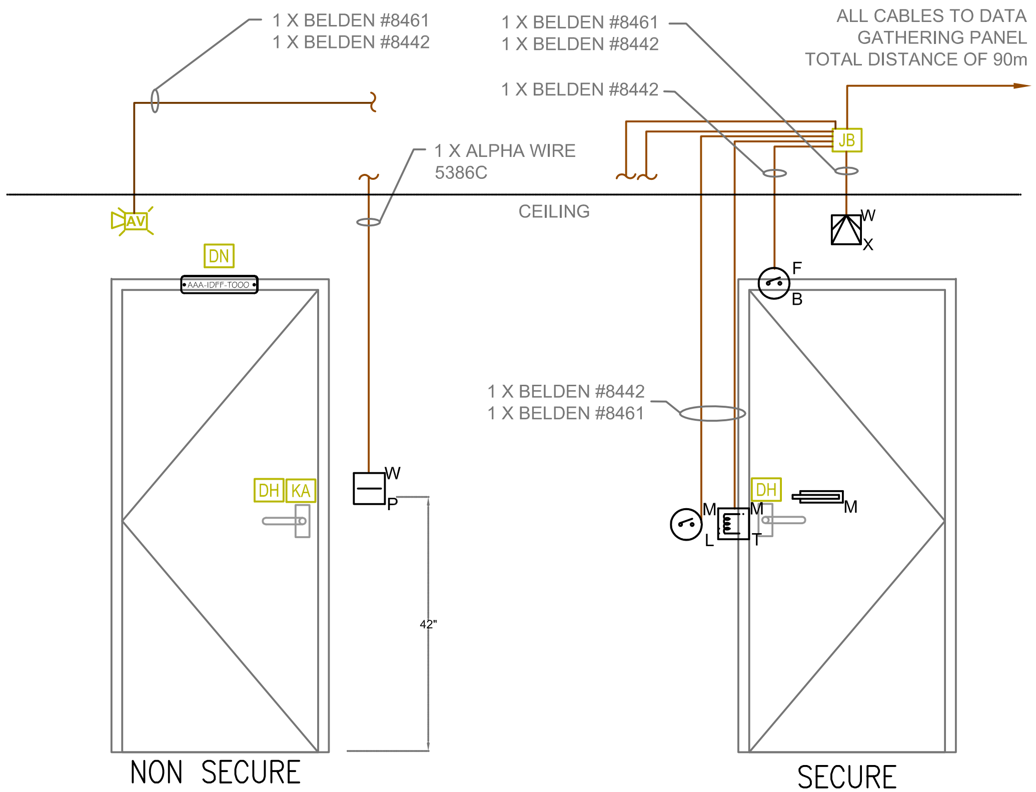
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE: NTS	DATE: April 23, 2009	CONTRACT No. N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0006		1 of 1
CHECK:	Walter Chan, CPP, CSPM				

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



NOTE:

1. ALL CABLE TO BE HOME RUN FROM DEVICE MOUNTING LOCATION TO CONTROL PANEL
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Door Typical's

SINGLE DOOR WITH PROXIMITY CARD READER, ELECTRIC STRIKE, LOCK SENSOR AND KEY ACCESS FUNCTIONALITY

Corporate Security

FACILITIES & REAL ESTATE

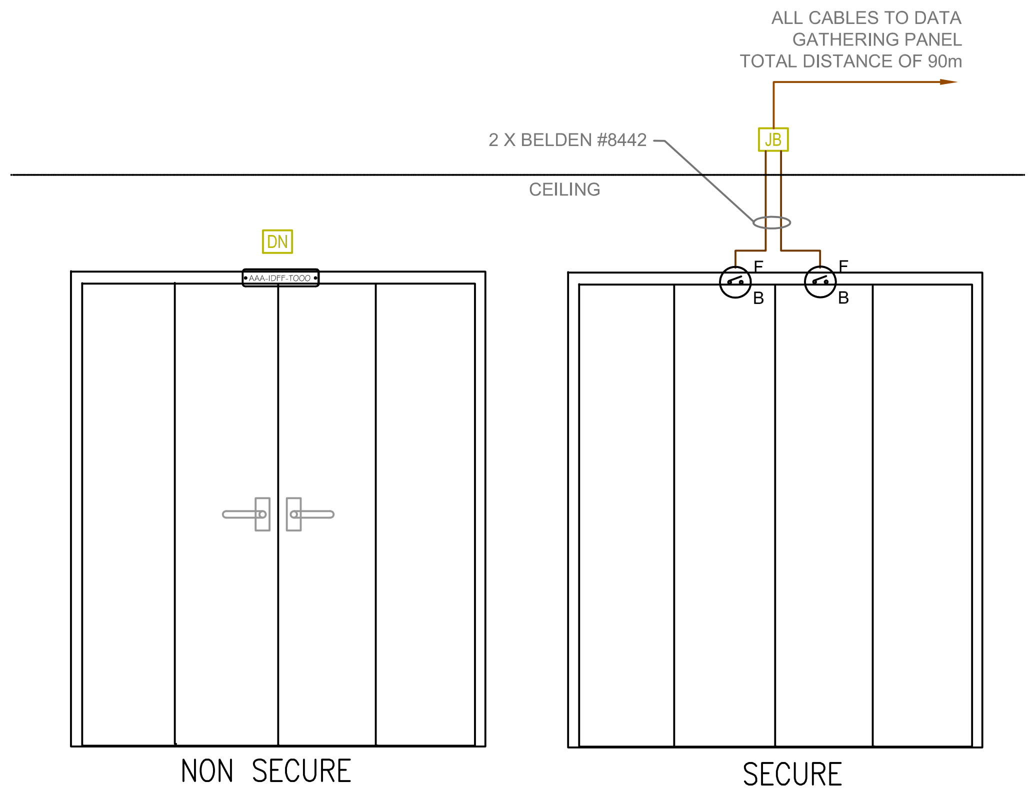
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0007					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



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Door Typical's

DOUBLE OVERHEAD BIFOLD DOORS WITH DOOR CONTACT FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE: NTS	DATE: April 23, 2009	CONTRACT No. N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0008		1 of 1
CHECK:	Walter Chan, CPP, CSPM				

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
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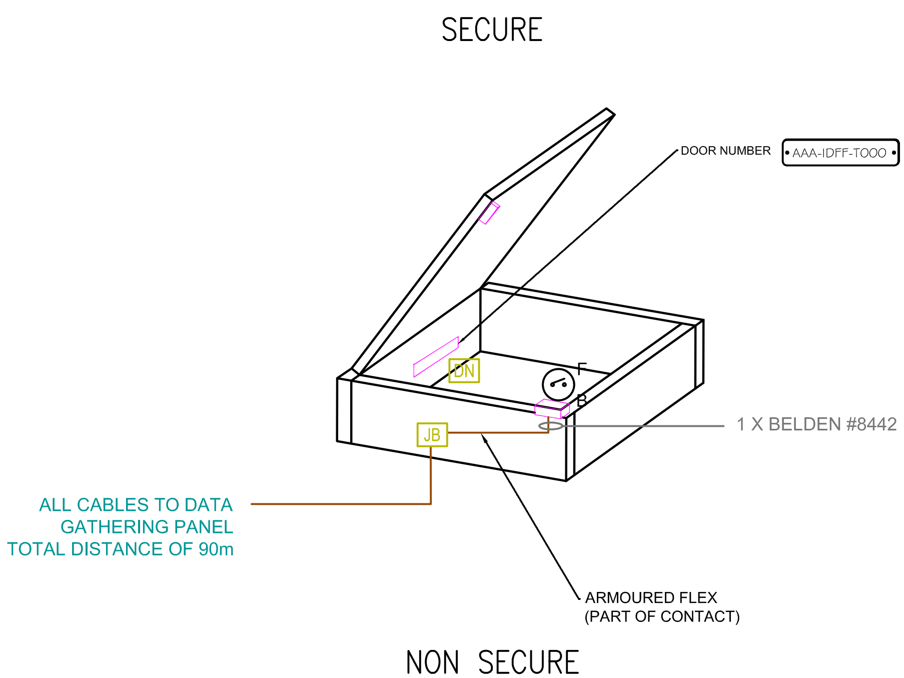
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



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Door Typical's

ROOF HATCH COMPLETE WITH DOOR CONTACT FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

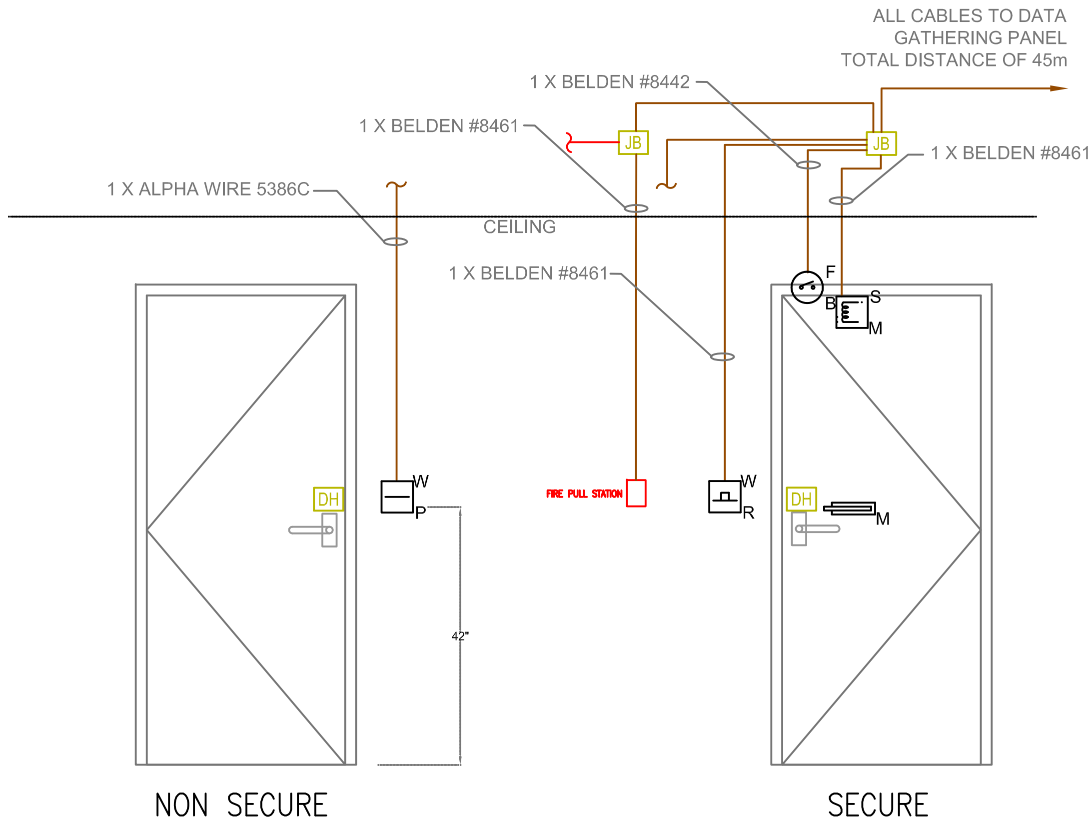
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE: NTS	DATE: April 23, 2009	CONTRACT No. N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0009		1 of 1
CHECK:	Walter Chan, CPP, CSPM				

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



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Door Typical's

SINGLE DOOR COMPLETE WITH MAGLOCK FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

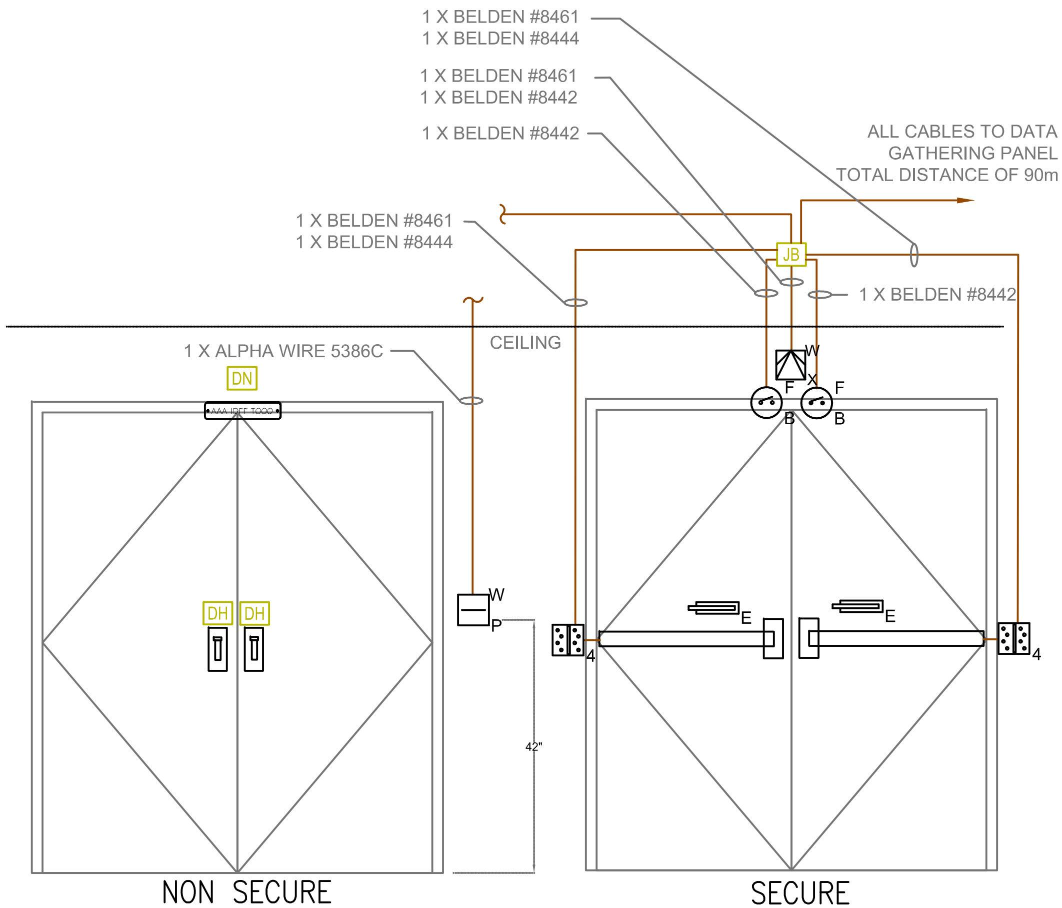
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0010			SHEET No.	1 of 1
CHECK:	Walter Chan, CPP, CSPM						

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
AV	AUDIO VISUAL / HORN STROBE
KA	KEY ACCESS

See SIA/IAPSC CAD for Security Symbols



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Door Typical's

DOUBLE DOOR ELECTRIC CRASH BAR FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.	1 of 1
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0011						
CHECK:	Walter Chan, CPP, CSPM								

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
DN	DOOR NUMBER TYPICAL
CC	CLEAR ACRYLIC COVER
LH	LOCKING HARDWARE
DH	DOOR HARDWARE
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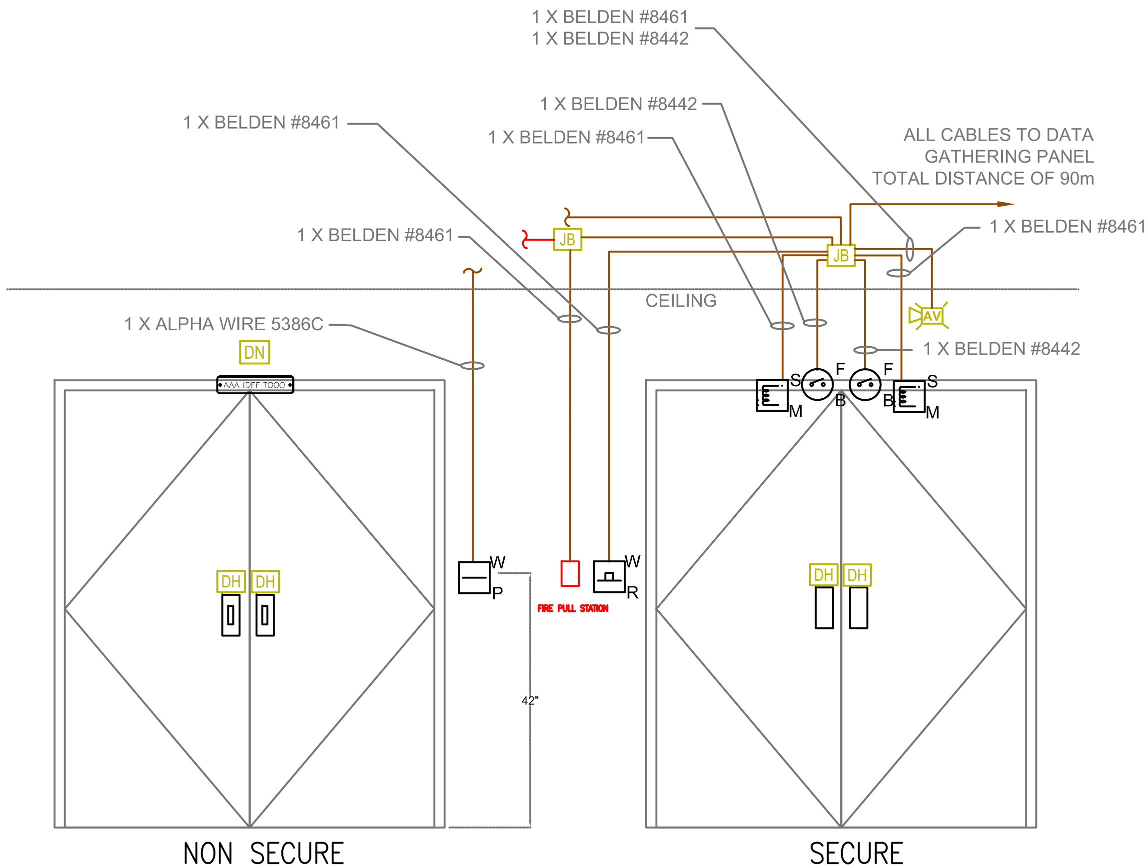
See SIA/IAPSC CAD for Security Symbols



HOLLOW METAL FRAME, METAL DOUBLE DOOR WITH CR, FLUSH CONTACT, EGRESS TYPE SNL-GANG, DOUBLE W/DSS MAGLOCK WITH RED FIRE PULL STATION

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Door Typical's (Original Standard)

Double Door Maglock Typical

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE: NTS	DATE: April 23, 2009	CONTRACT No. N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0012		1 of 1
CHECK:	Walter Chan, CPP, CSPM				

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX
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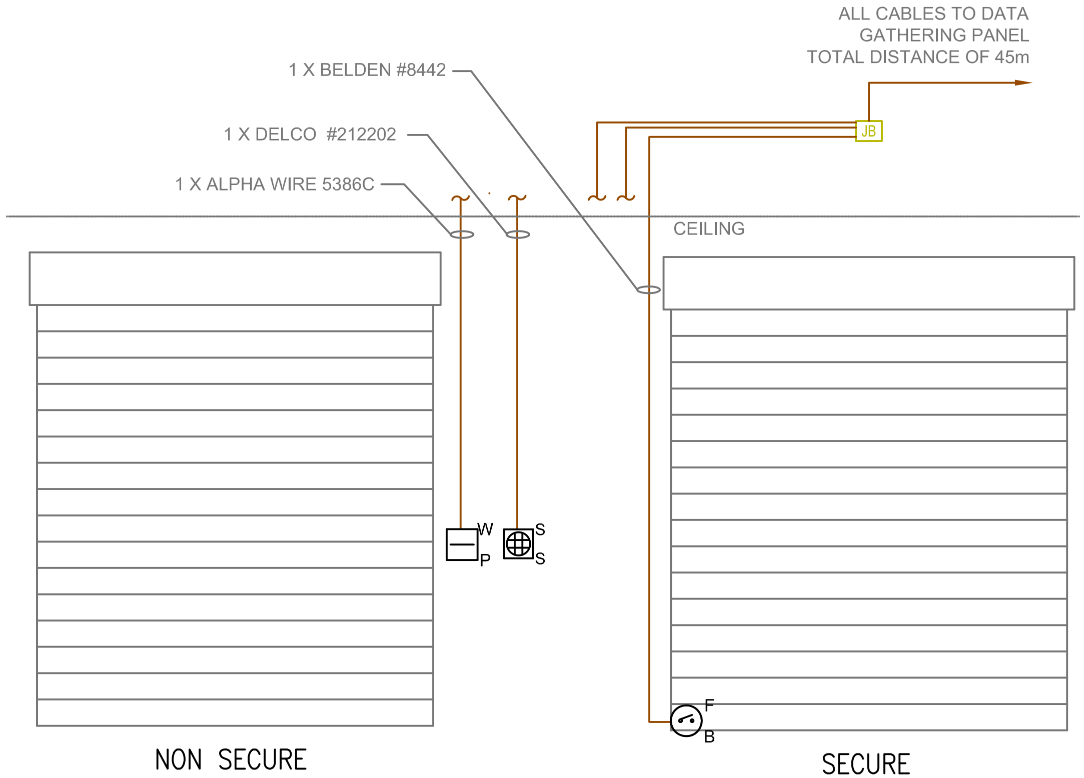

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Door Typical's

ROLL UP DOOR WITH CARD READER AND INTERCOM FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE: NTS	DATE: April 23, 2009	CONTRACT No. N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0013		1 of 1
CHECK:	Walter Chan, CPP, CSPM				

LEGEND

SYMBOL	DESCRIPTION
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DN	DOOR NUMBER TYPICAL
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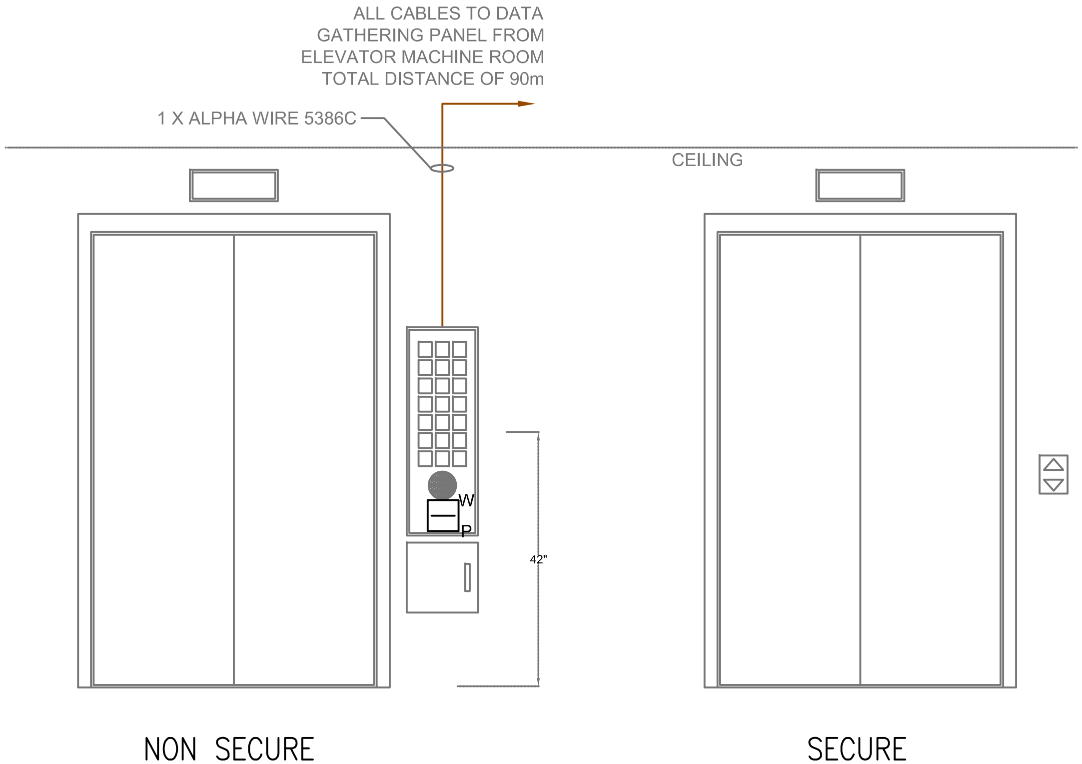

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4. ALL CABLE TO BE INDIVIDUALLY LABELLED
5. ALL CONDUIT AND JB TO BE SIZED ACCORDINGLY (MIN 21mm TO CONTROL PANEL, 12mm CONDUIT OK FROM JB TO DEVICE.
6. ALL CONDUIT TO BE ON THE SECURE SIDE OF DOOR AND JB TO BE LOCATED ABOVE DOOR
7. ALL DEVICES TO BE MOUNTED ON SGL-GANG BACKBOX AND WILL BE TERMINATED BY OTHERS (SECURITY CONTRACTOR), UNLESS OTHERWISE NOTED.
8. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
9. COORDINATE ELECTRIC STRIKE WITH DOOR FRAME MANUFACTURER FOR NEW CONSTRUCTION
10. DOOR CONTACT REQUIRES 25mm (1") DIAM. HOLE PREPPED 100mm - 150mm (4"-6") FROM EDGE OF DOOR FRAME.
11. CARD READER HEIGHT IS RECOMMENDED 1.07m (42") C/L AND TO BE MOUNTED ON ACTIVE EDGE OF DOOR.
12. EGRESS MOTION DETECTOR TO BE CENTERED ABOVE DOOR ON SECURE SIDE OF WALL. 2.44m (8') FROM FLOOR (WHERE APPLICABLE)
13. EXIT BUTTON TO BE MOUNTED ON SECURE SIDE OF WALL.
14. EMERGENCY FIRE PULL STATION TO BE WITHIN 600mm OF DOOR.
15. ALL DOOR LOCKING HARDWARE SHOULD BE PASSAGE SET FUNCTION WHERE MAGLOCKS INSTALLED, UNLESS OTHERWISE NOTED.
16. THE THROW LATCH ON THE LOCKING HARDWARE MUST BE A MINIMUM OF $\frac{3}{4}$" OR FITTED TO MAKE EFFECTIVE THE LATCH MONITOR. (I.E. NOT TO CAUSE ANY NUISANCE ALARMS).
17. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

Door Typical's

ELEVATOR PROXIMITY CARD READER FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

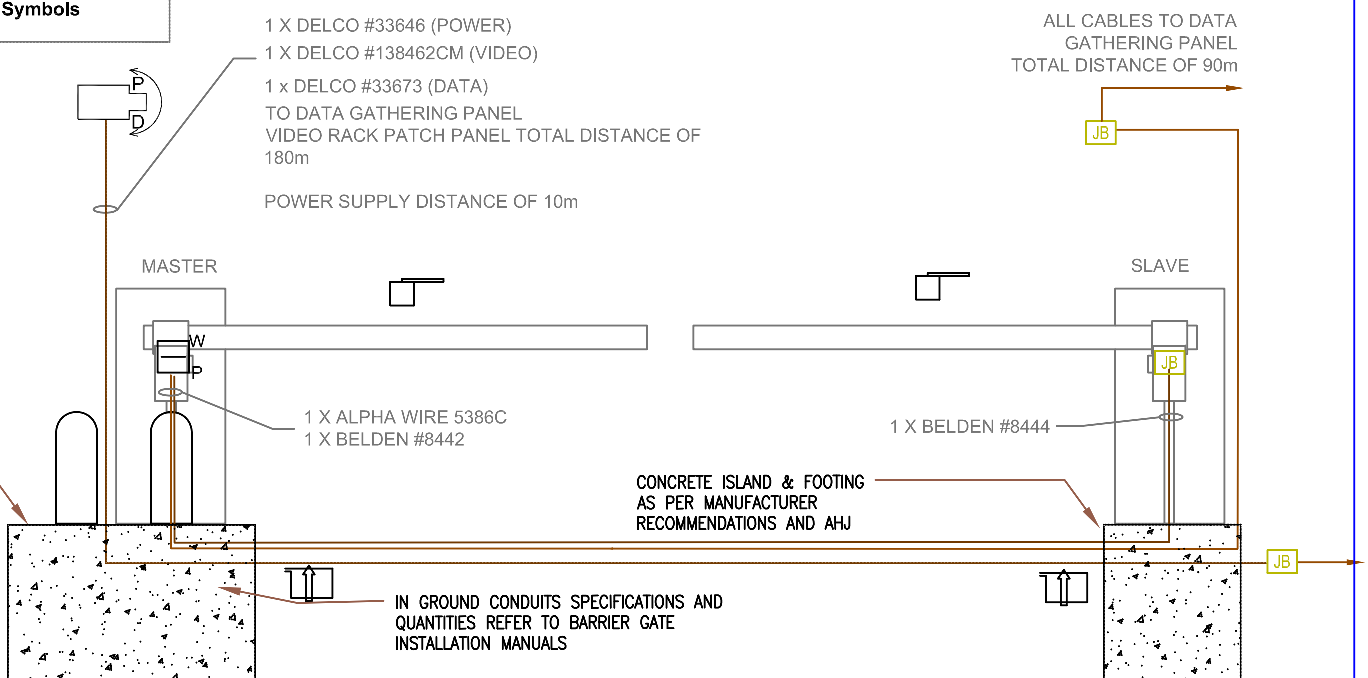
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-DOOR-0014					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX

See SIA/IAPSC CAD for Security Symbols



NOTE:

1. ALL CABLE TO BE HOME RUN FROM DEVICE MOUNTING LOCATION TO CONTROL PANEL
2. ALL CABLE TO BE IN EMT CONDUIT FROM EACH DEVICE AND FROM JB TO DGP
3. ALL BURIED UNDERGROUND CONDUIT SHALL BE RIGID PVC TYPE
4. ALL CABLE TO BE IN PLENUM RATED IF NOT IN CONDUIT, UNLESS OTHERWISE NOTED.
5. ALL CABLE TO BE INDIVIDUALLY LABELLED
6. ALL CONDUIT AND JB TO BE SIZED ACCORDINGLY (MIN 21mm TO CONTROL PANEL, 12mm CONDUIT OK FROM JB TO DEVICE.
7. ALL DEVICES TO BE MOUNTED ON SGL-GANG BACKBOX AND WILL BE TERMINATED BY SECURITY CONTRACTOR, UNLESS OTHERWISE NOTED.
8. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
9. CAMERA TO BE MOUNTED BY SECURITY CONTRACTOR
10. CCTV CABLE S TO BE IN SEPARATE CONDUIT FROM DOOR CABLES
11. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

TWO-WAY LANE APPLICATION

TYPICAL FOR SUPPLY / INSTALL PRICING:

1. GATE OPERATORS TO BE DOORKING 1601 BARRIER GATE
2. GATE ARM TO BE SIZED AT APPROXIMATELY 6.5 FOOT WOOD TYPE
3. INCLUDE HEATER AND BLOWER KIT
4. INCLUDE 4 GROUND LOOP DETECTORS (ARMING, SAFETY, DOWN, EXIT)
5. INCLUDE LOOP DETECTORS, LOOP WIRE AND SEALANTS
4. INCLUDE ALL WIRING AND TERMINATIONS
5. INCLUDE ALL PARTS AND ACCESSORIES TO PROVIDE A FULLY FUNCTIONAL SOLUTION

Gate Typical's

DOUBLE PARKING GATE WITH PROXIMITY CARD READER FUNCTIONALITY

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

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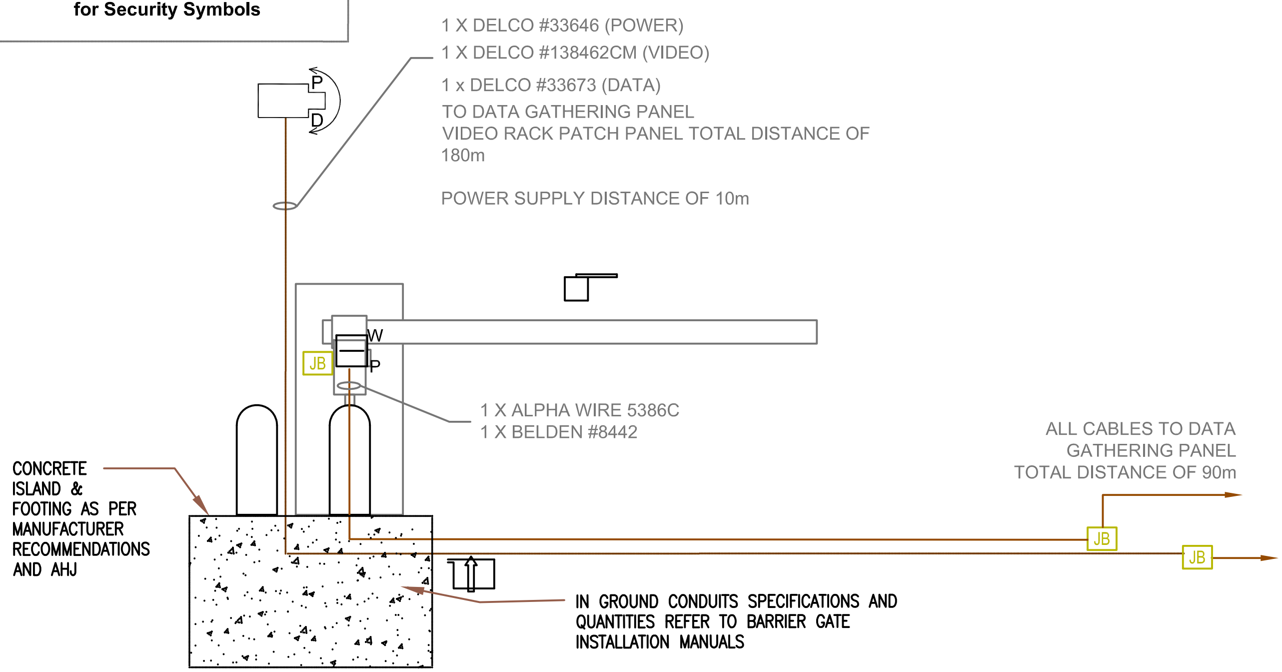
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-GATE-0001					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX

See SIA/IAPSC CAD for Security Symbols



NOTE:
1. ALL CABLE TO BE HOME RUN FROM DEVICE MOUNTING LOCATION TO CONTROL PANEL
2. ALL CABLE TO BE IN EMT CONDUIT FROM EACH DEVICE AND FROM JB TO DGP
3. ALL BURIED UNDERGROUND CONDUIT SHALL BE RIGID PVC TYPE
4. ALL CABLE TO BE IN PLENUM RATED IF NOT IN CONDUIT, UNLESS OTHERWISE NOTED.
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8. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
9. CAMERA TO BE MOUNTED BY SECURITY CONTRACTOR
10. CCTV CABLE S TO BE IN SEPARATE CONDUIT FROM DOOR CABLES
11. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

TWO-WAY LANE APPLICATION

TYPICAL FOR SUPPLY / INSTALL PRICING:

1. GATE OPERATOR TO BE DOORKING 1601 BARRIER GATE
2. GATE ARM TO BE SIZED AT APPROXIMATELY 6.5 FOOT WOOD TYPE
3. INCLUDE HEATER AND BLOWER KIT
4. INCLUDE 4 GROUND LOOP DETECTORS (ARMING, SAFETY, DOWN, EXIT)
5. INCLUDE LOOP DETECTORS, LOOP WIRE AND SEALANTS
4. INCLUDE ALL WIRING AND TERMINATIONS
5. INCLUDE ALL PARTS AND ACCESSORIES TO PROVIDE A FULLY FUNCTIONAL SOLUTION

Gate Typical's

SINGLE PARKING GATE WITH PROXIMITY CARD READER FUNCTIONALITY

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FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

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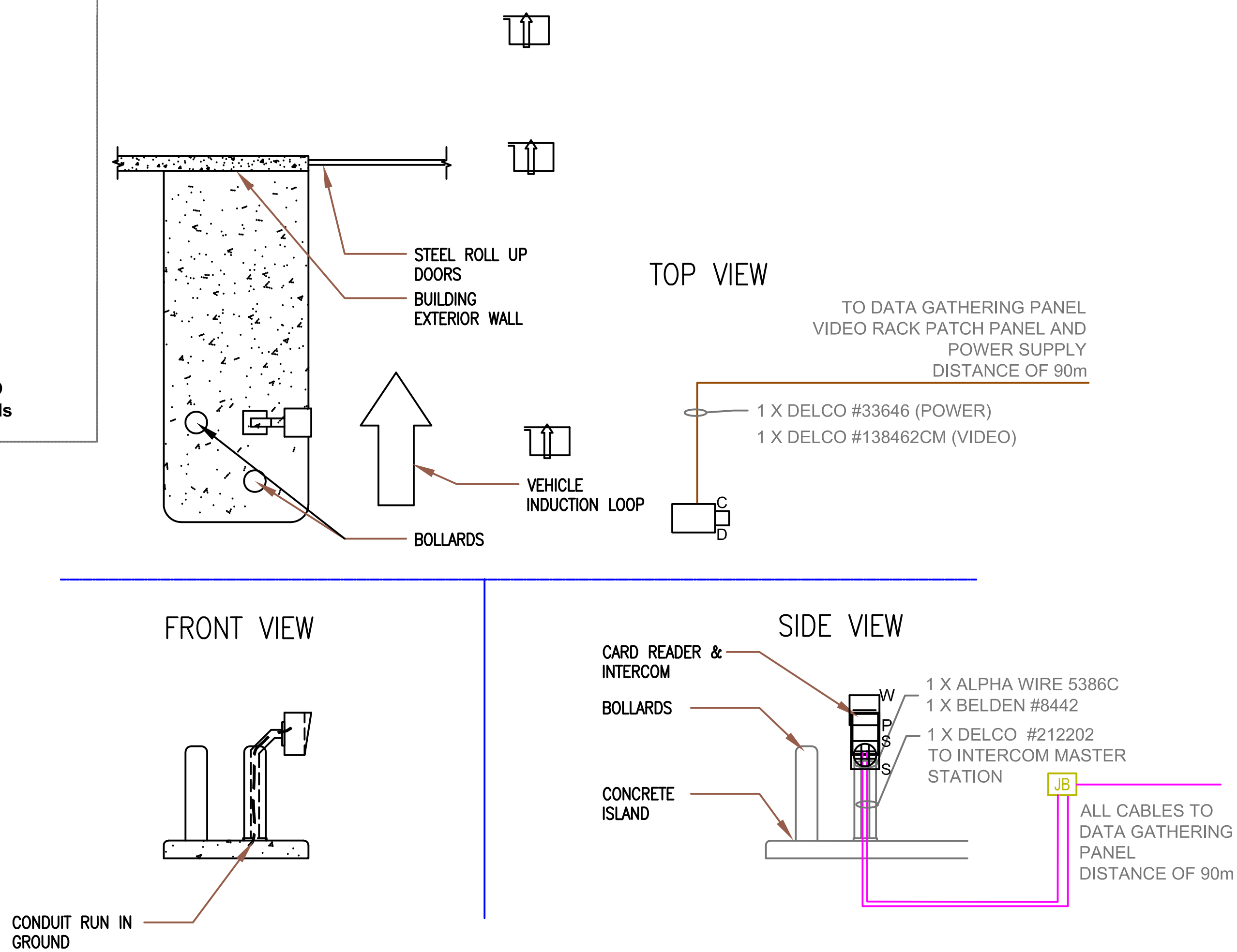
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-GATE-0002A					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

LEGEND

SYMBOL	DESCRIPTION
JB	JUNCTION BOX

See SIA/IAPSC CAD
for Security Symbols



PEDESTAL MOUNT

PROVIDE ONE PEDESTAL MOUNT AT CAR HEIGHT TO ACCOMMODATE ONE INTERCOM AND ONE PROXIMITY CARD READER, INCLUDE PEDESTAL, CONCRETE ISLAND, FOOTING AND TWO BOLLARDS.

NOTE:

1. ALL CABLE TO BE HOME RUN FROM DEVICE MOUNTING LOCATION TO CONTROL PANEL
2. ALL CABLE TO BE IN EMT CONDUIT FROM EACH DEVICE AND FROM JB TO DGP
3. ALL BURIED UNDERGROUND CONDUIT SHALL BE RIGID PVC TYPE
4. ALL CABLE TO BE IN PLENUM RATED IF NOT IN CONDUIT, UNLESS OTHERWISE NOTED.
5. ALL CABLE TO BE INDIVIDUALLY LABELLED
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8. EXACT DEVICE MOUNTING LOCATION TO BE CONFIRMED ON SITE WITH CITY CORPORATE SECURITY PROJECT MANAGER.
9. CAMERA TO BE MOUNTED BY SECURITY CONTRACTOR
10. CCTV CABLE S TO BE IN SEPARATE CONDUIT FROM DOOR CABLES
11. ALL CABLE TYPES AND DISTANCES LISTED ARE FOR TYPICAL INSTALLATION STANDARDS AND ARE FOR PRICING PURPOSES, IT IS THE RESPONSIBILITY OF THE SECURITY CONTRACTOR TO FINALIZE THE CABLES REQUIRED FOR THE SPECIFIC EQUIPMENT AND FUNCTIONALITY REQUIRED BY THE CITY.

Gate Typical's

PEDESTAL WITH PROXIMITY CARD READER AND INTERCOM FUNCTIONALITY

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CITY OF TORONTO
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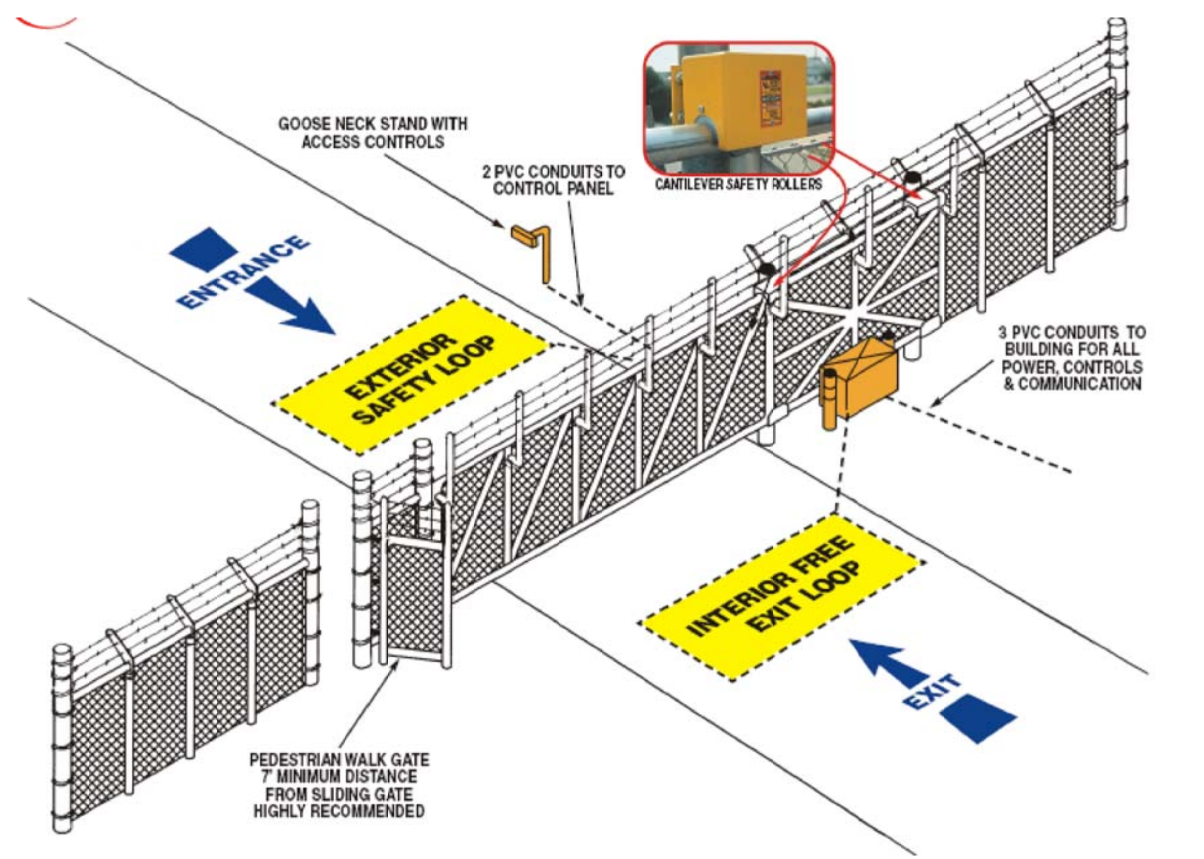
DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-GATE-0003			SHEET No.	1 of 1
CHECK:	Walter Chan, CPP, CSPM						



SYSTEM SEQUENCE

Entry:
As the vehicle approaches the gate entrance, the driver places a coded card against reader. This transmits an impulse to actuate the gate operator which opens the gate. A radio transmitter, key switch or a digital keypad can be used instead of a card reader, or the gate can be opened with a push button from a guardhouse at the site. As the vehicle goes through the opening, it passes over the exterior loop and interior loop, creating an impulse to hold the gate open. When the loops have been cleared, the timer, (after a pre-set period), sends an impulse to the gate operator to close the gate.If the gate is closing when the vehicle reaches the loop area, the gate reverses to the open position and the timer automatically resets.

Exit:
From inside the fence line, a vehicle approaches the gate and passes over the interior loop. This transmits an impulse that actuates the gate operator and opens the gate. As the vehicle passes over the loops, an impulse is transmitted to hold the gate open. When the vehicle clears both loops, the timer, after a pre-set period, sends an impulse to the gate operator to close the gate. For controlled exit, a card reader, radio transmitter, key switch, digital keypad or a push button in a guardhouse can again be utilized. In a controlled exit situation, the interior loop is set to act only as a safety.

CANTILEVER SLIDING GATE

PROVIDE THE FOLLOWING TYPICAL SUPPLY AND INSTALLATION

ONE CANTILEVER ALUMINUM GATE
To suit driveway as follows:
- Gate to have superior safety rollers
- Gate to have two 89,, galvanized steel posts schedule 40 for support
- Gate to have 45mm galvanized steel frame with supports as required
- Gate to have 50mm x 9 gauge galvanized steel fabric cover
- Centre U-guide keeps gate locked tight to prevent forced entry
- Gates to have 75mm x 127mm aluminum angle support for gate and chain1

Heavy duty sliding gate operator to suit overhead gate as follows:

ELECTRICAL FEATURES:
- Soft start and soft stop features
- Instant reversing industrial motors
- Voltage 600/3/60 1 HP
- Inherent obstruction sensing
- Gate movement warning- 24 volt Control circuit
- Contactor-type reversing starter
- Open, close & stop push buttons
- Full overload protection- On/Off switch
- Removable electrical control enclosure
- Run out timer
- 250 W. Heater and Thermostat

MECHANICAL FEATURES:
- Heavy duty worm gear reducer in oil bath
- Cast iron pillow block bearings
- Adjustable rotary limit switches
- Plated #50 roller chain
- Emergency release disconnect
- Adjustable friction clutch
- Solenoid brake for stops & locking
- Gate speed 300 mm per second
- NEMA 12 "Weatherproof" Enclosure
- Baked on enamel finish
- Swing door with pad-locking
- UL325, Class I, II, III & IV

OPERATION:
- 1 Timer to close
- 1 1.5 Second time delay in reversing cycle
- 1 Exterior magnetic loops for safety
- 1 Interior magnetic loops for safety and exit
- 1 Pedestal with housing for entry
- 1 Digital Pad (Fully programmable)
- 1 Support set up/demonstration and training

Gate Typical's

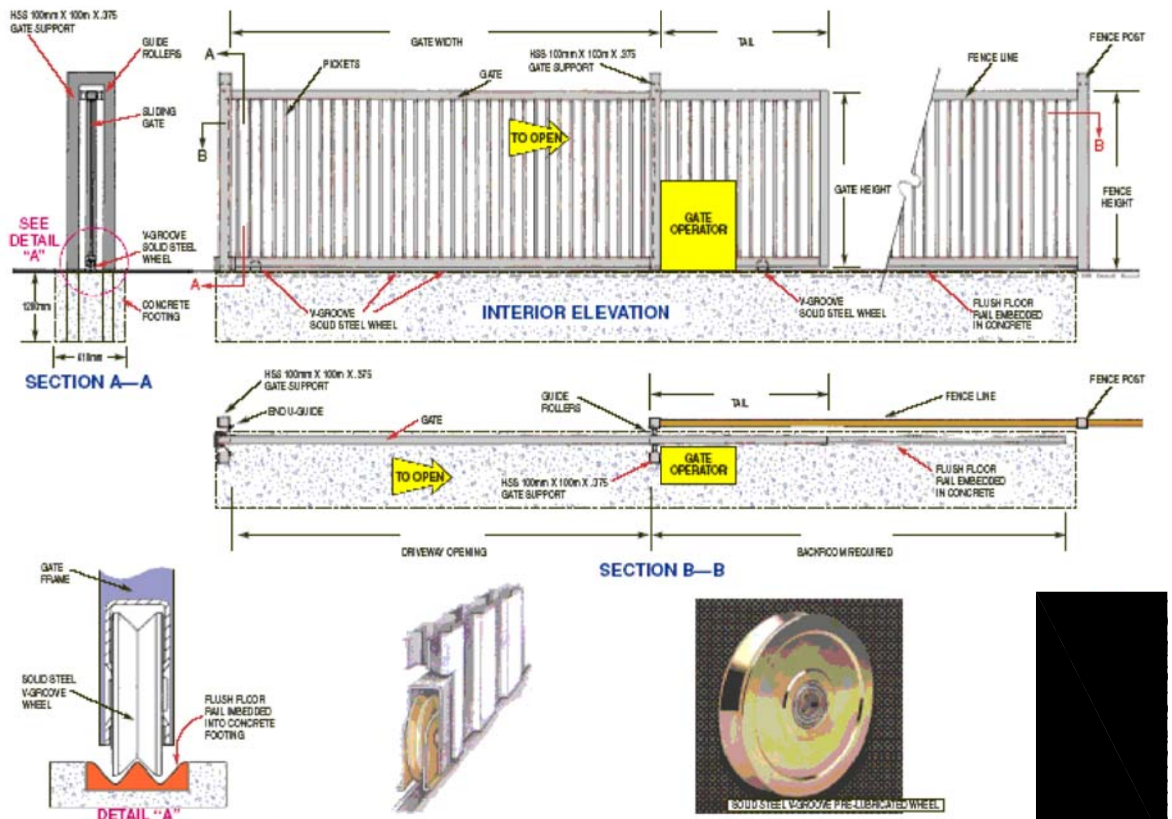
CANTILEVER SLIDING GATE

TORONTO Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	CITY	SCALE:	NTS	DATE:	Nov. 23, 2009	CONTRACT No.	N/A	SHEET No.	1 of 1
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-GATE-0004						
CHECK:	Walter Chan, CPP, CSPM								



Designed for sliding doors and gates where a difference in the ground level would create a trip hazard for pedestrians and obstruct the passage of fork lifts, trucks, snow plows, et

V-TRACK SLIDING GATE

V-TRACK SLIDING GATE

1 Superior Extra Heavy Duty 20 ft. wide Sliding Gate on V-TrackSystem as follows:

SPECIFICATIONS AS FOLLOWS:

- Gate frame to have 150mm x 3mm thick HSS tube
- Gate frame to have 50mm x 50mm x 2.5mm HSS tube pickets 100mm apart
- Gate to be welded together to withstand high cycle usage
- Gate to be galvanized prior to installation
- Gate to have high cycle pre-lubricated precision made V-groovewheel assembly
- Wheel assembly to ride on V-track welded to 100mm channel with rebar hooks that are imbedded into 1000mm 35 MPA concrete footing
- Footing to be minimum 300mm wide by 1000mm deep x 35MPAconcrete with rebar re-enforcement
- V-Track to be flush with driveway to prevent damage from snow plow etc.
- Gate to have supporting posts as required to keep gate up-right
- Gate to have end posts to prevent forced entry
- Gate to have guide rollers at top to keep gate rolling without friction or drag
- Gate to have 75mm x 127mm aluminum angle support for gate and chain

1 Heavy duty sliding gate operator to suit overhead gate as follows:

ELECTRICAL FEATURES:

- Soft start and soft stop feature
- Instant reversing industrial motors
- Voltage 600/3/60 1 HP
- Inherent obstruction sensing
- Gate movement warning-
- 24 volt Control circuit
- Contactor-type reversing starter
- Open, close & stop push buttons
- Full overload protection
- On/Off switch
- Removable electrical control enclosure
- Run out timer- 250 W. Heater and Thermostat

MECHANICAL FEATURES:

- Heavy duty worm gear reducer in oil bath
- Cast iron pillow block bearings
- Adjustable rotary limit switches
- Plated #50 roller chain
- Emergency release disconnect- Adjustable friction clutch
- Solenoid brake for stops & locking
- Gate speed 300 mm per second
- NEMA 12 "Weatherproof" Enclosure
- Baked on enamel finish
- Swing door with pad-locking

OPERATION:

- 1 Soft start and soft stop feature
- 1 Timer to close
- 1 1.5 Second time delay in reversing cycle
- 1 Exterior magnetic loops for safety
- 1 Interior magnetic loops for safety and exit

SYSTEM SEQUENCE

Entry:

As the vehicle approaches the gate entrance, the driver places a coded card against reader. This transmits an impulse to actuate the gate operator which opens the gate. A radio transmitter, key switch or a digital keypad can be used instead of a card reader, or the gate can be opened with a push button from a guardhouse at the site. As the vehicle goes through the opening, it passes over the exterior loop and interior loop, creating an impulse to hold the gate open. When the loops have been cleared, the timer, (after a pre-set period), sends an impulse to the gate operator to close the gate.

If the gate is closing when the vehicle reaches the loop area, the gate reverses to the open position and the timer automatically resets.

Exit:

From inside the fence line, a vehicle approaches the gate and passes over the interior loop. This transmits an impulse that actuates the gate operator and opens the gate. As the vehicle passes over the loops, an impulse is transmitted to hold the gate open. When the vehicle clears both loops, the timer, after a pre-set period, sends an impulse to the gate operator to close the gate. For controlled exit, a card reader, radio transmitter, key switch, digital keypad or a push button in a guardhouse can again be utilized. In a controlled exit situation, the interior loop is set to act only as a safety.

Gate Typical's

V-TRACK SLIDING GATE

Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

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DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-ACS-GATE-0005			SHEET No.	1 of 1
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SIA/IAPSC CAD Security Symbols

MARCH 2000
RELEASE: 2.0
PAGE 1 OF 7

SYMBOL #	SYMBOL	BLOCK NAME	DESCRIPTION
			M - MOUNT; T - TECHNOLOGY/TYPE (SPECIFIC TO DEVICE). M: P = PEDESTAL, T = TURNSTILE, S = SURFACE, F = FLUSH, R = RACK, M = MULLION, D = DESK, W = WALL, C = CEILING, H = HIDDEN
1. ANNOTATION			
1.01	A B C	REF	DEVICE REFERENCE A = DRAWING SHEET B = DETAIL C = DEVICE/ZONE NUMBER
2. ACCESS CONTROL			
2.01	M T	CARD-RDR	CARD ACCESS READER T: B = BARCODE, W = WEIGAND, P = PROXIMITY, M = MAG. STRIPE, F = ELEVATOR FLOOR CALL, H = ELEVATOR HALL CALL, T = TOKEN, S = SMART CARD
2.02	M T	BIO-RDR	BIOMETRIC ACCESS CONTROL DEVICE T: H = HAND GEOMETRY, F = FINGER PRINT, V = VOICE, R = EYE RETINA, I = EYE IRIS
2.03	M	KEYPAD	KEYPAD DEVICE
2.04	M	RDR-KPD	CARD READER WITH KEYPAD
2.05	M	TA-RDR	CARD READER WITH TIME AND ATTENDANCE

SIA/IAPSC CAD Security Symbols

MARCH 2000
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PAGE 2 OF 7

SYMBOL #	SYMBOL	BLOCK NAME	DESCRIPTION
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3. ANNUNCIATION: CONSOLE/PANEL			
3.01	M T	FLD-PNL	FIELD PANEL T: C = CARD READER, A = ALARM
3.02	M T	CTRL-PNL	CONTROL PANEL T: B = BURGLAR, F = FIRE, P = PERIMETER, D = DOOR
3.03		CPU	CENTRAL PROCESSING UNIT
3.04		KEYBOARD	KEYBOARD
3.05		PRINTER	PRINTER
3.06	T	PWR-SPLY	POWER SUPPLY T: L = LOCK, C = CAMERA, P = PANEL, I = INTERCOM
4. ANNUNCIATION: DEVICES			
4.01	M T	AUDIO	AUDIO DEVICE T: Z = BUZZER, B = BELL, C = CHIME, H = HORN, S = SPEAKER, L = LISTEN-IN, K = KLAXON, M = MICROPHONE, S = SOUNDER

SIA/IAPSC CAD
Security Symbols

Toronto Corporate Security

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CITY OF TORONTO
CORPORATE SECURITY

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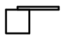
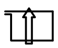
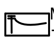
PAGE 3 OF 7

SYMBOL #	SYMBOL	BLOCK NAME	DESCRIPTION
			DESCRIPTION: M - MOUNT; T - TECHNOLOGY/TYPE (SPECIFIC TO DEVICE). M: P - PEDESTAL, T - TURNSTILE, S - SURFACE, F - FLUSH, R - RACK, M - MULLION, D - DESK, W - WALL, C - CEILING, H - HIDDEN
5. BARRIERS AND VEHICLE CONTROLS			
5.01		TRNSTL	TURNSTILE
5.02		REV-DOOR	REVOLVING DOOR
5.03		TRFC-ARM	TRAFFIC ARM
5.04		TRFC-LP	VEHICLE LOOP DETECTOR
5.05	 T	SEC-SCRN	SECURITY WINDOW SCREEN T: S - SHADE; B - BLIND (SEE 10.04 FOR ALARM SCREEN)
6. COMMUNICATIONS			
6.01	 S S	INTERCOM	INTERCOM T: M - MASTER; S - SUBSTATION
6.02	 M T	2WAY-MIC	2-WAY RADIO MICROPHONE
6.03	 M T	CELL-TX	CELLULAR TRANSMITTER
6.04	 M T	TEL-DIAL	TELEPHONE DIALER T: D - DIGITAL COMMUNICATOR; V - VOICE DIALER
6.05	 M T	FIBR-MOD	FIBER OPTIC MODULE T: TX - TRANSMITTER; R - RECEIVER; T - TRANSCEIVER
7. ELECTRICAL			
8. LIGHTING			

SIA/IAPSC CAD Security Symbols

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PAGE 4 OF 7

SYMBOL #	SYMBOL	BLOCK NAME	DESCRIPTION
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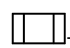
9. MISCELLANEOUS			
9.01		SHREDDER	DOCUMENT DESTROYER
10. SENSORS			
10.01	 M T	MOTION	MOTION DETECTOR T: M - MICROWAVE; IR - INFRARED; U - ULTRASONIC; X - REQUEST-FOR-EXIT; D - DUAL TECHNOLOGY
10.02	 F M T	BEAM	BI-STATIC BEAM SENSOR T: M - MICROWAVE; I - INFRARED F: TX - TRANSMIT; RX - RECEIVE
10.03	 M T	GLASS-BR	GLASS BREAK SENSOR T: S - SHOCK; A - AUDIO
10.04	 T	SCREEN-A	SECURITY SCREEN WITH ALARM T: S - SHADE; B - BLIND
10.05	 T	SCR-DEV	SCREENING DEVICE T: M - METAL DETECTOR; E - EXPLOSIVE DETECTOR; X - X-RAY; T - TAG DOOR (EAS); A - ACCESS

SIA/IAPSC CAD
Security Symbols

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FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-SIA-0002					2 of 4
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PAGE 5 OF 7

SYMBOL #	SYMBOL	BLOCK NAME	DESCRIPTION
			M - MOUNT; T - TECHNOLOGY/TYPE (SPECIFIC TO DEVICE). M: P - PEDESTAL, T - TURNSTILE, S - SURFACE, F - FLUSH, R - RACK, M - MULLION, D - DESK, W - WALL, C - CEILING, H - HIDDEN
11. SURVEILLANCE			
11.01	M T	MONITOR	MONITOR T: V - VIDEO, D - DATA, G - GRAPHICS, M - MULTISCREEN
11.02	M T	CAM-FXD	CAMERA T: S - SCOOP/WEDGE, C - CORNER, D - DOME, B - BOARD, E - ENVIRONMENTAL
11.03	M T	CAM-PTZ	CAMERA WITH PAN / TILT/ ZOOM T: D - DOME, E - ENVIRONMENTAL
11.04		VID-CTRL	VIDEO CONTROL KEYBOARD
11.05		VID-MUX	VIDEO MULTIPLEXER
11.06		VID-MOTN	VIDEO MOTION DETECTOR
11.07	M T	RECORDER	RECORDER T: V - VIDEO, A - AUDIO, D - DIGITAL

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PAGE 6 OF 7

SYMBOL #	SYMBOL	BLOCK NAME	DESCRIPTION
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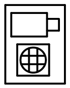
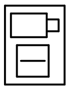
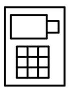
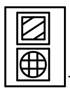
12. SWITCHES			
12.01	M T	SWITCH-A	AUTOMATIC MONITORING SWITCH T: T - TEMP, B - BALANCED MAG, H - HUMIDITY, W - WATER, L - LATCH, G - GATE
12.02	M T	SWITCH-M	MANUALLY OPERATED SWITCH T: E - EMERGENCY, L - LOCK, F - FOOT, M - MAT, H - HOLDUP
12.03	M T	BUTTON	PUSH BUTTON T: P - PANIC, D - DURESS, X - REQUEST-FOR-EXIT, R - DOOR RELEASE, B - BELL PUSH
12.04	M T	RELAY	RELAY SWITCH T: F - FIRE ALARM
13. DOOR AND LOCKING HARDWARE			
13.01	M T	EL-LOCK	ELECTRIC LOCK T: M - MAGNETIC, S - STRIKE, L - LOCKSET, H - HYBRID, D - DEADBOLT
13.02	T	EXIT-DEV	EXIT DEVICE T: E - ELECTRIFIED, M - MECHANICAL, D - DELAYED EGRESS, X - HIGH SECURITY
13.03	4	TX-HINGE	POWER TRANSFER HINGE T: 2 - TWO-WIRE, 4 - FOUR-WIRE, etc.

SIA/IAPSC CAD Security Symbols

MARCH 2000
RELEASE: 2.0
PAGE 7 OF 7

SYMBOL #	SYMBOL	BLOCK NAME	DESCRIPTION
			M - MOUNT; T - TECHNOLOGY/TYPE (SPECIFIC TO DEVICE). M: P - PEDESTAL, T - TURNSTILE, S - SURFACE, F - FLUSH, R - RACK, M - MULLION, D - DESK, W - WALL, C - CEILING, H - HIDDEN
	APPENDIX A: SAMPLE COMBINATION DEVICES		
A.01		VID-IC	VIDEO INTERCOM
A.02		VID-CR	CAMERA WITH CARD READER
A.03		VID-KPD	CAMERA WITH KEYPAD
A.04	 T	VID-ICM	VIDEO INTERCOM MASTER T: R - WITH DOOR RELEASE

SIA/IAPSC CAD

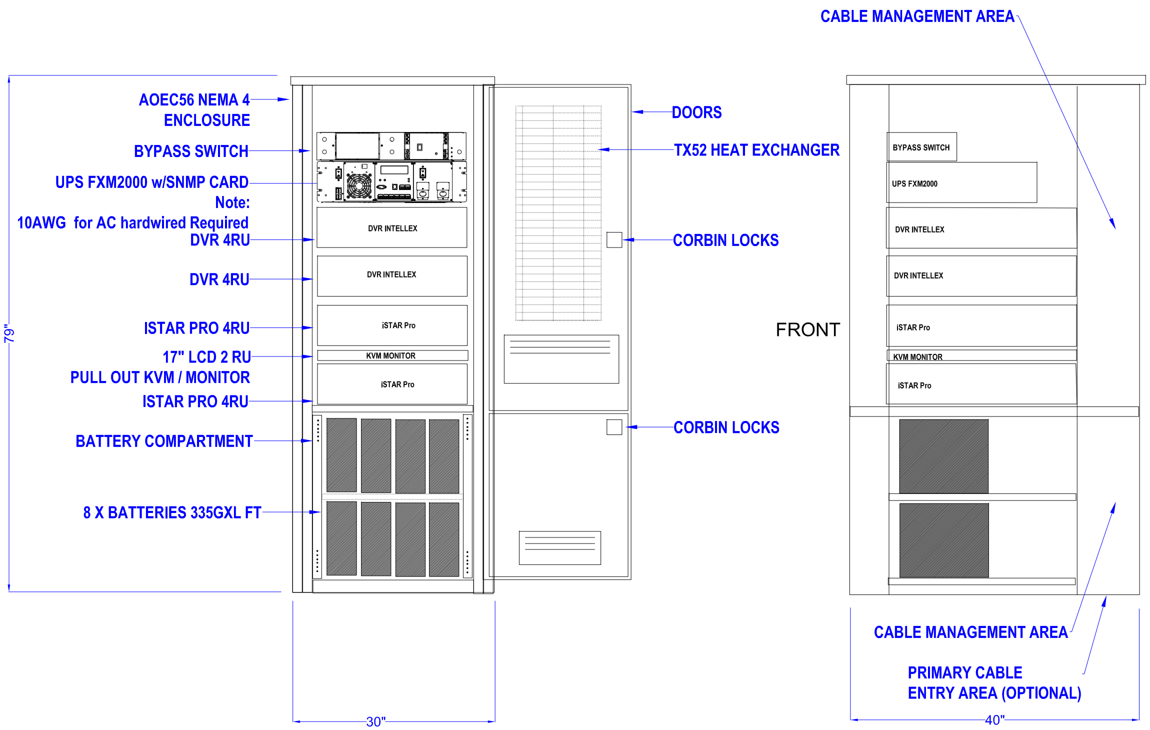
SIA/IAPSC CAD

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	April 23, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-SIA-0004					4 of 4
CHECK:	Walter Chan, CPP, CSPM							



FRONT

SIDE

QTY	PART No.	DESCRIPTION
		Alpha Technologies Ltd. indoor and outdoor AC Uninterruptible Power Supply and Backup Power solution.
1	AOEC 56	**Model: AOEC 56 / Consists of:**
		AOEC 56 Enclosure
		Failsafe Automatic/Manual Bypass Switch
		Heat Exchanger
		Tamper Switches for door
		Temperature High Alarm Dry Contact
		PDU - Power Distribution Unit; Power Bar with 12 receptacles
		Document Holder
		FXM module, batteries and AlphaGuard
1	026-072-22	Alpha Outdoor Enclosure Compartmented - 56 Cubic Feet, with Universal Automatic Transfer Switch, Power Distribution Unit, Tamper Switch, 150W per degree C Heat Exchanger (TX 52)
1	020-174-10	KVM SWITCH DSR2035-001
1	740-823-20	LCD CONSOLE TRAY ECS17PWRSCS-001
1	017-201-31	FXM2000, 120V Input/Output, 48VDC, with SNMP Card
8	181-234-10	Batteries 335GXL FT
2	012-306-21	AlphaGuard-Charge Management Technology-4SC, 48V

TYPICAL CONFIGURATION FOR ALPHA
AOEC56: AVERAGE TEMPERATURE RISE OF
5259 BTU/HR
CONSISTS OF:
1 X FAILSAFE AUTOMATIC.MANUAL BYPASS
SWITCH
1 X FXM 2000
2 X DVR
2 X ISTAR PRO
1 X KVM SWITCH
1 X LCD TRAY

UPS SYSTEMS - OUTDOOR

APLPHA AOEC56 - FXM 2000 - TX 52
TYPICAL OUTDOOR SECURITY CONFIGURATION

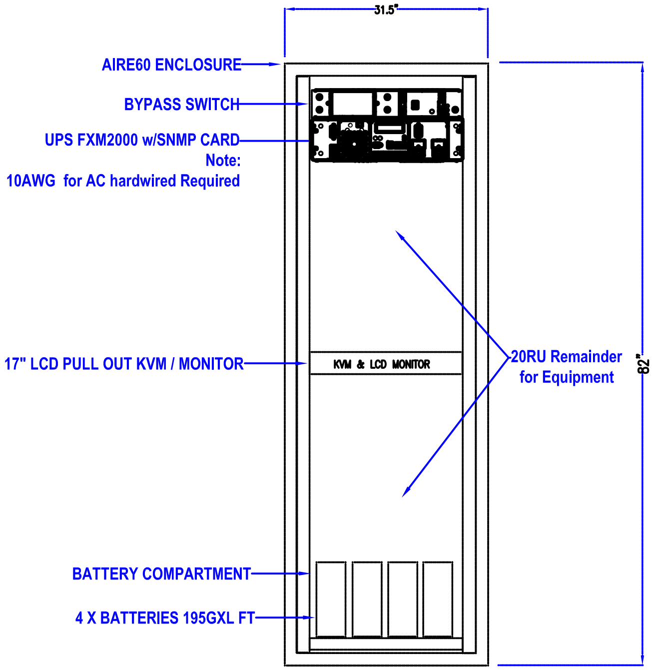
TORONTO
Corporate Security

FACILITIES & REAL ESTATE

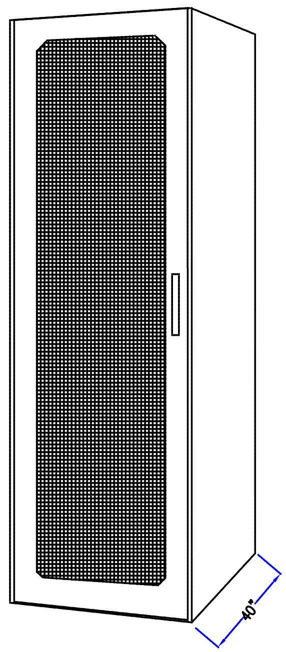
CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	OCTOBER 13, 2009	CONTRACT No.	N/A	SHEET No.
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-UPS-ALPHA-0001					1 of 1
CHECK:	Walter Chan, CPP, CSPM							

ALPHA TECHNOLOGIES LTD.



FRONT



ANGLE VIEW

QTY	PART No.	DESCRIPTION
		Alpha Technologies Ltd. Indoor AC Uninterruptible Power Supply and Backup Power solution.
1	AIRE60	**Model: AIRE60/ Consists of:**
		AIRE60 Enclosure
		Failsafe Automatic/Manual Bypass Switch
		FAN Option
		Tamper Switches for door
		Temperature High Alarm Dry Contact
		PDU - Power Distribution Unit; Power Bar with 12 receptacles
		Document Holder
		FXM module, batteries and AlphaGuard
1	026-074-22	Alpha Indoor Rack Enclosure 60 with Universal Automatic Transfer Switch, Power Distribution Unit, Tamper Switch, Fan Cooled 2 x 500cfm Fans
1	020-174-10	KVM SWITCH DSR2035-001
1	740-823-20	LCD CONSOLE TRAY ECS17PWRSCS-001
2	740-821-20	Side Rails (740mm long)
2	740-822-20	19" Pull out shelf 2RU
1	017-201-31	FXM2000, 120V Input/Output, 48VDC, with SNMP Card
4	181-070-10	Batteries 195GXL-FT
1	012-306-21	AlphaGuard-Charge Management Technology-4SC, 48V

AIRE60 SPECIFICATIONS

- 23" Cabinet, welded steel construction using 14 and 16 gauge cold rolled steel
- Front and rear doors - choice of flush solid, perforated or louvered; lockable handle
- Side panels - solid, perforated or louvered; lockable
- Top cover -solid, perforated or with fan top cover
- Rack angles can be infinitely positioned front to back
- Optional recessed ball-bearing casters allow cabinet repositioning with a minimum of effort.
- Leveler Kits allow the adjustment of cabinets to compensate for uneven floors.
- The joining kit enables joining multiple cabinets to form a single bank of cabinets.
- 20RU of 19" rack for customer equipment after UPS and battery banks are installed.

UPS SYSTEMS - INDOOR

APLPHA AIRE60 - FXM 2000 - FAN COOLED
TYPICAL INDOOR SECURITY/IT CONFIGURATION

Toronto Corporate Security

FACILITIES & REAL ESTATE

CITY OF TORONTO
CORPORATE SECURITY

DESIGN:	MMM GROUP	SCALE:	NTS	DATE:	OCTOBER 13, 2009	CONTRACT No.	N/A
DRAFTING:	L.B., CPO	DRAWING NUMBER:	CS-UPS-ALPHA-0002			SHEET No.	1 of 1
CHECK:	Walter Chan, CPP, CSPM						

ALPHA TECHNOLOGIES LTD.

Security System Cut Sheets and Drawings

AXIS P3225-LVE Mk II Network Camera

Streamlined, outdoor-ready HDTV 1080p fixed dome for any light conditions

AXIS P3225-LVE Mk II is a streamlined, outdoor-ready fixed dome that provides HDTV 1080p video. It features a varifocal lens and remote zoom and focus, which eliminates the need for hands-on fine tuning. Equipped with WDR – Forensic Capture to handle scenes with strong variations in light, Lightfinder technology for exceptional light sensitivity, as well as built-in IR illumination with OptimizedIR, this versatile camera provides outstanding video quality in any light conditions. It supports Axis Zipstream technology that significantly reduces bandwidth and storage requirements. The vandal-resistant AXIS P3225-LVE Mk II is IK10 rated.

> **HDTV 1080p video quality**

> **Outdoor ready and IK10 rated**

> **Lightfinder and WDR – Forensic Capture**

> **OptimizedIR illumination**

> **Axis Zipstream**

HDTV
NETWORK VIDEO

AXIS P3225-LVE Mk II Network Camera

Camera	
Image sensor	Progressive scan RGB CMOS 1/3"
Lens	Varifocal, 3.0–10.5 mm, F1.4 Horizontal field of view: 92°–34° Vertical field of view: 50°–20° Remote focus and zoom, P-Iris control, IR corrected
Day and night	Automatically removable infrared-cut filter
Minimum illumination	**HDTV 1080p 25/30 fps with WDR – forensic capture and Lightfinder:** Color: 0.16 lux at 50 IRE, F1.4 B/W: 0.03 lux at 50 IRE, F1.4, 0 lux with IR illumination on **HDTV 1080p 50/60 fps:** Color: 0.32 lux at 50 IRE, F1.4 B/W: 0.06 lux at 50 IRE, F1.4, 0 lux with IR illumination on
Shutter time	1/66500 s to 1 s
Camera angle adjustment	Pan ±180°, tilt -35 to +75°, rotation ±95°
Video	
Video compression	H.264 Baseline, Main and High Profile (MPEG-4 Part 10/AVC) Motion JPEG
Resolution	1920x1080 to 160x90
Frame rate	**With WDR:** 25/30 fps with power line frequency 50/60 Hz **Without WDR:** 50/60 fps with power line frequency 50/60 Hz
Video streaming	Multiple, individually configurable streams in H.264 and Motion JPEG Axis Zipstream technology in H.264 Controllable frame rate and bandwidth VBR/MBR H.264
Multi-view streaming	2 individually cropped out view areas
Pan/Tilt/Zoom	Digital PTZ, preset positions
Image settings	Compression, Color, Brightness, Sharpness, Contrast, Local contrast, White balance, Exposure control (including automatic gain control), Exposure zones, Fine tuning of behavior at low light, WDR - forensic capture: Up to 120 dB depending on scene, Text and image overlay, Mirroring of images, Privacy masks Rotation: 0°, 90°, 180°, 270°, including Corridor Format
Network	
Security	Password protection, IP address filtering, HTTPS[a] encryption, IEEE 802.1X[a] network access control, Digest authentication, User access log, Centralized Certificate Management, brute force delay protection
Supported protocols	IPv4, IPv6 USGv6, HTTP, HTTPS[a], SSL/TLS[a], QoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, Bonjour, UPnP™, SNMP v1/v2c/v3(MIB-II), DNS, DynDNS, NTP, RTSP, RTP, SRTP, SFTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS, SSH, LLDP
System integration	
Application Programming Interface	Open API for software integration, including VAPIX® and AXIS Camera Application Platform; specifications at *www.axis.com* AXIS Video Hosting System (AVHS) with One-Click Connection ONVIF Profile S and ONVIF Profile G, specification at *www.onvif.org*
Analytics	**Included** AXIS Video Motion Detection, active tampering alarm **Supported** AXIS Motion Guard, AXIS Fence Guard, AXIS Loitering Guard, AXIS Perimeter Defender AXIS Digital Autotracking, AXIS People Counter, AXIS Tailgating Detector, AXIS Direction Detector, AXIS Occupancy Estimator, AXIS Random Inspection, AXIS Queue Monitor Support for AXIS Camera Application Platform enabling installation of third-party applications, see *www.axis.com/acap*
Event triggers	Analytics, edge storage events, virtual inputs through API
Event actions	Record video: SD card and network share Upload of images or video clips: FTP, SFTP, HTTP, HTTPS, network share and email Pre- and post-alarm video or image buffering for recording or upload Notification: email, HTTP, HTTPS, TCP and SNMP trap Overlay text
Data streaming	Event data
Built-in installation aids	Remote zoom, remote focus, pixel counter, optimized IR with adjustable IR illumination intensity
General	
Casing	IP66- and NEMA 4X-rated, IK10 impact-resistant casing with hard-coated dome and dehumidifying membrane Encapsulated electronics and captive screws Color: white NCS S 1002-B For repainting instructions of skin cover or casing and impact on warranty, contact your Axis partner.
Mounting	Mounting bracket with holes for junction boxes (double-gang, single-gang, and 4" octagon) and for wall or ceiling mount ¼"-20 UNC tripod screw thread
Sustainability	PVC free
Memory	512 MB RAM, 256 MB Flash
Power	Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 3, max 10.8 W, typical 7.3 W
Connectors	RJ45 10BASE-T/100BASE-TX PoE
IR illumination	Optimized IR with power-efficient, long-life 850 nm IR LEDs with adjustable illumination intensity. Range of reach 30 m (100 ft) or more depending on scene
Storage	Support for microSD/microSDHC/microSDXC card Support for SD card encryption Support for recording to network-attached storage (NAS) For SD card and NAS recommendations see *www.axis.com*
Operating conditions	-40 °C to 50 °C (-40 °F to 122 °F) Start-up: -30 °C to 50 °C (-22 °F to 122 °F) Maximum temperature (intermittent): 55 °C (131 °F) Humidity 10 to 100% RH (condensing)
Storage conditions	-40 °C to 65 °C (-40 °F to 149 °F)
Approvals	**EMC** EN 55022 Class B, EN 61000-6-1, EN 61000-6-2, EN 55024, EN 50121-4, IEC 62236-4, FCC Part 15 Subpart B Class A and B, ICES-003 Class B, VCCI Class B, RCM AS/NZS CISPR 22 Class B, KCC KN22 Class B, KN24 **Safety** IEC/EN/UL 60950-1, IEC/EN/UL 60950-22, IEC/EN 62471 **Environment** IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-14 IEC 60068-2-6 (vibration), IEC 60068-2-27 (shock), IEC 60068-2-30, IEC 60068-2-78, IEC/EN 60529 IP66, NEMA 250 Type 4X, IEC/EN 62262 IK10 **Network** NIST SP500-267
Dimensions	Height: 104 mm (4 1/16 in) ø 149 mm (5 7/8 in)
Weight	800 g (1.8 lb)
Included accessories	Installation Guide, Windows decoder 1-user license, mounting bracket, cable gasket, Resistorx® T20 L-key, drill template, connector guard Weathershield
Optional accessories	AXIS ACI Conduit Bracket A, AXIS ACI Conduit Adapters, AXIS T94M01L Recessed Mount Kit, AXIS T94T01D Pendant Kit including weather shield, AXIS Mounts, Smoked dome For more accessories, see *www.axis.com*
Video management software	AXIS Companion, AXIS Camera Station, Video management software from Axis' Application Development Partners available on *www.axis.com/vms*
Languages	English, German, French, Spanish, Italian, Russian, Simplified Chinese, Japanese, Korean, Portuguese, Traditional Chinese
Warranty	Axis 3-year warranty and AXIS Extended Warranty option, see *www.axis.com/warranty*

a. *This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (www.openssl.org), and cryptographic software written by Eric Young (eay@cryptsoft.com).*

Environmental responsibility:

www.axis.com/environmental-responsibility

Smart-UPS On-Line

1–20 kVA

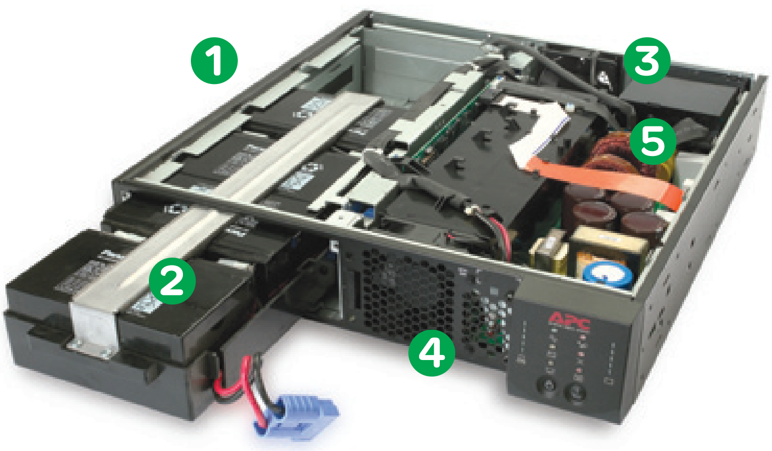
High-density, double-conversion online
power protection with scalable runtime

A versatile UPS developed for unstable power conditions worldwide.

Smart-UPS™ On-Line provides high-density, true double-conversion online power protection for servers, voice/data networks, medical labs, and light industrial applications. Capable of supporting loads from 1 to 20 kVA in a rack/tower convertible form, the Smart-UPS On-Line is available from 2 U to 12 U. The 15 kVA and 20 kVA models enable support of power-hungry blade servers or heavily loaded equipment racks. When business-critical systems require runtime in hours, not minutes, Smart-UPS On-Line can be configured with matching battery packs to comply with aggressive runtime demands. The included PowerChute™ management software provides unattended graceful shutdown of network operating systems. All models 5 kVA and above include an integrated network management card for remote management (optional on models below 5 kVA). The entire Smart-UPS On-Line family provides value to customers with demanding power conditions, including a very wide input voltage window, extremely tight output voltage regulation, frequency regulation, internal bypass, and input power factor correction.

APC™ by Schneider Electric

Features and benefits



1. **Rack/tower convertible**
   Ensures integration in various environments

2. **Hot-swappable/user-replaceable batteries**
   Ensures continuous operation of the load even when the batteries are being replaced

3. **Double-conversion online**
   Provides tight voltage and frequency regulation and zero transfer time for reactive loads (machinery, lab equipment, etc.)

4. **Advanced 16-segment LED display**
   Quickly understand unit and power status with visual indicators (LCD on 15 – 20 kVA models)

5. **Frequency and voltage regulation**
   Gives higher application availability by correcting poor frequency and voltage conditions without using the battery

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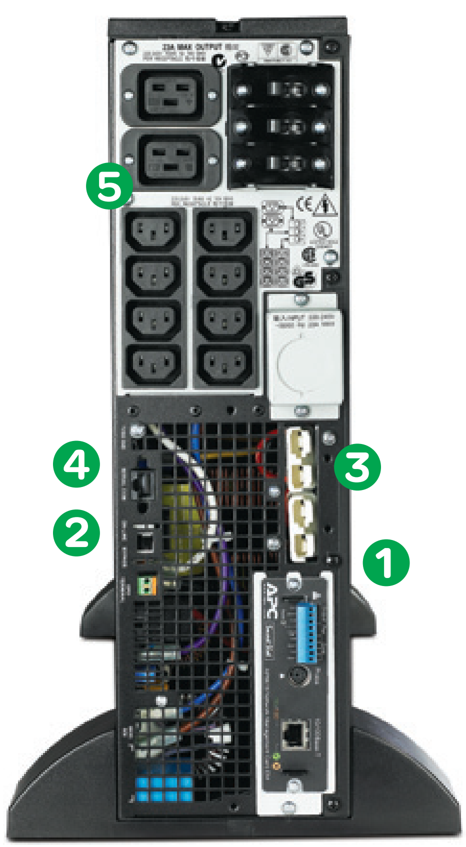


1. **UPS Network Management Card with Environmental Monitoring**
   Provides remote user interface, managed via web browser, SNMP, and Telnet. Includes graceful unattended shutdown. The UPS Network Management Card is pre-installed on UPS models 5 kVA through 20 kVA

2. **Serial connectivity**
   Enables quick and easy configuration of the UPS

3. **Scalable runtime**
   Allows additional runtime to be quickly added as needed

4. **Built-in automatic and manual bypass**
   Ensures seamless power to the load even in the event of catastrophic UPS failure

5. **Field-replaceable power distribution panels**
   Enables quick in-field modification of output receptacles to fit changing needs

Product accessories

Management cards

AP9610: Relay I/O SmartSlot™ Card (not compatible with SURTD UPS models)

AP9622: Modbus®/Jbus Interface Card (not compatible with SURTD UPS models)

AP9630: UPS Network Management Card

AP9631: UPS Network Management Card with Environmental Monitoring

AP9810: APC™ by Schneider Electric™ Dry Contact I/O Accessory (not compatible with SURTD UPS models)

AP9620: Legacy Communications SmartSlot Card (compatible with SURTD UPS models only)

Transformers

APTF10KW01: APC WW 10 kVA Isolation Transformer

APTF20KW01: APC WW 20 kVA Isolation Transformer

SURT001: APC Smart-UPS RT 3000 VA 230 V Isolation Transformer

SURT002: APC Smart-UPS RT 5000 VA 230 V Isolation Transformer

Backplate kits

SURT007: APC Smart-UPS RT 3/5/6 kVA Input/Output Hardwire Kit

SYPD10: Symmetra™ RM 230 V Backplate Kit with (2) IEC 320 C19 and (1) IEC 60309

Other

SURT013: SURT Equipment Cart

Rail kits

SURTRK: APC Smart-UPS RT 482 mm Rail Kit 1 kVA and 2 kVA

SURTRK2: APC Smart-UPS RT 482 mm Rail Kit for Smart-UPS RT 3/5/6/8/10 kVA

SURTRK4: APC Smart-UPS RT 482 mm Rail Kit for Smart-UPS RT 15/20 kVA

Battery packs

SURT48XLBP: APC Smart-UPS RT 48 V Battery Pack

SURT48RMXLBP: APC Smart-UPS RT 48 V RM Battery Pack

SURT192XLBP: APC Smart-UPS RT 192 V Battery Pack

SURT192RMXLBP: APC Smart-UPS RT 192 V RM Battery Pack

SURT192RMXLBP2: APC Smart-UPS RT 192 V RM Battery Pack 2 Rows

Service bypass panels

SBP3000: APC Service Bypass Panel 100 – 240 V; 30 A; BBM; Hardwire Input/Output

SBP6KRMI2U: APC Service Bypass Panel 230 V; 50 A; MBB; Hardwire Input; (4) IEC 320 C19 Output

SBP10KRMI4U: APC Service Bypass Panel 230 V; 100 A; MBB; Hardwire Input; IEC 320 Output (8) C13 (2) C19

SBP20KP: APC Service Bypass Panel 200/208/230/240 V 125 A HW Input/Output

SBP20KRMI4U: APC Service Bypass Panel 230 V 125 A HW Input IEC 320 Output (8) C19

A comprehensive portfolio of services

Schneider Electric Critical Power & Cooling Services (CPCS) provides the expertise, services, and support you need for your building, industry, power, or data center infrastructure. Our world-class life cycle services offer a smart way to install and maintain your critical applications, ensuring your systems are always running at peak performance.

Technical specifications

UPS VA	1000	2000	3000	5000	6000	8000	10000	15000	20000
Output									
Topology	Double-conversion online								
Nominal output voltage	Configurable for 220 : 230 or 240 nominal output voltage							Configurable for 220 : 230 : 240 : 400 V nominal output voltage	
Efficiency at full load	Up to 92%								
Output frequency (sync to mains)	50/60 Hz +/- 3 Hz user adjustable								
Output power capacity	700 W	1400 W	2100 W	3500 W	4200 W	6400 W	8000 W	12 kW	16 kW
Output connections	(6) IEC 320 C13		(8) IEC 320 C13; (2) IEC 320 C19			(1) Hardwire 3-wire (H + N + G); (4) IEC 320 C13; (4) IEC 320 C19		(1) Hardwire 3-wire (H + N + G); (1) Hardwire 5-wire (3PH + N + G); (8) IEC 320 C19	
Input									
Nominal input voltage	230 V					230 V or 400 V			
Input frequency	45 – 65 Hz (auto sensing)								
Input connections	British BS1363A; IEC 320 C20; Schuko CEE 7/EU1-16P			Hardwire 3-wire (1PH + N + G)		Hardwire 3-wire (1PH + N + G); Hardwire 5-wire (3PH + N + G)			
Bypass	Automatic and Manual (Built-in)								
Battery									
Battery type	Maintenance-free sealed lead-acid battery with suspended electrolyte: leak proof								
Replacement battery	RBC31		RBC44						
Runtime	See Chart Below								
Communications and Management									
Interface port(s)	DB-9 RS-232, SmartSlot, USB		RJ-45 10/100 Base-T, RJ-45 Serial, SmartSlot						
Pre-installed SmartSlot card	–	–	–	AP9631					
Emergency power off (EPO)	No		Yes						
Control panel	LEDs							LCD Display	
Physical									
Rack height	2 U		3 U			6 U		12 U	
Maximum height	432 mm							533 mm	
Maximum width	85 mm		130 mm			263 mm		432 mm	
Maximum depth	483 mm		660 mm			736 mm		773 mm	
Net weight	25.00 kg		54.55 kg			110.91 kg		247.70 kg	

Runtime estimates at half and full load (minutes)

UPS VA	1000	2000	3000	5000	6000	8000	10000	15000	20000
Internal	32/14	17/6	34/14	18/6	16/5	20/7	15/5	22/8	15/5
(1) Battery pack	122/69	67/30	122/57	70/31	49/21	48/21	37/15	53/23	38/15
(2) Battery pack	257/129	121/56	217/102	125/58	88/40	76/35	60/26	84/38	60/27
(3) Battery pack	360/180	177/83	315/150	183/85	130/60	106/49	83/38	117/54	85/38
(4) Battery pack	480/240	234/110	416/199	242/113	172/80	136/63	107/49	150/69	104/50

email: esupport@apc.com • 132 Fairgrounds Road, West Kingston, RI 02892 USA • 998-3956A

Middle Atlantic Products
EXCEPTIONAL SUPPORT & PROTECTION™

WRK Series Enclosure

GREENGUARD | RoHS | EIA/TIA Compliant | SEISMIC CERTIFIED | C UL US LISTED

The WRK Series 19” gangable enclosure accommodates large cable bundles

Features

- Fully welded construction provides the following weight capacities - UL Listed load capacity: 2,500 lbs - Static load capacity: 10,000 lbs. - Seismic certified load capacity: 900 lbs.
- 1/8” thick structural steel internal braces
- 24-1/4” OD width, available 27-5/8” or 32-5/8” OD depth
- 1/2”, 3/4”, 1” & 1-1/2” electrical knockouts on split rear plates top & bottom, easily removable for cable pass-through, top plates additionally include UHF / VHF knockouts
- 2 extra-wide pairs of 11-gauge 10-32 threaded rackrail with numbered rackspace increments
- Optional solid, fully vented, plexi & vented plexi doors
- Open top with configurable top panel options
- Durable black textured powder coat finish
- Seismic certified (when used with WRK-Z4 option) with an Ip value of 1.5
- UL Listed in the US and Canada

WRK-44-32

Enclosure Accessories
ADDITIONAL RACKRAIL KIT
CASTER BASE
COPPER BUSS BAR
CRATING SERVICE
DOCUMENT POCKET
DOOR LATCH
GANGING HARDWARE
INNER PLATFORM BASE
LEVELING FEET
TOUCH-UP PAINT
SEISMIC FLOOR ANCHOR BRACKETS
CONFIGURABLE TOPS
TOP RAILS
UNIVERSAL FRONT DOORS
UNIVERSAL VENTED REAR DOORS
for details - see Master Catalog or visit middleatlantic.com

Architects’ and Engineers’ Specifications

EIA compliant 19” gangable equipment rack shall be Middle Atlantic Products model # WRK-__-__(see chart for available models). Overall dimensions of rack shall be __” H x 24-1/4” W x __” D (refer to chart). Useable height shall be __ rackspaces, useable depth shall be __” (refer to chart). Fully welded construction shall provide a static load capacity of 10,000 lbs. and a UL Listed 2,500 lb. weight capacity. Rack shall be constructed of the following materials: top and bottom shall be 14-gauge steel, horizontal braces shall be 16-gauge steel welded to integral structural side panels of 16-gauge steel giving an 1/8” thick structure, all structural elements shall be finished in a durable black powder coat. Rack shall include locking, latching rear door. Rack shall come equipped with two pairs of 11-gauge steel rackrail with tapped 10-32 mounting holes in universal EIA spacing. Finished in black e-coat with numbered rackspaces. Top and bottom of rack shall have a vertical slotted vent pattern. Rack shall have removable split rear knockout panels with 1/2”, 3/4”, 1”, and 1-1/2” electrical knockouts installed in base, and removable split rear knockout panels with 1/2”, 3/4”, 1”, and 1-1/2” electrical knockouts, and BNC knockouts for UHF/VHF antennae installed in top. Grounding and bonding stud shall be 1/4-20 threaded, installed in base of enclosure. WRK Series enclosures shall satisfy the 2007 & 2010 CBC; 2006, 2009 & 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) “D” with lateral force requirements for protecting 900 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5 when used with WRK-Z4 seismic floor anchor bracket. Rack shall be UL Listed in the US and Canada. Rack shall be GREENGUARD Indoor Air Quality Certified for Children and Schools. Rack shall be RoHS EU Directive 2002/95/EC compliant. Rack shall be manufactured by an ISO 9001 and ISO 14001 registered company. Rack shall be warrantied to be free from defects in material or workmanship under normal use and conditions for the lifetime of the rack.

OPTIONS

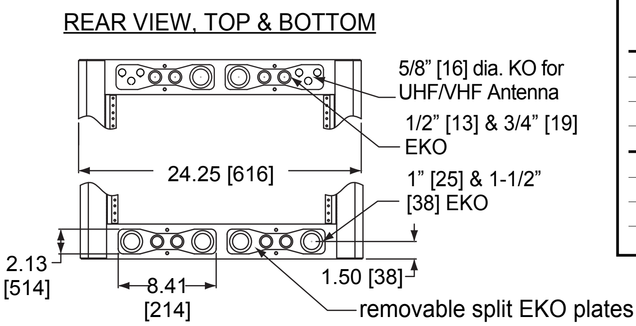
- Front doors shall be 16-gauge reinforced steel, model # FD-XX (solid), VFD-XX (vented, 25% open area), LVFD-XX (vented, 64% open area), PFD- XX(plexi), PVFD-44 (vented plexi) (X=# of rackspaces of WRK rack)
- Vented rear doors shall be 16-gauge steel model # MW-VRD-44 (vented, top and bottom), MW-LVRD-XX (vented 64% open area-excludes 24 and 37 space rack), (X= # of rackspaces of WRK rack), MW-CLVRD-44 (split rear door, vented, 79% open area)
- Removable keylocked side panels shall be model # SPN-XX-YY (X = # of rackspaces, Y = cabinet depth)
- Top panels multiple styles available in model # MW-ST (solid), #MW-10FT (10” fan), MW-4FT (four 4-1/2” fans), MW-6FT (three 6” fans), MW-VT (vented) and MW-LA (accepts 6” & 12” wide cable ladders) see A&E spec 96-01063 for more details
- Caster base, four casters shall have a total weight capacity of 1300 lbs, model # CBS-WRK-YY (Y= cabinet depth)
- Inner platform base (inset base w/out casters) model # BS-WRK-YY (Y= cabinet depth)
- Leveling feet model # LF, shall be 3/8” threaded steel, adjustable from top or bottom, adds 1/4” min. to 1” max. to rack overall height
- Additional rail kit, 11-gauge, 10-32 threaded, sold in pairs, hardware included, model # WRK-RRXX (X= # of rackspaces)
- AXS slide out option available (See AXS Spec sheet 96-052S)

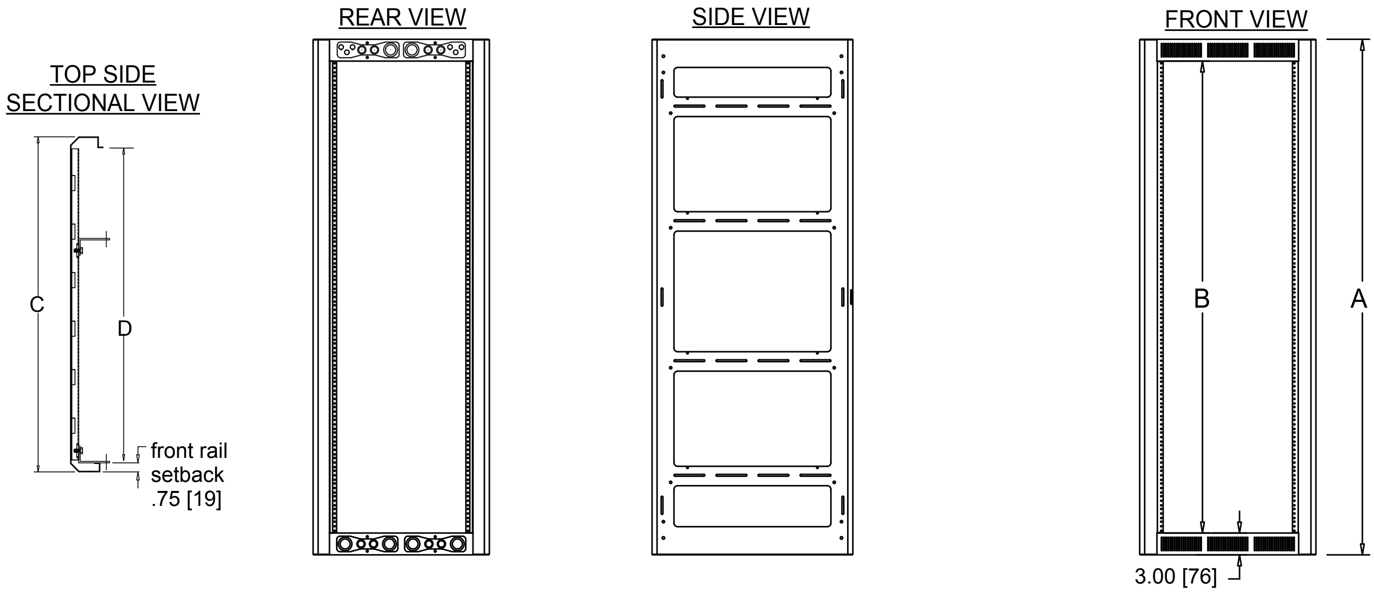
CUSTOMIZABLE SPECIFICATION CLIPS AVAILABLE AT MIDDLEATLANTIC.COM

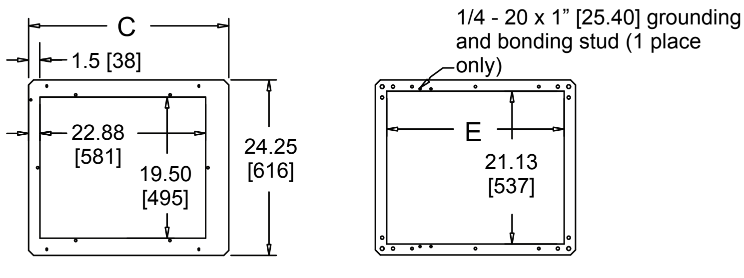
US: New Jersey • California • Illinois • Voice: 973-839-1011 Fax: 973-839-1976 • middleatlantic.com
Canada: Ontario • British Columbia • Voice: 613-836-2501 Fax: 613-836-2690 • middleatlantic.ca

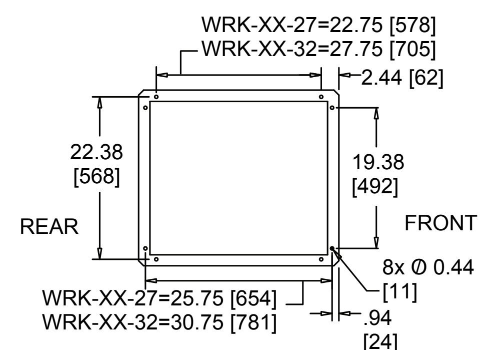
WRK basic dimensions

Part #	A OVERALL HEIGHT	B USEABLE HEIGHT	C OVERALL DEPTH	D USEABLE DEPTH	E BASE OPENING DEPTH
WRK-44-27	83.13 [2111]	77.13 [1959]	27.63 [702]	25.75 [654]	24.50 [622]
WRK-40-27	76.13 [1934]	70.13 [1781]	27.63 [702]	25.75 [654]	24.50 [622]
WRK-37-27	70.88 [1800]	64.88 [1648]	27.63 [702]	25.75 [654]	24.50 [622]]
WRK-24-27	48.13 [1222]	42.13 [1070]	27.63 [702]	25.75 [654]	24.50 [622]
WRK-44-32	83.13 [2111]	77.13 [1959]	32.63 [829]	30.75 [781]	29.50 [749]
WRK-40-32	76.13 [1934]	70.13 [1781]	32.63 [829]	30.75 [781]	29.50 [749]
WRK-37-32	70.88 [1800]	64.88 [1648]	32.63 [829]	30.75 [781]	29.50 [749]
WRK-24-32	48.13 [1222]	42.13 [1070]	32.63 [829]	30.75 [781]	29.50 [749]







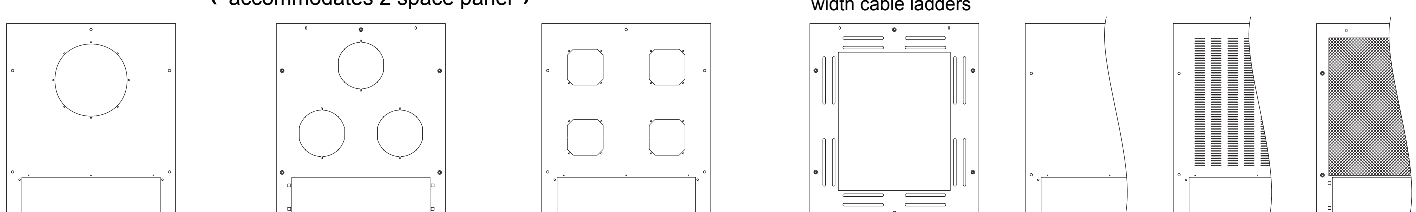


FLOOR MOUNTING LOCATIONS

All dimensions in inches unless otherwise noted [All dimensions in brackets are in millimeters]

TOP OPTIONS (removable plate opening accommodates 2 space panel)

accommodates 12" and 6" width cable ladders



MW-10FT accepts 10" fan
MW-10FT-550CFM includes 10" fan
MW-10FT-FC includes 10" fan and fan controller

MW-6FT accepts 6" fans
MW-6FT-660CFM includes 6" fans

MW-4FT accepts 4-1/2" fans
MW-4FT-380CFM includes 4-1/2" fans
MW-4QFT-FC includes 4-1/2" quiet fans and fan controller

MW-LA accepts 6", 9" and 12" width cable ladder

MW-ST solid

MW-VT slot vent

MW-LVT 64% open area

Milestone

HUSKY™ M20

Access Anywhere

Milestone Mobile

XProtect® Web Client

XProtect® Smart Client

The easiest installation **you've ever done**

Simply connect any camera and the Husky M20
is the quickest route to a complete surveillance solution.

Product **highlights**

Predictable installation every time

Smart Start plug-and-play to connect cameras and configure storage

Smart Start is automatic camera discovery, IP address assignment*, time synchronization* and storage allocation

8 or 16 port **Integrated Power over Ethernet (PoE) managed switch**

PoE+ on all ports, up to 250W total power

**For supported cameras*

Highest performance for the mid market

200 Mbit/s recording rate to handle high-megapixel cameras

Customer replaceable hard disk drives

Alarm I/O: 4 in and 4 out

Latest technology with 6th-generation Intel Skylake processors

Western Digital Purple hard disk drives made for surveillance

Supports up to **24 cameras**

Proven solution that works with any camera

Preloaded with an NVR-optimized version of **XProtect Professional**

Choose from **more than 5,000 cameras** from more than 100 manufacturers

Industry's **best mobile app** for free

Connect multiple Milestone Husky NVRs together in **master/slave setup**

Supports **third-party integrations** and Milestone add-on products

Includes **3-year hardware warranty**

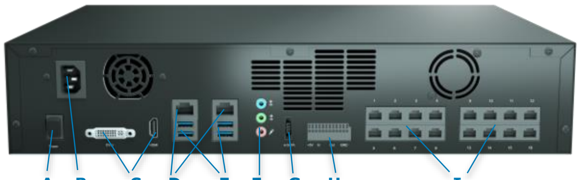
Milestone Systems HQ, DK: Tel: +45 88 300 300
Milestone Systems US : Tel: +1 503 350 1100
Milestone Systems Canada: Tel: +1 503 350 1132

milestone

Milestone
HUSKY ™ M20

Front and rear panel

Front
A. 2 x HDD bays
B. 1 x PoE LED
C. 1 x LAN LED indicator
D. 1 x HDD LED
E. 1 x Power LED



Rear interfaces
A. 1 x Power switch
B. 1 x Power input
C. 1 x DVI / 1 x HDMI up to 1920x1200
D. 2 x GbE RJ45 support PXE boot from LAN, wake on LAN function
E. 4 x USB 3.0
F. 1 x Line-out / MIC-in / Line-in
G. 1 x eSATA (ASM1153E)
H. 1 x Alarm I/O (4 in / 4 out, TTL 0/5V)
I. Network switch: IEEE 802.3at
RJ45 x 8/16 with status
Left-yellow LED to link status on
Right-green LED to display PoE

Selecting the right Husky M20

Days of recording	Number of cameras	
	8	16
7	0.4TB	0.6TB
15	0.7TB	1.3TB
30	1.3TB	2.5TB
45	2.5TB	3.8TB
60	3.8TB	--
90	--	--

Calculations for 20% motion-based recording for:
5MP @ 4fps 1080p @ 10fps 720p @ 22fps 4CIF @ 60fps

For more precise results, please use the Milestone Husky calculator.

Ordering information

SKU	Description
HM20-2T-8P	1x2TB, 8 licenses, G4400, 4GB RAM, 8-port PoE
HM20-4T-16	2x2TB, 16 licenses, i3, 8GB RAM
HM20-4T-16P	2x2TB, 16 licenses, i3, 8GB RAM, 16-port PoE
HMCL-4	Add-on licenses, 4-pack for -16 and -16P models
HMCP-XP	1 year Care Plus

Please contact your local Milestone representative to order Milestone Husky M20.

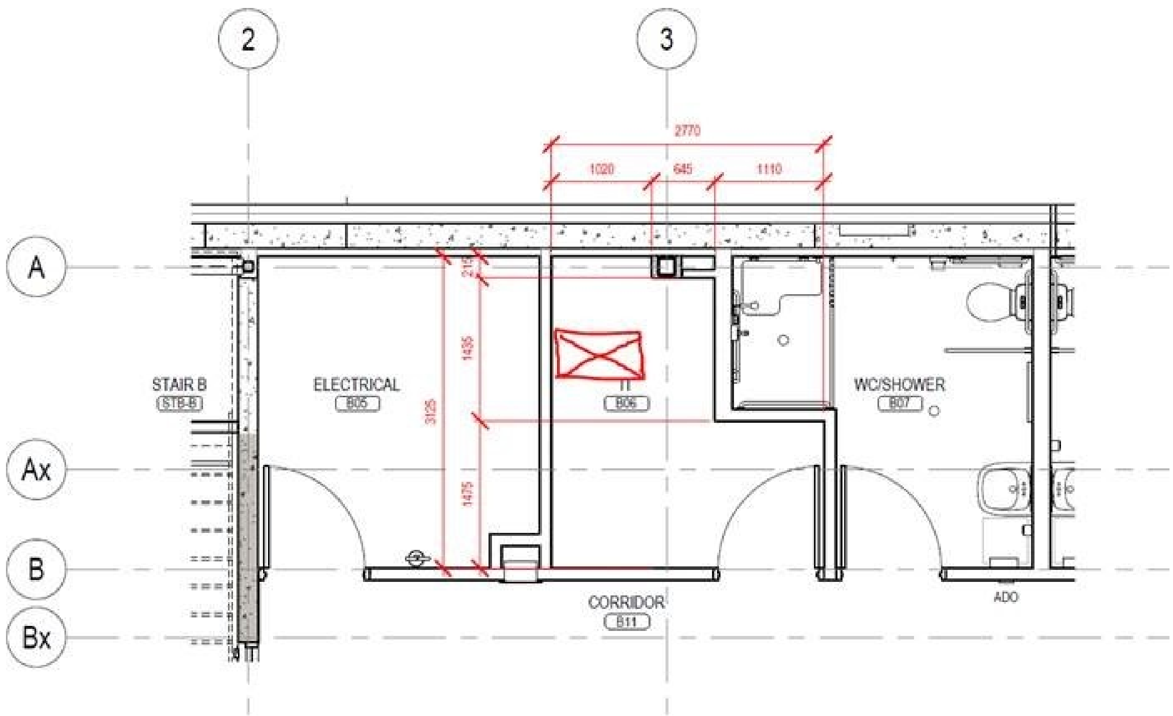
Specification

General	Detail
Form factor	Standalone, 2U-88mm rack-mount with optional rack mount kit
Type of deployment	Single or multi-unit setup
Dimensions	43(W) x 33(D) x 8.8(H) cm 16.9(W) x 13(D) x 3.5(H) in
Maximum number of cameras	8 port: 8 / 16 port: 24
Maximum recording rate	200 Mbit/s
Maximum local display	2
Camera licenses included	8 port: 8 / 16 port: 16
Add-on camera licenses	4 pack to 16 port only
Maximum number of users	Unlimited
Dual network interface cards	Yes
CPU	8 port: Skylake G4400 16 port: Skylake i3-6100
Passmark	8 port: 3673 / 16 port: 5475
Operating system support	Windows 10 IoT Enterprise
Memory	8 port: 4GB / 16 port: 8GB
Integrated PoE managed switch	Optional, IEEE 802.3at PoE+ (250W total power), port lock, power management, 10/100/1000BASE-T/Tx
Storage system	**Detail**
Video storage	2TB / 4TB SATA 2 customer-serviceable HDD bays
Drive type	Western Digital Purple Drives
VMS/OS storage	64GB mSATA SSD
Video management system	**Detail**
VMS preloaded	Optimized XProtect Professional 2016
Milestone Care Basic	Included
Milestone Care Plus	Optional
Hardware warranty	Three years included
Smart Start	Yes
Setup wizards	Yes
Supports ONVIF cameras	Yes
Codec support	H.264, MJPEG, MPEG4, MxPEG
Multiple video export formats	Yes
Pan-tilt-zoom (PTZ) support	Yes
Audio support	Yes, two-way
Third-party application support	Yes
Milestone Interconnect support	Yes
Customer Dashboard support	Yes, with Milestone Care Plus
Electrical	**Detail**
Power input	Non-PoE: 100-240VAC~, 250W PoE: 100-240VAC~, 500W
Maximum power consumption	Non-PoE: 250W PoE: 500W
Environmental	**Detail**
Operation temperature	0~40°C
Storage temperature	-20°C ~70°C
Humidity	10~90% relative humidity (non-condensing)
Other	**Detail**
Regulatory compliance	CE (class A), WEEE, FCC (class A), RCM, UL, VCCI, Mexico (CoC), South Africa (CoC)
Shipping dimensions	60.7(W) x 23.6 (D) x 47.2 (H) cm 23.8 (W) x 9.3 (D) x 16.8 (H) in
Shipping weight	Approx. 13.5 kg / 30 lbs

Product specifications subject to change without notice.

IT Rack Drawing

The area marked with a red rectangle is a possible location for IT rack. An alternative rack location will be considered if adequate clearance is available, sufficient light to work is provided and if power outlet on a dedicated circuit is within close proximity.



Building Automation System (BAS) Information

Standard Building Automation System (BAS) Specification

September, 2018

This document is the standard Building Automation System (BAS) Specification for use in all new construction, retrofits and upgrades in City of Toronto facilities and shall not be amended in any way without written consent from the Environment and Energy Division.

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****
This section includes the central building automation system components and network protocol specifications. It may be used as section 23 09 23 or 23 09 93 depending on specification format used.

In addition to this section it will be necessary to add project specific sections for control components and sequences of operation.
The intent of this specification is to describe the minimum features required for a new installation. For renovation or refit type projects, it will be necessary to determine to what extent any existing system can be upgraded or modified within the parameters of the project budget to achieve the general intent of this specification and provide appropriate edits.
****

PART 1 - GENERAL

1.0 GENERAL REQUIREMENTS

1.1 Conform to all, "Mechanical General Provisions".

1.2 The "provide" in this Division shall be interpreted as "supply and install".

1.3 All work shall conform to Canadian Metric Practice Guide CSA CAN3-2234.1.76

1.4 Provide all required adapters between metric and imperial components.

1.5 Metric descriptions in this Division are nominal equivalents of Imperial values.

1.6 All equipment and material to be new, CSA certified, manufactured to minimum standard quoted including additional specified requirements.

1.7 Where there is no alternative to supply equipment that is not CSA certified, submit such equipment to Inspection Authorities for special inspection and obtain approval before delivery of equipment to site.

1.8 Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by the owner. Spare parts shall be available for at least five years after completion of this contract.

1.9 Use material and equipment available from a regular production by manufacturer concerned.

2.0 WORK INCLUDED

****
Add to this section any site specific qualifications that may apply to the specific project with respect to application of the specified requirements for the system.
****

2.1 The City of Toronto has standardized Building Automation Systems utilizing native BACnet area, system and application controllers. Extend the existing Framework as detailed herein.

2.2 The system shall support standard Web browser access via the City's Intranet/Internet. It shall support a minimum of 100 simultaneous users with the ability to access the graphical data and real time values simultaneously. (Refer to Section 7.16)

2.3 Provide an open protocol Building Automation System (BAS) incorporating Direct Digital Control (DDC), equipment monitoring, and control consisting of: A PC based Operator Work Station (OWS) with colour graphic data displays; Microcomputer based Building Controllers (BCs) and Microcomputer based Advanced Application Controllers (AACs) and Application Specific Controllers (ASCs) interfacing **directly** with sensors, actuators and environmental delivery systems (i.e., HVAC units, boilers, chillers, lighting systems, etc.); electric controls and mechanical devices for all items indicated on drawings described herein including dampers, valves, panels and compressed air plant.

2.4 City of Toronto has standardized the use of Direct Digital Controllers (DDC) and End Devices. No **NEW** pneumatic control devices shall be connected or incorporated into the BAS network. It applies to new installations as well as retrofit applications.

2.5 Open Protocols by definition are to be BACnet (ASHRAE Standard 135 – Annex J) only.

2.6 Provide BAS controllers (BCs, AACs and ASCs) based on native BACnet (ASHRAE Standard 135 – Annex J) protocols.

2.7 Provide submittals, data entry, electrical installation, programming, startup, test and validation acceptance documentation, and system warranty.

3.0 WORK BY OTHERS

3.1 Access doors and setting in place of valves, flow meters, water pressure and differential taps, flow switches, thermal wells, dampers, air flow stations, and current transformers shall be by others.

4.0 QUALITY ASSURANCE

4.1 Codes and Approvals:

4.1.1 Work, materials, and equipment shall comply with the Ontario Building Code, Ontario Electrical Code, ANSI/ASHRAE 135-2004: Data Communication Protocol for Building Automation and Control Systems (BACnet) and Authorities having jurisdiction over this work. All devices shall be ULC, UL or FM listed and labeled for the specific use, application and environment to which they are applied.

4.1.2 The BAS shall comply with NFPA 90A Air Conditioning and 90B Warm Air Heating, Air Conditioning.

4.1.3 All electronic equipment shall conform to the requirements of CSA for electromagnetic emissions standards and placed in approved locations such that it does not interfere with building equipment or computers.

4.2 Provide satisfactory operation without damage at 110% above and 85% below rated voltage and at 3 hertz variation in line frequency. Provide static, transient, and short circuit protection on all inputs and outputs. Communication lines shall be protected against incorrect wiring, static transients and induced magnetic interference. Bus connected devices shall be AC coupled, or equivalent so that any single device failure will not disrupt or halt bus communication.

5.0 ABBREVIATIONS AND SYMBOLS

5.1 All letter symbols and engineering unit abbreviations utilized in information displays ANSI/ISA S5.5 and printouts shall conform to ANSI 710.19/IEEE 260-letter symbols for SI and certain other units of measurement.

5.2 Specification Nomenclature - Acronyms used in this specification are as follows:

AAC	Advanced Application Controller
ASC	Application Specific Controller
BAS	Building Automation System
BC	Building Controller

BIBB BACnet Interoperability Building Blocks
DDC Direct Digital Controls
GUI Graphical User Interface
HTTP Hyper Text Transfer Protocol
LAN Local Area Network
ODBC Open Database Connectivity protocol
OOT Object Oriented Technology
OPC Object linking and embedding for Process Control
OWS Operator Workstation
PDA Personnel Data Assistant device
PICS Protocol Implementation Conformance Statement
PWS Portable Workstation
SNVTS Standard Network Variables Types
SQL Standard Query Language
TCP/IP Transmission Control Protocol / Internet Protocol
TCU Terminal Control Unit
WAN Wide Area Network
WAP Wireless Application Protocol device
WBI Web Browser Interface
XML Extensible Markup Language
XIF External Interface Files

6.0 APPROVED CONTROL SYSTEMS

****
Applicable to new construction projects, new installations within existing buildings and major retrofit/overhaul of existing BAS systems.
****

6.1 Any vendors that are authorized dealers or distributors of the following control systems are acceptable.

6.1.1 DELTA CONTROLS
6.1.2 RELIABLE CONTROLS
6.1.3 SCHNEIDER ELECTRIC (MNB SERIES)
6.1.4 DISTECH
6.1.5 FACILITY EXPLORER

6.2 BAS Systems Integration:

6.2.1 TRIDIUM NIAGARA FRAMEWORK <u>OR</u>

6.2.2 DELTA CONTROLS- ENTELIWEB (City of Toronto has already purchased EnteliWEB Software Package) <u>OR</u>

6.2.3 Installer must be licensed TRIDIUM system integrator.

6.2.4 For TRIDIUM NIAGARA FRAMEWORK, Soft JACE is NOT accepted.

6.2.5 For ENTELIWEB applications, installer must be licensed and authorized vendor of DELTA Controls.

6.3 Licensing Requirements

6.3.1 Licenses shall be provided to and in the name of the City of Toronto
6.3.2 Licenses shall be perpetual, transferrable, assignable and royalty-free
6.3.3 Tridium licenses shall allow all Workbench/Supervisor brands complete system access and functionality.

6.4 Installer and Manufacturer Qualifications

6.4.1 Installer shall have an established working relationship with Control System Manufacturer.

6.4.2 Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

6.4.3 It is the intent of this specification to define an open protocol state-of-the-art distributed computerized Building Management and Control System which is user friendly, has known reliability, is extremely responsive, and which is to be designed, installed, implemented, and supported by a <u>local office</u> of approved bidders.

6.4.4 BAS contractor shall provide three locations of successful installations of similar open protocol computer based systems. Sites provided must consist of more than 150 hardware inputs/outputs. Project sites must be local to the location of this project.

7.0 SYSTEM DESIGN

****
For retrofit projects where a gateway might be considered the most appropriate economic decision for interface to an existing automation system, remove article 7.2.
****

7.1 The system shall consist of a network of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), and Smart Actuators (SA). Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

7.2 Systems utilizing gateways will not be considered. A gateway device is considered to be a device where only mapping of system points from one protocol to another occurs. A gateway device cannot perform higher-level energy management functions such as Outdoor Air Optimization, Electrical Demand Limiting and the like.

7.3 The Building Automation System software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a BAS server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.

7.4 A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer’s internal Intranet network. Systems employing a flat single tiered architecture shall not be acceptable. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

8.0 BACnet.

8.1 Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

8.2 Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

8.3 Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

8.4 Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.

8.5 Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

8.6 BACnet Communication.

8.6.1 Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.

8.6.2 BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.

8.6.3 Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

8.6.4 Each ASC shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

8.6.5 Each SA shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

8.6.6 Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using MS/TP Data Link/Physical layer protocol.

8.6.7 The maximum number of controllers on an MS/TP network/subnet shall be no more than 64 or the manufacturer recommended limit, whichever is less.

8.6.8 BAS contractor or subcontractor must contact the Environment and Energy Division to obtain an approved addressing scheme and include the scheme on project network architecture diagram(s). Buildings without approved schemes shall not exist on the City WAN.

9.0 COMMUNICATION

9.1 Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

9.2 Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.

9.3 Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.

9.4 Stand-Alone Operation. Each piece of equipment specified in the sequence of operation shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

10.0 ENVIRONMENT

Controller hardware shall be suitable for anticipated ambient conditions.

10.1 Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

10.2 Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

11.0 REAL-TIME CLOCK

11.1 Controllers that perform scheduling shall have a real-time clock.

12.0 SERVICEABILITY

12.1 Controllers shall have diagnostic LEDs for power, communication, and processor.

12.2 Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.

12.3 Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

13.0 MEMORY

13.1 Controller memory shall support operating system, database, and programming requirements.

13.2 Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

13.3 Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

14.0 IMMUNITY TO POWER AND NOISE

14.1 Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

15.0 POWERFAIL RESTART

15.1 In the event of the loss of normal power, there shall be an orderly shutdown of all controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

15.2 Upon restoration of normal power, the controller shall automatically resume full operation without manual intervention. The controllers shall incorporate random start sequences to ensure a power spike does not result.

15.3 Controller memory shall not be lost during a power failure.

15.4 The user shall have the capability of loading or re-loading all software via the OWS or the local terminal port.

16.0 DYNAMIC DATA ACCESS

16.1 All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the local area network. Access to data shall be based upon logical identification of building equipment.

17.0 INPUT AND OUTPUT INTERFACE

17.1 General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

17.2 Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

17.3 Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

17.4 Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

17.5 Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

17.6 Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

17.7 Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

17.8 Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

17.9 Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

18.0 POWER SUPPLIES AND LINE FILTERING

18.1 Power Supplies: Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with CEC requirements. Limit connected loads to 80% of rated capacity.

18.1.1 DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes.

Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

18.1.2 Unit shall operate between 0℃ and 50℃ (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

18.1.3 Line voltage units shall be UL recognized and CSA listed.

18.2 Power Line Filtering.

18.2.1 Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

18.2.1.1Dielectric strength of 1000 V minimum

18.2.1.2Response time of 10 nanoseconds or less

18.2.1.3Transverse mode noise attenuation of 65 dB or greater

18.2.1.4Common mode noise attenuation of 150 dB or greater at 40-100 Hz

19.0 AUXILIARY CONTROL DEVICES

19.1 Electric Damper and Valve Actuators.

19.1.1 Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.

19.1.2 Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).

19.1.3 Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 16.8)

19.1.4 Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.

19.1.5 Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

19.2 Binary Temperature Devices.

19.2.1 Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13℃-30℃ (55°F-85°F) setpoint range, 1℃ (2°F) maximum differential, and vented ABS plastic cover.

19.2.2 Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13℃-30℃ (55°F-85°F) setpoint range, 1℃ (2°F) maximum differential, and vented ABS plastic cover.

19.2.3 Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

19.3 Temperature Sensors

19.3.1 Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor (10K).

19.3.2 Duct Sensors. Duct sensors shall be single point or averaging. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m^2 (10 ft^2) of duct cross-section.

19.3.3 Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.

19.3.4 Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port.

19.3.5 Differential Sensors. Provide matched sensors for differential temperature measurement.

19.4 Humidity Sensors.

19.4.1 Differential Sensors. Provide matched sensors for differential temperature measurement.

19.4.2 Duct and room sensors shall have a sensing range of 20%-80%.

19.4.3 Duct sensors shall have a sampling chamber.

19.4.4 Outdoor air humidity sensors shall have a sensing range of 20%-95% RH and shall be suitable for ambient conditions of 40°C-75°C (40°F-170°F).

19.4.5 Humidity sensors shall not drift more than 1% of full scale annually.

19.5 Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service). Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

19.5.1 Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

19.5.2 Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

19.6 Relays.

19.6.1 Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

19.6.2 Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

19.7 Override Timers.

19.7.1 Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

19.8 Current Transmitters.

19.8.1 AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

19.8.2 Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

19.8.3 Unit shall be split-core type for clamp-on installation on existing wiring.

19.9 Current Transformers.

19.9.1 AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

19.9.2 Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

19.9.3 Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

19.10 Voltage Transmitters.

19.10.1 AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

19.10.2 Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

19.10.3 Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

19.11 Voltage Transformers.

19.11.1 AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

19.11.2 Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

19.11.3 Windings (except for terminals) shall be completely enclosed with metal or plastic.

19.12 Power Monitors.

19.12.1 Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.

19.12.2 Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

19.13 Current Switches.

19.13.1 Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

19.14 Pressure Transducers.

19.14.1 Transducers shall have linear output signal and field-adjustable zero and span.

19.14.2 Continuous operating conditions of positive or negative pressure 50% greater than calibrated span shall not damage transducer sensing elements.

19.14.3 Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4-20 mA output, suitable mounting provisions, and block and bleed valves.

19.14.4 Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.) Transducer shall have 4-20 mA output, suitable mounting provisions, and 5-valve manifold.

19.15 Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

20.0 NETWORKS

20.1 BAS contractor to coordinate with the City's IT department for the connections to the City's Network.

20.2 Design for the Network LAN (BC LAN) shall include the following provisions:

20.2.1 Provide access to the BC LAN from a remote location, via the Intranet.

20.2.2 The network LAN shall utilize BACnet/IP (ASHRAE standard SPC-135A-2004 - Annex L) for communication between BCs. Manufacturer specific proprietary protocols, gateways, or protocol converters are not acceptable for this project. The OWS shall communicate to the BCs utilizing standard Ethernet to IEEE 802.3 Standards.

20.2.3 High-speed data transfer rates for alarm reporting, quick report generation form multiple controllers and upload/download efficiency between network devices.

20.2.4 Detection and accommodation of single or multiple failures of workstations, controller panels and the network media. The network shall include provisions for automatically reconfiguring itself to allow all operational equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.

20.2.5 Message and alarm buffering to prevent information from being lost.

20.2.6 Error detection, correction, and retransmission to guarantee data integrity.

20.2.7 Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.

20.2.8 Commonly available, multiple sourced, networking components shall be used to allow the system to coexist with other networking applications such as office automation. ETHERNET is the only acceptable technology.

20.2.9 Synchronization of the real-time clocks in all BC panels shall be provided.

20.2.10 The BC LAN shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Building Controllers (BCs), user workstations and where specified, a local server. Local area network minimum physical and media access requirements:

20.2.10.1 Ethernet; IEEE standard 802.3

20.2.10.2 Cable; 100 Base-T, UTP-8 wire, category5
20.2.10.3 Minimum throughput; 10 Mbps, with ability to increase to 100 Mbps

20.2.11 Provide access to the BC LAN via a Wireless Application Protocol (WAP) device as well. Through this connection the BC LAN will provide authorized staff with the ability to monitor and control the BAS from any location within the City network through a web browser, cellular phone, pager, WebPads, or PDA. (Pocket Computer).

21.0 SERVER FUNCTION

21.1 Local connections shall be via an Ethernet LAN.

21.2 It shall be possible to provide access to all Building Control Units (BC) via a single connection to the server. In this configuration, each Building Control Unit (BC) can be accessed from an Operator Workstation (OWS) using a standard Web browser by connecting to the BAS LAN. The server shall provide the following functions, as a minimum:

21.2.1 Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
21.2.2 Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any Building Control Unit (BC) in the network, local or remote.
21.2.3 The server shall include a master clock service for its subsystems and provide time synchronization for all Building Control Units (BC).
21.2.4 The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
21.2.5 The server shall provide scheduling for all Building Control Units and their underlying field control devices.
21.2.6 The server shall provide demand limiting that operates across all Building Control Units. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shedding lists for effective demand control.
21.2.7 The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Building Control Units. Systems not employing this prioritization shall not be accepted.
21.2.8 Each Building Control Unit supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
21.2.9 The server shall provide central alarm management for all Building Control Units supported by the server. Alarm management shall include:
21.2.10 Routing of alarms to display, printer, email and pagers
21.2.11 View and acknowledge alarms
21.2.12 Query alarm logs based on user-defined parameters
21.2.13 The server shall provide central management of log data for all Network Control Units supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:
21.2.14 Viewing and printing log data
21.2.15 Exporting log data to other software applications
21.2.16 Query log data based on user-defined parameters
21.2.17 Minimum BACnet features supported are
-Standard BACnet Objects (Analog In/Out/Value, BinaryInput/Output/Value, Multi-State -- Input/Output/Value, Schedule(export), Calendar(export), Trend(Export), Device).
-Segmented Capability (Segmented Request-Segmented Response).
-Application Services (Read Property, Read Property Multiple, Write Property, Write Property Multiple, Confirmed Event, Notification, Acknowledge Alarm, Get Alarm Summary Who-has, I-have, Who-is, I-am, Subscribe COV, Confirmed COV notification, Unconfirmed COV notification).

-BACnet Broadcast Management

22.0 SCOPE OF WORK

22.1 The work covered by this specification and related sections consists of providing shop drawings, equipment, labour, materials, engineering, technical supervision, and transportation as required to furnish and install a fully operational BAS to monitor and control the facilities listed herein, and as required to provide the operation specified in strict accordance with these documents, and subject to the terms and conditions of the contract. The work in general consists of but is not limited to, the following:

22.1.1 The preparation of submittals and provision of all related services.

22.1.2 Operator workstations located as listed in the specifications **(OWS will be provided by the City's IT, SEE PART 2, SECTION 1.1.4).**

22.1.3 Furnish and install all controllers to achieve system operation, any control devices, conduit and wiring, in the facility as required to provide the operation specified.

22.1.4 Furnish and load all software required to implement a complete and operational BAS.

22.1.5 Furnish complete operating and maintenance manuals and field training of operators, programmers, and maintenance personnel.

22.1.6 Perform acceptance tests, commissioning or re-commissioning as indicated.

22.1.7 Provide full documentation for all application software and equipment.

22.1.8 Miscellaneous work as indicated in these specifications.

23.0 PERMITS, FEES AND CODES

23.1 Apply for, obtain and pay for all permits, licenses, inspections, examinations and fees required. Also submit, if required, information and other data that may be obtained from the Engineer. Should the authorities require the information on specific forms, fill in these forms by transcribing the information provided by the Engineer.

23.2 BAS contractor shall obtain and pay for the police clearance certificates if required for the project.

23.3 Arrange for inspection of all work by the authorities having jurisdiction over the Work. On completion of the Work, present to the Engineer the final unconditional certificate of approval of the inspecting authorities.

23.4 Comply with the requirements of the latest edition of the applicable ULC or CSA standards, the requirements of the Authorities, Federal, Provincial/Territorial and Municipal Codes, the applicable standards of ULC and all other authorities having jurisdiction. These Codes and Regulations constitute an integral part of these Specifications.

23.5 Where there is no alternative to supply equipment which is CSA certified, submit such equipment to the local electrical authority for special inspection and obtain approval before delivery of equipment to site.

23.6 In case of conflict, applicable Codes take precedence over the Contract Documents. In no instance reduce the standard or Scope of Work or intent established by the Drawings and Specifications by applying any of the Codes referred to herein.

23.7 Before starting any work, submit the required number of copies of documentation to the authorities for their approval and comments. Comply with any changes requested as part of the Contract, but notify the

Engineer immediately of such changes, for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

24.0 COORDINATION

24.1 All work shall be performed at times acceptable to the Engineer/Construction Manager. Provide work schedule at the start of the job for the approval of the Engineer/Construction Manager. Schedule shall show when all staff and sub-contractors shall be on-site.

24.2 Organize all sub-contractors and ensure that they maintain the schedule.

24.3 Full cooperation shall be shown with other sub-contractors to facilitate installations and to avoid delays in carrying out the work.

24.4 Notify Engineer/Construction Manager of any changes to the schedule. Send any schedule changes and weekly progress reports via fax to Engineer/Construction Manager.

24.5 Where, in the judgment of the Engineer/Construction Manager, the work could disrupt the normal operations in or around the building, contractor shall schedule work to eliminate or minimize interference, subject to owner's approval.

24.6 When connecting to the existing systems, advise the Engineer/Construction Manager and obtain permission to so. Perform work at a time acceptable to the Engineer/Construction Manager and Owner.

24.0 SUPERVISION OF PERSONNEL

24.1 Maintain at this building qualified personnel and supporting staff with proven experience in erecting, supervising, testing, and adjusting projects of comparable nature and complexity.

24.2 Supervisory personnel and their qualifications are subject to the approval of the Owner.

24.3 All personnel working on-site shall sign in as required by the Owner and shall wear company identification.

24.4 When requested and for whatever reason, remove personnel and/or support staff from project. Take immediate action. Contractors and subcontractors may require police clearance.

25.0 ELECTRICAL WORK AND SAFETY REQUIREMENTS

25.1 Control and interlock wiring and installation shall comply with national and local electrical codes, and manufacturer's recommendations.

25.2 CEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by CEC.

25.3 Low-voltage wiring shall meet CEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.

25.4 CEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.

25.5 Install wiring in raceway where subject to mechanical damage and at levels below 3 m (10ft) in mechanical, electrical, or service rooms.

25.6 Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

25.7 Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

25.8 Do not install wiring in raceway containing tubing.

25.9 Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 3 m (10 ft) intervals.

25.10 Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.

25.11 Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

25.12 Size raceway and select wire size and type in accordance with manufacturer's recommendations and CEC requirements.

25.13 Include one pull string in each raceway 2.5 cm (1 in.) or larger.

25.14 Use color-coded conductors throughout.

25.15 Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

25.16 Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 15 cm (6 in.) between raceway and high-temperature equipment such as steam pipes or flues.

25.17 Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.

25.18 Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.

25.19 Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.

25.20 Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

25.21 All equipment and systems installed under this Contract shall be grounded, isolated, or conditioned as required to permit equipment to continue to function normally, without interruption, in the event of radio frequency interference (RFI), electromagnetic interference (EMI), power surges/dips or other electrical anomalies.

25.22 It shall be the responsibility of the Contractor or his Sub-contractor to ensure that any coring of holes through the walls or floors will not penetrate existing conduits, cables or mechanical equipment in or under the floor slabs or walls. He shall be responsible to take any and all action as deemed necessary by the Project Manager to correct any such penetrations at his cost. No coring shall be undertaken unless the Project Manager gives permission. Scan walls and floors prior to core drilling to identify hidden piping. Ensure that water does not flow into equipment and below floors. Waterproof and fire stop all penetrations.

26.0 COMMUNICATION WIRING

26.1 Communication wiring shall be low-voltage Class 2 wiring and shall comply with Article 25 (Electrical Work).

26.2 Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

26.3 During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

26.4 Verify entire network's integrity following cable installation using appropriate tests for each cable.

26.5 Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

26.6 Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

26.7 Label communication wiring to indicate origination and destination.

26.8 Ground coaxial cable according to OEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

27.0 LOCKABLE PANELS

27.1 Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.

27.2 Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.

27.3 Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

28.0 WARNING LABELS

28.1 All Controller panelsAffix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.
2. Warning labels shall read as follows.

C A U T I O N **This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.**

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.
2. Warning labels shall read as follows.

C A U T I O N **This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.**

29.0 IDENTIFICATION OF HARDWARE AND WIRING

29.1 Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.

29.2 Permanently label or code each point of field terminal strips to show instrument or item served.

29.3 Label control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

29.4 Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement (lamacoids).

29.5 Label room sensors related to terminal boxes or valves with nameplates (lamacoids).

29.6 Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

29.7 Label identifiers shall match record documents.

29.8 Insert laminated points list in the control panel

30.0 PRELIMINARY DESIGN REVIEW

30.1 The BAS contractor shall submit a preliminary design document for review. This document shall contain the following information:

30.1.1 Provide a description of the proposed system along with a system architecture diagram with the intention of showing the contractors solution to meet this specification.

30.1.2 Provide product data sheets and a technical description of BC, AAC, ASC hardware required to meet specifications listed herein.

30.1.3 Provide product brochures and a technical description of the Server, Operator Workstation, and Building Control Unit (BC) software required to meet this specification. Provide a description of software programs included.

30.1.4 Open Protocols - For all hardware Building Controllers, Advanced Application Controllers (AAC) and Advanced Specific Controllers (ASC), provide BACnet Interoperability Building Blocks BIBBs certification. Provide complete description and documentation of any proprietary services and/or objects where used in the system.

30.1.5 Provide a description and samples of Operator Workstation graphics and reports.

30.1.6 Provide an overview of the BAS contractor’s local/branch organization, local staff, recent related project experience with references, and local service capabilities.

30.1.7 Provide information on the BAS contractors project team including project organization, project manager, project engineer, programmers, project team resumes, and location of staff.

31.0 DRAWING REQUIREMENTS

31.1.1 Within 45 days of award of contract and before start of construction, submit 3 hard copies and 1 soft copy of manufacturers information and shop drawings. Soft copy to be in AutoCAD or VISIO and WordPerfect or Word formats (latest versions) structured using menu format for easy loading and retrieval on the OWS.

31.1.2 Manufacturer's Data: Provide in completely coordinated and indexed package to assure full compliance with the contract requirements. Piecemeal submittal of data is not acceptable and such submittals will be returned without review. Information shall be submitted for all material and equipment the contractor proposes to furnish under terms of this contract work. Arrange the submittals in the same sequence as these specifications and reference at the upper right-hand corner the particular specification provision for which each submittal is intended. Submittals for each manufactured item shall be manufacturer's descriptive literature (equipment specification), equipment drawings, diagrams, performance and characteristic curves, and catalog cuts, and shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size layout dimension, capacity, specification reference, applicable specification references, and all other information necessary to establish contract compliance.

31.1.3 Shop drawings: Provide in completely coordinated and indexed package:

31.1.3.1 Wiring and piping diagrams.

31.1.3.2 Control schematics with narrative description and control descriptive logic fully showing and describing operation and/or manual procedures available to operating personnel to achieve proper operation of the building, including under complete failure of the BAS.

31.1.3.3 Shop drawings for each input/output point showing all information associated with each particular point including sensing element type and location; details of associated field wiring schematics and schedules; point address; software and programming details (CDL's) associated with each point; and manufacturer's recommended installation instructions and procedures for each type of sensor and/or transmitter.

31.1.3.4 Detailed system architecture showing all points associated with each controller, controller locations, and describing the **spare points capacity** at each controller and BAS LAN.

31.1.3.5 Each BC shall contain a minimum of 20% spare resource capacity. The BC shall provide a throughput capable of transmitting all BAS LAN data connected to it within 10 seconds.

31.1.3.6 Each AAC and ASC shall have a minimum of 10% spare capacity for each point type for future point connection. Provide all processors, power supplies and communication controllers complete so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring. As a minimum, provide one of each type of point available on the controller.

31.1.3.7 Specification sheets for each item including manufacturers descriptive literature, drawings, diagrams, performance and characteristic curves, manufacturer and model number, size, layout, dimensions, capacity, etc

31.1.3.8 Colour graphic displays detailing hierarchical structure of facility, including floor plans, with multi-level penetration to equipment level.

32.0 START-UP AND CHECKOUT

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City's BAS Project Manager shall be present during the Start-Up and Checkout- FOR FACILITIES MANAGEMENT PROJECTS ONLY, FOR OTHER DIVISIONS THIS IS OPTIONAL

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32.1 This work shall include field testing and adjustment of the complete BAS, and on-site final operational acceptance test of the complete operational BAS. The Engineer shall be advised at least 14 days in advance of the dates of all tests and may attend at his discretion. If the Engineer witnesses the test, such tests shall be subject to his approval prior to the release of equipment. If the Engineer elects not to witness the tests, the contractor shall provide performance certification. Acceptance of tests by the Engineer and Project Manager shall not relieve the contractor of responsibility for the complete system meeting the requirements of these specifications after installation.

32.2 Static testing:

32.2.1 Static testing shall include point-by-point testing of the entire system and completion of Component Test Sheets. The contractor shall forward proposed Test Sheets at the shop drawing review stage. These Component Test Sheets shall be completed during the contractor's own testing and verification procedure that is done prior to the request for a final inspection. The completed Component Test Sheets shall then be returned to the Engineer for review and approval. The Engineer may repeat a random sampling of at least 50% of the tests during the Engineers commissioning procedure to corroborate their accuracy. The Contractor shall be on site with test equipment during this verification process. The test procedures shall include the following.

32.2.1.1 Digital input component test sheet:

32.2.1.1.1 DI status shall be verified at the POT and OWS for ON and OFF status.

32.2.1.1.2 All digital alarm inputs shall be proven using actual field conditions where possible or be jumpered at the field device for testing with the approval of the Engineer.

32.2.1.2 Digital output component test sheet:

32.2.1.2.1 Status to be verified at the equipment location. Verification at the OWS shall be completed for ON and OFF status, software DISABLE indicator and OVERRIDEN indicator

32.2.1.3 Analog input component test sheet:

32.2.1.3.1 All temperature sensors shall be calibrated using a hand held meter with equal or better accuracy.

32.2.1.3.2 Selected temperature sensors chosen by the Engineer shall be verified by spraying with a cold spray or other means to ensure response and to test the low temperature alarm condition.

32.2.1.3.3 All pressure sensing devices and analog output feedback shall be verified using a device with equal or better accuracy to ensure correct calibration.

32.2.1.3.4 All humidity sensing devices must be verified using a recently calibrated device with equal or better accuracy

32.2.1.3.5 All CTs shall be set to accurately reflect motor status, including removing belts on belt driven equipment

32.2.1.3.6 All other devices shall be verified using appropriate devices of equal or better accuracy

32.2.1.3.7 Adjust span on feedback devices so that input matches the end device

32.2.2 Analog output component test sheet:

32.2.2.1 Al points shall be tested by sending a command from the PWS or OWS to incrementally stroke the field device from full CLOSED to full OPEN and measuring the signal at the field device. The increments of the test shall be no larger than 10% of the output span.

32.2.2.2 The AO feedback requirement shall also be tested by failing the field device and verifying that the alarm registers

32.2.2.3 Each output shall be exercised over the full output capability of the panel

32.2.2.4 Field device hysteresis shall be measured at a minimum of three output levels for each direction of travel. Output increments shall not exceed 2% of span for this test

33.0 STANDARDS COMPLIANCE

33.1 Where materials or equipment are specified to conform to requirements of the standards of organizations, such as the Canadian Standards Association (CSA) that use a label or listing as method of indicating compliance, proof of such conformance shall be submitted and approved, indexed and cross-referenced with the specification. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the contractor shall submit a certificate from a testing organization adequately equipped and competent to perform such services, and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code. For materials whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate from the manufacturer shall be furnished to the Engineer stating that the material complies with the applicable referenced standard or specification.

34.0 FINAL ACCEPTANCE

34.1 Final acceptance shall commence only after satisfactory completion of start-up, verification of performance and the 30-day test period described earlier. When the Contractor has satisfied himself as to proper system operation he shall advise the BAS Commissioning Engineer/Consultant to establish a date for Final Acceptance. This will involve a point-by-point check of all hardware and software items including graphics and displayed data, as well as performing tasks as directed.

34.2 Supply 2-way radios and all test equipment as previously specified. Have on-site technical personnel capable of re-calibrating all field hardware and modifying software.

34.3 Test each system independently and then in unison with other related systems. Test weather sensitive systems twice- once near winter design conditions and again near summer design conditions.

34.4 Optimize operation and performance of each system. Test full-scale emergency operation and integrity of smoke management and other life safety systems.

34.5 Demonstrate to the Engineer the operation of each system including sequence of operations in regular and emergency modes, under all normal and emergency conditions, start-up, shut-down, interlocks, and lock-outs.

34.6 Upon completion of the testing submit a report to the Engineer to summarize all testing.

35.0 DOCUMENTATION

35.1 Documentation shall consist of 4 hard copies and one soft copy for all information described below

35.2 The final documentation package shall include:

35.2.1 Hard and soft copies of all control drawings (As-Builts).

35.2.2 Manufacturer’s technical data sheets for all hardware and software

35.2.3 Factory operating and maintenance manuals with any customization required

35.2.4 Soft copies of programming and front-end software and each controller’s database. Hard copy output of programming is not necessary

35.2.5 Provide clear, concise, typewritten and soft copy descriptions of all control sequences in the working language.

35.2.6 Soft copy text files shall be in MS-Word.

35.3 Each instruction and reference manual shall be bound in hardback, 3 ring, binders or an approved equivalent shall be provided to the Engineer. Binders to be no more than 2/3 full. Each binder to contain index to full volume. One complete set of manuals shall be furnished prior to the time that the system or equipment tests are performed, and the remaining manuals shall be furnished at acceptance. The identification of each manual's contents shall be inscribed on the cover and spine. The manuals shall include the names, addresses and telephone numbers of each subcontractor installing equipment systems and of the local representatives for each item of equipment and each system. The manuals shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. Additionally, each manual shall contain a comprehensive index of all manuals submitted in accordance with this paragraph. Manuals and specifications shall be furnished which provide full and complete coverage of the following subjects:

35.4 <u>Operational Requirements</u>: This document shall describe in concise terms, all the functional and operational requirements for the system and its functions that have been implemented. It shall be written using common terminology for building operation staff and shall not presume knowledge of digital computers, electronics or in-depth control theory.

35.5 <u>System Operation</u>: Complete step by step procedures for operation of the system, including required actions at each operator station; operation of computer peripherals; input and output formats; and emergency, alarm and failure recovery. Step-by-step instructions for system startup, back-up equipment operation, and execution of all system functions and operating modes shall be provided.

35.6 <u>Maintenance</u>: Documentation of all maintenance procedures for all system components including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective module. This shall include calibration, maintenance, and repair or replacement of all system hardware.

35.7 <u>Test Procedures and Reports</u>: The test implementation shall be recorded with a description of the test exercise script of events and documented as test procedures. A provision for the measurement or observation of results, based on the previously published test specification, forms the test reports. The procedures record and the results of these exercises shall be conveniently bound and documented together.

35.8 <u>Configuration Control</u>: Documentation of the basic system design and configuration with provisions and procedures for planning, implementing, and recording any hardware or software modifications required during the installation, test, and operating lifetime of the system. This shall include all information required to ensure necessary coordination of hardware and software changes, data link or message format/content changes, and sensor or control changes in the event system modification are required, and to fully document such new system configurations.

36.0 TRAINING

36.1 The Contractor shall provide the services of competent instructors who will provide instruction to designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment and system specified. The training shall be oriented towards the system installed rather than being a general "canned" training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. The number of person-days (eight hours) of instruction furnished shall be as specified below as a minimum. A training manual shall be provided for each trainee that describes in detail the data included in each training program.

36.2 All equipment and material required for classroom training shall be provided by the contractor. A person-week shall be considered as 37.5 hours, 8:00 am to 12:00 noon, and 12:30 pm to 4:30 pm Monday through Friday. Provide 5 days of training as specified herein.

36.3 Training shall enable operators to accomplish the following objectives:

36.3.1 Proficiently operate system

36.3.2 Understand control system design and configuration

36.3.3 Create and change system graphics

36.3.4 Create, delete, and modify alarms, including configuring alarm reactions

36.3.5 Configure and run reports

36.3.6 Add, remove, and modify system's physical points

36.3.7 Create, modify, and delete application programming

36.3.8 Add a new controller to system

36.3.9 Download firmware and advanced applications programming to a controller

36.3.10 Configure and calibrate I/O points

36.3.11 Maintain software and prepare backups

36.3.12 Understand DDC system components

36.3.13 Understand system operation, including DDC system control and optimizing routines (algorithms)

36.3.14 Operate workstation and peripherals

36.3.15 Log on and off system

36.3.16 Access graphics, point reports, and logs

36.3.17 Adjust and change system setpoints, time schedules, and holiday schedules

36.3.18 Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools

36.3.19 Access data from DDC controllers

36.3.20 Add new users and understand password security procedures

37.0 WARRANTY

37.1 Provide warranty certificates showing the name of the firm giving the warranty, dated from the issuance of the Certificate of Substantial Performance and acknowledged on specific equipment and systems.

37.2 Include these certificates with the Operation and Maintenance Manual in the appropriate sections.

37.3 Contractor shall give a minimum two-year warranty for parts and labor on all equipment and materials installed and shall select materials and equipment where the Manufacturer gives the same warranty arrangements. Warranty shall commence on the date of the Engineers issuance of the Certificate of Substantial Completion.

37.4 Provide a warranty as indicated in 38.0 - Maintenance/Service.

37.5 The Contractor shall agree to make good at his own expense any equipment that fails to operate due to poor workmanship, manufacturing defect or improper installation. Any repairs shall be made at the convenience of the Engineer during normal working hours, unless deemed an emergency.

37.6 Provide upgrades to all software or all panel firmware issued during the warranty period at no charge to Owner.

38.0 MAINTENANCE/SERVICE

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BAS contractor to show the price of service contract as separate line item.
Applicable to New System Installations OR Major overhaul of existing BAS system/s

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38.1 Provide warranty in accordance with the warranty section of this specification. In addition provide scheduled maintenance and service during the warranty period on all control system apparatus including but not limited to valves, dampers, linkages, control panels, interfaces, direct digital control systems, OWS, Server, BC, AAC, ASC, Software and application programs.

38.2 Scheduled preventive maintenance inspections will provide those services required to maintain the system at maximum performance and reliability levels and may include the following:

38.3 Analyze, adjust, calibrate the applicable temperature sensors, humidity sensors, diagnostic LEDs, printers, power supplies, work stations, controllers, modems, input/output points, communication cabling, transmitters, transducers, UPS for the BAS system.

38.4 Conduct inspections and thorough preventive maintenance routine on each piece of covered equipment. In addition, make tests and adjustments to ensure efficient and reliable operation of other major components.

38.5 Examine, clean and calibrate as required sensors, thermostats, humidity controls, temperature controls, pressure controls, relays, damper actuators, instrumentation and accessories directly pertaining to the Building Automation System.

38.6 Check and confirm control system sequence of operation to insure optimum system efficiency and economy.

38.7 A log of each loop tested and each control sequence verified shall be reviewed with the owner.

38.8 All components of the Pneumatics Control System will be serviced according to manufacturer’s recommendations during each year of the contract. This will include (but not be limited to) all lubricant changes, filter changes, adjustments, calibrations and cleaning.

38.9 The system includes, but is not limited to, the air compressor, air receiver, pressure reducing valves, air dryers and all sensors, controllers, transducers, damper and valve operators, thermostats, pilot positioners, electro-pneumatic switches, linkages and any other pneumatic and electronic devices used to maintain the environmental comfort in the building.

38.10 The Contractor will provide preventative maintenance and diagnostic inspections to all electronic system components on a frequency established by manufacturer’s recommendations, component age and condition and discussion with the Supervisor of Operations responsible for the site.

38.11 Provide a fully trained BAS service technician and a Pneumatic fitter (Required for Pneumatic/DDC system) a minimum of one day per month (8 hours for DDC technician and 8 hours for pneumatic fitter) during the warranty period to provide the preventive maintenance and service described above. Provide written reports to the owner outlining the work performed. Allow for 12 annual visits of one day each (24 days total for 2 years) during the warranty period to provide required service. *(This may change in accordance with the size of the project).*

38.12 Provide emergency service for parts and labor on an as needed basis. Response to an emergency call shall be 2 hours maximum on Mon.-Fri. including on holidays and weekends.

38.13 Provide remote service diagnostic monitoring from the local office. At the request of the owner, a service diagnostic call will be made to troubleshoot and resolve (if possible) any reported system complaints.

38.14 Provide a price for a three-year service agreement based on the above requirements to come in to effect upon the completion of the warranty period. Show this price as OPTION: Service Agreement.

PART 2 – OPERATOR WORKSTATION (OWS) AND SOFTWARE

1.0 GENERAL

1.1 General Requirements: Section 23 09 23 BUILDING AUTOMATION SYSTEM (BAS)

1.2 Performance requirements of the Operator WorkStation (OWS) and the Graphical Users Interface are specified in this section.

1.3 Environmental Conditions: The OWS and its immediate associated devices shall be able to operate properly under environmental conditions of 10 deg.C to 32 deg.C and a relative humidity of 20 to 90% non-condensing.

1.4 **OWS shall be provided by the City's IT department.** BAS contractor shall **NOT** include the cost of the computer for the pricing of the project. The OWS shall be provided for centralized system control, information management, alarm management and data base management functions. All real time control functions shall be resident in the standalone Building Control Unit (BC) and local controllers (AACs and ASCs).

1.5 Provide two copies of all Programming Software; one each for OWS and a laptop; **if requirement of a laptop is deemed necessary otherwise provide only one copy. Requirement of a laptop is site specific and shall be provided by the City's IT department. City's project manager shall consult with the district operation manager/supervisor to determine if a laptop is required for the project.**

1.6 Any computer on the BAS LAN shall be capable of displaying the systems in a graphical and dynamic format utilizing a standard web browser. Screen refresh shall be automatic. Manual refresh is not acceptable.

2.0 WORKSTATION HARDWARE REQUIREMENTS

2.1 Reference 1.1.5

2.2 BAS contractor shall coordinate with the City's IT department through the project manager to discuss minimum requirement of the workstation's (computer) hardware, software (operating system) to ensure BAS system will meet or exceed the performance requirement of this specifications.

2.3 Connection to the BAS LAN network shall be via an Ethernet network interface card, 100 Mbps.

2.4 Provide____Workstations. The Workstation(s) will be located as directed by the engineer.

2.5 **This Item is for guidance only.** Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications. Hard disk shall have sufficient memory to store system software, one year of data for trended points specified by the conusltant's sequence of operation and the points list. Workstations shall be with a minimum of:

2.5.1 Intel Pentium 2.66 GHz processor (Pentium IV- Duo Core)

2.5.2 8 GB RAM

2.5.3 100 GB hard disk providing data at 100 MB/sec

2.5.4 48x CD-ROM drive

2.5.5 Keyboard

2.5.6 Mouse

2.5.7 24-inch 24-bit color monitor with at least 1024 x 768 resolution

2.5.8 Serial, parallel, and network communication ports and cables as required for proper system operation

2.5.9 Two (2) USB 2.0 or 3.0 ports

3.0 PRINTERS

3.1 BAS contractor to coordinate with the City's IT department through the project manager to ensure a network printer is connected to the Operator Workstation that is provided by the City's IT department.

3.2 If the site doesn’t have a printer available then City's IT department shall provide a desktop printer.

3.3 **Printer Specifications- For Guidance only:** The printer shall be a bubble jet or inkjet printer, 1440 x1440 dpi resolution, internal 1MB buffer memory, minimum 8 ppm in black. No colour printer is required.

4.0 UNINTERRUPTABLE POWER SUPPLIES

4.1 Provide the OWS, Server (if applicable), and each BC with individual UPS to provide clean, reliable, noise-filtered power at all times and to protect and maintain systems operation throughout short term power interruptions of at least 15 minutes duration. (site specific)

5.0 PROGRAMMING SOFTWARE

5.1 Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

5.1.1 Language. Language shall be graphically based or English language oriented. If graphically based, language shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks. If English language oriented, language shall be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and shall allow for free-form programming that is not column-oriented or "fill-in-the-blanks."

5.1.2 Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.

5.1.3 Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.

5.1.4 Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

5.1.5 Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

5.1.6 Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

5.1.7 Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

5.1.7.1 Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

5.1.7.2 System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

5.2 The software shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the software shall be through password access as assigned by the system administrator.

5.3 Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

5.4 Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's flywheel effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.

FOR TRIDIUM INTEGRATION (IF APPLICABLE) BAS CONTRACTOR SHALL CONFORM TO ITEMS 5.1, 5.2, 5.3, 5.4 PLUS ITEM 5.5

5.5 A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide real-time data updates. Any real-time data value or object property may be connected to display its current value on a user display.

Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

5.5.1 Programming Methods

5.5.1.1 Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in colour depending on the type of link; i.e., internal, external, hardware, etc.

5.5.1.2 Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.

5.5.1.3 The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.

5.5.1.4 All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.

5.5.1.5 The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

5.5.1.6 The user shall be able to pick a graphical function block from the menu and place on the screen. Programming tools shall place lines connecting appropriate function blocks together automatically. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.

5.5.1.7 The programming tools shall include a test mode. Test mode shall show user real-time data on top of graphical display of selected function blocks. Data shall be updated real-time with no interaction by the user. Function blocks shall be animated to show status of data inputs and outputs. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

5.5.1.8 Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the contained application that are represented on the graphical shell of this container.

5.6 OPERATOR WORKSTATION SOFTWARE

5.6.1 Operating System: City's IT department will provide OWS including operating system.

5.6.2 The BAS software shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

5.6.3 Real-Time Displays. The OWS, shall at a minimum, support the following graphical features and functions:

5.6.3.1 Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.

5.6.3.2 Graphic screens shall have the capability to contain objects for text, real-time values, animation, colour spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URLs, and links to other graphic screens.

5.6.3.3 Graphics shall support layering and each graphic object shall be configurable for assignment to one a layer. A minimum of six layers shall be supported.

5.6.4 Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

5.6.5 Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

5.6.6 Right-clicking the selected object and using a graphical slider to adjust the value shall make adjustments to analog objects, such as set points. No entry of text shall be required.

5.6.7 System Configuration. At a minimum, the OWS shall permit the operator to perform the following tasks, with proper password access:

5.6.7.1 Create, delete or modify control strategies.

5.6.7.2 Add/delete objects to the system.

5.6.7.3 Tune control loops through the adjustment of control loop parameters.

5.6.7.4 Enable or disable control strategies.

5.6.7.5 Generate hard copy records or control strategies on a printer.

5.6.7.6 Select points to be alarm-able and define the alarm state.

5.6.7.7 Select points to be trended over a period of time and initiate the recording of values automatically.

5.6.8 On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

5.6.9 Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

5.6.10 System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

5.6.11 Alarm Console. The system shall be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

5.6.12 Operator's workstation software shall contain an easy-to-operate system; allowing configuration of system-wide controllers, including management and display of the controller programming. This system shall provide the capability to configure controller binary and analog inputs/outputs.

5.6.13 The system shall be capable of utilizing third-party Windows-based programs for such things as spreadsheet analysis, graphing, charting, custom report generation, and graphics design packages. Graphics generation shall be done using standard Windows packages. No proprietary graphics generation software shall be needed.

5.6.14 Provide software, which enables the non-programmer operator to easily perform, tasks which are likely to be part of his daily routine.

5.6.15 The operator's console shall provide facilities for manual entries and visual displays enabling an operator to enter information into the system and obtain displays and logs of system information. All requests for status, analog, graphic displays, logs, and control shall be selected from the operator's console. The operator interface shall minimize the use of typewriter style keyboard by implementing a mouse or similar pointing device and "point and click" approach to command selection. The facility shall be provided to permit the operator to perform the following tasks:

5.6.15.1 Automatic logging of digital alarms and change of status message.

5.6.15.2 Automatic logging of all analog alarms.

5.6.15.3 System changes (alarm limits, set-points, alarm lock-outs, etc.).

5.6.15.4 Display specific points as requested by the operator.

5.6.15.5 Provide reports as requested by the operator and on Scheduled basis where so required.

5.6.15.6 Display graphics as requested by the operator.

5.6.15.7 Display help information.

5.6.15.8 Provide trend logs as required by the operator.

5.6.15.9 Provide manual control of digital and analog outputs as required by the operator.

5.6.15.10 Direct the hard copy output of information to the device selected by the operator.

5.6.15.11 Data displayed on monitor to cyclic update as appropriate.

5.6.16 Online changes:

5.6.16.1 Alarm limits

5.6.16.2 Setpoints

5.6.16.3 Deadbands

5.6.16.4 Changes/deletions/additions of points.

5.6.16.5 Control and change of state changes.

5.6.16.6 Time of day, day, month, year.

5.6.16.7 Control loop control description changes for NCU based CDM's.

5.6.16.8 Control loop tuning changes

5.6.16.9 Schedule changes

5.6.16.10 Changes/additions/deletions to system graphics

5.6.16.11 Changes/additions/deletions to total systems

5.6.17 It shall be possible for the OWS operator to initiate analog and digital output commands. Where the BAS software normally originates these outputs, the provision shall exist for the operator to terminate automatic BAS control of any particular output and to originate a manual analog or digital output command. The provision shall exist for the operator to return analog or digital output command functions to automatic BAS software control.

5.6.18 It shall be possible for the OWS operator to place any computed system setpoint to a computed basis or manual value as and when required.

5.6.19 All above functions shall operate under the password protection system.

5.6.20 A vocabulary of at least 25 different descriptions using at least six alphanumeric characters to identify engineering units for analog input and output points. Typical description is as follows: %, Deg.C, KPA, KW, KWH, L/S, CFM, Deg.F, PSI. The descriptions shall be alterable from the OWS console with the system on-line.

5.6.21 Upon operator's request, the system shall present the condition of any single point, any system, and area or the whole system on printer or CRT. The output device shall be by operator's choice. Analog values and status displayed on the CRT shall be updated whenever new values are received. Points in alarm shall be flagged by blinking, inverse video different colour, bracketed, or by some other means to differentiate them from points not in alarm. Overridden (not in auto) points/values shall similarly be identified.

5.7 REPORTING ACCURACY

5.7.1 System shall report values with minimum end-to-end accuracy listed in Table 1.

5.8 CONTROL STABILITY AND ACCURACY

5.8.1 Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table 1
Reporting Accuracy

Measured Variable	**Reported Accuracy**
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Dew Point	±1.5ºC (±3ºF)

Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15ºC (±0.25ºF)
Relative Humidity	±5% RH for monitor only, ±3% RH for control
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO_2)	±50 ppm
Note 1: 10% - 100% of scale	
Note 2: For both absolute and differential pressure	
Note 3: Not including utility-supplied meters	

Table 2
Control Stability and Accuracy

Controlled Variable	**Control Accuracy**	**Range of Medium**
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0-1.5 kPa (0-6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1-150 psi) 0-12.5 kPa (0-50 in. w.g.) differential

5.9 ERROR MESSAGES

5.9.1 Inform operator of all errors in data, errors in entry instructions, failure of equipment to respond to requests or commands, or failure of communications between components of EMCS.

5.9.2 Error messages to be comprehensive and communicate clearly to operator precise nature of problem.

5.10 PASSWORD PROTECTION

5.10.1 Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator’s terminal functions unless user is logged on. This includes displays as outlined above.

5.10.2 Each user shall have an individual User ID, User Name and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 8 characters, User Name shall be 29 characters, and Password shall be 8 characters long. Each system user shall be allowed individual assignment of only those control functions and menu items to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator’s terminal. Each user shall also have a set security level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct security levels for assignment to users.

5.11 AUDIT LOGS

5.11.1 Provide and maintain an Audit Log that tracks all activities performed on the NCU. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached it=s user-defined buffer size. Provide the ability to archive the log locally (to the NCU), to another NCU on the network, or to a server. For each log entry, provide the following data:

5.11.2 Time and date

5.11.3 User ID

5.11.4 Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

5.12 TREND DATA

5.12.1 System shall periodically gather historically recorded selected samples of object data stored in the field equipment (global controllers, field controllers) and archive the information on the operator's workstation (server) hard disk. Archived files shall be appended with new sample data, allowing samples to be accumulated over several years. Systems that write over archived data shall not be allowed, unless limited file size is specified. Samples may be viewed at the operator's terminal in a trendlog. Logged data shall be stored in spreadsheet format. Operator shall be able to scroll through all trendlog data. System shall automatically open archive files as needed to display archived data when operator scrolls through the data vertically. All trendlog information shall be displayed in standard engineering units.

5.12.2 Software shall be included that is capable of graphing the trend logged object data. Software shall be capable of creating two-axis (x,y) graphs that display up to six object types at the same time in different colours. Graphs shall show object type value relative to time.

5.12.3 Operator shall be able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be password protected. Setup and viewing may be accessed directly from any and all graphics on which object is displayed.

5.12.4 System shall be capable of periodically gathering energy log data stored in the field equipment and archive the information on the operator workstation's hard disk. Log data shall include both instantaneous and accumulated values. Archive files shall be appended with the new data, allowing data to be accumulated over several years. Systems that write over archived data shall not be allowed unless limited file size is specified. System shall automatically open archive files as needed to display archived data when operator scrolls through the data. Display all energy log information in standard engineering units.

5.12.5 System software shall be provided that is capable of graphing the energy log data. Software shall be capable of creating two-axis (x,y) graph that show recorded data, relative to time. All data shall be stored in comma-delimited file format for direct use by third-party spreadsheet or other database programs. Operation of system shall not be affected by this operation. In other words, it shall stay completely online.

5.12.6 Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. All operations shall be password protected.

5.13 GRAPHICS

5.13.1 The operator's workstation shall display all data associated with the project. The operator's terminal software shall accept Windows BITMAP (*.bmp) format graphic files for display purposes. Graphic files shall be created using scanned, full colour photographs of system installation, AutoCAD drawing files of field installation drawings and wiring diagrams from as-built drawings. Operator's terminal shall display all data using 3-D graphic representations of all mechanical equipment.

5.13.2 Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 seconds.

5.13.3 Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 seconds and shall automatically refresh every 15 seconds

5.13.4 Colour graphic displays detailing hierarchical structure of facility, including floor plans, with multi-level penetration to equipment level.

5.13.5 System shall be capable of displaying graphic file, text, and dynamic object data together on each display. Information shall be labelled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Terminal shall allow user to change all field-resident BAS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.

5.13.6 All displays shall be generated and customized in such a manner that they fit the project as specified. Canned displays shall not be acceptable. Displays shall use standard English for labelling and readout. Systems requiring factory programming for graphics or DDC logic are specifically prohibited. The installing contractor without factory dependency or assistance shall support all graphics and DDC programming locally.

5.13.7 Binary objects shall be displayed as ON/OFF/NULL or with customized text. Text shall be justified left, right or centre as selected by the user. Also, allow binary objects to be displayed as individual change-of-state bitmap objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three bitmap files for display when the point is ON, OFF or in alarm. For binary outputs, toggle the objects commanded status when the bitmap is selected with the system digitizer (mouse). Similarly, allow the terminal operator to toggle the object's status by selecting (with the mouse) a picture of a switch or light, for example, which then displays a different picture (such as an ON switch or lighted lamp). Additionally, allow binary objects to be displayed as an animated graphic.

5.13.8 Animated graphic objects shall be displayed as a sequence of multiple bitmaps to simulate motion. For example: when a pump is in the OFF condition, display a stationary picture of the pump. When the operator selects the pump picture with the mouse, the represented objects status is toggled and the picture of the pumps impeller rotates in a time-based animation. The operator shall be able to click on an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change bitmap file assignment and also create new and original bitmaps online. System shall be supplied with a library of standard bitmaps, which may be used unaltered or modified by the operator. Systems that do not allow customisation or creation of new bitmap objects by the operator (or with third-party software) shall not be allowed.

5.13.9 Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual bitmap items on the display screen as an overlay to the system graphic. Each analog input object may be assigned to a minimum of five bitmap files, each with high/low limits for automatic selection and display of the bitmaps. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling setpoint. Analog output objects, when selected with the mouse, shall be displayed as a prompted dialog (text only) box. Selection for display type shall be individual for each object. Analog object values may be changed by selecting either the increase or decrease arrow in the analog object spinner box without using the keypad. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trendlogs.

5.13.10 Analog objects may also be assigned to an area of a system graphic, where the colour of the defined area would change based on the analog objects value. For example, an area of a floor-plan graphic served by a single control zone would change colour with respect to the temperature of the zone or its deviation from setpoint. All editing and area assignment shall be created or modified online using simple icon tools.

5.13.11 A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label push buttons may be mixed on the same display to allow sub-displays to exist for each item. Each display may be protected from viewing unless operator has appropriate security level. A separate security level may be assigned to each display and system object.

5.13.12 A mouse, or other form of digitizer, shall be used to move the pointer arrow to the desired item for selection of new display or to allow the operator to make changes to object data.

5.13.13 Displays may be modified on site or via remote communications.

5.13.14 Entire system shall operate without dependency on the operator's terminal. Provide graphic generation software at each workstation.

5.14 ALARMS

5.14.1 Operator’s terminal shall provide audible, visual, and printed means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s), currently running (such as a word processor). Printout of alarms shall be sent to the assigned terminal and port.

5.14.2 System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator’s terminal. Each entry shall include a description of the event-initiating object generating the alarm, time and date of alarm occurrence, time and date of object state return to normal, and time and date of alarm acknowledgement.

5.14.3 Alarm messages shall be in user-definable text English (or other specified language) and shall be entered either at the operator’s terminal or via remote communication.

5.15 SCHEDULING

5.15.1 Operator’s terminal display of weekly schedules shall show all information in easy-to-read 7-day (weekly) format for each schedule. This includes all ON/OFF times (to the minute) for each days events.

5.15.2 Exception schedules (non-normal schedules, such as holidays or special events) shall display all dates that are an exception to the weekly schedules. These speciality schedules shall be displayed at the operator’s terminal in a format similar to the weekly schedules, again allowing easy data entry. Exception schedule data is entered by the following methods: date entries (one day entries), date-to-date (a range or span of days), and by weekday (for example, a given day of a given week each month). User shall be able to scroll easily through the months for each year as a minimum.

5.15.3 At the operator’s terminal, the system user shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.

5.16 ARCHIVING

5.16.1 Store back-up copies of all controllers databases in at least one OWS and/or the server(if applicable).

5.16.2 Provide continuous supervision of integrity of all controller databases. If controller loses database, system to automatically download new copy of database to restore proper operation.

5.16.3 Data base back up and downloading to occur over LAN without operator intervention. Operator to be able to manually download entire controller database or parts thereof.

5.17 REPORTS

5.17.1 Provide a report facility to generate and format for display, printing, or permanent storage, as selected by the operator, the reports as specified in this section. If display output (CRT) is requested, it shall be scrollable; scroll bars will be used to allow easy and flexible movement within the report. Output to be sorted by area, system, point.

5.17.2 Periodic/Automatic Report: Provide the software to automatically generate any report specified, the user will be able to specify the type of report, start time and date, interval between reports (hourly, daily, weekly, monthly) and output device. The software will allow the operator to modify the periodic/automatic reporting profile at any time.

5.17.3 As a minimum, the following reports shall be configured on the system:

5.17.3.1 Dynamic Reports: To allow operator to request a display of the dynamic value for the user specified points which shall indicate the status at the time the request was entered and updated at an operator modifiable scan frequency. It shall be possible to select points on the following basis:

5.17.3.1.1 All points in all areas
5.17.3.1.2 Area (all points in area)
5.17.3.1.3 Area system (all points in system)
5.17.3.1.4 Area system point (individual point)
5.17.3.1.5 System (all points by system and point type)
5.17.3.1.6 System point (all points by system and point type)
5.17.3.1.7 Area point (all points by area and point type).

5.17.3.2 Summary Report: To permit the display or printing the dynamic value for the user specified points which shall indicate the status at the time the CLM was entered. Reports to be available on same basis as dynamic reports. Output will be to the user selected output device.

5.17.3.3 Trend Reports: To permit the trending of points selected by the operator, including as a minimum digital input and output, analog input and output, set points, and calculated values.

5.17.3.4 Historical Data Collection: Provision shall be made to ensure historical data is not lost. The ability to off-load historical data to removable media, and to later load data previously backed-up, will be provided. Historical data values, for an operator specified time range and for operator specified points, may be output the same as for trend data.

5.17.3.5 Critical Alarm Summary: Provide a summary of those points in the critical alarm state and include as a minimum; point acronym, point description, alarm type, limit exceed, current value, alarm type, time and date of occurrence.

5.17.3.6 Maintenance Alarm Summary: Provide a summary of those points in maintenance alarm and include as a minimum; point acronym, point description, current value, alarm type, limit exceed, time and date of occurrence.

5.17.3.7 Alarm Summary: Provide a summary of all points in alarm and include as a minimum; point acronym, point description, current value, alarm type, limit exceeded, and time and date of occurrence.

5.17.3.8 Disable Point Summary: Provide a summary of all points in the disabled state and include as a minimum point acronym and point description.

5.17.3.9 Run Time Summary: Provide a summary of the accumulated running time of selected pieces of equipment with point acronym and description, run time to date, alarm limit setting. The run time shall continue to accumulate until reset individually by means of suitable operator selection.

5.17.3.10 Schedule Summary: Provide a summary of all schedules and indicate as a minimum, which days are holidays and, for each section, the day of the week, the schedule times and associated values; for digital schedules value will be on or off; for analog schedules value will be an analog value.

5.17.3.11 User Record Summary: Provide a summary of all user records to include as a minimum; user name, password, initials, command access level and point groups assigned.

5.18 UTILITY SOFTWARE

5.18.1 Supply and install software products to allow the owner to access and manipulate the control schematic diagrams, and to access product data sheets in an electronic format.

5.18.2 Enter all soft copy submissions; including "Record" drawings as specified herein [Shop Drawings, Product Data, etc.] in OWS.

5.19 WEB BROWSER CLIENTS

5.19.1 The system shall be capable of supporting at least 100 simultaneous users using a standard Web browser such as Internet Explorer. Systems requiring additional software to be resident on the client machine to enable a standard Web browser, or manufacturer-specific browsers shall not be acceptable.

5.19.2 The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BAS, shall not be acceptable.

5.19.3 The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

5.19.4 The Web browser client shall support as a minimum, the following functions:

5.19.4.1 User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

5.19.4.2 Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the Software shall be supported by the Web browser interface.

5.19.4.3 HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

5.19.4.4 Storage of the graphical screens shall be in the Network Control Unit (NCU), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

5.19.4.5 Real-time values displayed on a Web page shall update automatically without requiring a manual refresh of the Web page.

5.19.5 User's shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

5.19.5.1 Modify common application objects, such as schedules, calendars, and set points in a graphical manner. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

5.19.5.1.1 Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

5.19.5.1.2 View logs and charts

5.19.5.1.3 View and acknowledge alarms

5.19.5.1.4 Setup and execute SQL queries on log and archive information

5.19.6 The system shall provide the capability to specify a user's home page (as determined by the log-on user identification). Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

5.19.7 Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

Arborist Report

WHITESIDE TREE
& GARDEN INC.
21 GLENHOLME AVE.
TOR. ONT.M6H 3A8
416-873-4736
trevor@whitesidetreeandgarden.com

ATTN: 2017-11-20
CITY OF TORONTO
URBAN FORESTRY
WEST DISTRICT
tpprwest@toronto.ca

RE: TREE INVENTORY & PRESERVATION PLAN FOR 1234 WESTON ROAD.

There currently exists a vacant lot and building at the property addressed 1234 Weston Rd. The building is to be demolished. The property is to be developed into an extensive day care facility with a contained parking area.

TREE INVENTORY

#	SPECIES	DBH	TPZ	CONDITION	COMMENTS
1.	Norway maple	63cm	4.2m	Fair	Private @ 1234.
2.	Norway maple	47cm	3.0m	Fair	Private @ 1234.

COMMENTS

TREE #1, & #2.
These are two Norway maples located on the private portion of the property addressed 1234 Weston Rd. They are also located within the footprint of the proposed required parking area.

While the canopies of the two trees appear healthy and intact, both trees have been severely and completely ringed at the base with a chain saw. The trees will definitely go into decline and likely die off completely within the next few years. As the property is being developed and upgraded to accommodate a busy daycare, it would be prudent to have the trees removed prior to them becoming a liability. As mentioned, they are also located in the footprint of the required parking lot and therefore within required excavation.

RECOMMENDATIONS AND REQUIREMENTS

It is understood that no tree requiring a ‘Permit to Injure or Destroy Trees’ will be injured or removed prior to the payment of all fees and the issuance of all permits. Until this time all City of Toronto managed trees of any size will be fully protected. All private managed trees measuring 30cm DBH or greater will also be fully protected.

All required hoarding is to be erected and approved by Urban Forestry prior to the commencement of the project. All trees at the front of the property to be preserved are to have TPZ hoarding erected with the use of snow fencing and 2x4 lumber. All trees at the side or rear of the property to be preserved are to have TPZ hoarding erected with the use of plywood and 2x4 lumber. Hoarding is to be erected at the distances stipulated in the Tree Inventory or to the edge of existing hardscape, i.e. Driveways, roadways, sidewalks, etc… TPZ hoarding signage is to be attached to all hoarding. All hoarding is to be erected and approved by Urban Forestry prior to the commencement of the project. No use of heavy equipment, storage of materials or excavation is permitted within the TPZ of any tree without an issued permit by Urban Forestry.

It is suggested that a site visit occur by a qualified arborist at the commencement and completion of the project, with periodic visits throughout. This will help ensure all trades are in compliance of the various City of Toronto by-laws concerning trees. Any root or branch pruning can be performed by the arborist during one of these visits.

It is understood that for every tree permitted for removal for construction related reasons 3x50mm caliper large growing native trees require to be replanted. Six trees are required to be replanted for this project.

PRIVATE TREES REQUIRING REMOVAL: TREE #1, #2. TOTAL: 2 TREES.

SUMMARY

The property addressed 1234 Weston Rd. is currently requiring development. The only 2 trees within the realm of the project have been severely damaged and would require removal regardless of the proposed project. Nonetheless, they are also located within the footprint of the required parking space for the day care. As series of boulevard trees is proposed along the perimeter of the property that will fulfill the required replanting requirement.

Please review the accompanying photos and site plan for greater clarity.

If there are any concerns in regard to this information please contact Trevor Whiteside at 416-873-4736.

With Kind Regards,

Trevor Whiteside
Whiteside Tree & Garden Inc.

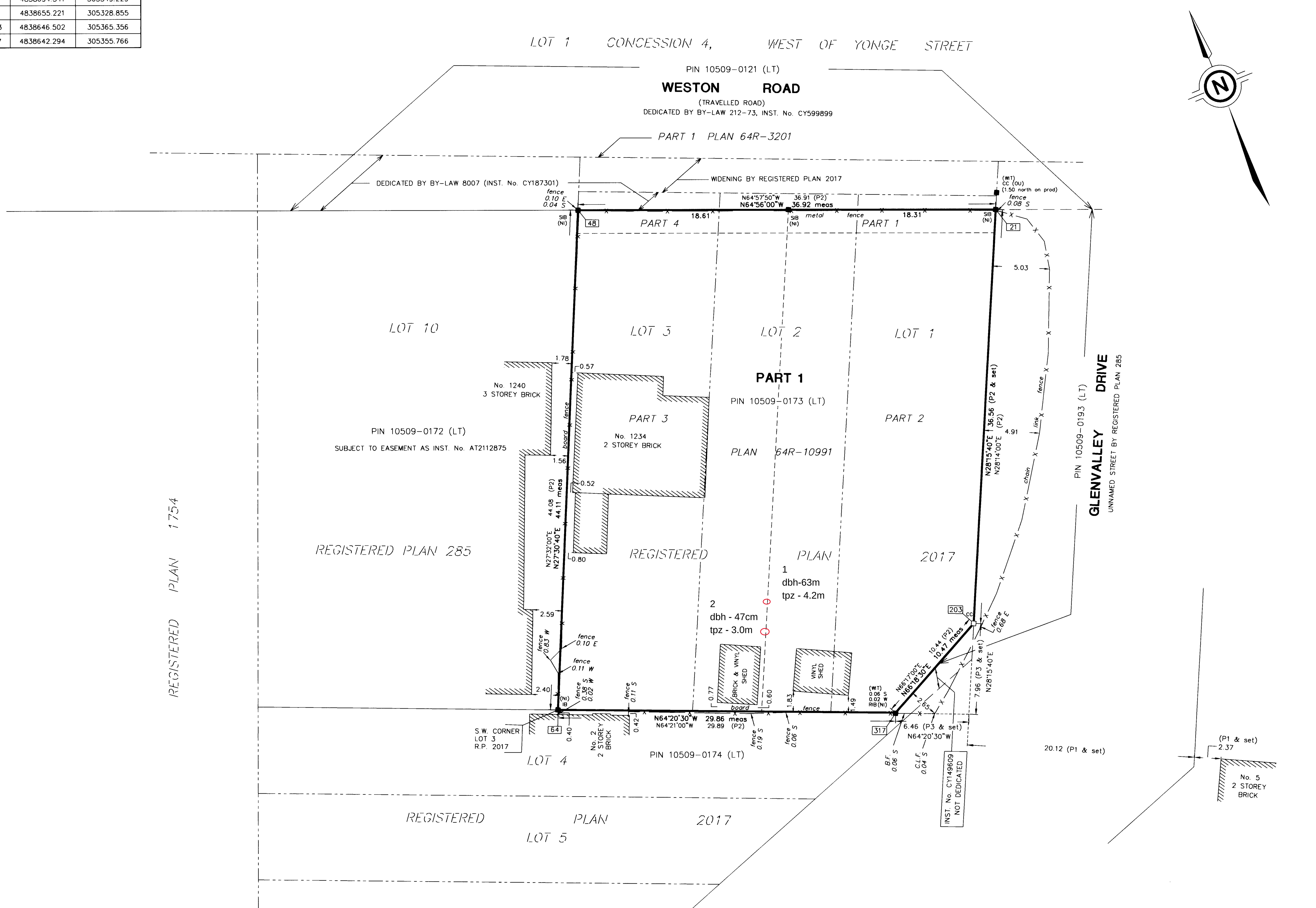
This is a view of the vacant lot. The two Norway maple can be seen to the left in the photo.

This is a closer view of the two trees in full view.

This is a close up of the base of one of the trees. A distinct ring can be seen that has been made with a chainsaw. It has effectively cut off the vascular system of the tree. The tree will dry out and die. The ring goes around the entire trunk of both trees.

COORDINATE TABLE		
POINT	NORTHING	EASTING
21	4838678.702	305382.665
48	4838694.341	305349.229
64	4838655.221	305328.855
203	4838646.502	305365.356
317	4838642.294	305355.766

PE 279D



PLAN AT 4607775

I CERTIFY THAT THIS PLAN AT4607775 IS REGISTERED IN THE LAND TITLES DIVISION OF THE TORONTO REGISTRY OFFICE No. 66 AT 12:19 O'CLOCK ON THE 26 DAY OF JUNE, 2017 AND ENTERED IN THE REGISTER FOR PIN 10509-0173(LT)

"KEVIN SHIU"

REPRESENTATIVE FOR THE LAND REGISTRAR

SCHEDULE				
PART	PART OF LOT	PLAN	ALL OF PIN	AREA (m²)
1	1, 2 & 3	2017	10509-0173(LT)	1595

EXPROPRIATIONS ACT
PLAN OF SURVEY OF
PART OF LOTS 1, 2 AND 3
REGISTERED PLAN 2017
CITY OF TORONTO
FORMERLY CITY OF YORK

0 4 8 12 16m

SCALE: 1:200

METRIC DISTANCES AND CO-ORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

CERTIFICATE OF APPROVAL

THE COUNCIL OF THE CITY OF TORONTO (THE APPROVING AUTHORITY) HEREBY CERTIFIES THAT APPROVAL WAS GIVEN TO THE CITY OF TORONTO (THE EXPROPRIATING AUTHORITY) ON THE 28th DAY OF APRIL, 2017 TO EXPROPRIATE THE FEE SIMPLE INTEREST AND ALL OTHER RIGHT, TITLE AND INTEREST IN THE LANDS DESIGNATED AS PART 1 ON THIS PLAN.

PER:

NAME: MARILYN M. TOFT

FOR: ULLI S. WATKISS, CITY CLERK

FOR: THE COUNCIL OF THE CITY OF TORONTO (THE APPROVING AUTHORITY)

DATED AT TORONTO THIS 20th DAY OF June, 2017

STATEMENT OF EXPROPRIATING AUTHORITY

THE CITY OF TORONTO (THE EXPROPRIATING AUTHORITY) EXERCISED ITS POWER, PURSUANT TO SECTIONS 7, 8 AND 9 OF THE CITY OF TORONTO ACT, 2006 (S.O. 2006 CHAPTER 11,SCHEDULE A) TO EXPROPRIATE THE FEE SIMPLE INTEREST AND ALL OTHER RIGHT, TITLE AND INTEREST IN THE LANDS DESIGNATED AS PART 1 ON THIS PLAN, BY ENACTING BY-LAW NUMBER 480-2017 ON THE 28th DAY OF APRIL, 2017.

THIS STATEMENT IS SIGNED PURSUANT TO SECTION 9 OF THE EXPROPRIATIONS ACT (R.S.O. 1990, CHAPTER E.26).

CITY OF TORONTO

PER:

NAME: MARILYN M. TOFT

FOR: ULLI S. WATKISS, CITY CLERK

PER:

NAME: M. St. Amant for

FOR: ROBERTO ROSSINI, DEPUTY CITY MANAGER & CHIEF FINANCIAL OFFICER

WE HAVE AUTHORITY TO BIND THE CORPORATION

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, THE LAND TITLES ACT, THE EXPROPRIATIONS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 10th DAY OF FEBRUARY 2017.

DATE June 7, 2017

P. Suppa

P.SUPPA

ONTARIO LAND SURVEYOR

APPROVED BY

DATE June 7, 2017

K. Ferguson

K. FERGUSON – ONTARIO LAND SURVEYOR

MANAGER – LAND AND PROPERTY SURVEYS

LEGEND

■	DENOTES SURVEY MONUMENT FOUND
□	DENOTES SURVEY MONUMENT SET
WIT	DENOTES WITNESS
P1	PLAN 64R- 3201
P2	PLAN 64R- 10991
P3	PLAN BY D.FAZIO O.L.S. DATED JULY 22,1975
NI	NOT IDENTIFIED
C.L.F.	CHAIN LINK FENCE
B.F.	BOARD FENCE
N.S.E.W	NORTH,SOUTH,EAST,WEST

BEARINGS HEREON ARE MTM GRID, DERIVED FROM THE SPECIFIED CONTROL POINTS (SCP's) AS LISTED IN THE FOLLOWING TABLE :

SCP	NORTHING	EASTING
02019680952	4 838 758.557	305 262.927
02019680956	4 838 573.046	305 638.881

SCPs) ARE MTM ZONE 10, NAD83(CSRS)(1997.0) CO-ORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O. REG. 216/10

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

DISTANCES SHOWN ON THIS PLAN ARE ADJUSTED GROUND DISTANCES AND CAN BE USED TO COMPUTE GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR : 0.999900

TORONTO

Engineering & Construction Services
Engineering Support Services

Land & Property Surveys
18 Dyas Road
2nd Floor
Toronto, Ontario
M3B 1V5

FOR CITY OF TORONTO USE ONLY	JOB NUMBER
1234 WESTON ROAD	2017-04793
	PLAN NUMBER
	2017-04793

DATE	CAD	MAP NO.	DESIGN FILE	CHECKED BY
MAY 29, 2017	H.S.	47L-11	2017-04793.DGN	P.S.