BID DOCUMENTS & SPECIFICATIONS

For Tender, Permit & Construction

CASTLE Lab

for

Queen's University
RFQ No. Q-2023-031-EL

VOLUME III

Date: **May 11, 2023**
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Appendix A
Geotechnical Investigation Report – Proposed New CFI Facility, Queen's University", prepared by Malroz Engineering Inc., dated June 29, 2022.

Appendix B
Excess Soils Management Plan –
Proposed New CFI Facility, Queen's University prepared by Malroz Engineering dated June 28, 2022

Appendix C
Owner supplied laboratory equipment.

Appendix D
Owner ITS Communications Infrastructure Guidelines

Appendix A

Geotechnical Investigation Report –
Proposed New CFI Facility, Queen's University
prepared by Malroz Engineering
dated June 29, 2022

Geotechnical Investigation Report

Proposed New CFI Facility
Queen's University, Kingston ON

Prepared for: Queen's University

June 29, 2022
File: 1591.00-102

Prepared by:
Malroz Engineering Inc.
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MALROZ

Geotechnical Investigation Report

Proposed New CFI Facility

Queen's University, Kingston ON

Prepared for:

Queen's University

File: 1591.00-102

Queen's University – 1 PDF copy
Malroz Engineering Inc. – 1 PDF copy

Notice to Reader

This document contains the professional opinion of Malroz Engineering Inc. (Malroz), as to the matters set out herein, based on professional judgement and reasonable care. It is to be read in the context of the agreement (the Agreement) between Malroz and Queen's University (the Client), the methodology, procedures and techniques used, Malroz's assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should not be read or relied upon out of context.

Malroz has, in preparing the geotechnical parameters and recommendations, followed accepted methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgement and reasonable care, and is thus of the opinion that there is a high probability that actual geotechnical conditions will fall within the predicted range. However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories, equipment suppliers, etc.) upon which Malroz's opinions are based, have not been verified by Malroz; Malroz makes no representation as to their accuracy and disclaims all liability with respect thereto.

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Respectfully submitted,

Malroz Engineering Inc.

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1.0 Introduction

Malroz Engineering Inc. (Malroz) was retained by Queen's University (the Client) to conduct a geotechnical investigation in support of the construction of the proposed new Canada Foundation for Innovation (CFI) facility to be located on Queen's University's west campus, to the north of Richardson Stadium and south of the existing Coastal Engineering Lab and West Campus Storage buildings in Kingston, Ontario (the Site).

We understand that the development will consist of the construction of a new single storey building, new access laneways and parking area, and related buried utility infrastructure. The building will have some below grade equipment installed, which we understand will consist of a trench along its north extent to a depth of roughly 1.8 m below the finished floor and a pit in another location to approximately 2.6 m below the finished floor.

This report summarizes the results of the investigation completed by Malroz in support of the proposed development. Work for this investigation was completed in general accordance with Malroz's approved proposal dated January 6, 2022 (ref. 1591.00-100). The agreed scope of work consisted of the following:

1. Advancement of a total of 10 boreholes to a depth of 4.6 m below existing site grades (mbg) or to practical auger refusal;
2. Installation of one PVC piezometer, as well as one return trip to the Site to make groundwater observations;
3. Submittal of all retrieved samples with sufficient quantity for moisture contents testing, as well as up to two grain size analyses on recovered soil samples. One groundwater sample and one soil sample will also be collected and submitted to an external analytical laboratory for analysis of pH and sulphate and pH, redox potential, sulphate, sulfide and resistivity parameters, respectively ; and
4. Reporting of field and laboratory results.

In addition to the above scope, three boreholes were advanced to further assess bedrock depth, and four boreholes were advanced to further assess soil environmental quality. An excess soils characterization program was conducted in conjunction with this

investigation and is summarized in an excess soil management plan under separate cover.

The recommendations and comments contained herein are based on factual information obtained during the investigation and are intended only for the use of project designers and engineers. They have been prepared with the understanding that the design will be carried out in accordance with applicable codes and standards. The General Conditions and Limitations (Section 7.0 of this report) form an integral part of this report.

2.0 Site Description

The Site is presently an undeveloped area approximately 4,450 m^2 in area to the south of the Queen's University Coastal Engineering Lab and West Campus Storage building ("grounds maintenance" building). Richardson Memorial Stadium is located to the south of the Site, Hargreaves Way to the East and Stadium Lane to the west. Johnson Street is located approximately 120 m to the north of the Site, and Sir John A. MacDonald Boulevard approximately 210 m to the east.

Figure 1 – Site, looking south east (February 2022)

Topography at the Site was locally generally flat, sloping gently downwards towards the west. Regional topography trends downward to the south, toward Lake Ontario.

3.0 Method of Investigation

3.1 Fieldwork – Drilling Investigation

A total of 17 boreholes, identified as BH01 through BH17 were advanced on January 31, February 1 and April 1, 2022 in the vicinity of the proposed development based on sketches provided to Malroz prior to the field investigation. BH04 was re-advanced following initial drilling to obtain rock core below its original terminus , denoted as BH04a. A Borehole Location Plan (Figure 1) is presented in Appendix A. All boreholes were advanced to practical auger refusal using a truck mounted CME-55 drill rig, equipped with solid stem continuous flight augers. One borehole location, BH07, was equipped with a 50 mm diameter PVC monitoring well to assess stabilized static groundwater levels in the vicinity of the proposed development. Locations and ground surface elevations at each borehole was surveyed with a Trimble R10 Global Navigation Satellite System survey system, connected to the Can-Net Virtual Reference Station network, and are assumed to be accurate within the operating limits of the device. Survey information is summarized in the following table.

Table 1 – Borehole Locations and Ground Surface Elevations

Test Location	Northing	Easting	Elevation (mASL)
BH01	4898445.7	378866.0	97.2
BH02	4898425.8	378877.3	97.1
BH03	4898423.6	378848.5	97.0
BH04/BH04a	4898442.9	378829.1	96.9
BH05	4898471.3	378828.8	96.1
BH06	4898473.4	378864.3	97.7
BH07	4898461.3	378845.0	97.0
BH08	4898482.5	378870.2	98.7
BH09	4898484.1	378842.5	96.5
BH10	4898487.6	378822.0	95.4
BH11	4898452.8	378829.2	96.8
BH12	4898454.2	378866.9	97.3
BH13	4898440.8	378846.3	97.1
BH14	4898403.5	378880.8	97.0
BH15	4898403.2	378862.6	96.9
BH16	4898399.7	378843.4	97.0
BH17	4898393.4	378826.7	96.9

Input By: DPH
Validated By: JeMP

At each borehole location, with the exceptions of BH11 through BH13 which were augered to refusal without sampling, soil samples were collected while performing the Standard Penetration Test (SPT) in general accordance with the procedure as described in ASTM D1586. This consisted of freely dropping a 63.5 kg (140 lb) hammer from a vertical distance of 0.76 m (30 in), in order to drive a 51 mm (2 in) outer diameter split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground a distance of 300 mm (12 in) was recorded as the SPT 'N' value, which correlates to the relative density of non-cohesive soils and is, in certain cases, indicative of the consistency of cohesive soils. Each retrieved sample was placed in a resealable plastic bag.

Borehole logs are attached in Appendix B.

4.0 Subsurface Assessment

Details of the subsurface conditions encountered are presented in the borehole records presented in Appendix B of this report. We strongly emphasize, however, that the soil types, their sequence, thickness, and physical properties may vary between boreholes, sample and test locations, both vertically and horizontally. This information is solely for general planning purposes and should not be used for detailed quantity take-offs.

Our assessment of subsurface conditions and borehole observations are summarized in the following sections.

4.1 Local Geology / Physiography

The Ontario Geological Survey (OGS, 2010a) characterized the bedrock geology of the area as Limestone, dolostone, shale, arkose, sandstone of the Ottawa Group, Simcoe Group, and/or Shadow Lake formations. The surficial geology (OGS, 2010b) is characterized as Palezoic bedrock of the Tweed formation. A single quaternary geologic unit (OGS, 2000) is located within and surrounding the Project Area consisting of undifferentiated carbonate and clastic sedimentary rock, exposed, or covered by a discontinuous, thin layer of drift. The drift cover is noted to consist of clay, silt, sand, gravel, and diamicton. The physiography of the area is described by Chapman and Putnam (2007) as limestone plains.

4.2 Surficial Materials

4.2.1 Topsoil

A surficial covering of topsoil was observed at all sampled boreholes with the exception of boreholes BH08 through BH10, with approximate thickness of 100 mm. In our experience, topsoil thicknesses can vary greatly across a Site, between and beyond boring locations. Topsoil thicknesses presented in this report should not be used for detailed quantity takeoffs. Contractors should ensure they make their own validations of topsoil thicknesses. Organics and topsoil will be thicker in areas where there is or has been tree growth. Root balls should be expected in these areas as well.

4.2.2 Asphalt

A surficial covering of asphaltic concrete was observed at boreholes BH08, BH09 and BH10, and was observed to be 25, 50 and 50 mm in thickness at those locations, respectively.

4.3 Sandy Fill

A brown to light brown sandy fill, consisting of sand and gravel to silty sand and gravel with the exception of BH03 and BH07 which were predominantly gravel. Possible rock rubble was noted at BH10 within this material. Fractions of silt and clay should be expected to vary throughout this fill. This material was visually observed to be generally moist. Moisture contents measured on recovered samples of this material varied from 2 to 34% by dry weight. SPT 'N' values of 3 to 85 blows per 300 mm of penetration were recorded in this material, indicating a relative density ranging from loose to very dense.

4.4 Clayey Fill

A brown silty clay fill with varying amounts of sand and gravel was observed at boreholes BH02, BH03, BH05, BH07. This material was observed to be generally moist. Moisture contents easured on recovered samples of this material varied from 25 to 39% by dry weight. SPT 'N' values of 9 to 29 blows per 300 mm of penetration were measured in this material, which is an estimate of a consistency ranging from stiff to very stiff.

4.5 Native Silty Clay

A brown to greyish brown native silty clay with traces of sand and/or gravel was observed boreholes BH01, BH02, BH05, BH06, BH07, BH09, BH10, and BH14 through BH17, and was noted to occasionally be blocky/friable. This material was generally described as being generally moist. Moisture contents measured on recovered samples of this material ranged from 8 to 36% by dry weight. SPT 'N' values of 8 to 35 blows per 300 mm of penetration were measured in this material, indicating a consistency ranging from stiff to hard.

4.6 Native Silty Sand

A brown native silty sand with some gravel and trace clay was observed at boreholes BH02, BH06, BH09.This material was observed to be generally moist. Moisture contents measured on recovered samples of this material ranged from 11 to 33% by dry weight. SPT 'N' values of 8 to 106 blows per 300 mm of penetration were measured in this material, indicating a relative density ranging from loose to very dense.

4.7 Limestone Bedrock

A summary of the information obtained from the core drilling at BH04a is presented the following table, and core information and material descriptions are reported on the respective records of boreholes. Inferred depth to bedrock across the Site is presented in Figure 2, Appendix A.

Table 2 – Bedrock Core Information Summary

Borehole / Core Run ID	Depth to Rock Surface (mbg/mASL)	Total Core Recovery, TCR (%)	Solid Core Recovery, SCR (%)	Rock Quality Designation, RQD (%)
BH04a/RC1		95	49	33
BH04a/RC1 ○	1.2 / 95.7	96	76	30

Input By: DPH
Validated By: JeMP

Bedrock cores were described as grey limestone. A core photograph is attached in Appendix C.

Total core recovery (TCR) of the obtained core was found to be between 95 and 96% and solid core recover (SCR) was found to be between 49 and 76%. The solid core recovery is generally influenced by the orientations of joints and is low when joints oblique to the axis are intercepted. The rock quality designation (RQD) is highly dependent on the frequency of joints/bedding plane partings in the retrieved cores. On the basis of the recorded RQD values of between 30 and 33%, the rock quality is estimated to be poor within the depths investigated.

4.8 Groundwater

A detailed hydrogeological investigation was not included as a part of this work. However, static groundwater levels were assessed in the monitoring well installed at BH07. The water level measured from the monitoring well is summarized in the following table.

Table 3 – Groundwater Observation (May 11, 2022)

Borehole ID	Groundwater Observation (mbg/mASL)
BH07	3.2 / 93.8

Input By: DH
Validated By: JeMP

Groundwater levels should be expected to fluctuate based on seasonal atmospheric conditions and heavy precipitation events.

5.0 Laboratory Testing

5.1 Geotechnical Laboratory

Samples recovered during drilling were transported to Malroz's geotechnical laboratory in Kingston, Ontario. A total of two samples were submitted for hydrometer grain size analysis. As well, one sample of recovered bedrock was submitted for unconfined compressive strength testing. Moisture contents were measured on select recovered soil samples from boreholes BH01 through BH10 with sufficient available quantity to test. Results are summarized in the following table.

Table 4 – Summary of Gradation and Plasticity Testing Results

Sample ID	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH01-S04/SS4	2	8	41	49
BH06-S06/SS6	20	44	27	9

Input By: DPH
Validated By: DH

Table 5 – Summary of Unconfined Compressive Strength

Sample ID	Unconfined Compressive Strength (MPa)
BH04a/RC1	169.0

Input By: DPH
Validated By: DH

Detailed laboratory test reports are included in Appendix D of this report, and moisture contents are summarized in borehole logs in Appendix B.

5.2 Chemical Attack of Soil to Ductile Iron and Concrete

Results of one soil sample tested for soil corrosivity and attack to buried metal are provided in Appendix E. Results of corrosivity testing is summarized in the following table:

Table 6 – Summary of Corrosivity Testing

Sample ID	Parameters					Total Points[1]	Corrosivity Potential
	Resistivity (ohm·cm)	pH	Redox Potential (mV)	Sulphides (%)	Moisture/Drainage		
BH5-S05/SS5	3370	7.30	320	<RDL	Moist	**3**	**NO**

Input By: DPH
Validated By: DH

Note:

(1) Soil test evaluation carried out using AWWA C105/A21.5-05. A score of ten points or more indicates the soil is corrosive to ductile iron. Additional protection would be recommended if the score is 10 or greater. It was assumed that samples with a laboratory result of less than the reportable detection limit (RDL) for sulphides would be considered a trace condition (score of 2) and results greater than the RDL would be considered positive (score of 3.5).

Table 3 of CSA A23.1/A23.2 'Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Procedure for Concrete' divides the degree of exposure of concrete structures to sulphate attack into the following classes:

Table 7 – Sulphate Exposure Classes

Degree of Exposure (Class)	Water Soluble Sulphate (SO4) in Soil Sample (%)
Very Severe (S-1)	> 2.0
Severe (S-2)	0.2 – 2.0
Moderate (S-3)	0.1 – 0.2

The laboratory results indicated that the sulphate content of the sample was 0.0056% by weight, indicating a low potential for sulphate attack on concrete. Based on these results, standard Portland cement should be suitable for use on this project.

6.0 Discussion and Recommendations

Based on the results of the field investigation, we anticipate that foundations for the proposed building will be comprised of typical conventional spread, strip or pad footings founded on competent native soils, bedrock, or on Engineered Fill overlying either soil or bedrock. Fill soils are ubiquitous throughout the Site, and will require removal in areas of new foundations and below the proposed slab on grade in the building. Up to 3 m of fill was observed within the building footprint at borehole BH07. Structural transition details should be considered where strip footings cross more than one subgrade type to avoid differential settlements. Construction of an Engineered Fill pad to a uniform subgrade elevation may provide the simplest implementation for shallow foundations.

6.1 Excavation and Temporary Shoring

Excavations up to a depth of approximately 3 to 5 m from the existing site grades may be necessary for construction of foundations, or for buried utilities or stormwater management chambers/systems. We would expect that sufficient area would be available to backslope excavations to this depth without the use of shoring at this Site. Once foundations are constructed, excavations should not extend within a zone extending 10 horizontal to 7 vertical from the bottom outside edge of these foundations, to prevent them from becoming underminined.

All excavations and construction of any shoring should be carried out in accordance with the latest edition of the OHSA and Regulations for Construction Projects. The OHSA regulations require that if workers must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced in accordance with OHSA requirements. OHSA specifies the maximum slope of excavations into four broad soil types, summarized as follows:

Table 8 – OHSA Soil Types

Soil Type	Maximum Slope Inclination	Base of Slope Location
Type 1	1 horizontal to 1 vertical	Within 1.2 m of base of excavation
Type 2	1 horizontal to 1 vertical	Within 1.2 m of base of excavation
Type 3	1 horizontal to 1 vertical	From bottom of excavation
Type 4	3 horizontal to 1 vertical	From bottom of excavation

At this Site, native silty clay may be considered as Type 2 to 3, while native silty sand should be considered as Type 3, both provided they are unaffected by seepage. Fill soils should be considered generally as Type 3. Any soils affected by seepage must be considered as Type 4, and the lowest soil type in any given excavation shall govern its sideslopes.

Excavations into overburden soils should be relatively easy using conventional excavating equipment; however, contractors should be prepared to manage erratic large particles up to boulder sized material that could be found within the overburden. If rock removals are required, the use of breakers or blasting techniques will be necessary. Use of rippers in this formation is not feasible.

Stockpiles of excavated materials should be kept away from the edges of open excavations by a distance at least equivalent to the depth of the excavation to avoid slope instability. Care should be taken to avoid overloading any underground services/structures from any construction stockpiles. It should be noted that this distance is also applicable to the passage of heavy machinery near excavations. This condition should be respected at all times, unless specific studies are conducted for individual cases.

A shoring system will be required anywhere appropriate backsloping is not possible, (e.g. potentially in utility trench excavations). Shoring systems must be designed by a professional engineer licensed in the province of Ontario, in accordance with relevant codes, standards and regulations such as the latest version of the Canadian Foundation Engineering Manual and the Ontario Occupational Health and Safety Act (OHSA) Regulations for Construction Projects. The system should be designed to resist full earth and hydrostatic pressures, as well as surcharges due to construction and highway traffic loadings. The following parameters may be used in the design of temporary shoring:

Table 9 – Lateral Earth Pressure Parameters

Soil Type	Bulk Unit Weight (kN/m^3)	Angle of Internal Friction (deg.)	Coefficient of Lateral Earth Pressure		
			K_a	K_o	K_p
Clayey Fill	19.5	28	0.36	0.53	2.77
Sandy Fill	20.5	30	0.33	0.5	3.00
Native Silty Sand	20.0	32	0.31	0.47	3.25
Native Silty Clay	19	29	0.35	0.52	2.88
Compacted Gran. 'A'	21	34	0.28	0.44	3.54
Compacted Gran. 'B' Type II	21.5	35	0.27	0.43	3.69

At rest parameters should be utilized for non-yielding shoring elements. We recommend shoring plans be reviewed by a geotechnical engineer prior to the start of construction.

6.2 Dewatering

Based on the observed groundwater at 3.2 mbg in the installed monitoring well at BH07, groundwater infiltration into excavations should be expected near the fill-native soil interface. However, we expect that this infiltration should be able to be controlled using a number of conventional filtered sumps and construction pumps and/or passive relief wells installed below the lowest point of the excavation based on our experience on this Site. It should be noted that silty/sandy soils within may produce a much higher quantity of infiltration into open excavations. Use of cutoff methods can also be considered, e.g. installation of tightly interlocking sheeting, particularly if any excavation is required to be shored if adequate area to backslope is not possible. Carrying out excavations in dry seasonal conditions will reduce dewatering requirements.

6.3 Foundations

6.3.1 Conventional Shallow Foundations

Conventional spread, strip or pad foundations constructed on competent native silty clay or silty, or on an Engineered Fill pad constructed over these subgrade types, can be designed for a factored geotechnical bearing reaction at the ultimate limit state (ULS) of 200 kPa and a geotechnical bearing reaction 150 kPa at the serviceability limit state (SLS). This assumes that there will be no load eccentricities and the foundations will be constructed on flat and level ground.

If foundations are constructed directly on limestone bedrock (or on lean mix concrete poured over rock to create an even working surface), a factored bearing reaction of 1.5 MPa at ULS can be considered on its upper mildly to moderately weathered surface. No corresponding SLS bearing reaction would be applicable as no settlements would occur prior to brittle failure of the rock. If an Engineered Fill pad is constructed directly over limestone bedrock, a factored bearing reaction of 400 kPa at the ULS and a bearing reaction of 350 kPa at SLS can be considered.

Both clayey and silty soil types at this Site are susceptible to disturbance due to infiltration of moisture, freezing, and repeated loading from construction traffic. Contractors should make provisions to ensure the subgrade is not exposed to these conditions. All subgrade surfaces should be inspected by a geotechnical engineer or their designate prior to placement of foundations.

6.3.2 Design for Earthquakes

In accordance with the Ontario Building Code 2012 (OBC), foundations must be designed to withstand a minimum earthquake force. Based on the average SPT 'N' values and associated estimations of shear strength, along with a conservative assigned value of strength for the rock mass, a Site Classification for Seismic Site Response of 'C' could be considered by designers in accordance with OBC Table 4.1.8.4.A. A higher site class may be available by conducting in-situ shear wave velocity testing at the Site (classes 'A' and 'B' are only available via direct measurement), however may not provide significant benefits for this development. Project structural designers can be consulted to confirm whether class 'A' or 'B' would be advantageous.

6.3.3 Foundation Dewatering

Generally, provided surficial slabs are located 0.2 m above existing site grades, we would not consider underslab drainage a necessity. Perimeter drainage around the structure and any below grade pits should be provided, tied to a frost free outlet. Surface grades should be sloped away from the building, and landscaped areas directly adjacent to the building should be capped with impermeable soils, if practicable.

Buried utilities could be provided with subdrains to reduce groundwater flow towards the building envelope.

6.3.4 Frost Protection

Design frost depth in the Kingston area should be considered 1.5 m below unprotected surface grades. If thermal insulation is utilized as opposed to soil cover, it should be noted that some manufacturers recommend placement of foundations directly over top of insulating boards.

6.4 Backfilling

Backfill around the building should consist of non-frost susceptible, free draining granular material. Below hardscaped areas, all backfill material should be compacted to a minimum of 98% of its Standard Proctor Maximum Dry Density (SPMDD) to 1 m below the hardscape base or pavement subbase, and 100% thereafter. Elsewhere, all backfill should be compacted to 95% of its SPMDD.

Earth pressure parameters provided in Table 9 above can be used for any walls subjected to such pressures (e.g. for sump pits, etc.).

6.5 Slabs on Grade

Modulus of subgrade reaction is not a fundamental soil property, with its value depending on size and shape of the load. Its value would change for example, in areas where stresses are concentrated such as under columns. An iterative approach between determination of contact stresses and resultant subgrade reaction moduli should be considered. Based on a slab size of approximately 35 m by 35 m and a typical loading of 15 kPa, a modulus of subgrade reaction of approximately 12 MPa/m can be considered. Malroz can provide further assistance during design should more detailed slab geometries and/or loading magnitudes be provided.

We recommend that a minimum of 150 mm of new Ontario Provincial Standard Specifications (OPSS) Granular 'A' be placed under any slabs on grade.

6.6 Pavement Design

Based on the proposed development's use case, for the proposed new access laneway we recommend considering a pavement section consisting of 40 mm of HL3 (or SP12.5 Cat. A) and 50 mm of HL8 (or SP19.0 Cat. A), 150 mm of OPSS Granular 'A' and 300 mm of OPSS Granular 'B', at a minimum based on the proposed delivery route use.

6.6.1 Materials and Construction Considerations

For Site preparation, surface vegetation, tree roots, topsoil and organics should be stripped under the pavement areas, and the underlying subgrade surface proof rolled. Some limited amount of organics in these areas may be able to remain, subject to review by a geotechnical engineer or their designate (e.g. pavement areas would not require all organics to be necessarily removed, provided the Client understands there may be some longer term maintenance risk, albeit likely minor following a review and successful proof roll). New fill under pavement areas should be placed as an Engineered Fill operation as described in the section below.

Paving work should be completed in accordance with the requirements of applicable OPSS and municipal standards. All asphalt mix designs should be reviewed prior to the commencement of construction.

HMA used in this project should meet the minimum requirements of OPSS 1150/1151 (depending on whether Marshall or Superpave mixes are utilized). Asphalt cements should be minimum grade of PG 58-28, and meet the requirements of OPSS 1101.

Tack coat should be applied between any vertical surfaces or joints including curbs, abutting and walls, etc., butt and lap joints and at all tie-ins to other existing asphalt. SS-1 emulsified asphalts used for this purpose should meet requirements of applicable OPSS.

6.7 Engineered Fill

Engineered Fill application may be required on this project to raise subgrade elevations during construction of the lowest elevation slab. For any operation to be considered Engineered Fill, the following criteria must be satisfied:

- Materials used as Engineered Fill must be uniform and homogenous. The material should be free of deleterious materials and organics;
- Prior to the placement of Engineered Fill, it must be assessed in a geotechnical laboratory for, at a minimum, gradation and Standard Proctor analyses;
- The material must be within +/- 2% of its optimum moisture content, as determined through laboratory testing;
- Engineered Fill operations must take place under the supervision of a geotechnical engineer or their designate;
- Suitable compaction equipment must be selected for the operation, based on the material to be compacted;
- Materials should be placed in lifts which are suitable for the compaction equipment utilized, but generally not greater than 0.2 m loose lifts;
- Density testing must be taken on each lift of Engineered Fill. Any Engineered Fill which is tested and found to be outside of the specified density range shall be either removed, reworked or retested; and
- Under no circumstances shall frozen material be placed in any Engineered Fill operation.
- Site activities may be carried out in the winter months and periods of cold weather. The following procedures are recommended for the placement of engineered or structural fill during cold weather conditions:
    - The fill placement must be inspected by qualified field personnel on a full time basis under the supervision of a geotechnical engineer, with the authority to stop the fill operations at any time when conditions are considered to be unfavorable.
    - The intended area of fill must be clearly identified in the field prior to commencing the work.
    - Ramps for access must be constructed outside of the limits of intended fill.

- The fill material must be comprised of OPSS Granular 'B' - Type 1, or other approved equivalent granular material when temperatures are below 0^0C.
- Imported fill containing ice, snow or any frozen material cannot be accepted for use and should be returned to the source.
- Overnight frost penetration into the fill mantle in areas below intended structure construction, parking lots, and on side slopes of the fill mantle within this area must be prevented by using insulation blankets. Any frozen fill must be completely removed prior to placing subsequent lifts. Breaking the frost and frozen fill in situ will not be accepted. Following removal of frozen materials the remaining exposed surface should be compacted to a minimum of 98% of SPMDD prior to placement of new fill.
- During periods of cold where ambient temperatures are -5^0C or less, placement of engineered fill shall stop and the existing fill materials must be protected from frost penetration.

It should be noted that the placement of engineered or structural fill materials during cold weather conditions requires extra effort beyond that typical in better climatic conditions. At any time where conditions are deemed unfavourable, the Engineered Fill operation must be suspended.

7.0 General Conditions and Limitations

This report was completed for the specific needs of Queen's University and is based on a specific scope of work which is defined in the mutually agreed upon workplan. The scope of work has limitations as described throughout the report and in the notice to reader. Data, tables, charts, and interpretive illustrations presented in this document are instruments of service for this mandate and can only be properly evaluated when reviewed together with the accompanying report. Reference to this report should only be made to the complete signed document.

By issuing this report, Malroz is the Geotechnical Engineer of Record for this project. It is recommended that Malroz be retained during construction of all foundations, for earthwork operations and for paving. The intent of this requirement is to verify conditions encountered during construction are consistent with the findings in the report and, that inherent knowledge developed as a part of our study is correctly carried forward to construction phases. We should be retained to review whether our recommendations have been applied appropriately, once drawings and specifications are complete. Without this review, Malroz will not be liable for any misunderstanding of our recommendations or their application and adaptation into final designs.

The work performed in this report was carried out in accordance with the terms and conditions made as a part of our proposal and/or contract pursuant to which this report was issued, in a manner consistent with that level of care and skill ordinarily exercised by members of the Geotechnical Engineering profession currently practicing under similar conditions in the same locality. The conclusions presented in the report are based solely upon the scope of services, governed by the time and budgetary considerations to which this work was subject.

The factual data, recommendations and comments in this report pertain to the specific project as described in the report, and are not applicable to any other project or location. If the project is conceptually modified or changes location, or if it is not initiated within twelve months of the date of this report, Malroz should be given an opportunity to confirm that the information in this report is still valid and/or applicable.

The comments in this report are intended only for the guidance of project designers and engineers. Contractors bidding on or undertaking the work should rely on their own

investigations, as well as their own interpretations of the factual borehole and in-situ test information, and how subsurface conditions may affect their work.

This report must be read as a whole, as sections taken out of context can be misleading. Drafts and working copies, whether or not marked as "draft", "for discussion purposes" or otherwise, do not necessarily reflect Malroz's final opinion following consideration of all matters which are subject to the study giving rise thereto; they are issued for comment and information purposes only, and are subject to change and should not be relied upon in any way or for any purpose.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based solely on the results obtained at the borehole locations only. Soil and groundwater conditions between and beyond the borehole locations may differ both horizontally and vertically from those encountered at the borehole locations and may become apparent during construction, which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found during this investigation, we request that we be notified immediately in order to permit a reassessment of our comment and recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by Malroz has been completed.

8.0 Closure

We trust that this report meets your present requirements. Please do not hesitate to contact us should there be any further questions or comments.

Respectfully Submitted,

Malroz Engineering Inc.,

per: Dylan Hill, P. Eng.
Geotechnical Engineer, Project Manager

reviewed: David Hodgson, P.Eng.
Senior Engineer, Principal

9.0 References

Canadian Geotechnical Society. (2006). Canadian Foundation Engineering Manual, 4th Edition.

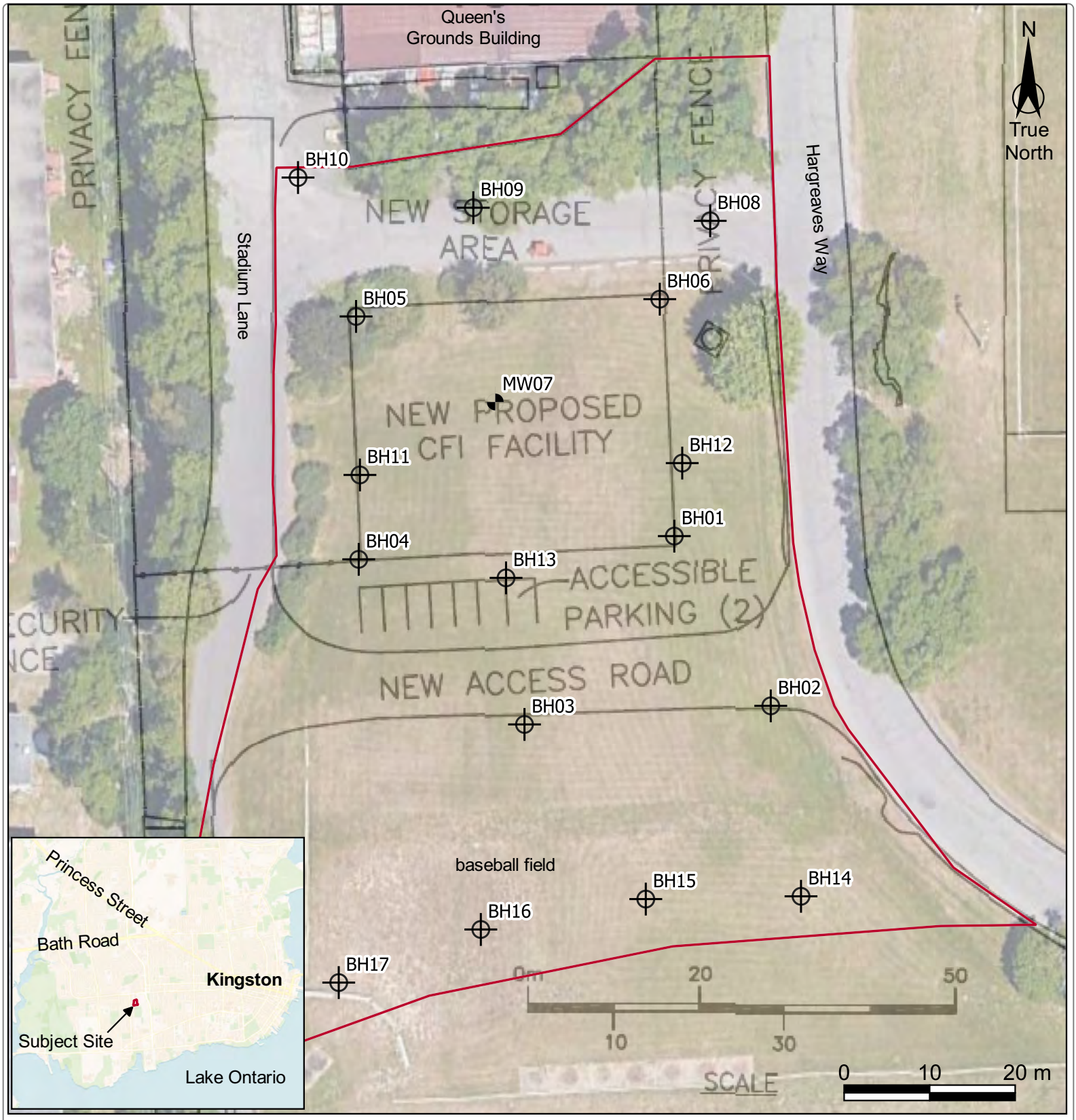
Chapman, L.J. and Putnam, D.F. (2007). Physiography of southern Ontario; Ontario Geological Survey. Miscellaneous Release Data 228.

Ontario Geological Survey (2010a). Surficial geology of Southern Ontario; Ontario Geological Survey. Miscellaneous Release Data 128.

Ontario Geological Survey (2010b). Bedrock geology of Ontario; Ontario Geological Survey. Miscellaneous Release Data 126 revisions 1, scale 1:250,000.

Ontario Geological Survey (2000). Quaternary geology of Ontario, Data Set 14 (Revised)

Appendix A
Figures



Legend

- approximate Project Area
- approximate borehole location and depth to bedrock
- approximate monitoring well location and depth to bedrock

Rev	Date	Description	By	Chkd
D0	2022-06-29	for issue	RV	DPH

Borehole Location Plan

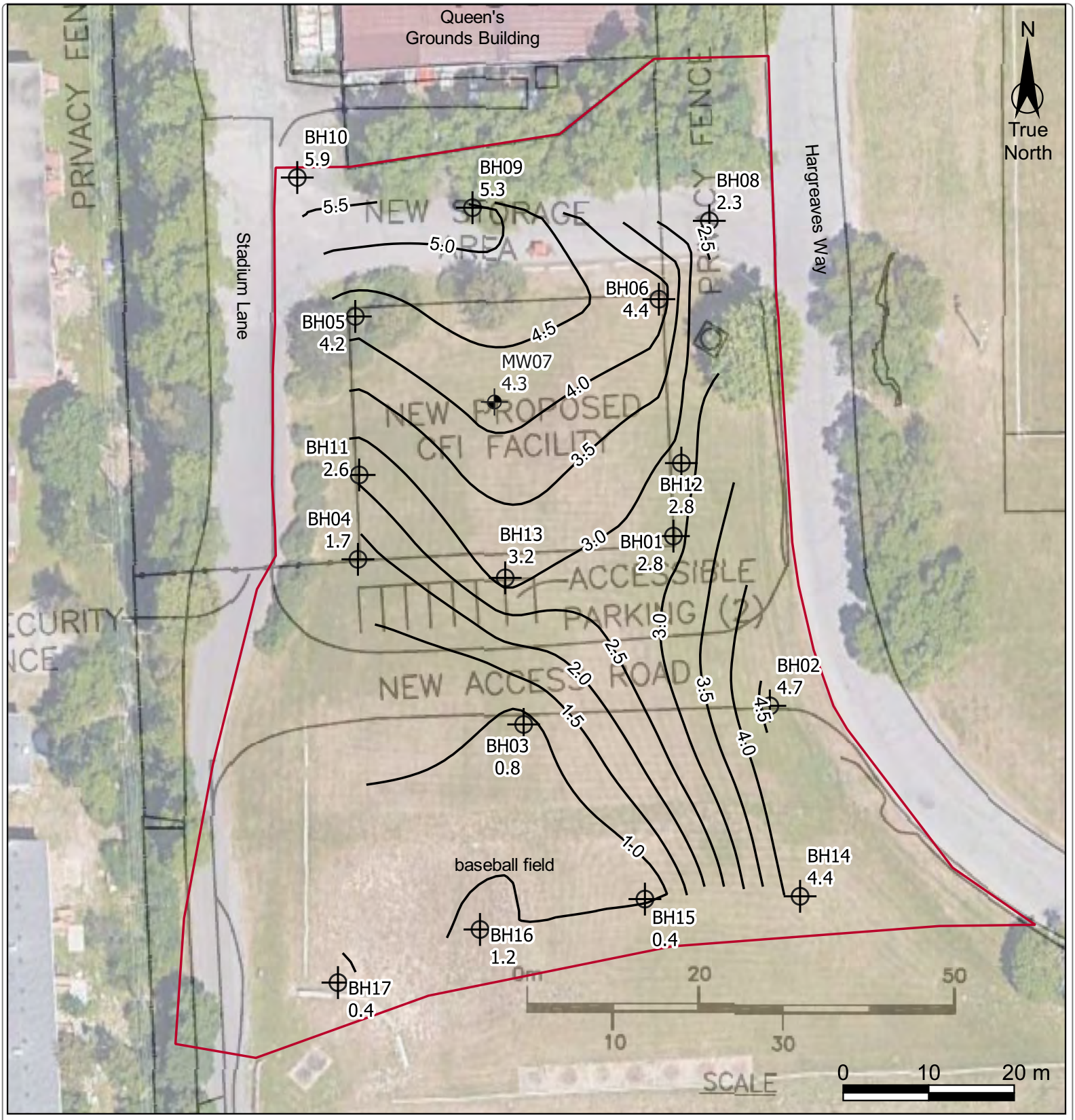
Geotechnical Investigation
Proposed New CFI Facility
Queen's University, Kingston, ON

File: 1591.00-102

Figure 1

MALROZ

Data Sources: Figure based on Malroz field observations and Google Earth imagery.



Legend

- approximate Project Area
- approximate borehole location and depth to bedrock
- approximate monitoring well location and depth to bedrock
- interpolated depth to bedrock

Rev	Date	Description	By	Chkd
D0	2022-06-29	for issue	RV	DPH

Aproximate Depth to Bedrock

Geotechnical Investigation
Proposed New CFI Facility
Queen's University, Kingston, ON

File: 1591.00-102

Figure 2

MALROZ

Data Sources: Figure based on Malroz field observations and Google Earth imagery.

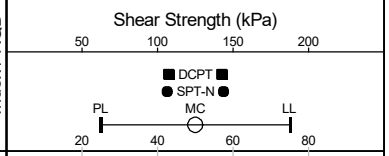
Appendix B
Record of Boreholes

BOREHOLE LOG

Enclosure No.: 1

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH01**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.2 m**
Drilling Equipment: **CME 55**	Easting: **378866.0 m**	Northing: **4898445.7 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
	97.2		**TOPSOIL** sandy, brown.				
0.2			**FILL** sand and gravel, light brown, dense, becoming silty sand, some gravel, compact.				
0.4					SS1	50	34
0.6							
0.8							
1.0					SS2	38	20
1.2							
1.4							
1.6	95.7		**SILTY CLAY** trace sand, trace gravel, trace organics in upper several cm, brown, moist, stiff to very stiff				
1.8					SS3	54	13
2.0			G: 2%, S: 8%, SI: 41%, CL: 49%.				
2.2			Becoming blocky.				
2.4							
2.6					SS4	100	16
2.8	94.3		Borehole terminated with auger refusal at 2.8m.				
3.0							
3.2							
3.4							
3.6							
3.8							
4.0							
4.2							
4.4							
4.6							
4.8							
5.0							
5.2							
5.4							
5.6							
5.8							



NOTES:

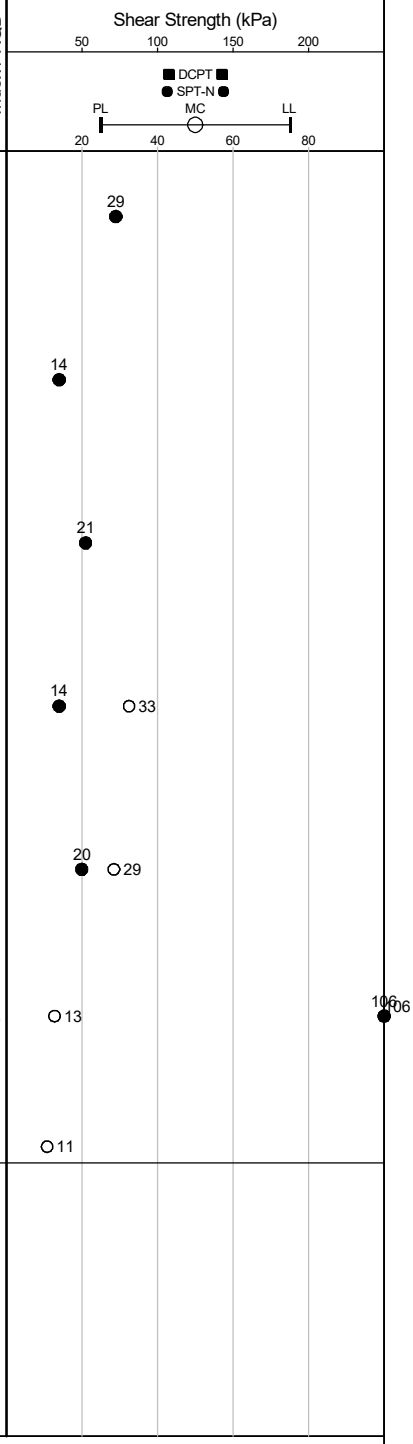
BOREHOLE LOG 1591 - BOREHOLE LOGS - 2-17-2022 - MS.GPJ MALROZ ENGINEERING.GDT 6/16/22

BOREHOLE LOG

Enclosure No.: 2

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH02**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.1 m**
Drilling Equipment: **CME 55**	Easting: **378877.3 m**	Northing: **4898425.8 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
0.2	97.0	**TOPSOIL** sandy, brown.				
0.4		**FILL** silty clay and sand, some gravel, brown, moist, very dense.		SS1	42	29
0.6						
0.8	96.3	**SILTY CLAY** trace sand, blocky, brown, moist, stiff to very stiff.				
1.0				SS2	100	14
1.2						
1.4						
1.6						
1.8				SS3	42	21
2.0						
2.2	94.8	**SILTY SAND** some gravel, trace clay, brown, moist, compact to very dense.				
2.4						
2.6				SS4	92	14
2.8						
3.0						
3.2						
3.4				SS5	92	20
3.6						
3.8						
4.0				SS6	45	106
4.2						
4.4						
4.6				SS7	100	R
4.8	92.4	Borehole terminated with auger refusal at 4.7m.				
5.0						
5.2						
5.4						
5.6						
5.8						



NOTES:

BOREHOLE LOG 1591 - BOREHOLE LOGS - 2-17-2022 - MS.GPJ MALROZ ENGINEERING.GDT 6/16/22

BOREHOLE LOG

Enclosure No.: 3

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH03**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378848.5 m**	Northing: **4898423.6 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (50, 100, 150, 200; DCPT, SPT-N; PL, MC, LL; 20, 40, 60, 80)
	97.0		**TOPSOIL** sandy, brown. **FILL** silty clay with organics throughout, some sand, brown, moist, very stiff.		SS1	59	17	17, 39
0.2, 0.4, 0.6								
0.8	96.3		Borehole terminated with auger refusal at 0.8m.					
1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.4, 3.6, 3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0, 5.2, 5.4, 5.6, 5.8								

NOTES: Borehole attempted in 3 locations, auger refusal at each location between 0.6m - 0.8m

BOREHOLE LOG

Enclosure No.: 4

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH04**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **96.9 m**
Drilling Equipment: **CME 55**	Easting: **378829.1 m**	Northing: **4898442.9 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (50, 100, 150, 200) ■ DCPT ● SPT-N ● PL MC LL (20, 40, 60, 80)
	96.9		**TOPSOIL** some sand, brown.					
0.2			**FILL** silty sand, some gravel, some clay, trace asphalt, organics throughout, brown, moist, compact.					
0.4					SS1	50	10	10 ● ○ 33
0.6								
0.8								
1.0					SS2	25	19	19 ●
1.2								
1.4								
1.6					SS3	40	R	○ 19
	95.3		Borehole terminated with auger refusal at 1.7m.					
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 5

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH04a**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **96.9 m**
Drilling Equipment: **CME 55**	Easting: **378829.1 m**	Northing: **4898442.9 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **J. Payeur**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
			Augered to refusal at 1.2m.				
1.2	95.7		**LIMESTONE** grey, poor rock quality.				
2.0					RC1	95	33
3.4					RC2	96	30
4.0	92.8		Borehole terminated within limestone bedrock at 4.1m.				

Shear Strength (kPa)

50 100 150 200

■ DCPT ■
● SPT-N ●

PL MC LL

20 40 60 80

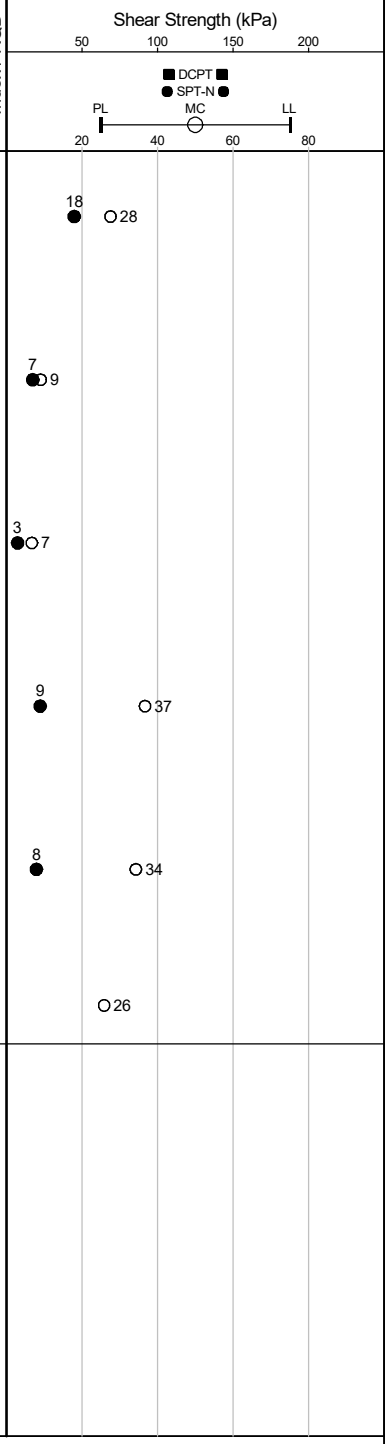
NOTES:

BOREHOLE LOG

Enclosure No.: 6

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH05**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **96.1 m**
Drilling Equipment: **CME 55**	Easting: **378828.8 m**	Northing: **4898471.3 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
	96.1		**TOPSOIL** sandy, brown.				
0.2			**FILL** silty sand and gravel, some organics, trace asphalt, brown, moist, compact to loose.		SS1	75	18
0.4							
0.6							
0.8							
1.0					SS2	25	7
1.2							
1.4							
1.6							
1.8					SS3	17	3
2.0							
2.2							
2.4	93.8		**FILL** silty clay, some gravel, trace sand, brown, moist, stiff.				
2.6					SS4	59	9
2.8							
3.0	93.2		**SILTY CLAY** some sand, brown, moist, stiff.				
3.2							
3.4					SS5	75	8
3.6							
3.8			Becoming sandy, some gravel.				
4.0					SS6		R
4.2	92.0		Borehole terminated with auger refusal at 4.2m.				
4.4							
4.6							
4.8							
5.0							
5.2							
5.4							
5.6							
5.8							



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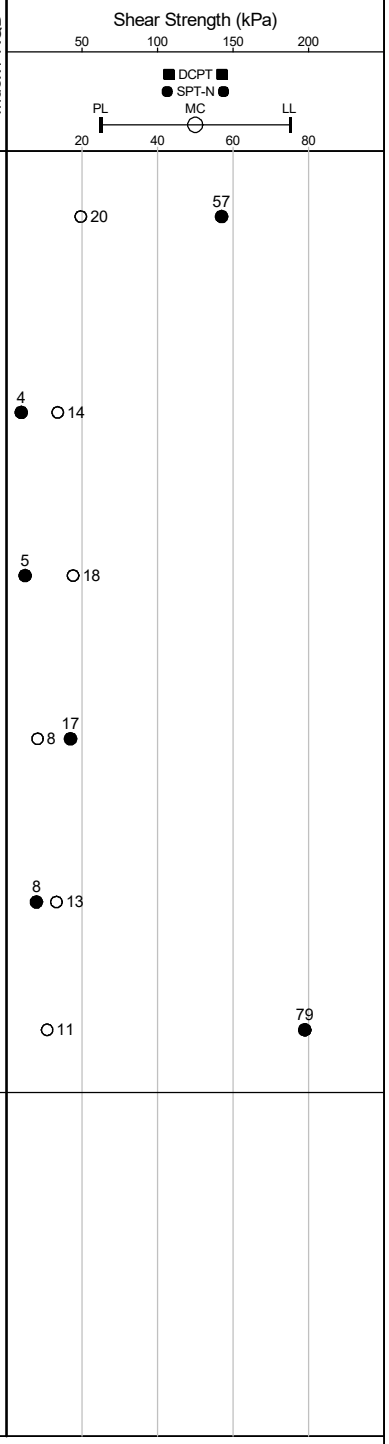
WELL LOG

Enclosure No.: 7

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Well Number: **BH06**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.7 m**
Drilling Equipment: **CME 55**	Easting: **378864.3 m**	Northing: **4898473.4 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
0.2	97.7		**TOPSOIL** sandy, brown.				
0.4			**FILL** silty sand, some gravel, trace asphalt in upper several cm, brown, moist, very dense to loose.		SS1	75	57
1.2					SS2	79	4
2.0					SS3	59	5
2.4	95.4		**SILTY CLAY** trace to some sand, some gravel, brown, moist, very stiff.				
2.8					SS4	100	17
3.4	94.4		**SILTY SAND** some gravel, trace clay, brown, moist, loose to very dense. G: 20%, S: 44%, SI: 27%, CL: 9%.		SS5	50	8
4.2					SS6	100	79
4.4	93.3		Borehole terminated with auger refusal at 4.4m.				



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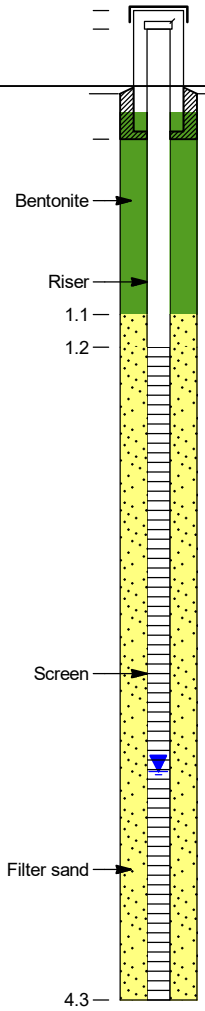
BOREHOLE LOG

Enclosure No.: 8

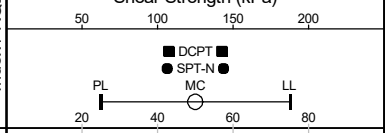
Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH07**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378845.0 m**	Northing: **4898461.3 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
0.2	97.0		**TOPSOIL** clayey, brown.				
0.4			**FILL** gravel, some sand and silt, trace clay, brown, moist, compact.		SS1	42	14
0.6							
0.8							
1.0					SS2	59	18
1.2							
1.4							
1.6							
1.8					SS3	25	13
2.0							
2.2							
2.4	94.7		**FILL** silty clay, trace sand, brown, moist, stiff.				
2.6					SS4	100	12
2.8							
3.0							
3.2							
3.4	93.7		**SILTY CLAY** trace sand, trace organics, brown, stiff to very stiff.		SS5	79	11
3.6							
3.8							
4.0					SS6		11
4.2	92.7		Borehole terminated with auger refusal at 4.3m.				
4.4							
4.6							
4.8							
5.0							
5.2							
5.4							
5.6							
5.8							

Monitoring Well



Shear Strength (kPa)



NOTES:

Well Construction Details
stick-up with aluminum monument
Sch. 40 PVC
slotted screen
screen
#1 sand

Groundwater Monitoring Details
monitored on May 11, 2022
DTW[1]: 3.2 m
DTB[1]: 4.3 m
[1]depths are reported from TOP

BOREHOLE LOG 1591 - BOREHOLE LOGS - 2-17-2022 - MS.GPJ MALROZ ENGINEERING.GDT 6/16/22

BOREHOLE LOG

Enclosure No.: 9

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH08**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **98.7 m**
Drilling Equipment: **CME 55**	Easting: **378870.2 m**	Northing: **4898482.5 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (50, 100, 150, 200) ■ DCPT ● SPT-N ● PL MC LL (20, 40, 60, 80)
	98.6		**ASPHALT** approx. 25 mm.					
0.2			**FILL** sand and gravel, some silt, possible rock rubble, some sand and silt, grey, very dense to compact.					
0.4					SS1	88	85	○ 2; ● 85
0.6								
0.8								
1.0					SS2	9	54	● 54
1.2								
1.4								
1.6								
1.8					SS3	42	10	○ ● 10
2.0								
2.2	96.4		Borehole terminated with auger refusal at 2.3m.					
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

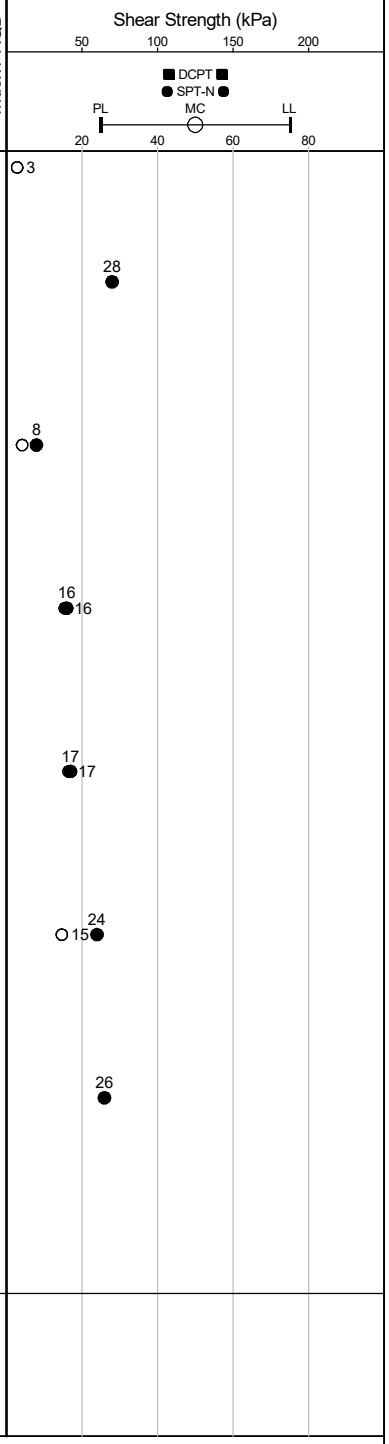
NOTES:

BOREHOLE LOG

Enclosure No.: 10

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH09**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **96.5 m**
Drilling Equipment: **CME 55**	Easting: **378842.5 m**	Northing: **4898484.1 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
	96.5		**ASPHALT** approx. 50 mm.		SS1	100	R
0.2			**FILL** sand and gravel, some silt, possible rock rubble, brown, moist, compact to loose.				
0.4							
0.6					SS2	67	28
0.8							
1.0							
1.2							
1.4					SS3	34	8
1.6							
1.8	94.7		**SILTY CLAY** trace sand, brown, very stiff.				
2.0							
2.2					SS4	100	16
2.4							
2.6							
2.8					SS5	59	17
3.0							
3.2							
3.4	93.2		**SILTY SAND** some gravel, trace clay, brown, moist, compact.				
3.6					SS6	84	24
3.8							
4.0							
4.2							
4.4					SS7	34	26
4.6							
4.8							
5.0							
5.2							
5.4	91.2		Borehole terminated with auger refusal at 5.33.				
5.6							
5.8							



NOTES:

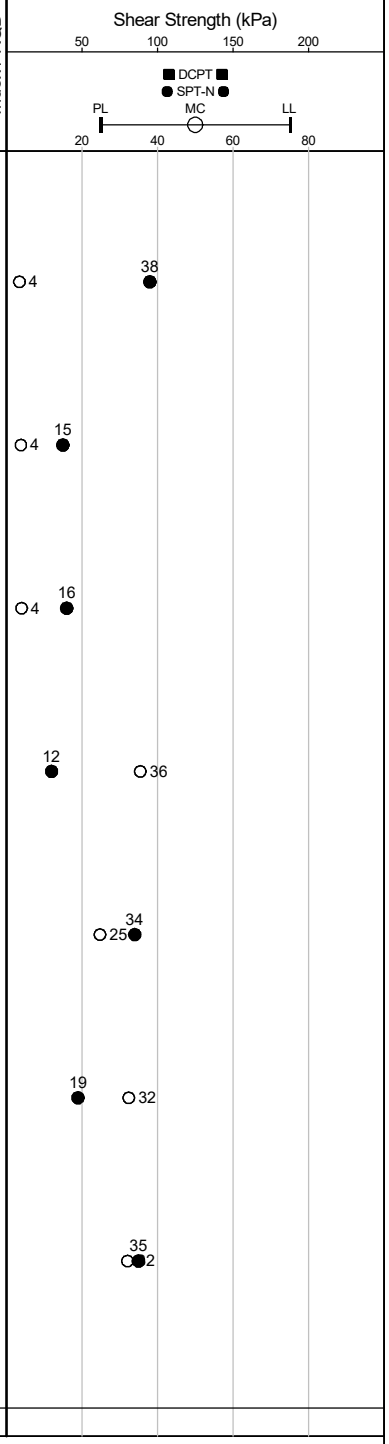
BOREHOLE LOG 1591 - BOREHOLE LOGS - 2-17-2022 - MS.GPJ MALROZ ENGINEERING.GDT 6/16/22

BOREHOLE LOG

Enclosure No.: 11

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH10**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **95.4 m**
Drilling Equipment: **CME 55**	Easting: **378822.0 m**	Northing: **4898487.6 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Description	Sample Number	Recovery (%)	Penetration Index / RQD
	95.4	**ASPHALT** approx. 50 mm.	SS1	100	R
0.2		**FILL** silty sand and gravel, possible rock rubble, trace organics, brown, moist, dense to compact.			
0.4					
0.6			SS2	25	38
0.8					
1.0					
1.2					
1.4			SS3	50	15
1.6					
1.8					
2.0					
2.2			SS4	50	16
2.4					
2.6	92.8	**SILTY CLAY** trace sand, brown, moist, stiff to hard.			
2.8			SS5	25	12
3.0					
3.2					
3.4		Trace gravel, becoming blocky.			
3.6			SS6	100	34
3.8					
4.0					
4.2					
4.4			SS7	50	19
4.6					
4.8					
5.0		Faintly varved.			
5.2			SS8	59	35
5.4					
5.6					
5.8	89.6	Borehole terminated with auger refusal at 5.9m.			



NOTES:

BOREHOLE LOG 1591 - BOREHOLE LOGS - 2-17-2022 - MS.GPJ MALROZ ENGINEERING.GDT 6/16/22

BOREHOLE LOG

Enclosure No.: 12

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH11**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **96.8 m**
Drilling Equipment: **CME 55**	Easting: **378829.2 m**	Northing: **4898452.8 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **J. Payeur**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
			Augered to refusal, no sampling.					
0.2								
0.4								
0.6								
0.8								
1.0								
1.2								
1.4			Possible weathered bedrock.					
1.6								
1.8								
2.0								
2.2								
2.4								
2.6	94.2		Borehole terminated with auger refusal at 2.6m.					
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 13

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH12**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **97.3 m**
Drilling Equipment: **CME 55**	Easting: **378866.9 m**	Northing: **4898454.2 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **J. Payeur**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
0.2			Augered to refusal, no sampling.					
0.4								
0.6								
0.8								
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8	94.4		Borehole terminated with auger refusal at 2.8m.					
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 14

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH13**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **97.1 m**
Drilling Equipment: **CME 55**	Easting: **378846.3 m**	Northing: **4898440.8 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **J. Payeur**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
0.2			Augered to refusal, no sampling.					
0.4								
0.6								
0.8								
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2	93.9		Borehole terminated with auger refusal at 3.2m.					
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 15

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH14**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378880.8 m**	Northing: **4898403.5 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (DCPT / SPT-N; PL, MC, LL)
	96.9		**TOPSOIL** sandy, brown.					
0.2			**FILL** silty sand, some gravel, brown, moist, compact to loose.					
0.4					SS1	34	50	50
0.6								
0.8								
1.0					SS2	25	18	18
1.2								
1.4								
1.6								
1.8					SS3	0	6	6
2.0								
2.2								
	94.7		**SILTY CLAY** trace to some sand, some gravel, brown, moist, very stiff.					
2.4								
2.6					SS4	100	27	27
2.8								
3.0								
3.2					SS5	100	28	28
3.4								
3.6								
3.8								
4.0					SS6	100	30	30
4.2								
4.4	92.6		Borehole terminated at 4.4m.					
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 16

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH15**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **96.9 m**
Drilling Equipment: **CME 55**	Easting: **378862.6 m**	Northing: **4898403.2 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
	96.8		**TOPSOIL**.					
0.2			**SILTY CLAY** trace sand, brown, moist.		SS1	47	R	
0.4	96.5		Borehole terminated with auger refusal at 0.4m.					
0.6								
0.8								
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 17

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH16**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378843.4 m**	Northing: **4898399.7 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (50, 100, 150, 200; DCPT, SPT-N; PL, MC, LL; 20, 40, 60, 80)
	96.9		**TOPSOIL**.					
0.2			**SILTY CLAY** some gravel, trace sand, brown, moist, stiff to very stiff.		SS1	50	13	13
0.4								
0.6								
0.8								
1.0					SS2	33	21	21
1.2	95.8		Borehole terminated with auger refusal at 1.2m.					
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 18

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-102**
Client: **Queen's University**	Borehole Number: **BH17**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **96.9 m**
Drilling Equipment: **CME 55**	Easting: **378826.7 m**	Northing: **4898393.4 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
	96.8		**TOPSOIL**.					
0.2			**SILTY CLAY** trace sand, brown, moist.		SS1	50	R	
0.4	96.4		Borehole terminated with auger refusal at 0.4m.					
0.6								
0.8								
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

Appendix C
Bedrock Core Photograph

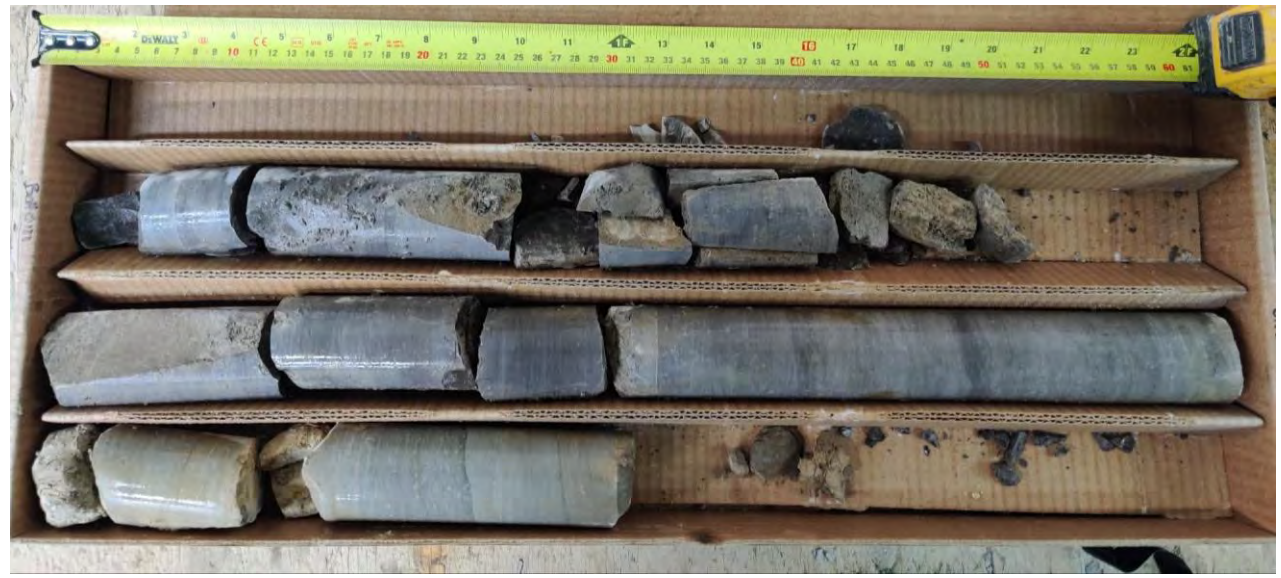


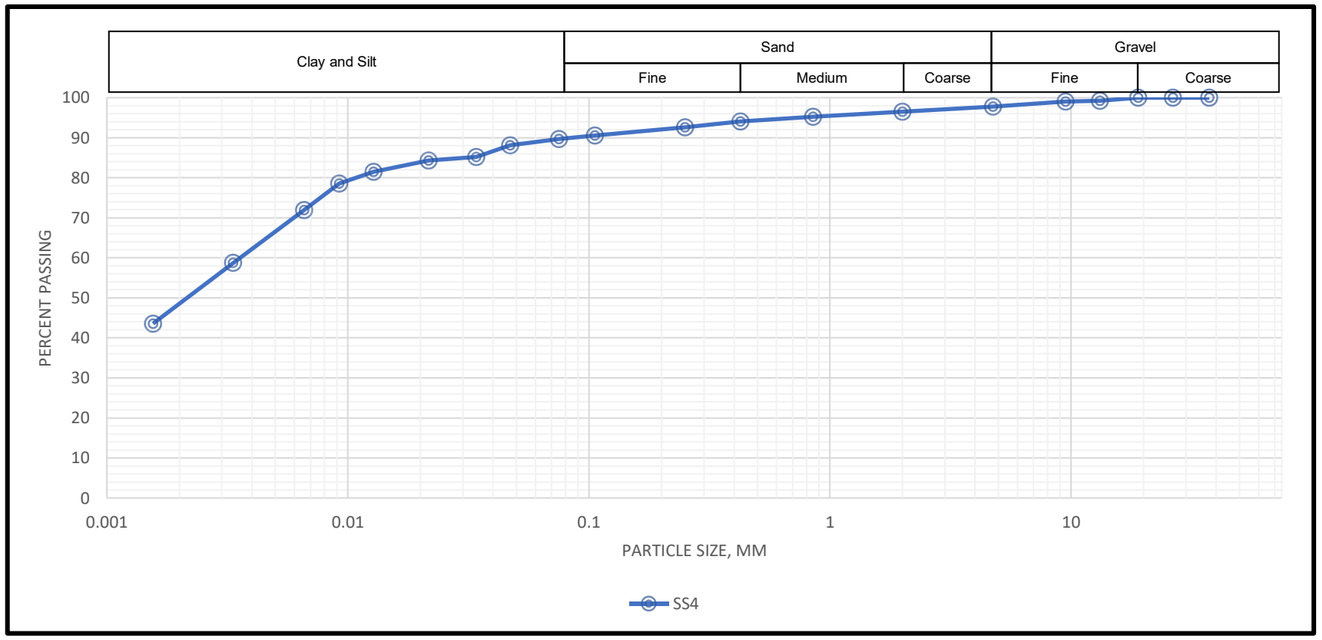
Figure 1 – BH4a/RC1

Figure 2 – BH4a/RC2

Appendix D
Geotechnical Laboratory Results

Malroz Engineering Inc. Laboratory
745 Development Drive Unit 4B
Kingston, ON, K7M 4W6

Particle Size Analysis (LS-702)



Clay (%)	Silt (%)	Sand (%)	Gravel (%)
49	41	8	2
SILT AND CLAY, trace sand, trace gravel			

Lab No.: 274B
Project No.: 1591
BH: BH01
Sample: SS4
Client: Queens University
Location: Kingston, ON

Tested: JS
Date: 3/9/2022

Validated:
Date: 5/4/2022

Notes: Additional information available upon request

Supplementary Data:

Volume of bulb, V_B (cm^3)	57	Specific Gravity, GS (assumed):	2.7
Length of Bulb, L_2 (cm)	13.60	Dispersing Agent (g/L):	40
Scale Dimension, h_s (cm/Div.)	0.18	Area of Cylinder, A (cm^2)	28.3
Maximum Particle Size (mm):	13.2	0' to Top of Bulb, L_1 (cm)	11.0

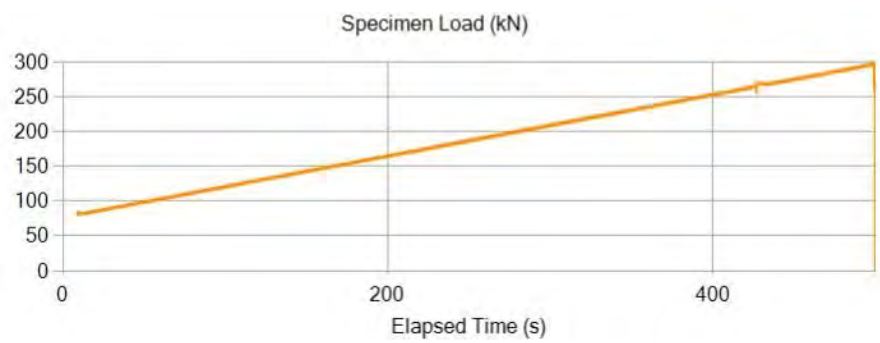
CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Malroz Engineering Inc. Laboratory
745 Development Drive Unit 4B
Kingston, ON, K7M 4W6

Summary of Results for Unconfined Compressive Strength

Sample ID	Density (g/cm^3)	UCS (MPa)
RC1	2.72	169.0

Client:	Queens University
Project No.:	1591
Location:	Queens University, Kingston, ON
BH:	04A
Depth:	1.22 m – 2.74 m
Lab No.:	274A
Date Sampled:	February 1, 2022
Sampled By:	Jessie Payeur
Date Tested:	March 8, 2022



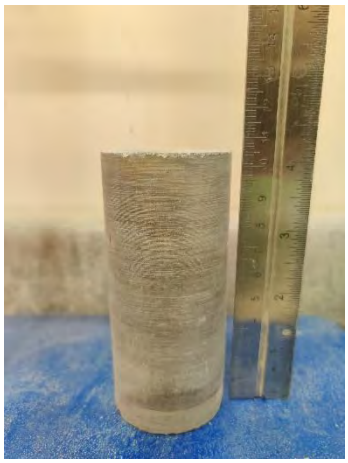


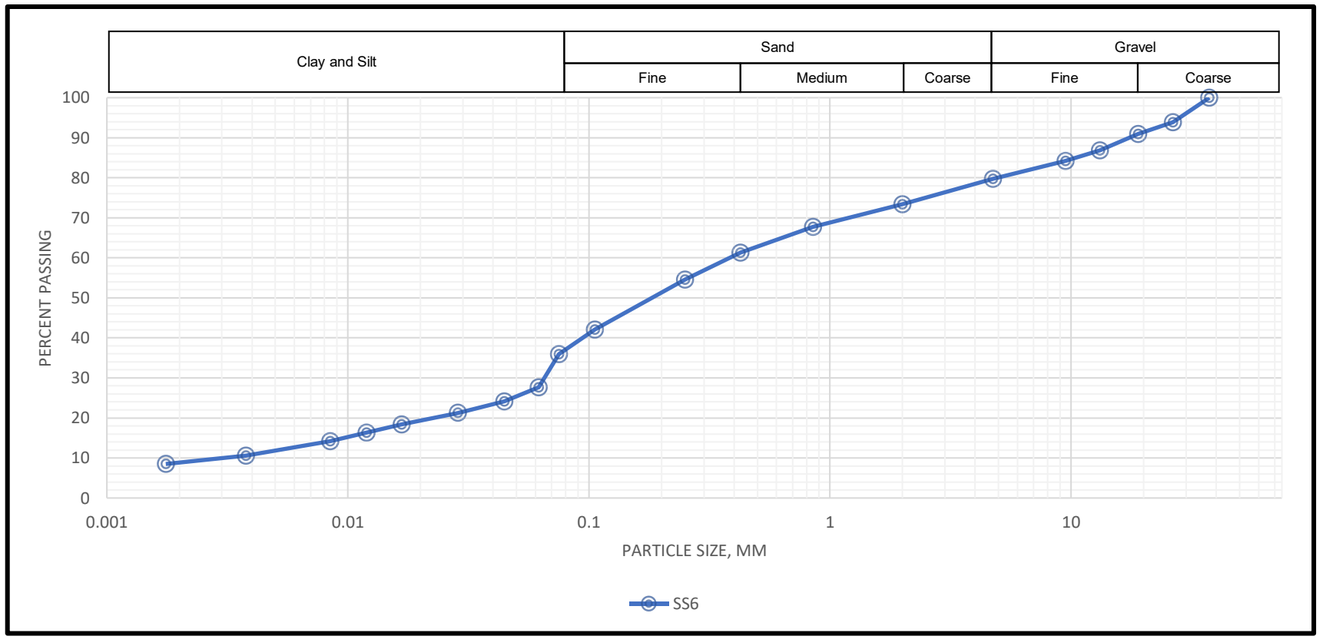
***Figure 1**: Pre- and Post-Test Specimen Photos*

Tested By: Jesse Sherwin
Approver:

Date: March 8, 2022

Malroz Engineering Inc. Laboratory
745 Development Drive Unit 4B
Kingston, ON, K7M 4W6

Particle Size Analysis (LS-702)



Clay (%)	Silt (%)	Sand (%)	Gravel (%)
9	27	44	20
silty SAND, some gravel, trace clay			

Lab No.: 274C
Project No.: 1591
BH: BH06
Sample: SS6
Client: Queens University
Location: Kingston, ON

Tested: JS
Date: 3/9/2022

Validated:
Date: 5/4/2022

Notes: Additional information available upon request

Supplementary Data:

Volume of bulb, V_B (cm^3)	57	Specific Gravity, GS (assumed):	2.7
Length of Bulb, L_2 (cm)	13.60	Dispersing Agent (g/L):	40
Scale Dimension, h_s (cm/Div.)	0.18	Area of Cylinder, A (cm^2)	28.3
Maximum Particle Size (mm):	26.5	0' to Top of Bulb, L_1 (cm)	11.0

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Appendix E
Analytical Laboratory Results

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Malroz Engineering Incorporated

308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Jessie Payeur

Client PO:
Project: 1591
Custody: 134950

Report Date: 9-Feb-2022
Order Date: 2-Feb-2022

Order #: 2206241

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2206241-01	BH05-S05

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Certificate of Analysis

Client: Malroz Engineering Incorporated

Client PO:

Report Date: 09-Feb-2022

Order Date: 2-Feb-2022

Project Description: 1591

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC, water extraction	8-Feb-22	8-Feb-22
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	3-Feb-22	4-Feb-22
Resistivity	EPA 120.1 - probe, water extraction	7-Feb-22	8-Feb-22
Solids, %	Gravimetric, calculation	4-Feb-22	5-Feb-22

PARACEL LABORATORIES LTD.

Order #: 2206241

Certificate of Analysis

Report Date: 09-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 2-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH05-S05	-	-	-
	Sample Date:	31-Jan-22 09:00	-	-	-
	Sample ID:	2206241-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	73.8	-	-	-
General Inorganics					
pH	0.05 pH Units	7.30	-	-	-
Resistivity	0.10 Ohm.m	33.7	-	-	-
Anions					
Sulphate	5 ug/g dry	56	-	-	-

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 09-Feb-2022

Order Date: 2-Feb-2022

Project Description: 1591

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	ND	5	ug/g						
General Inorganics									
Resistivity	ND	0.10	Ohm.m						

Certificate of Analysis

Report Date: 09-Feb-2022

Client: Malroz Engineering Incorporated

Order Date: 2-Feb-2022

Client PO:

Project Description: 1591

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	55.2	5	ug/g dry	56.0			1.6	20	
General Inorganics									
pH	7.54	0.05	pH Units	7.58			0.5	2.3	
Resistivity	9.40	0.10	Ohm.m	9.55			1.6	20	
Physical Characteristics									
% Solids	85.3	0.1	% by Wt.	87.2			2.2	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	156	5	ug/g	56.0	100	80-120			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

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Subcontracted Analysis

Malroz Engineering Incorporated
308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Jessie Payeur

Paracel Report No.	**2206241**	Order Date:	02-Feb-22
Client Project(s):	**1591**	Report Date:	7-Feb-22
Client PO:			
Reference:	**Standing Offer - ENV**		
CoC Number:	**134950**		

Sample(s) from this project were subcontracted for the listed parameters. A copy of the subcontractor's report is attached

Paracel ID	Client ID	Analysis
2206241-01	BH05-S05	Redox potential, soil Sulphide, solid

TESTMARK Laboratories Ltd.
Committed to Quality and Service

CERTIFICATE OF ANALYSIS

Client:	Dale Robertson	Work Order Number:	454340
Company:	Paracel Laboratories Ltd. - Ottawa	PO #:	
Address:	300-2319 St. Laurent Blvd. Ottawa, ON, K1G 4J8	Regulation:	[No Reg - Always Include Reg Report]
		Project #:	2206241
Phone/Fax:	(613) 731-9577 / (613) 731-9064	DWS #:	
Email:	drobertson@paracellabs.com	Sampled By:	
Date Order Received:	2/3/2022	Analysis Started:	2/7/2022
Arrival Temperature:	10.4 °C	Analysis Completed:	2/7/2022

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
BH05-S05	1726096	Soil	None		1/31/2022	

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
RedOx - Soil (T06)	Mississauga	Determination of RedOx Potential of Soil	Modified from APHA-2580B

REPORT COMMENTS

Non-Testmark container received, sample received past hold time for redox potential, proceed with analysis as per client notes 02/03/22 YH

This report has been approved by:

Marc Creighton
Laboratory Director

TESTMARK Laboratories Ltd.
Committed to Quality and Service

CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd. - Ottawa

Work Order Number: 454340

WORK ORDER RESULTS

Sample Description	BH05 - S05
Sample Date	1/31/2022 12:00 AM
Lab ID	1726096

General Chemistry	Result	MDL	Units	Criteria: [No Reg - Always Include Reg Report]
RedOx (vs. S.H.E.)	320	N/A	mV	~

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

MDL: Method detection limit or minimum reporting limit.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Quality Control: All associated Quality Control data is available on request.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

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6820 Kitimat Road Unit 4, Mississauga, ON, L5N 5M3
Phone: (905) 821-1112 Fax: (905) 821-2095 Web: www.testmark.ca

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

23-February-2022

Paracel Laboratories
Attn : Dale Robertson

300-2319 St.Laurent Blvd.
Ottawa, ON
K1G 4K6, Canada

Phone: 613-731-9577
Fax:613-731-9064

Date Rec. : 03 February 2022
LR Report: **CA12165-FEB22**
Reference: Project#: 2206241

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Sulphide (Na2CO3) %
1: Analysis Start Date		22-Feb-22
2: Analysis Start Time		22:13
3: Analysis Completed Date		23-Feb-22
4: Analysis Completed Time		09:52
6: QC - STD % Recovery		120%
7: QC - DUP % RPD		4%
8: RL		0.02
9: BH05-S05	31-Jan-22	< 0.04

RL - SGS Reporting Limit

Kimberley Didsbury
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002808302

Data reported represents the sample submitted to SGS. Reproduction of this analytical report in full or in part is prohibited without prior written approval. Please refer to SGS General Conditions of Services located at https://www.sgs.ca/en/terms-and-conditions (Printed copies are available upon request.)
Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
SGS Canada Inc. Environment-Health & Safety statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

Appendix B

Excess Soils Management Plan –
Proposed New CFI Facility, Queen's University
prepared by Malroz Engineering
dated June 28, 2022

Excess Soils Management Plan
In Support of Proposed New CFI Facility
Queen's University, Kingston, Ontario

Prepared for: Queen's University

June 28, 2022
File: 1591.00-101

Prepared by:
Malroz Engineering Inc.
308 Wellington St, 2nd Floor
Kingston, ON K7K 7A8

MALROZ

Excess Soils Management Plan
In Support of New CFI Facility
Queen's University, Kingston, Ontario

prepared for

Queen's University

File: 1591.00-101

Queen's University – 1 PDF copy
Malroz Engineering Inc. – 1 PDF copy

Malroz Engineering Inc.

NOTICE TO READER

This document contains the professional opinion of Malroz Engineering Inc. (Malroz), as to the matters set out herein, based on professional judgement and reasonable care. It is to be read in the context of the agreement (the Agreement) between Malroz and Queen's University (the Client), the methodology, procedures and techniques used, Malroz's assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should not be read or relied upon out of context.

Malroz has followed accepted methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgement and reasonable care, and is thus of the opinion that there is a high probability that actual geo-environmental conditions will fall within the predicted range. However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories, equipment suppliers etc.) upon which Malroz's opinions are based, have not been verified by Malroz; Malroz makes no representation as to their accuracy and disclaims all liability with respect thereto.

Malroz disclaims any liability to third parties in respect of the publication, reference, quotation, or distribution of this report or any of its contents and reliance thereon by any third party.

This page forms an integral part of this document and must remain with it at all times.

Respectfully submitted,

MALROZ ENGINEERING INC.

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1.0 Introduction

Malroz Engineering Incorporated (Malroz) is pleased to provide an Excess Soil Management Plan (ESMP) in support of the proposed Canada Foundation for Innovation (CFI) Facility at Queen's University in Kingston Ontario (the Project Area).

This ESMP has been prepared to support excess soil management in general accordance with the Ministry of the Environment, Conservation and Parks (MECP) Ontario Regulation (O. Reg.) 406/19, On-Site and Excess Soil Management. This regulation was introduced on December 4, 2019, by the MECP and specifies new requirements for the reuse of soil, including related Rules for Soil Management and Excess Soil Quality Standards (MECP, 2019), hereafter referred to as the "Soil Rules." Under the new Regulation and related Rules:

- As of January 1, 2021, most excess soil leaving the Project Area is designated as waste, unless the soil is beneficially reused in accordance with the specific requirements of the Regulation and Rules.
- Additional requirements came into effect for some sites on January 1, 2022, but were subsequently deferred to January 1, 2023, by O. Reg. 388/22. These requirements include the following:
    - Registration of the project as an excess soil source project on the Excess Soils Registry. Registration requires excess soil reuse planning activities to be completed including the preparation of an Assessment of Past Uses (APU), a Sampling and Analysis Plan (SAP), and an Excess Soils Destination Assessment Report (ESDAR).
    - Implementation of a tracking system in accordance with Part I, Section B5 of the Soil Rules.
- To be transferred to an offsite receiving site for beneficial reuse, excess soils must meet the applicable excess soil quality standards for the receiving site, and the beneficial reuse of the soil must be identified. Soils must be beneficially re-used within 2 years of the date of transfer.

Given that the proposed redevelopment is expected to begin in 2022, the January 1, 2021, requirements must be met for this project. Implementation of the components of the Regulation and Rules originally slated to come into force January 1, 2022, should be considered as a best management practice in 2022. It is our understanding that Queen's University intends to implement a tracking system ,as described in the Soil Rules, for the duration of the project (i.e. as a best practice in 2022 and as required in 2023). Registration of excess soil will be necessary after January 1, 2023 (unless the project is considered exempted under Schedule 2 of the regulation).

This ESMP summarizes the assessment of past uses, sampling and analysis plan, and soil characterization for the Project Area. The ESMP provides guidance to Queen's University (the Client) on soil management activities considering the new regulation and Soil Rules, subject to the scope and limitations referenced in the following sections of this document.

2.0 Description of the Project and Project Area

The Project Area (see Figure 1, Appendix A) is approximately 4,450 m^2, abutted by the Queen's University West Campus Storage building (also known as the "grounds maintenance building") to the north; Richardson Memorial Stadium to the south; Hargreaves Way to the east; and Stadium Lane to the west (Figure 1, Appendix A). Johnson Street is approximately 120 m north of the Project Area, and Sir John A. MacDonald Boulevard is approximately 210 m east of the Project Area (see Figure 1, attached).

We understand that the project will include the development of the Project Area to include the construction of a new proposed CFI facility and storage area. According to a concept site plan and details provided by the Client the development will include a slab on grade building with a footprint of approximately 160 m^2 as well as relocation of the east-west portion of Stadium Lane from the northern portion of the Project Area to the southern portion.

Excess soils will be generated from construction of the building and adjacent roadway. Excess soils generated from the Project Area may include fill and native materials from variable depths up to 5.5 meters below grade (mbg) based on observed depths of bedrock.

Based on the provided project details we understand that excess soil registration may be required (after January 1, 2023 implementation) in accordance with the regulation, as an excess of 2,000 m^3 of excess soil may be generated from the Project Area, therefore potential exemptions from registration under Schedule 2 of the regulation are not expected to apply. Registration is not required prior to January 1, 2023.

Where possible, soil generated during the work should be reused on-site to minimize the volume of excess soil generated from the project, if possible/practicable (e.g., if the requirements for material re-use as Engineered Fill can be met, and, for soils that exceed applicable environmental standards, if environmental risks can be adequately mitigated).

We understand that no change in property use (e.g. to a more sensitive land use) is contemplated for the Project Area, therefore a Record of Site Condition (RSC) has not been filed, nor is one intended to be filed. To our knowledge, no orders to remediate have been issued for the Project Area, nor are any instruments currently in place that govern excess soil management.

The setting of the Project Area is described in the following table.

Topography	Topography of the Subject Property is generally flat, sloping downward towards the west.

	Regionally the topography appears to slope downward south towards Lake Ontario.
Surface Run-Off	Limited surface water run-off is anticipated. Surface water runoff is inferred to infiltrate ground as the Project Area lacked impermeable surfacing with the exception of Stadium Lane which traverses northern portion of the Project Area. Any surface water that does not infiltrate ground is anticipated to flow west or southwest, consistent with site topography.
Surface Water	Surface water was not observed within the Project Area. Lake Ontario is approximately 950 m south of the Project Area
Geology	The Ontario Geological Survey (OGS, 2010a) characterized the bedrock geology of the area as Limestone, dolostone, shale, arkose, sandstone of the Ottawa Group, Simcoe Group, and/or Shadow Lake formations. The surficial geology (OGS, 2010b) is characterized as Palezoic bedrock of the Tweed formation. A single quaternary geologic unit (OGS, 2000) is located within and surrounding the Project Area consisting of undifferentiated carbonate and clastic sedimentary rock, exposed, or covered by a discontinuous, thin layer of drift. The drift cover is noted to consist of clay, silt, sand, gravel, and diamicton. The physiography of the area is described by Chapman et al. (2007) as limestone plains.
Utility Corridors	Utility corridors were identified through a Utilities Kingston Locate Sheet provided to Malroz on January 17, 2022. Based on the information provided by Utilities Kingston no utility corridors were identified on or under the Project Area, with the exception of a gas main traversing the southern portion of the Project Area. Utility corridors are a potential pathway for contaminant transport.
Groundwater Flow Direction	Regional shallow groundwater flow is inferred to be south towards Lake Ontario.

We understand that subsequent to the investigations completed for this ESMP portions of the Project Area have been used for access to and as a construction laydown area for the south adjacent development of a new pavilion at Richardson Memorial Stadium. This ESMP does not include evaluation of changes to the site following initiation of these activities.

3.0 List of Persons Involved in the Project

The following section identifies the project leaders, qualified persons, and other persons involved in the management plan for excess soils. Contractor and sub-contractor (where applicable) contacts should be added, when identified.

Jamie Thompson (Project Leader)
Senior Project Manager, Facilities
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payeur@malroz.com

4.0 Assessment of Past Uses

Malroz conducted an assessment of past uses for the Project Area, as a best management practice, and to support registration on the Excess Soils Registry (if required).

The assessment of past uses included a records review, interviews and site reconnaissance as summarized in the following sections. These activities were undertaken to assess for potential contaminating activities (PCAs) and evaluate for potential related areas of potential environmental concern (APECs) at the Project Area.

4.1 Records Review

The records review included the following tasks:

- Requesting site operating records and any prior reports for the Project Area;
- Commissioning a search for and reviewing fire insurance plans (FIP);
- Commissioning a search for and reviewing city directory records for the Project Area and surrounding sites;

- Commissioning a search for and reviewing chain of title records for the Project Area;
- Commissioning and reviewing a "standard" Environmental Risk Information Services (ERIS) report; and
- Reviewing historic aerial photos of the Project Area and surrounding area.

The APU for the site relied on documents and aerial photos obtained for the adjacent Richardson Memorial Stadium pavilion development as reported in our Excess Soil Management Plan (Malroz, 2021). These documents and photos have been attached to this report, as noted in the following sections.

4.1.1 Site Operating Records

The Client did not provide any operating records for the Project Area.

4.1.2 Previous Reports

Malroz was furnished with a Soil Quality Analyses report conducted by ASC (2015) on behalf of DBA Engineering Ltd. The report included analyses of soil sampling from borehole drilling at Richardson Stadium in 2014 and 2015. Results of the investigation identified metal and polycyclic aromatic hydrocarbon (PAH) contamination at one location (AP11-15) south of the Project Area, with the contaminated area inferred to extend onto the Project Area.

Malroz additionally undertook soil characterization to support development of a pavilion for Richardson Stadium in the area south and adjacent to the Site. Results of this investigation were reported in our Excess Soil Management Plan dated August 17, 2021 and identified additional metal (mercury) contamination in the area adjacent to the site.

These contaminated areas are depicted as PCA 1 in Figure 1, contributing to APEC A in Figure 2.

4.1.3 Fire Insurance Plans

Malroz retained ERIS to conduct a search of available Fire Insurance Plans (FIPs) for the Project Area and surroundings. ERIS subcontracted the search to Opta Information Intelligence Inc.

Opta reported that one FIP record was available for the surrounding area:

- The 1963 FIP sheets provided covered properties to the north and southwest of the Project Area. Both areas were illustrated as being residential in nature and occupied by single houses or apartments.

A copy of the Opta findings are provided in Appendix B.

4.1.4 City Directory Search

A city directory was requested from Environmental Risk Information Services (ERIS) for addresses for the Project Area and other nearby properties. The search included a review of available city directories approximately every five years between the years of 1950 and 2000 for the subject site (938 Johnson Street) and 9 neighbouring properties on Johnson Street, Hargreaves Way, Sir John A. MacDonald Boulevard, Union Street and Yonge Street. Results of the search are summarized as follows:

- Surrounding properties were generally listed as residential or institutional.
- One PCA was identified at civic address 169 Yonge Street which is listed as an auto body shop from the years 1979 to 2000, and as a garage in 1960 and 1967. However, given its location relative to the subject site (more than 600 m southwest), we do not consider this PCA to contribute to an APEC within the Project Area.

The city directory search results are including in Appendix C.

4.1.5 Chain of Title

A summary of the ownership (land title) from Crown to the present-day owner, based on a search of the land registry, was provided by ERIS. The land title search indicated that the Project Area was transferred from the Crown to Queen's University on April 6, 1964. The land title search results did not identify PCAs at the Project Area.

Title information is included in Appendix D.

4.1.6 ERIS Database Report

Malroz commissioned a standard ERIS report for the site which included a search of 60 private, provincial and federal databases within a 300 m search radius from the center of the subject site. The ERIS report is included in Appendix E. No records were located for the Project Area and 37 records were located for the surrounding 300 m. The following PCA was identified based on our review:

- Several ERIS database records indicated the presence of drums containing high-level PCBs in ballasts and low-level PCBs in soil between the years of 1998 and 2013, which were mapped by ERIS approximately 250 meters southeast of the Project Area.
    - Subsequent information provided by Queen's in an email from Sola Ashcroft , confirmed that PCB containing ballasts are stored in drums located in two shipping containers stored outside of the ground's maintenance building approximately 10 metres north of the Project Area (PCA 2, Figure 1). The shipping containers have a spill containment lip. Reportedly no spills have occurred. However due to the proximity of the

PCA to the Project Area it is considered to contribute to APEC B (Figure 2) at the Project Area.

4.1.7 Aerial Photographs

Aerial photographs were selected to span the period from the first available aerial photo to the most recent available aerial photo, for the purpose of identifying buildings and structures, PCAs and potential environmental concerns, over time.

A minimum of one photo was selected from each decade that had an available photo, with priority given to aerials with better resolution and to maintain a 10 year or less interval between aerial photos. Copies of obtained aerial images are included in Appendix F.

A summary of aerial photographs reviewed to evaluate the Project Area is tabulated in Table 1.

Table 1 - Aerial Photographs

Date	Source	Project Area	Neighboring Properties within 250m of Project Area
1953	City of Kingston GIS mapping application	The Project Area has evidence of fill placement/earth moving activities.	The property immediately east of the Project Area has evidence of fill placement/earth moving activities. The area surrounding the Project Area appears to be agricultural and residential land use. A roadway consistent with present-day Palace Road is observed east of the Project Area.
1957	City of Kingston GIS mapping application	The 1957 aerial image is generally consistent with the 1953 aerial image.	A roadway to the east of the Project Area consistent with present-day Yonge Street runs north to south along with an intersecting street consistent with present-day Forsyth Avenue are observed. Roadways consistent with present-day Oakridge Avenue and Gibson Avenue are observed east of the Project Area. Several buildings have been constructed along these roadways.
1970	City of Kingston GIS mapping application	The disturbed areas of fill placement/earth moving activities appear to have changed, indicating some site grading alternations have been made.	A building, consistent with the present-day Coastal Engineering Lab is observed north of the Project Area south of a roadway consistent with present-day Johnson Street. Significant groundworks and potentially fill placement is evident across the area south of the Project Area. East to Northeast of the Project Area a roadway consistent with present day Sir John A

Date	Source	Project Area	Neighboring Properties within 250m of Project Area
			MacDonald Boulevard is observed connecting to Palace Road.
1978	City of Kingston GIS mapping application	The 1978 aerial image is generally consistent with the 1970 aerial image with the exception of a roadway consistent with present-day Stadium Lane traversing the northern portion of the Project Area. Some additional changes to the areas of fill placement/earth moving activities are also observable.	The 1978 aerial image shows significant changes at adjacent properties from the 1970 image. There now appears to be a recreational facility south of the Project Area (oval track with a field the center and rectangular structures to the east and west. Properties further south are developed with large residential and commercial/institutional buildings (Queen's residences and faculty of education buildings). An additional building is evident south of the Queen's Coastal Engineering Lab, consistent with the present-day Queen's West Campus Storage building. Two additional roadways are also observed surrounding the Project Area Stadium Lane to the west and, Hargreaves Way to the east. A small connecting pathway is also observed south of the Project Area.
1990	City of Kingston GIS mapping application	The 1990 aerial image is generally consistent with the 1978 aerial image with the exception of several trees present along the southern boundary of Stadium Lane.	The 1990 aerial image is generally consistent with the 1978 aerial image with the exception of a recreational facility east of the Project Area (rectangular field with painted markings) as well as a baseball diamond to the south of the Project Area.
2008	City of Kingston GIS mapping application	The 2008 aerial image is generally consistent with the 1990 aerial image.	The 2008 aerial image is generally consistent with the 1990 aerial image with the exception of two additional parking lots, the first observed east of the aforementioned rectangular athletic field and the other east of the oval track.
2018	City of Kingston GIS mapping application	The 2018 aerial image is generally consistent with the 2008 aerial image.	The 2018 aerial image shows significant changes to the stadium facility located south of the Project Area from the 2008 image, and it appears to be in its present-day configuration. The present-day seating area along the west, east and south of the stadium are evident. temporary buildings that are currently present at the site are visible to the west

Date	Source	Project Area	Neighboring Properties within 250m of Project Area
			of the stadium. The structures to the east of the stadium have been re-developed to include the present-day seating area.

The historical importation of fill onto the Project Area is considered a PCA (see PCA 3, Figure 1, Appendix A) contributing to APEC C (Figure 2, Appendix A).

4.2 Site Reconnaissance

A non-intrusive site reconnaissance visit was completed during the excess soil characterization performed by Malroz on April 9, 2021. The site visit included a visual inspection of the Project Area and publicly accessible surrounding properties. The following PCAs were identified during the site visit:

- Two above ground storage tanks (ASTs) containing bulk petroleum products were observed at the West Campus Storage building, located approximately 5 m north of the Project Area (PCA 4, Figure 1) due to its proximity to the Project Area this PCA is considered to contribute to APEC D.
- Fill/vent pipes were observed at the exterior a limestone building located approximately 250 m southeast of the Project Area suggesting current or historic oil use (PCA 5, Figure 1).
- A pad mounted transformer was observed within the stadium facilities compound, approximately 200 m south of the Project Area (PCA 6, Figure 1).

Additional site reconnaissance conducted during the geotechnical investigation and soil characterization programs on January 31 and February 1, 2022 confirmed no significant deviations from our previous observations.

General	The Project Area comprises a vacant parcel of land covered in vegetation, grass, shrubs and trees. Stadium Lane traverses the northern portion of the Project Area. The portion of the Project Area occupied by Stadium Lane is at a lower elevation that the remainder of the Project Area.
Topography	The Project Area is generally flat however it is elevated compared to the portion of the Project Area occupied by Stadium Lane. The elevation slopes slightly upwards towards the east.
Ground cover	The Project Area was generally snow covered with the exception of Stadium Lane with some trees and shrubs observed along the north east and western extents.

Parking Facilities and Right of Ways	No parking facilities were observed on the Project Area during site reconnaissance. Stadium lane was observed traversing the northern portion of the Project Area.
Wells	Wells were not observed on the Project Area during site reconnaissance.
Stressed Vegetation	Stressed vegetation was not observed during site reconnaissance although the ground could not de adequately assessed due to snow cover.
Stained Soil, Vegetation or Pavement	Stained soil was not observed during site reconnaissance although the ground could not de adequately assessed due to snow cover.
Fill	Fill was not observed during site reconnaissance.
Utilities	No services or utilities were observed on the Project Area during site reconnaissance with the exception of a gas main traversing the southern portion of the Project Area.
Odours	No unusual odours were noted during site reconnaissance.
Storage Tanks, Drums, and Pails	No storage tanks or drums were observed on the Project Area during site reconnaissance. However, as noted above, ASTs were observed at the adjacent West Campus Storage building.
Hazardous Materials	No hazardous substances were identified during site reconnaissance.
Unidentified Substances	Unidentified substances were not observed during site reconnaissance.
Pits and Lagoons	Pits and lagoons were not observed during site reconnaissance.
Watercourses, Ditches or Standing Water	No watercourses ditches or standing water were identified during site reconnaissance.

Surface water Management	No engineered surface water management features were observed within the Project Area. Precipitation is inferred to infiltrate into the ground as the Project Area lacked impermeable surfacing and was relatively vegetated with the exception of Stadium Lane. Any surface water that does not infiltrate ground is anticipated to flow west or southwest, consistent with site topography.
Railway Lines	There were no railway lines observed within the Project Area.

Surrounding land use observed during site reconnaissance is described with respect to true north and included:

North	The Queen's Grounds building was observed to the north, followed by the Queen's Coastal Engineering Lab, then Johnson Street. Beyond Johnson Street a residential neighborhood was observed.
South	Richardson Memorial Stadium was observed south of the Project Area, further south a recreational field was observed as well as Queen's residence buildings.
East	The Project Area is bounded by Hargreaves Way to the east. Two recreational fields were observed east of Hargreaves Way, followed by a gravel parking area and Sir John A. MacDonald Boulevard. Beyond Sir John A. MacDonald Boulevard, a residential neighborhood was observed.
West	The Project Area is bounded by stadium Lane to the west. Beyond Hargreaves Way, a residential neighborhood was observed.

4.3 Interview

Malroz conducted interviews with personnel deemed to have knowledge of current and/or historical site operations by the Client for the August 2021 Excess Soil Management Plan for the Richardson Stadium Pavilion. The following are summaries of the conducted interviews.

An interview was conducted with Duane Parliament, an employee with Queen's University facilities management on May 26, 2021 via telephone. Mr. Parliament was an employee with Queen's in the Athletics department for approximately 20 years and has been with facilities management for 3 years. The following PCAs were identified from the interview:

- Importation of fill materials may have occurred during the redevelopment of Richardson Stadium in 2015-2016 (PCA 7, Figure 1).

- Oil changes on stadium maintenance equipment occur within the mega dome building at the southwest corner of the stadium compound (PCA 8, Figure 1).
- Stadium buildings were heated by oil in the past (confirmed by a follow-up email from Sola Ashcroft including mechanical drawings from 1971) (PCA 9, Figure 1).

These PCAs are not considered to contribute to APECs in the Project Area, as they are located downgradient.

An interview was conducted with Matthew Barrett, grounds master for Queen's University at the time of the interview, on May 31, 2021 via telephone. Mr. Barrett had been the grounds manager since 2012 and managed the grounds maintenance building located north of the Project Area. The following PCAs were identified from the interview:

- The building facilitates vehicle maintenance on the lawn cutting and snow removal equipment including oil changes (PCA 10 contributing to APEC D, Figures 1 and 2) and there is a paint booth located inside the ground maintenance building. The building was re-developed in 2015-2016 and included the installation of a trench drain system and oil water separator (OWS) this PCA may contribute to APEC D.
- There are two approximately 2000 L ASTs located at the south exterior of the building containing dyed diesel and gasoline (PCA 4 contributing to APEC D, Figures 1 and 2).
- There are two shipping containers stored at the west exterior of the building that contain PCB containing ballasts (PCA 2 contributing to APEC B, Figures 1 and 2).

Mr. Barrett was contacted via telephone on March 2, 2022. Mr. Barrett confirmed the accuracy of the above noted information.

4.4 Summary of Assessment of Past Uses

Based on the identified information, five PCAs were identified as contributing to APECs within the Project Area as summarized in the preceding sections, Figure 2 (Appendix A), and in the Table 2 (below). Some offsite PCAs were identified within the study area but were not considered to contribute to an APEC.

Our interpretations with respect to APECs are based on professional judgement, consideration of the type and quantity of contaminants of potential concern, distance from the Project Area, potential transport pathways and/or due to their location with consideration to the inferred shallow groundwater flow direction south.

Should new information not discussed in this report, become available, our conceptual understanding of PCAs and APECs should be reviewed and revised as necessary.

Table 2 – Summary of Identified APECs

PCA Reference Number (PCA ID on Figure 1)	Area of Potential Environmental Concern (APEC ID on Figure 2)	Location of Area of Potential Environmental Concern	Description	Potentially Contaminating Activity[1]	Location of Potentially Contaminating Activity	Contaminants of Potential Concern
1	**A**	Southern portion of Project Area	Contaminated fill identified during 2015 and 2021 investigations.	Known and inferred soil contamination	Adjacent south of Project Area, and inferred as extending into the southern portion of the Project Area	Metals and PAHs
2	**B**	Northwestern corner of Project Area	Interviews identified PBC containing ballasts stored in drums in 2 shipping containers adjacent to the West Campus Storage building	PCB containing ballasts stored in drums	10 m north of Project area	Polychlorinated biphenyls (PCBs), petroleum hydrocarbons (PHCs), PAHs and metals
3	**C**	Entire Project Area	Historical review and interviews identified potential fill placement in the Project Area	#30 Importation of Fill Material of Unknown Quality	Entire Project Area	PHCs; benzene, toluene, ethylbenzene, and xylenes (BTEX); PAHs; metals; electrical conductivity (EC); sodium adsorption ratio (SAR)
4	**D**	Northern portion of Project Area	Interviews and site reconnaissance identified two ASTs containing petroleum products	#28 Gasoline and Associated Products Storage in Fixed Tanks	5 m north of Project Area	PHCs, BTEX, PAHs
10	**D**	Northern portion of Project Area	Interviews identified that vehicle maintenance is performed within the ground maintenance building	#52 Storage, maintenance, fueling and repair of equipment, vehicles, and material used to maintain transportation systems	10 m north of the Project Area	PHCs, BTEX, PAHs, metals

[1] As defined in Schedule D, Part VI, Table 2 of O. Reg. 153/04, as amended

5.0 Sampling and Analysis Plan

A sampling and analysis plan (SAP) was developed to support the management of excess soils that may be generated from the Project Area during the proposed construction of the CFI building. The SAP included an in-situ soil characterization program and may also include further in situ or ex situ soil characterization if further assessment of soil quality is required at a later date.

5.1 In-Situ Characterization

The SAP included an assessment of soils via borehole sampling within the Project Area to provide a general assessment of the anticipated locations of excess soils that will be generated from across the Project Area. This approach was intended to provide a broad assessment of APEC C (imported fill of unknown quality). Additional sampling locations (BH02, BH03 and BH14-BH16) were targeted to characterize soil near the contaminated areas previously identified south of the Project Area by ASC and Malroz (APEC A), and to characterize the soils within APECs B and D (BH08-BH10).

A total of 17 boreholes, identified as BH01 through BH17; including three probe holes, identified as BH11 to BH13, were advanced in conjunction with geotechnical investigation program to obtain soil samples within the Project Area on January 31 and February 1, 2022. Boreholes BH14 to BH17 were advanced on April 4, 2022. Boring was conducted by G.E.T. Drilling Limited using a track mounted CME-55 drill rig, equipped with continuous flight augers and split spoon samplers. Boreholes were advanced to refusal. Soil types observed during the drilling generally consisted of the following:

- topsoil,
- asphalt (along Stadium Lane),
- fill, ranging from sand and gravel to silty clay,
- native soil, ranging from clayey sandy silt to silty clay, and
- limestone bedrock.

Soil samples were screened for potential contaminants by measuring vapours using an RKI Eagle combustible gas indicator (CGI) and photoionization detector (PID) primarily to help in the selections of "worst case" conditions from each borehole and achieve geographic coverage of the Project Area. Soils were also screened for contamination based on visual and olfactory observations. Related observations are recorded in Table H1 (Appendix H) and on the borehole logs (Appendix G).

Soil samples were collected in laboratory provided containers and kept cool until submitted to the laboratory. Samples collected for analysis of VOCs were preserved in the field using vials containing methanol that was pre-filled and supplied by the laboratory. Sampling equipment was decontaminated between sample locations.

Duplicate samples were collected for analysis at a rate of approximately 10% for quality assurance/quality control (QA/QC).

A minimum of one soil sample from each borehole (excluding probeholes) was
Soil analyses were submitted to Paracel Environmental Laboratories for analysis of contaminants of potential concern (COPCs) commonly associated with fill material of unknown quality, the PCAs/APECs identified in Table 2, including: petroleum hydrocarbons (PHCs), benzene, toluene, ethylbenzene, and xylene (BTEX); polycyclic aromatic hydrocarbons (PAHs), metals, electrical conductivity (EC), and sodium adsorption ratio (SAR). Samples from BH9 and BH10 were submitted for additional analysis of PCBs, a COPC related to APEC B. Select samples were also submitted to assess soil pH within the Project Area. Additional analysis of PHCs, metals, and PAHs was conducted for select samples to delineate or further assess for impacts related to PHC, metals, and PAHs.

Leachate analysis (e.g., using modified synthetic precipitation leaching procedure, mSPLP) are required under the Soil Rules in some circumstances, including where soils may be reused at a site where the "Table 1" background excess soil quality standards are applicable (as referenced in section 5.2, below) and to meet the volume independent excess soil standards for certain COPCs. However, mSPLP analysis is not anticipated to be required for excess soil from this project, as soils from the project are generally not expected to be suitable for beneficial reuse at sites where the "Table 1" standards would apply, and parameters otherwise requiring leachate analysis met the "Table 1" standards or were not considered a COPC where they exceeded the "Table 1" standards.

Waste characterization analyses were conducted to support potential disposal of soils from the Project Area. One sample from BH05 was analyzed by Paracel metals parameters using the toxicity characteristic leaching procedure (TCLP).

5.2 Additional Characterization

If additional soil characterization is determined to be required, additional in situ soil sampling can be conducted prior to or during the project. Alternatively, ex situ characterization may be conducted as prescribed by the Soil Rules from soils stockpiled within the Project Area.

6.0 Soil Characterization Summary

Sample locations from the Project Area and analytical results for analyzed parameters are summarized in Figure 3, Appendix A. Results of soil sample analyses are summarized in Table H2, Appendix H. Laboratory certificates of analysis are enclosed in Appendix I.

Applicable environmental standards were selected by referencing the excess soil quality standards published by the MECP in the Soil Rules, pursuant to O. Reg. 406/19. Potential excess soil reuse sites have not been identified. However, based on

anticipated property uses for potential reuse sites, sample results were compared to the following standards:

- "Table 1" background standards for residential/parkland/institutional/industrial/ commercial/community property use,
- "Table 2.1" volume independent standards for residential/parkland/institutional (R/P/I) property use, and
- "Table 2.1" volume independent standards for industrial/commercial/community (I/C/C) property use.

In general, "Table 2.1" I/C/C standards are the least stringent of the foregoing standards, and the "Table 1" standards are the most stringent. Once one or more reuse sites have been identified, the Project Leader must confirm appropriate reuse standards in consultation with a QP. This may require comparison of data to additional/alternate reference standards.

Soil analytical results for the Project Area are compared to the volume independent standards in Figure 3 (Appendix A) and Table H2 (Appendix H). In summary, results generally met the "Table 2.1" I/C/C and R/P/I standards with the following exceptions:

- Samples BH02-S03, BH03-S01 and BH07-S04 exceeded the "Table 2.1" R/P/I and/or I/C/C standards for barium, cobalt and/ or vanadium. These exceedances are expected to be related to naturally elevated background concentrations of specific metals based on a regional study of similar soils from the Champlain Sea deposits (Geofirma, 2017). Results are less than the proposed geo-regional background values from this study.
- Samples BH05-S02 and BH10-S02 exceeded the "Table 2.1" R/P/I and I/C/C standard for lead.
- Sample BH08-S01 exceeded the "Table 2.1" R/P/I standards for PHC F2.
- Samples BH08-S01, BH09-S04/S05, and BH10-S03 exceeded the "Table 2.1" R/P/I and/or I/C/C standards for EC and/ or SAR. These impacts are expected to be related to de-icing salt application on the roadways.

Various "Table 1" exceedances were also identified within the Project Area, however, these results are not discussed in detail as excess soils are generally not expected to be suitable for reuse at sites where these standards would be applicable without further consideration.

Based on the analytical results, the following soil management cells were delineated:

- **Cell A**: Results from various sample locations met the "Table 2.1" R/P/I and I/C/C standards except for naturally elevated background concentrations of barium, cobalt and/or vanadium.

- **Cell B**: Results from various sample locations met the "Table 2.1" I/C/C and R/P/I standards, except for naturally elevated background concentrations barium, cobalt and/or vanadium. Results also exceeded the "Table 2.1" R/P/I and/or I/C/C standards for EC and/or SAR, which are expected to be related to de-icing salt application on the roadways. This cell is inferred to extend along the west side of the Project Area along Stadium Lane, given anticipated de-icing salt application along this lane.
- **Cell C**: Shallow soil from BH08 exceeded the "Table 2.1" R/P/P standard for PHC F2 at a depth of up to 1.5 mbg. Soil also exceeded the "Table 2.1" R/P/I and I/C/C standards for EC and SAR.
- **Cell D**: Shallow soil from BH05 and BH10 exceeded the "Table 2.1" R/P/I and I/C/C standards for lead. These exceedances are inferred to extend from surface to a depth of 1.1. to 1.5 mbg.

Malroz did not complete the modified synthetic precipitation leaching procedure (mSPLP) based on assessed parameters meeting the Table 1 "Background" site condition standards, and/or not having a leachate screening value (e.g. lead, PHC F2).

Results from TCLP waste characterization analyses for BH05-S02 (provided in Appendix H) met Schedule 4 of Regulation 558, indicating that contaminated soil may be considered non-hazardous waste.

6.1 QA/QC

Two duplicate samples were submitted to Paracel for the suite of analyses described in Section 5.1. Duplicate sample results generally showed reasonable agreement for the analyzed parameters. Based on our evaluation of the duplicate results, we are of the opinion that the results of sampling may be relied upon.

7.0 Preliminary Excess Soil Destination Assessment

The MECP encourages beneficial reuse of the excess soil "in a manner promoting sustainability and protection of the environment," wherein excess soils will be reused at the receiving site for a specific purpose and within a specific timeframe (e.g., two years). Beneficial reuse must be undertaken in a manner protective of human health and the environment.

Soil reused with the Project Area is not considered excess soil as it relates to the new regulation and Soil Rules. Reuse of soils within the Project Area that exceed the "Table 2.1" I/C/C standards should be reviewed by Malroz (or an alternate QP) to confirm that risk of potential adverse impact to human health and the environment has been appropriately managed.

Prior to moving excess soil, the Project Leader must obtain written consent from the owner or operator of the reuse site for the deposition of excess soil from the Project

Area at the reuse site. The consent should identify the quantity and quality of excess soils to be shipped to the reuse site is acceptable.

Additionally, if the project requires registration (e.g. after January 1, 2023), a final excess soil destination report will be required in accordance with the requirements outlined in the Soil Rules Part I Section B 4.

7.1 Soil Management Options and Recommendations

To support excess soil management, the inferred soil management areas represented by the borehole samples are depicted in Figure 3, Cells A to D2.

Contaminated soil areas were inferred to be contiguous to the next nearest sample location that met the standards. An assessment of management options for each soil cell is provided in the discussion below.

- **Cell A:** Excess soil generated from Cell A is expected to be suitable for reuse off-site where "Table 2.1" R/P/I or I/C/C standards apply in accordance with requirements for soils with naturally occurring elevated background concentrations of certain metals per Soil Rules Part I Section D 2. (3).
- **Cell B:** Excess soil generated from Cell B is expected to be suitable for off-site where "Table 2.1" R/P/I or I/C/C standards apply, in accordance with requirements for salt-impacted soils per Soil Rules Part I Section D 1. (3) and requirements for soils with naturally occurring elevated background concentrations of certain metals per Soil Rules Part I Section D 2. (3).
- **Cell C:** Excess soils generated from Cell C to a depth of 1.5 mbg is expected to be suitable for reuse off-site where "Table 2.1" I/C/C standards apply in accordance with requirements for salt-impacted soils per Soil Rules Part I Section D 1. (3) and requirements for soils with naturally occurring elevated background concentrations of certain metals per Soil Rules Part I Section D 2. (3). Excess soil generated from below 1.5 mbg may be considered part of Cell B.
- **Cell D:** Excess soil generated from Cell D to a depth of 1.5 mbg exceeds "Table 2.1" I/C/C standards for lead and therefore will likely <u>require management within the Project Area under specific conditions or may require disposal at a landfill or a facility licensed to accept waste</u>. Excess soil generated from below 1.5 mbg may be considered part of Cell B.

Soils from each of these cells may be suitable for beneficial reuse where other excess soil quality standards apply (e.g., sites with a site-specific instrument, or where the Beneficial Reuse Assessment Tool has been used to develop site specific standards), provided that the analytical results meet the applicable standards for the reuse site, as determined by a Qualified Person, QP, based on the regulation and related Rules. The project leader and contractor must ensure that excess soils are adequately represented by the samples as identified in the above soil management cells and ensure that soil

types and conditions are consistent with the observations provided in this ESMP document.

Any beneficial reuse sites receiving soils from the Project Area should be provided with this ESMP. The reuse site should retain a QP to review the results of this report to confirm that they meet the excess soil quality standards that are applicable at the reuse site, and that the quantity of soil to be received from the Project Area meets the limits for the reuse site. As a best management practice, the reuse site should also have a fill management plan prepared by a QP. Reuse sites other than those discussed above may be considered appropriate (e.g., sites with a site-specific instrument, or where the Beneficial Reuse Assessment Tool has been used to develop site specific standards) if soils meet the applicable excess soil quality standards for the reuse site as confirmed by a QP.

The approximate inferred area of Cells A, B, C, and D are summarized in Table 3, below. The volume of soil to be excavated from each cell is expected to vary significantly based on the depth to bedrock and extent of excavation required for the development.

Table 3 – Soil Management Cell Summary

Soil Management Cell	Approx. Area (m^2)
A	4,000
B	2,800
C	700
D	1,000

Input: JeMP
Validation: DH

Based on the number of samples collected from Cells A and B and C, the volume of excess soil anticipated to be supported for reuse under the soil characterization program reported in this ESMP may be up to 2,800 m^3.

7.2 Other Soil Management Considerations

Appropriate erosion and sediment control and dust mitigation measures should be implemented while undertaking work. These measures may include (but are not limited to) provision of erosion controls in accordance with OPSS 805 and following guidelines of the MTO Drainage Management Manual - Erosion and Sediment.

Contractors employed at the site should develop and implement health and safety practices for handling soils, including protection from inhalation (dust) and ingestion. Typically, these protections include proper personal protective equipment (e.g. "Level D" protection) and sanitation practices (e.g. hand washing).

7.3 Contingency Plan

If excess soils are not beneficially reused, they should be disposed of as waste at a licensed non-hazardous waste disposal facility.

If soil loads are rejected by a reuse site (e.g. because they are determined to differ from what was reported) they should either be diverted to a licensed non-hazardous waste disposal facility for disposal as waste, or returned to the Project Area and segregated in a stockpile for further assessment by Malroz or an alternate QP.

8.0 Tracking System

A tracking system should be established, as required by Queen's University, and to support registration (if required) of the project after January 1, 2023.

The tracking system is intended to ensure the implementation of the following items:

- Excess soil is appropriately segregated and stockpiled (where necessary) at the designated area (e.g., within the Project Area).
- Excess soil is adequately represented by the results of soil characterization from this report, or are subject to additional characterization, as further discussed in Section 5.
- Excess soil is transferred to an appropriate receiving site or disposed of appropriately and is not hauled to an inappropriate/unintended site.
- Any hazardous or other non-soil waste (e.g., wood waste, concrete, asphalt, metal debris) is segregated and appropriately disposed in a separate waste stream.
- Keep records of the time of departure, volume, quality (source within Project Area) and destination of each load of excess soil.
- Produce a hauling record.
- Track the volume and source of exported soil.

A hard copy hauling record form developed by the Ontario Environment Industry Association is enclosed in Appendix J. Alternatively a digital tracking system may be implemented, as there are a number of commercial service providers.

Tracking forms or other records should be maintained by the contractor, with input from representatives of the source site (the Project Area) and the reuse site, as required. Tracking forms and other records of excess soil management must be provided to the Client by the contractor upon request.

9.0 Procedures if Certain Observations Made

Throughout the work, contractor(s) should take all necessary precautions to keep soil separated from asphaltic materials and any other non-soil materials encountered during the work.

If evidence of contamination is encountered during excavation (e.g., stained or discoloured earth, garbage or waste, oily residue on soils, drums or containers, sheen/product/film, cinders/ash, etc.), excavation activities must be halted and the contract authority should be immediately notified so that soils may be re-evaluated by a QP (e.g. Malroz).

Soils that are not considered to be represented by the sampling program may be stockpiled on-site for further environmental testing to determine appropriate management options in accordance with this excess soil management plan. If evidence of contamination is encountered, appropriate efforts should be undertaken to mitigate potential contaminant migration from erosion or sedimentation, including but not limited to covering stockpiles with an impermeable barrier (e.g., polyethylene sheeting). Sampling of stockpiled soils should be conducted under the supervision of a QP.

10.0 General Conditions and Limitations

This report was completed for the specific needs of Queen's University (the Client) and is based on a specific scope of work which is defined in the mutually agreed upon workplan (dated January 6, 2022) and subsequent amendments (e-mails dated February 14 and March 17, 2022). The scope of work has limitations as described throughout the report and in the notice to reader. Data, tables, charts, and interpretive illustrations presented in this document are instruments of service for this mandate and can only be properly evaluated when reviewed together with the accompanying report. Reference to this report should only be made to the complete signed document.

The work performed in this report was carried out in accordance with the terms and conditions made as a part of our proposal and/or contract pursuant to which this report was issued, in a manner consistent with that level of care and skill ordinarily exercised by members of the environment profession currently practicing under similar conditions in the same locality. The conclusions presented in the report are based solely upon the scope of services, governed by the time and budgetary considerations to which this work was subject.

The factual data, recommendations and comments in this report pertain to the specific project as described in the report and are not applicable to any other project, location, or portions of the subject property. If the project is conceptually modified or changes location, or if it is not initiated within twelve months of the date of this report, Malroz should be given an opportunity to confirm that the information in this report is still valid and/or applicable.

This report must be read as a whole, as sections taken out of context can be misleading. Drafts and working copies, whether or not marked as "draft", "for discussion purposes" or otherwise, do not necessarily reflect Malroz's final opinion following consideration of all matters which are subject to the study giving rise thereto; they are issued for comment and information purposes only, and are subject to change and should not be relied upon in any way or for any purpose.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based solely on the results obtained at the test pit locations only. Soil conditions between and beyond the borehole locations may differ both horizontally and vertically from those encountered at the borehole locations and may become apparent during construction, which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found during this investigation, we request that we be notified immediately in order to permit a reassessment of our comment and recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by Malroz has been completed.

11.0 Closing

We trust that this report meets your present requirements. Please do not hesitate to contact us should there be any further questions or comments.

Respectfully Submitted,

Malroz Engineering Inc.,

LICENSED PROFESSIONAL ENGINEER
D. W. HODGSON
100206802
2022-06-28
PROVINCE OF ONTARIO

per: Jessie Payeur, E.I.T.
Environmental Specialist

reviewed: David Hodgson, P.Eng., QP
Senior Environmental Engineer

12.0 References

Chapman, L. J., and Putnam, D., F. (2007). *Physiography of Southern Ontario*, Ontario Geological Survey, Miscellaneous Release Data 22

Geofirma Engineering Ltd. (2017), *Elevated Background Metals Concentrations in Fine-Grained Champlain Sea Deposits, Eastern Ontario - Ottawa Region*.

Malroz Engineering Inc. (2021). *Excess Soils Management Plan, Proposed Richardson Stadium Pavilion, Kingston, Ontario.* August 17, 2021. File: 1489.00-102.

Ministry of Environment Conservation and Parks (2019). *Environmental Protection Act, Ontario Regulation 406/19, On-Site and Excess Soil Management, Environmental Protection Act, R.S.O. 1990, c. E.19*

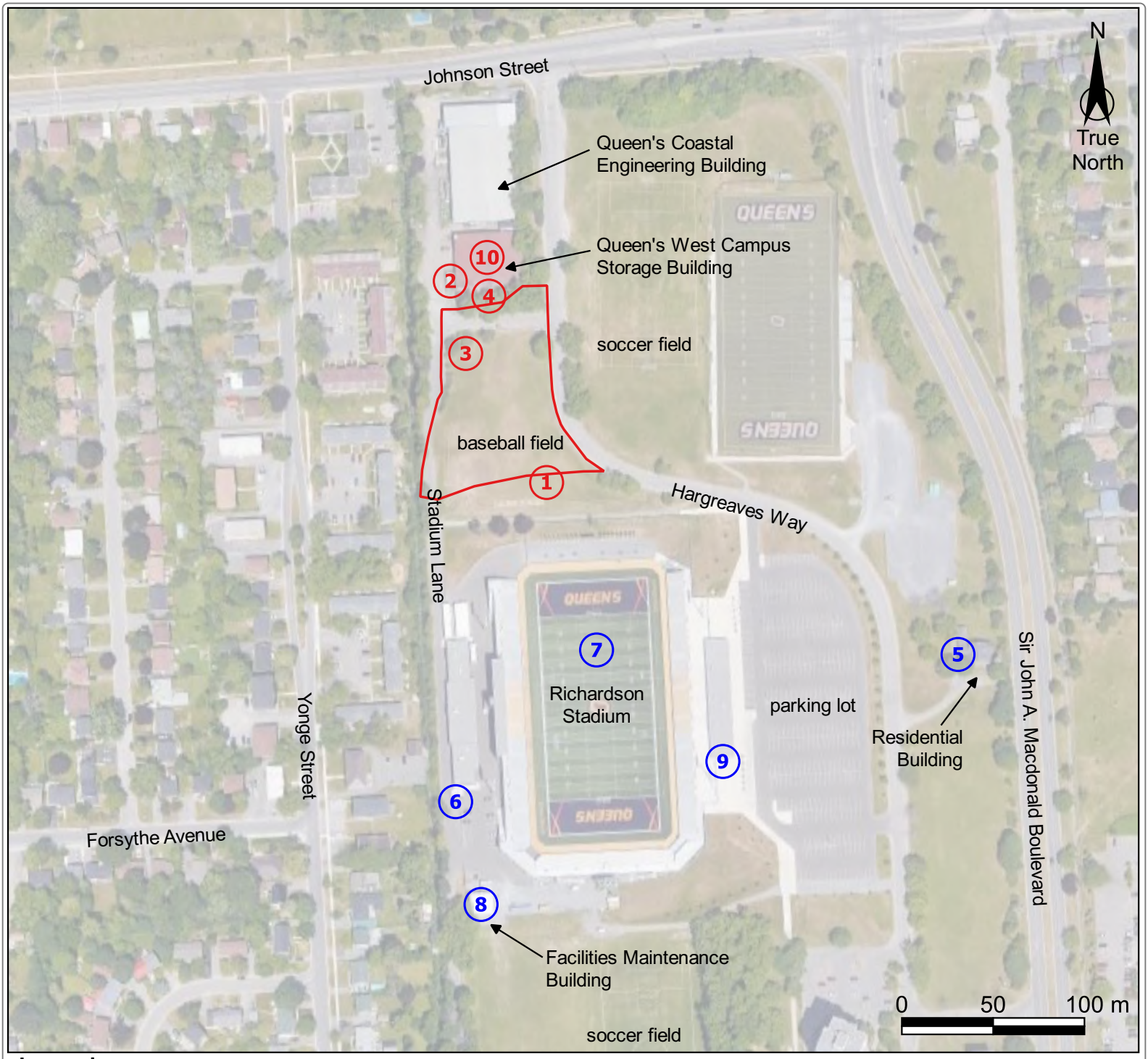
Ministry of Environment Conservation and Parks (2011). *Environmental Protection Act, Ontario Regulation 153/04, Records of Site Condition, Part XV.I of the Act*

Ministry of Environment Conservation and Parks (2022). *Rules for Soil Management and Excess Soil Quality Standards*

Ontario Geological Survey (2000). *Quaternary geology of Ontario*, Data Set 14 (Revised)

Ontario Geological Survey (2010). *Bedrock geology of Ontario*; Ontario Geological Survey. Miscellaneous Release Data 126 revisions 1, scale 1:250,000.

Appendix A
Figures



Legend

approximate Project Area | PCA contributing to an APEC | PCA not contributing to an APEC

PCAs and Other Concerns Contributing to APECs

1 - contaminated fill identified during prior investigations (ASC, 2015 & Malroz, 2021)
2 - presence of PCB storage facility
3 - potential fill placement on site during site development activities
4 - bulk storage of petroleum products in ASTs
10 - maintenance and repair of equipment and bulk storage of petroleum products

PCAs and Other Concerns Not Contributing to APECs

5 - observed fill/vent pipes and inferred bulk storage of petroleum products
6 - presence of electrical transformer and inferred PCB use
7 - potential importation of fill of unknown quality during development
8 - location of maintenance equipment repair garage
9 - historical storage of heating oil

Data Sources: Figure based on Malroz field observations and Google Earth imagery.

Rev	Date	Description	By	Chkd
R0	2022-02-24	issued in final	JeMP	RB

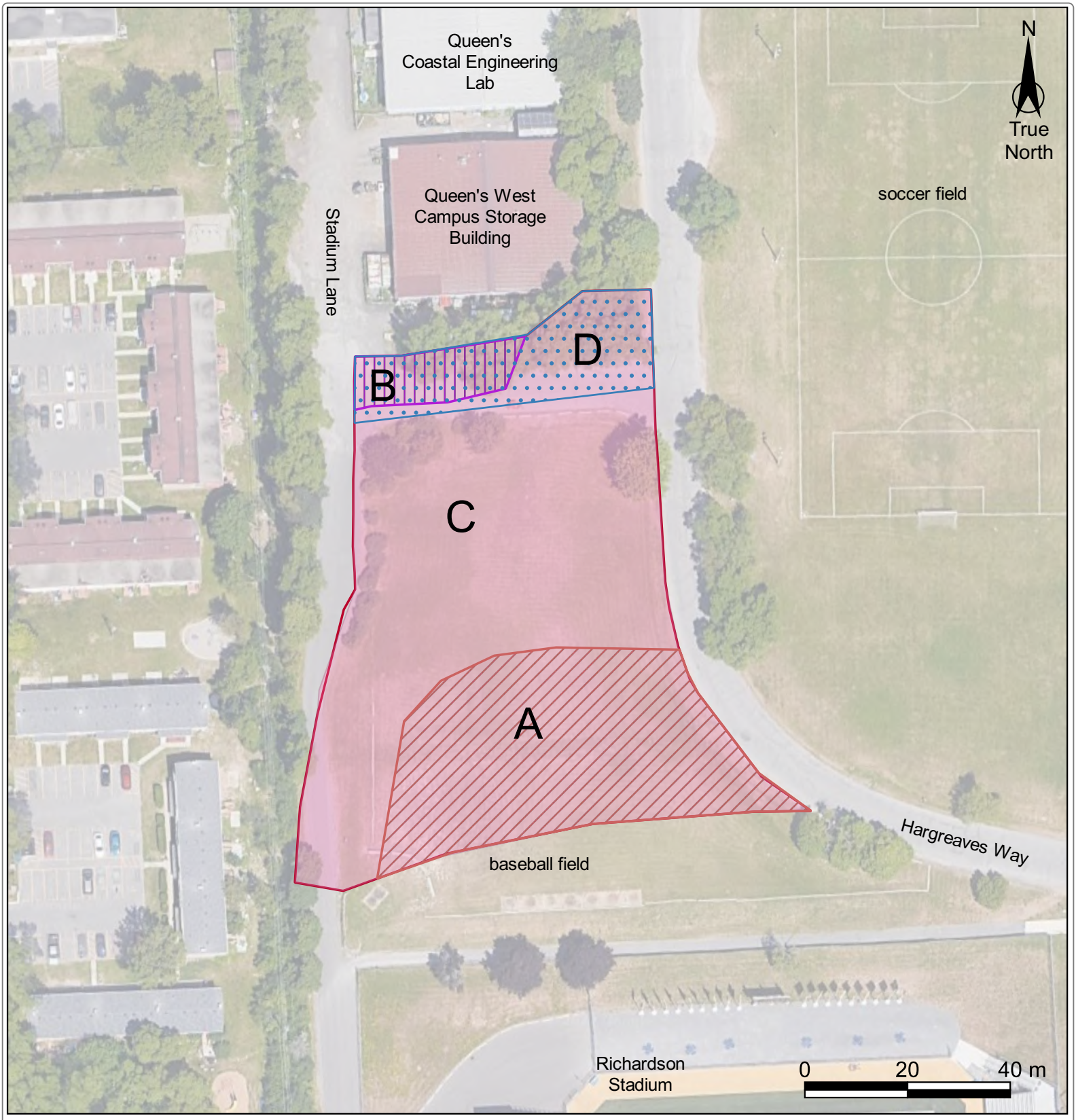
Site Location Plan and Potentialy Contaminating Activities

Excess Soil Management Plan
Proposed New CFI Facility
Queen's University, Kingston, ON

File: 1591.00-101

Figure 1

MALROZ



Legend

- approximate Project Area
- A — Potential contaminated soil inferred from prior investigations (ASC, 2015 & Malroz, 2021)
- B — Storage of PCB wastes adjacent to the Project Area
- C — Potential importation of fill material of unknown quality from prior site activities and during site development
- D — Storage of bulk PHC products and equipment repairs/ maintenance adjacent to the Project Area

Data Sources: Figure based on Malroz field observations and Google Earth imagery.

Rev	Date	Description	By	Chkd
R0	2022-02-24	issued in final	JeMP	RB

Areas of Potential Environmental Concern

Excess Soil Management Plan
Proposed New CFI Facility
Queen's University, Kingston, ON

File: 1591.00-101

Figure 2

MALROZ

Legend

- approximate extent of project area
- soil sample location meets MECP Table 1 standards for R/P/I/I/C/C property use
- soil sample location exceeds MECP Table 1 standards for R/P/I/I/C/C property use
- soil sample location exceeds MECP Table 2.1 standards for R/P/I property use
- soil sample location exceeds MECP Table 2.1 standards for I/C/C property use
- environmental soil samples not collected
- **A** Excess soil suitable for reuse off-site where MECP Table 2.1 R/P/I or I/C/C standards apply with similar background conditions.
- **B** Excess soil suitable for reuse off-site where MECP Table 2.1 R/P/I or I/C/C standards apply with similar background conditions and subject to salt impacted requirements.
- **C** Excess soils to a depth of 1.5 mbg suitable for reuse off-site where MECP Table 2.1 I/C/C standards apply with similar background conditions and subject to salt impacted requirements. Excess soil from below 1.5 mbg may be considered Cell B.
- **D** Excess soil to a depth of 1.5 mbg exceeds Table 2.1 I/C/C standards; to be managed under specific conditions or may require disposal as waste. Excess soil below 1.5 mbg may be considered Cell B.

Data Sources: Figure based on Malroz field observations, and Google Earth imagery.

Rev	Date	Description	By	Chkd
R0	2022-05-04	issued in final	JeMP	ZL

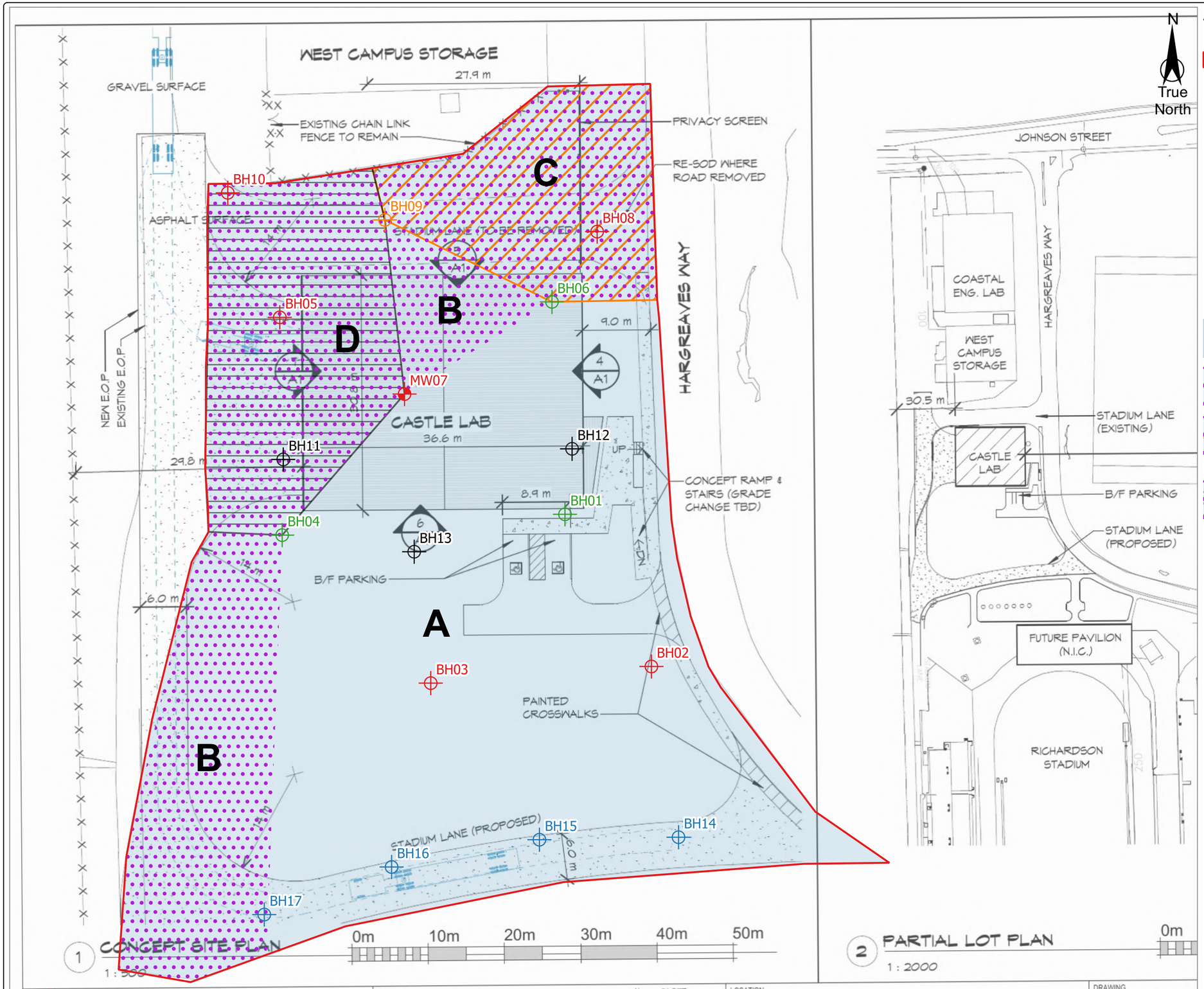
Soil Management Plan
(Current Site Layout)

Excess Soil Management Plan
Proposed New CFI Facility
Queen's University, Kingston, ON

File:1591.00-101

Figure 3a

MALROZ



Legend

- approximate extent of project area
- soil sample location meets MECP Table 1 standards for R/P/I/I/C/C property use
- soil sample location exceeds MECP Table 1 standards for R/P/I/I/C/C property use
- soil sample location exceeds MECP Table 2.1 standards for R/P/I property use
- soil sample location exceeds MECP Table 2.1 standards for I/C/C property use
- environmental soil samples not collected
- **A** Excess soil suitable for reuse off-site where MECP Table 2.1 R/P/I or I/C/C standards apply with similar background conditions.
- **B** Excess soil suitable for reuse off-site where MECP Table 2.1 R/P/I or I/C/C standards apply with similar background conditions and subject to salt impacted requirements.
- **C** Excess soils to a depth of 1.5 mbg suitable for reuse off-site where MECP Table 2.1 I/C/C standards apply with similar background conditions and subject to salt impacted requirements. Excess soil from below 1.5 mbg may be considered Cell B.
- **D** Excess soil to a depth of 1.5 mbg exceeds Table 2.1 I/C/C standards; to be managed under specific conditions or may require disposal as waste. Excess soil below 1.5 mbg may be considered Cell B.

Data Sources: Figure based on Malroz field observations, Google Earth imagery, and the Preliminary Site Plan for the Castle Laboratory by Colbourne & Kembel Architects Inc. revised March 3, 2022.

Rev	Date	Description	By	Chkd
R0	2022-05-04	issued in final	JeMP	ZL

Soil Management Plan
(Proposed Site Layout)

Excess Soil Management Plan
Proposed New CFI Facility
Queen's University, Kingston, ON

File:1591.00-101

Figure 3b

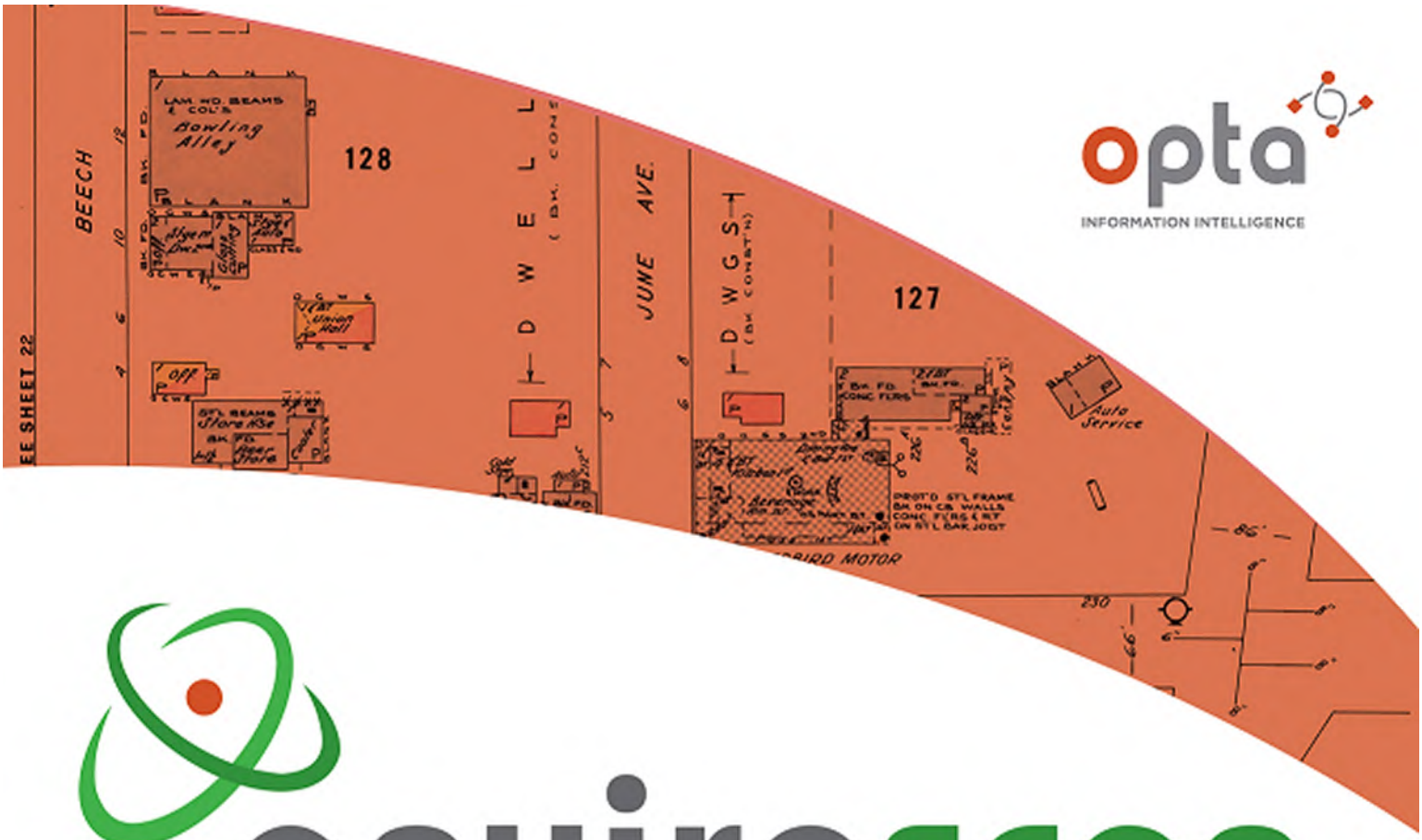
MALROZ

COLBOURNE & KEMBEL, ARCHITECTS INC.
73RD ARLINGTON PARK PLACE KINGSTON ONTARIO K7H 3M8
TEL 613-384-2240
FAX 613-384-1277
E-MAIL trfoe@kol.ca

PROJECT CASTLE LABORATORY
No. 21075
LOCATION 950 JOHNSON ST
CLIENT QUEENS
DRAWING PRELIMINARY SIT

0 10 20 m

Appendix B
Fire Insurance Plans



enviroscan

An SCM Company

175 Commerce Valley Drive W
Markham, Ontario L3T 7Z3

T: 905-882-6300
W: www.optaintel.ca

Report Completed By:

Midori

Site Address:

Richardson Stadium, 938 Johnson Street, Kingston, ON

Requested By:

Eleanor Goolab
ERIS

Project No:

21040100125

Opta Order ID:

88446

Date Completed:

4/8/2021 11:52:42 AM

Project Name: Richardson Stadium Redevelopment

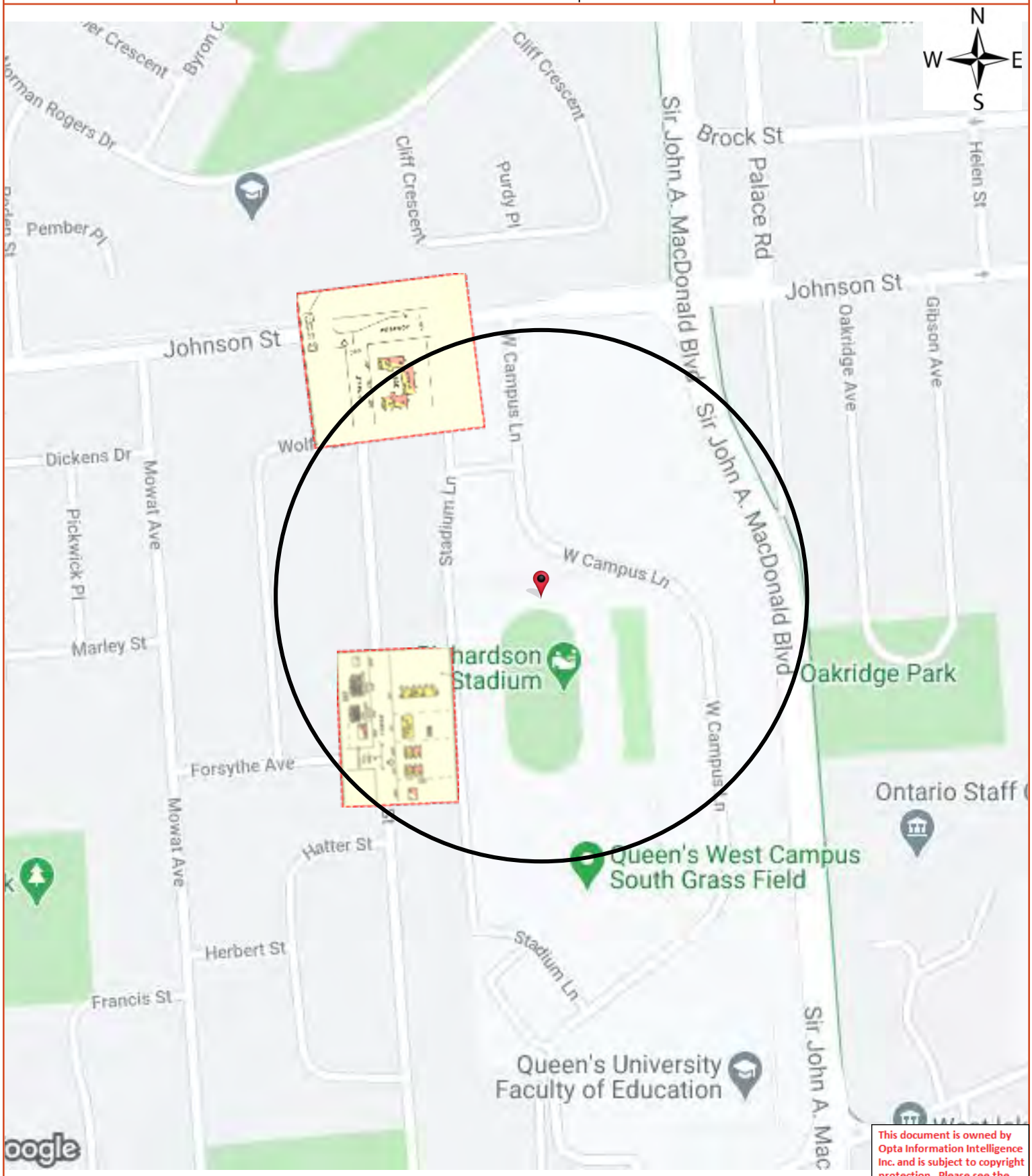
Project #: 21040100125
P.O. #: 1489

ENVIROSCAN Report

Search Area: Richardson Stadium, 938 Johnson Street, Kingston, ON

Requested by:
Eleanor Goolab
Date Completed: 04/08/2021 11:52:42

enviroscan
OPTA INFORMATION INTELLIGENCE



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Opta Historical Environmental Services Enviroscan ™ Terms and Conditions

Report

The documents (hereinafter referred to as the "Documents") to be released as part of the report (hereinafter referred to as the "Report") to be delivered to the purchaser as set out above are documents in Opta's records relating to the described property (hereinafter referred to as the "Property"). Opta makes no representations or warranties respecting the Documents whatsoever, including, without limitation, with respect to the completeness, accuracy or usefulness of the Documents, and does not represent or warrant that these are the only plans and reports prepared in association with the Property or in Opta's possession at the time of Report delivery to the purchaser. The Documents are current as of the date(s) indicated on them. Interpretation of the Documents, if any, is by inference based upon the information which is apparent and obvious on the face of the Documents only. Opta does not represent, warrant or guarantee that interpretations other than those referred to do not exist from other sources. The Report will be prepared for use by the purchaser of the services as shown above hereof only.

Disclaimer

Opta disclaims responsibility for any losses or damages of any kind whatsoever, whether consequential or other, however caused, incurred or suffered, arising directly or indirectly as a result of the services (which services include, but are not limited to, the preparation of the Report provided hereunder), including but not limited to, any losses or damages arising directly or indirectly from any breach of contract, fundamental or otherwise, from reliance on Opta Reports or from any tortious acts or omissions of Opta's agents, employees or representatives.

Entire Agreement

The parties hereto acknowledge and agree to be bound by the terms and conditions hereof. The request form constitutes the entire agreement between the parties pertaining to the subject matter hereof and supersedes all prior and contemporaneous agreements, negotiations and discussions, whether oral or written, and there are no representations or warranties, or other agreements between the parties in connection with the subject matter hereof except as specifically set forth herein. No supplement, modification, waiver, or termination of the request shall be binding, unless confirmed in writing by the parties hereto.

Governing Document

In the event of any conflicts or inconsistencies between the provisions hereof and the Reports, the rights and obligations of the parties shall be deemed to be governed by the request form, which shall be the paramount document.

Law

This agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein.

Project Name: Richardson Stadium Redevelopment

Project #: 21040100125
P.O. #: 1489

ENVIROSCAN Report

Report Index

Requested by:
Eleanor Goolab
Date Completed: 04/08/2021 11:52:42

OPTA INFORMATION INTELLIGENCE

Page	Report Title
6	(1963) Volume: Kingston Firemap: 8
8	(1963) Volume: Kingston Firemap: 8

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N
W E
S

Project Name: Richardson Stadium Redevelopment

Project #: 21040100125
P.O. #: 1489

ENVIROSCAN Report

1963 Volume: Kingston Firemap: 8
Kingston Plan: 1006 (1963)
Sheet: 8 (1963)

Requested by:
Eleanor Goolab
Date Completed: 04/08/2021 11:52:42

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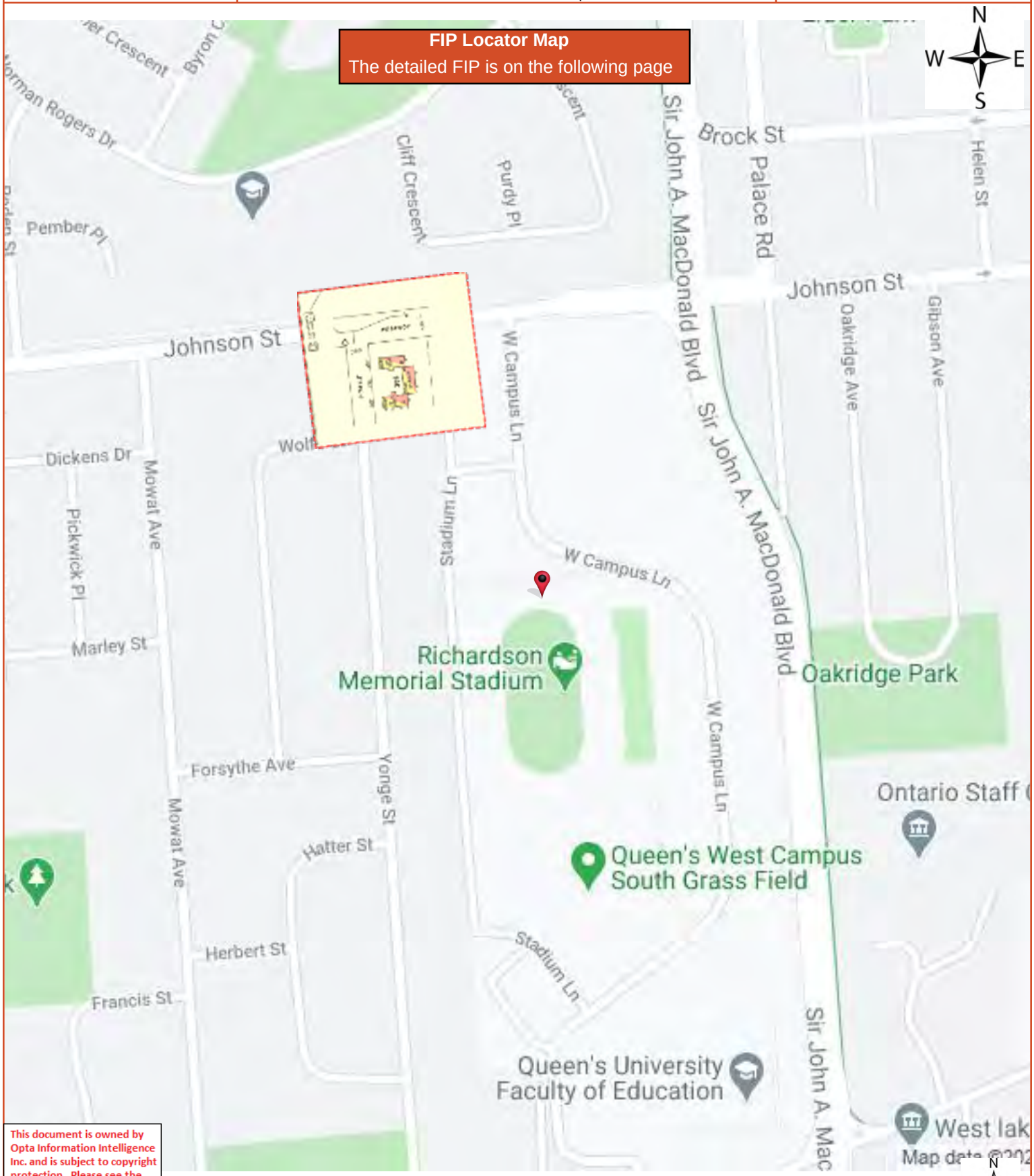
OPTA INFORMATION INTELLIGENCE

FIP Locator Map
The detailed FIP is on the following page



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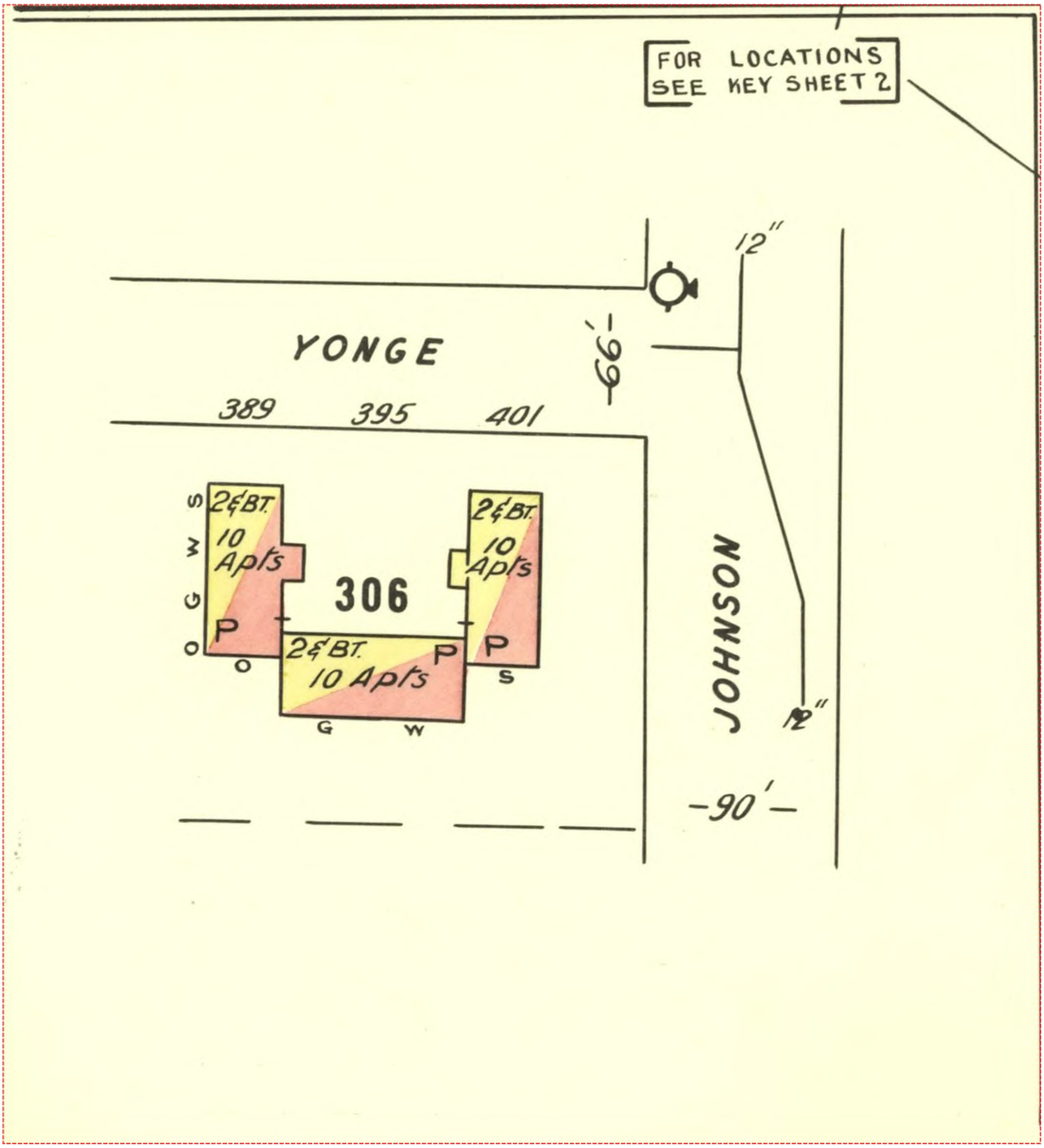
ENVIROSCAN Report

1963 Volume: Kingston Firemap: 8
Kingston Plan: 1006 (1963)
Sheet: 8 (1963)

Requested by:
Eleanor Goolab
Date Completed: 04/08/2021 11:52:42

opta INFORMATION INTELLIGENCE
OPTA INFORMATION INTELLIGENCE



Project Name: Richardson Stadium Redevelopment

Project #: 21040100125
P.O. #: 1489

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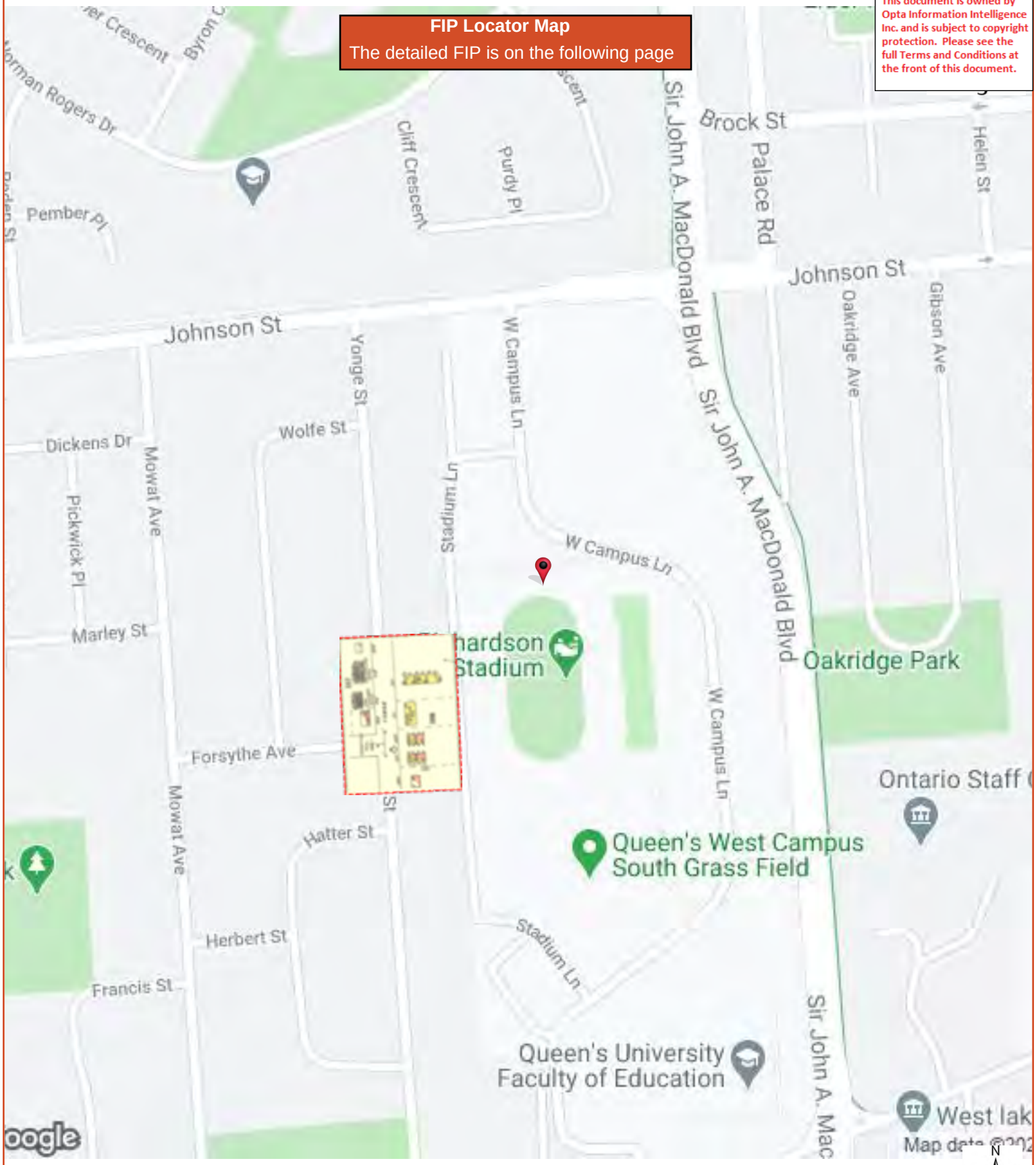
FIP Locator Map
The detailed FIP is on the following page



ENVIROSCAN Report

1963 Volume: Kingston Firemap: 8
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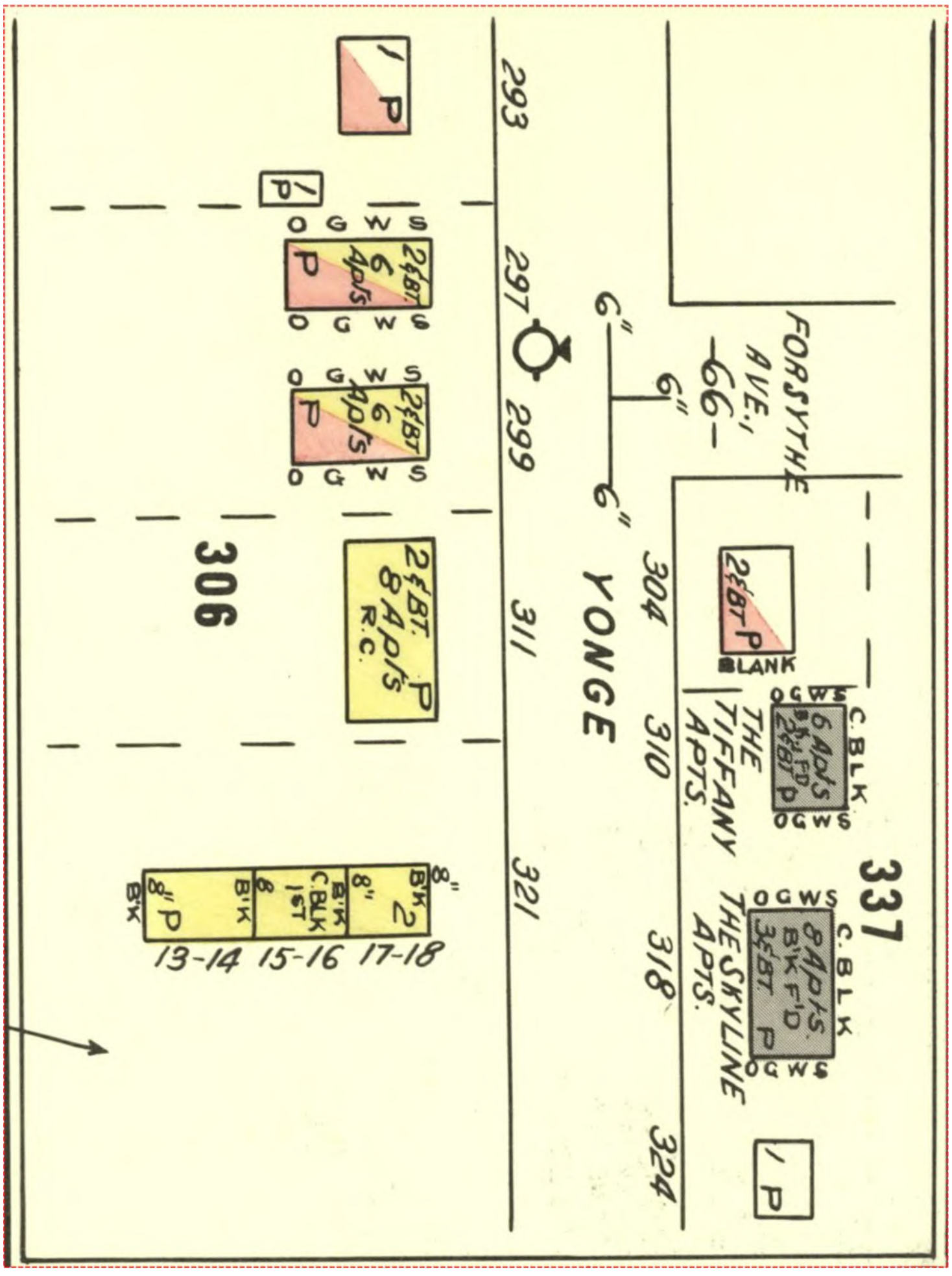
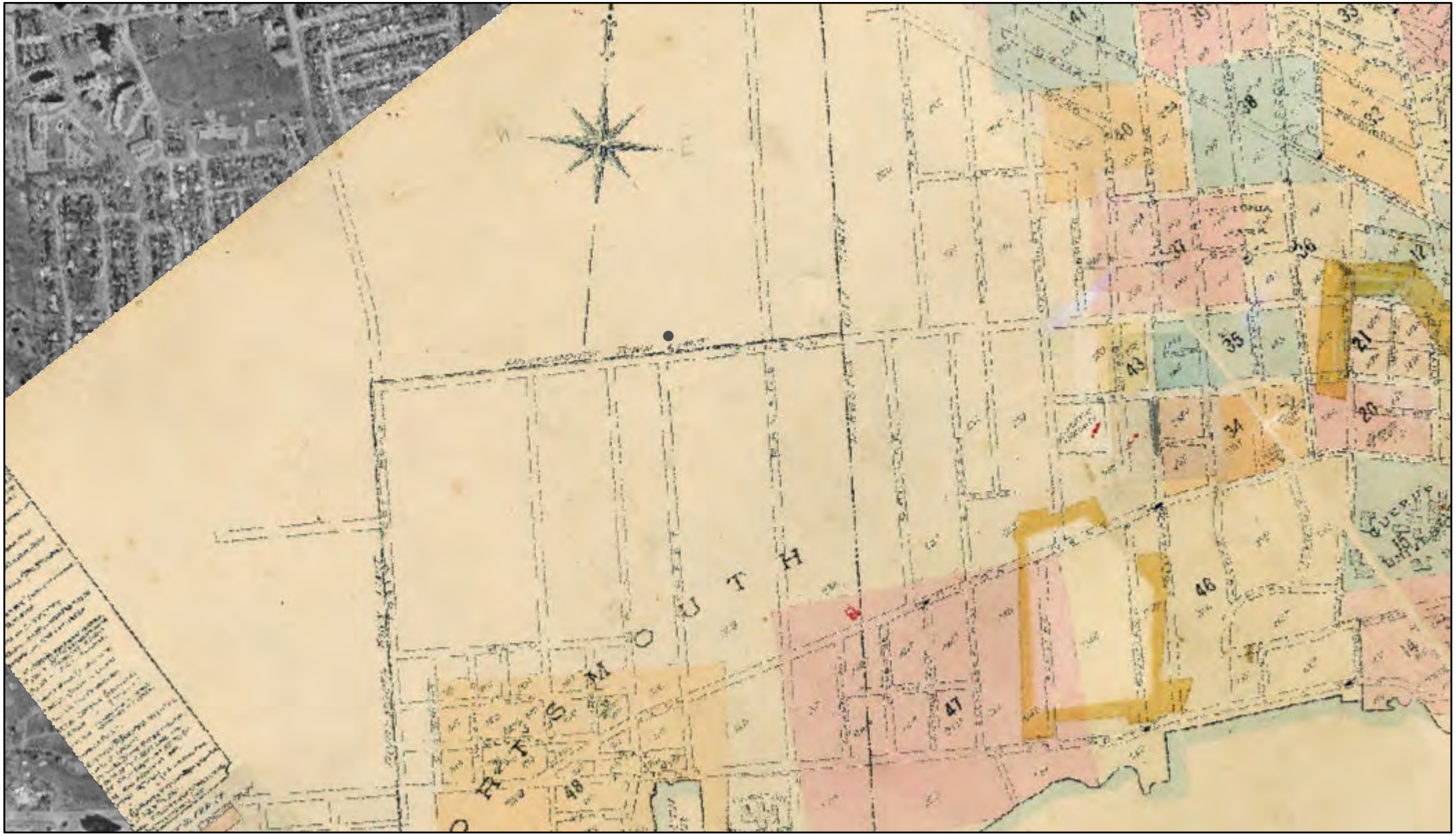
Sheet: 8 (1963)

Requested by:
Eleanor Goolab
Date Completed: 04/08/2021 11:52:42

opta INFORMATION INTELLIGENCE
OPTA INFORMATION INTELLIGENCE



1908-11 FIP



4/8/2021, 3:07:08 PM

1:18,056

0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Opta Information Intelligence Inc, Corporation of the City of Kingston, Corporation of the City of Kingston, Sources:

Corporation of the City of Kingston

This map is subject to the City's website disclaimer and terms of use (https://www.cityofkingston.ca/general/privacy-policy).

Appendix C
City Directory Results

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

CITY DIRECTORY

Project Property:	*938 Johnson Street, Kingston, Ontario*
Report Type:	*City Directory*
Order No:	*21041400086*
Information Source:	*Polk's Kingston, Ontario City Directory*
Date Completed:	*15-03-2022*

Environmental Risk Information Services
A division of Glacier Media Inc.
1.866.517.5204 | info@erisinfo.com | erisinfo.com

City Directory Information Source
Polk's Kingston, Ontario City Directory

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 2000	
Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	-Govt of Canada Correctional Service
443 Union Street	-Regional Correctional Staff College
169 Yonge Street	-Ron's Auto Body

321 Yonge Street	-Multi Tenant Residential
347 Yonge Street	-Multi Tenant Residential

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1995/96	
Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	-Govt of Canada Correctional Service
443 Union Street	-Regional Correctional Staff College

169 Yonge Street	-Ron's Auto Body
321 Yonge Street	-Multi Tenant Residential
347 Yonge Street	-Multi Tenant Residential

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1989/90	
Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	-Govt of Canada Kingston Prison for Women

443 Union Street	-Correctional Staff College
169 Yonge Street	-Ron's Auto Body
321 Yonge Street	-Multi Tenant Residential
347 Yonge Street	-Multi Tenant Residential

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1984/85	
Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed

40 Sir John A MacDonald	- Kingston Prison for Women
443 Union Street	-Correctional Staff College
169 Yonge Street	-Ron's Auto Body
321 Yonge Street	-Multi Tenant Residential
347 Yonge Street	-Multi Tenant Residential

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1979	
Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Coastal Engineering Laboratory
244 Hargreaves Way	- Street Not Listed

535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	- Kingston Prison for Women
443 Union Street	-Correctional Staff College
169 Yonge Street	-Ron's Auto Body
321 Yonge Street	-Multi Tenant Residential
347 Yonge Street	-Multi Tenant Residential

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1974	
Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed

244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	- Kingston Prison for Women
443 Union Street	-Correctional Staff College
169 Yonge Street	-Address Not Listed
321 Yonge Street	-Multi Tenant Residential
347 Yonge Street	-Multi Tenant Residential

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1967	
Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed

950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	- Address Not Listed
443 Union Street	-Correctional Staff College
169 Yonge Street	-McDonald's Garage
321 Yonge Street	-Multi Tenant Residential
347 Yonge Street	-Multi Tenant Residential

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1960	
Site Listing:	-Address Not Listed
Adjacent Properties:	

876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	- Street Not Listed
443 Union Street	-Address Not Listed
169 Yonge Street	-McDonald's Garage
321 Yonge Street	-Address Not Listed
347 Yonge Street	-Address Not Listed

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1954	
Site Listing:	-Address Not Listed

Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	- Street Not Listed
443 Union Street (West)	-Address Not Listed
169 Yonge Street	-Address Not Listed
321 Yonge Street	-Address Not Listed
347 Yonge Street	-Address Not Listed

PROJECT NUMBER: 21041400086	
Site Address:	938 Johnson Street, Kingston, Ontario
Year: 1950	

Site Listing:	-Address Not Listed
Adjacent Properties:	
876 Johnson Street	- Address Not Listed
950 Johnson Street	- Address Not Listed
244 Hargreaves Way	- Street Not Listed
535 Hargreaves Way	- Street Not Listed
40 Sir John A MacDonald	- Address Not Listed
443 Union Street (West)	-Address Not Listed
169 Yonge Street	-Address Not Listed
321 Yonge Street	-Address Not Listed
347 Yonge Street	-Address Not Listed

-All listings for businesses were listed as they are in the city directory.

-Listings that are residential are listed as “residential” with the number of tenants. The name of the residential tenant is not listed in the above city directory.

ERIS

Appendix D
Chain of Title

CHAIN OF TITLE REPORT

Project #:	21040100125	Searched at:	Kingston
Address:	938 Johnson Street, Kingston	LRO #:	13
Legal Description:	Lts 16, 24, 74-179, e/s Gardiner St Pt Block 181 Plan 54		
PIN #:	36017-0123 (LT)		

INSTR #	DOC. TYPE	REG. DATE	PARTY FROM	PARTY TO
FR144592	Deed (Lts 16, 24,74-179)	06 04 1964	Crown: Her Majesty The Queen	Queen's University at Kingston, Ontario
FR166407	Deed (Pt Blk 181)	30 09 1966	Her Majesty the Queen	Queen's University
FR636577	Easement	09 08 1995	Queen's University	Bell Canada
FC207783	Lease	01 10 2015	Queen's University at Kingston	Bell Mobility Inc. (Lessee)
FC323165	Deed **(Present Owner)**	16 04 2021	Queen's University at Kingston	**Queen's University at Kingston**

* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT * SUBJECT TO RESERVATIONS IN CROWN GRANT *

PROPERTY DESCRIPTION: LT 16 E/S GARDINER ST, 24 E/S GARDINER ST, 74 W/S GARDINER ST, 75 W/S GARDINER ST, 76 W/S GARDINER ST, 77 W/S GARDINER ST, 78 W/S GARDINER ST, 79 W/S GARDINER ST, 80 W/S GARDINER ST, 81 W/S GARDINER ST, 82 W/S GARDINER ST, 83 W/S GARDINER ST, 84 W/S GARDINER ST, 85 W/S GARDINER ST, 86 W/S GARDINER ST, 87 W/S GARDINER ST, 88 W/S GARDINER ST, 89 W/S GARDINER ST, 90 W/S GARDINER ST, 91 W/S GARDINER ST, 92 W/S GARDINER ST, 93 W/S GARDINER ST, 94 W/S GARDINER ST, 95 W/S GARDINER ST, 96 W/S GARDINER ST, 97 W/S GARDINER ST, 98 W/S GARDINER ST, 99 W/S GARDINER ST, 100 W/S GARDINER ST, 101 W/S GARDINER ST, 102 W/S GARDINER ST, 103 W/S GARDINER ST, 104 W/S GARDINER ST, 105 W/S GARDINER ST, 106 W/S GARDINER ST, 107 W/S GARDINER ST, 108 W/S GARDINER ST, 109 W/S GARDINER ST, 110 W/S GARDINER ST, 111 W/S GARDINER ST, 112 W/S GARDINER ST, 113 W/S GARDINER ST, 114 W/S GARDINER ST, 115 W/S GARDINER ST, 116 W/S GARDINER ST, 117 W/S GARDINER ST, 118 W/S GARDINER ST, 119 W/S GARDINER ST, 120 E/S GARDINER ST, 121 E/S GARDINER ST, 122 E/S GARDINER ST, 123 E/S GARDINER ST, 124 E/S GARDINER ST, 125 E/S GARDINER ST, 126 E/S GARDINER ST, 127 E/S GARDINER ST, 128 E/S GARDINER ST, 129 E/S GARDINER ST, 130 E/S GARDINER ST, 131 E/S GARDINER ST, 132 E/S GARDINER ST, 133 E/S GARDINER ST, 134 E/S GARDINER ST, 135 E/S GARDINER ST, 136 E/S GARDINER ST, 137 E/S GARDINER ST, 138 E/S GARDINER ST, 139 E/S GARDINER ST, 140 E/S GARDINER ST, 141 E/S GARDINER ST, 142 E/S GARDINER ST, 143 E/S GARDINER ST, 144 E/S GARDINER ST, 145 E/S GARDINER ST, 146 E/S GARDINER ST, 147 E/S GARDINER ST, 148 E/S GARDINER ST, 149 E/S GARDINER ST, 150 E/S GARDINER ST, 151 E/S GARDINER ST, 152 E/S GARDINER ST, 153 E/S GARDINER ST, 154 E/S GARDINER ST, 155 E/S GARDINER ST, 156 E/S GARDINER ST, 157 E/S GARDINER ST, 158 E/S GARDINER ST, 159 E/S GARDINER ST, 160 E/S GARDINER ST, 161 E/S GARDINER ST, 162 E/S GARDINER ST, 163 E/S GARDINER ST, 164 E/S GARDINER ST, 165 E/S GARDINER ST, 166 E/S GARDINER ST, 167 E/S GARDINER ST, 168 E/S GARDINER ST, 169 E/S GARDINER ST, 170 E/S GARDINER ST, 171 E/S GARDINER ST, 172 E/S GARDINER ST, 173 E/S GARDINER ST, 174 E/S GARDINER ST, 175 E/S GARDINER ST, 176 E/S GARDINER ST, 177 E/S GARDINER ST, 178 E/S GARDINER ST, 179 E/S GARDINER ST PL 54 KINGSTON CITY; PT BLK 181 PL 54 KINGSTON CITY; PT GARDINER ST PL 54 KINGSTON CITY AS IN FR144592, FR201344, EXCEPT FR207571, FR223893, FR203526; S/T FR144592; S/T FR636577; KINGSTON ; THE COUNTY OF FRONTENAC; TOGETHER WITH AN EASEMENT OVER LOT 20 E/S YONGE ST & N/S UNION STREET, PLAN 54, PART 2 PLAN 13R21133 AS IN FC238815

PROPERTY REMARKS:

ESTATE/QUALIFIER:
FEE SIMPLE
LT CONVERSION QUALIFIED

RECENTLY:
DIVISION FROM 36017-0056

PIN CREATION DATE:
2017/02/10

OWNERS' NAMES
QUEEN'S UNIVERSITY AT KINGSTON

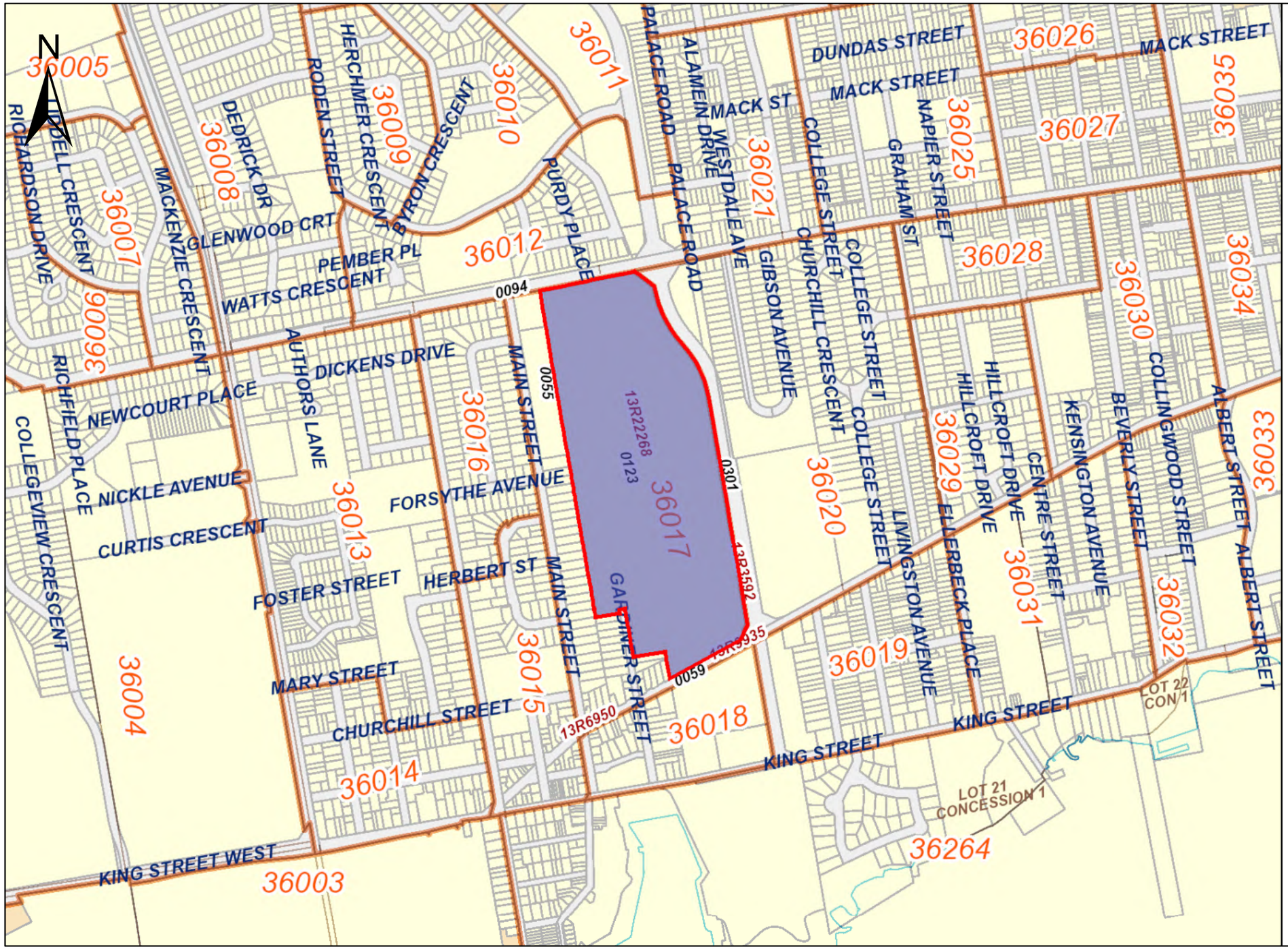
CAPACITY SHARE
BENO

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
** PRINTOUT INCLUDES ALL DOCUMENT TYPES AND DELETED INSTRUMENTS SINCE 2017/02/10 **						
**SUBJECT, ON FIRST REGISTRATION UNDER THE LAND TITLES ACT, TO:						
**	SUBSECTION 44(1) OF THE LAND TITLES ACT, EXCEPT PARAGRAPH 11, PARAGRAPH 14, PROVINCIAL SUCCESSION DUTIES *					
**	AND ESCHEATS OR FORFEITURE TO THE CROWN.					
**	THE RIGHTS OF ANY PERSON WHO WOULD, BUT FOR THE LAND TITLES ACT, BE ENTITLED TO THE LAND OR ANY PART OF					
**	IT THROUGH LENGTH OF ADVERSE POSSESSION, PRESCRIPTION, MISDESCRIPTION OR BOUNDARIES SETTLED BY					
**	CONVENTION.					
**	ANY LEASE TO WHICH THE SUBSECTION 70(2) OF THE REGISTRY ACT APPLIES.					
**DATE OF CONVERSION TO LAND TITLES: 2004/09/20 **						
FR144592	1964/04/06	TRANSFER			QUEEN'S UNIVERSITY AT KINGSTON, ONTARIO	C
	REMARKS: PLAN ATTACHED					
FR166407	1966/09/30	TRANSFER	$798		QUEEN'S UNIVERSITY	C

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH DESCRIPTION REPRESENTED FOR THIS PROPERTY.
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT * SUBJECT TO RESERVATIONS IN CROWN GRANT *

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
FR242419	1973/10/03	MECHANICS LIEN				C
FR242898	1973/10/17	MECHANICS LIEN				C
13R794	1974/03/06	PLAN REFERENCE				C
13R1833	1976/04/29	PLAN REFERENCE				C
FR313043	1978/09/28	AGREEMENT			THE CORP. OF THE CITY OF KINGSTON	C
FR315683	1978/11/24	BYLAW				C
13R12532	1994/12/08	PLAN REFERENCE				C
FR636577	1995/08/09	TRANSFER EASEMENT			BELL CANADA	C
FR730787	2004/01/15	AGREEMENT		QUEENS UNIVERSITY	THE CORPORATION OF THE CITY OF KINGSTON	C
	REMARKS: RE SITE PLAN					
FC130822	2012/02/09	NOTICE		THE CORPORATION OF THE CITY OF KINGSTON	QUEEN'S UNIVERSITY AT KINGSTON	C
	REMARKS: SITE PLAN CONTROL AGREEMENT AFFECTS LTS 169-179 AND PT BLK 181, PL 54					
FC198621	2015/05/07	NOTICE	$1	THE CORPORATION OF THE CITY OF KINGSTON	QUEEN'S UNIVERSITY AT KINGSTON	C
	REMARKS: SITE PLAN CONTROL AGREEMENT					
FC207783	2015/10/01	NOTICE OF LEASE	$2	QUEEN'S UNIVERSITY AT KINGSTON	BELL MOBILITY INC.	C
FC208188	2015/10/07	NOTICE	$1	THE CORPORATION OF THE CITY OF KINGSTON	QUEEN'S UNIVERSITY AT KINGSTON	C
FC236542	2017/03/13	NOTICE	$1	THE CORPORATION OF THE CITY OF KINGSTON	QUEEN'S UNIVERSITY AT KINGSTON	C
	REMARKS: SITE PLAN AGREEMENT					
13R22268	2020/08/13	PLAN REFERENCE				C
FC323165	2021/04/16	TRANSFER	$2	QUEEN'S UNIVERSITY AT KINGSTON	QUEEN'S UNIVERSITY AT KINGSTON	



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SCALE

0 90 180 270 360 450 meters

PROPERTY INDEX MAP

FRONTENAC(No. 13)

LEGEND

FREEHOLD PROPERTY	
LEASEHOLD PROPERTY	
LIMITED INTEREST PROPERTY	
CONDOMINIUM PROPERTY	
RETIRED PIN (MAP UPDATE PENDING)	
PROPERTY NUMBER	*0449*
BLOCK NUMBER	**08050**
GEOGRAPHIC FABRIC	
EASEMENT	

THIS IS NOT A PLAN OF SURVEY

NOTES

REVIEW THE TITLE RECORDS FOR COMPLETE PROPERTY INFORMATION AS THIS MAP MAY NOT REFLECT RECENT REGISTRATIONS

THIS MAP WAS COMPILED FROM PLANS AND DOCUMENTS RECORDED IN THE LAND REGISTRATION SYSTEM AND HAS BEEN PREPARED FOR PROPERTY INDEXING PURPOSES ONLY

FOR DIMENSIONS OF PROPERTIES BOUNDARIES SEE RECORDED PLANS AND DOCUMENTS

ONLY MAJOR EASEMENTS ARE SHOWN

REFERENCE PLANS UNDERLYING MORE RECENT REFERENCE PLANS ARE NOT ILLUSTRATED

Ontario

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Appendix E
ERIS Database Report

DATABASE REPORT

Project Property:	*Richardson Stadium Redevelopment* *Richardson Stadium, 938 Johnson Street* *Kingston ON K7M*
Project No:	*1489*
Report Type:	*Quote - Custom-Build Your Own Report*
Order No:	*21040100125*
Requested by:	*Malroz Engineering Inc.*
Date Completed:	*April 7, 2021*

Environmental Risk Information Services
A division of Glacier Media Inc.
1.866.517.5204 | info@erisinfo.com | erisinfo.com

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Executive Summary

Property Information:

Project Property:	*Richardson Stadium Redevelopment* *Richardson Stadium, 938 Johnson Street Kingston ON K7M*
Project No:	*1489*

Coordinates:

Latitude:	*44.2283986*
Longitude:	*-76.5162737*
UTM Northing:	*4,898,358.90*
UTM Easting:	*378,901.02*
UTM Zone:	*18T*

Elevation:	*319 FT* *97.12 M*

Order Information:

Order No:	*21040100125*
Date Requested:	*April 1, 2021*
Requested by:	*Malroz Engineering Inc.*
Report Type:	*Quote - Custom-Build Your Own Report*

Historical/Products:

Insurance Products	*Fire Insurance Maps/Inspection Reports/Site Plans*
Land Title Search	*Historical Land Title Search*

Executive Summary: Report Summary

Database	Name	Searched	Project Property	Within 0.30 km	Total
AAGR	Abandoned Aggregate Inventory	Y	0	0	0
AGR	Aggregate Inventory	Y	0	0	0
AMIS	Abandoned Mine Information System	Y	0	2	2
ANDR	Anderson's Waste Disposal Sites	Y	0	0	0
AST	Aboveground Storage Tanks	Y	0	0	0
AUWR	Automobile Wrecking & Supplies	Y	0	0	0
BORE	Borehole	Y	0	0	0
CA	Certificates of Approval	Y	0	1	1
CDRY	Dry Cleaning Facilities	Y	0	0	0
CFOT	Commercial Fuel Oil Tanks	Y	0	0	0
CHEM	Chemical Manufacturers and Distributors	Y	0	0	0
CHM	Chemical Register	Y	0	0	0
CNG	Compressed Natural Gas Stations	Y	0	0	0
COAL	Inventory of Coal Gasification Plants and Coal Tar Sites	Y	0	0	0
CONV	Compliance and Convictions	Y	0	0	0
CPU	Certificates of Property Use	Y	0	0	0
DRL	Drill Hole Database	Y	0	0	0
DTNK	Delisted Fuel Tanks	Y	0	0	0
EASR	Environmental Activity and Sector Registry	Y	0	0	0
EBR	Environmental Registry	Y	0	0	0
ECA	Environmental Compliance Approval	Y	0	0	0
EEM	Environmental Effects Monitoring	Y	0	0	0
EHS	ERIS Historical Searches	Y	0	7	7
EIIS	Environmental Issues Inventory System	Y	0	0	0
EMHE	Emergency Management Historical Event	Y	0	0	0
EPAR	Environmental Penalty Annual Report	Y	0	0	0
EXP	List of Expired Fuels Safety Facilities	Y	0	0	0
FCON	Federal Convictions	Y	0	0	0
FCS	Contaminated Sites on Federal Land	Y	0	0	0
FOFT	Fisheries & Oceans Fuel Tanks	Y	0	0	0
FRST	Federal Identification Registry for Storage Tank Systems (FIRSTS)	Y	0	0	0
FST	Fuel Storage Tank	Y	0	0	0
FSTH	Fuel Storage Tank - Historic	Y	0	0	0
GEN	Ontario Regulation 347 Waste Generators Summary	Y	0	3	3
GHG	Greenhouse Gas Emissions from Large Facilities	Y	0	0	0
HINC	TSSA Historic Incidents	Y	0	0	0

Database	Name	Searched	Project Property	Within 0.30 km	Total
IAFT	Indian & Northern Affairs Fuel Tanks	Y	0	0	0
INC	Fuel Oil Spills and Leaks	Y	0	0	0
LIMO	Landfill Inventory Management Ontario	Y	0	0	0
MINE	Canadian Mine Locations	Y	0	0	0
MNR	Mineral Occurrences	Y	0	2	2
NATE	National Analysis of Trends in Emergencies System (NATES)	Y	0	0	0
NCPL	Non-Compliance Reports	Y	0	0	0
NDFT	National Defense & Canadian Forces Fuel Tanks	Y	0	0	0
NDSP	National Defense & Canadian Forces Spills	Y	0	0	0
NDWD	National Defence & Canadian Forces Waste Disposal Sites	Y	0	0	0
NEBI	National Energy Board Pipeline Incidents	Y	0	0	0
NEBP	National Energy Board Wells	Y	0	0	0
NEES	National Environmental Emergencies System (NEES)	Y	0	0	0
NPCB	National PCB Inventory	Y	0	0	0
NPRI	National Pollutant Release Inventory	Y	0	0	0
OGWE	Oil and Gas Wells	Y	0	0	0
OOGW	Ontario Oil and Gas Wells	Y	0	0	0
OPCB	Inventory of PCB Storage Sites	Y	0	8	8
ORD	Orders	Y	0	0	0
PAP	Canadian Pulp and Paper	Y	0	0	0
PCFT	Parks Canada Fuel Storage Tanks	Y	0	0	0
PES	Pesticide Register	Y	0	0	0
PINC	Pipeline Incidents	Y	0	3	3
PRT	Private and Retail Fuel Storage Tanks	Y	0	0	0
PTTW	Permit to Take Water	Y	0	0	0
REC	Ontario Regulation 347 Waste Receivers Summary	Y	0	0	0
RSC	Record of Site Condition	Y	0	0	0
RST	Retail Fuel Storage Tanks	Y	0	0	0
SCT	Scott's Manufacturing Directory	Y	0	0	0
SPL	Ontario Spills	Y	0	6	6
SRDS	Wastewater Discharger Registration Database	Y	0	0	0
TANK	Anderson's Storage Tanks	Y	0	0	0
TCFT	Transport Canada Fuel Storage Tanks	Y	0	0	0
VAR	Variances for Abandonment of Underground Storage Tanks	Y	0	0	0
WDS	Waste Disposal Sites - MOE CA Inventory	Y	0	0	0
WDSH	Waste Disposal Sites - MOE 1991 Historical Approval Inventory	Y	0	0	0
WWIS	Water Well Information System	Y	0	5	5
		Total:	0	37	37

Executive Summary: Site Report Summary - Project Property

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev diff (m)	Page Number

No records found in the selected databases for the project property.

Executive Summary: Site Report Summary - Surrounding Properties

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
1	EHS		321 - 401 Yonge Street Kingston ON K7M 1G2	WNW/127.0	-2.23	19
2	EHS		321 Yonge St Kingston ON K7M 1G2	WNW/142.9	-2.20	19
2	EHS		321 Yonge St Kingston ON K7M 1G2	WNW/142.9	-2.20	19
2	EHS		321 Yonge St Kingston ON K7M 1G2	WNW/142.9	-2.20	19
3	EHS		321-401Yonge St Kingston ON K7M 1G2	WNW/143.1	-2.32	20
4	EHS		371 Yonge St Kingston ON K7M1G2	WNW/145.5	-2.35	20
5	MNR	PORTSMOUTH QUARRY #1	ON	NNW/172.6	2.19	20
6	AMIS	PORTSMOUTH QUARRY #1	KINGSTON ON	NNW/172.9	2.19	20
7	MNR	PORTSMOUTH QUARRY #3	ON	SW/175.5	-5.29	21
8	AMIS	PORTSMOUTH QUARRY #3	KINGSTON ON	SW/175.5	-5.29	22
9	OPCB	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE/183.1	1.89	22
9	OPCB	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE/183.1	1.89	23

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
9	OPCB	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE/183.1	1.89	24
9	OPCB	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE/183.1	1.89	24
9	OPCB	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE/183.1	1.89	25
9	OPCB	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE/183.1	1.89	25
9	SPL	Air Time Express	at Sir John A McDonald Kingston ON	SSE/183.1	1.89	26
10	EHS		Corner of Sir John A. Macdonald Blvd and Johnson Street Kingston ON	NE/201.7	4.69	26
11	SPL	Utilities Kingston	366 Yonge St Kingston ON	WNW/216.7	-3.22	26
11	PINC	PIPELINE HIT - 1/2"	366 YONGE ST,,KINGSTON,ON,K7M 1G7, CA ON	WNW/216.7	-3.22	27
12	OPCB	Queen's University	950 Johnson Street 207 Stuart Street (Department of Environmental Health and Safety) Kingston ON	NNW/227.1	-0.30	27
12	OPCB	Queen's University	950 Johnson Street 207 Stuart Street (Department of Environmental Health and Safety) Kingston ON	NNW/227.1	-0.30	28
12	SPL	Queen's University at Kingston	950 Johnson St Kingston ON NA	NNW/227.1	-0.30	28
13	PINC	GERARDO G LABERINTO	6 FORSYTHE AVE,,KINGSTON,ON,K7M 2L8,CA ON	SW/250.1	-7.19	28

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
13	SPL		6 Forsythe Street, at the orner of Yonge Str Kingston ON	SW/250.1	-7.19	29
14	GEN	M Sullivan & Son Ltd.	948 Johnson Street Kingston ON K7L 1Z2	N/257.8	1.96	29
15	PINC	SOUSA READY MIX	401 YONGE ST,,KINGSTON,ON,K7M 1G2, CA ON	NW/267.8	-2.22	30
15	SPL	Kingston Utilities<UNOFFICIAL>	401 yonge street Kingston ON	NW/267.8	-2.22	30
16	WWIS		401 YONGE ST Kingston ON ***Well ID:*** 7180707	NW/268.1	-2.34	31
17	WWIS		401 YOUNGE ST Kingston ON ***Well ID:*** 7180706	NW/276.9	-2.18	33
18	WWIS		401 YONGE ST Kingston ON ***Well ID:*** 7180708	NW/280.2	-1.82	36
19	WWIS		401 YOUNGE ST Kingston ON ***Well ID:*** 7180704	NW/281.2	-1.79	39
20	WWIS		401 YOUNGE ST Kingston ON ***Well ID:*** 7180705	NW/286.9	-1.82	42
21	GEN	KINGSTON PUBLIC UTILITIES COMM.	SUBSTN. #12, 876 JOHNSON ST. C/O 211 COUNTER ST. P.O.BOX 790 KINGSTON ON K7L 4X7	NE/288.3	5.61	45
21	GEN	KINGSTON PUBLIC UTILITIES COMM. 23-413	SUBSTN. #12, 876 JOHNSON ST. C/O 211 COUNTER ST. P.O.BOX 790 KINGSTON ON K7L 4X7	NE/288.3	5.61	45
22	CA	KINGSTON CITY	WOLFE ST./FORSYTHE AVE. KINGSTON CITY ON	WSW/290.7	-7.35	45
23	SPL		Corner of Wolfe St and Forsythe Ave Kingston ON	WSW/290.8	-7.35	46

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number

Executive Summary: Summary By Data Source

AMIS - Abandoned Mine Information System

A search of the AMIS database, dated 1800-Oct 2018 has found that there are 2 AMIS site(s) within approximately 0.30 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
PORTSMOUTH QUARRY #1	KINGSTON ON	NNW	172.90	6

Lower Elevation	Address	Direction	Distance (m)	Map Key
PORTSMOUTH QUARRY #3	KINGSTON ON	SW	175.48	8

CA - Certificates of Approval

A search of the CA database, dated 1985-Oct 30, 2011* has found that there are 1 CA site(s) within approximately 0.30 kilometers of the project property.

Lower Elevation	Address	Direction	Distance (m)	Map Key
KINGSTON CITY	WOLFE ST./FORSYTHE AVE. KINGSTON CITY ON	WSW	290.71	22

EHS - ERIS Historical Searches

A search of the EHS database, dated 1999-Jan 31, 2021 has found that there are 7 EHS site(s) within approximately 0.30 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
	Corner of Sir John A. Macdonald Blvd and Johnson Street Kingston ON	NE	201.71	10

Lower Elevation	Address	Direction	Distance (m)	Map Key
	321 - 401 Yonge Street Kingston ON K7M 1G2	WNW	127.00	1

321 Yonge St Kingston ON K7M 1G2	WNW	142.90	2
321 Yonge St Kingston ON K7M 1G2	WNW	142.90	2
321 Yonge St Kingston ON K7M 1G2	WNW	142.90	2
321-401Yonge St Kingston ON K7M 1G2	WNW	143.08	3
371 Yonge St Kingston ON K7M1G2	WNW	145.46	4

GEN - Ontario Regulation 347 Waste Generators Summary

A search of the GEN database, dated 1986-Jan 31, 2021 has found that there are 3 GEN site(s) within approximately 0.30 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
M Sullivan & Son Ltd.	948 Johnson Street Kingston ON K7L 1Z2	N	257.83	14
KINGSTON PUBLIC UTILITIES COMM.	SUBSTN. #12, 876 JOHNSON ST. C/O 211 COUNTER ST. P.O.BOX 790 KINGSTON ON K7L 4X7	NE	288.32	21
KINGSTON PUBLIC UTILITIES COMM. 23-413	SUBSTN. #12, 876 JOHNSON ST. C/O 211 COUNTER ST. P.O.BOX 790 KINGSTON ON K7L 4X7	NE	288.32	21

MNR - Mineral Occurrences

A search of the MNR database, dated 1846-Dec 2020 has found that there are 2 MNR site(s) within approximately 0.30 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
PORTSMOUTH QUARRY #1	ON	NNW	172.64	5

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key

Lower Elevation	Address	Direction	Distance (m)	Map Key
PORTSMOUTH QUARRY #3	ON	SW	175.47	7

OPCB - Inventory of PCB Storage Sites

A search of the OPCB database, dated 1987-Oct 2004; 2012-Dec 2013 has found that there are 8 OPCB site(s) within approximately 0.30 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE	183.11	9
QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE	183.11	9
QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE	183.11	9
QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE	183.11	9
QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE	183.11	9
QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	SSE	183.11	9

Lower Elevation	Address	Direction	Distance (m)	Map Key
Queen's University	950 Johnson Street 207 Stuart Street (Department of Environmental Health and Safety) Kingston ON	NNW	227.14	12

Queen's University	950 Johnson Street 207 Stuart Street (Department of Environmental Health and Safety) Kingston ON	NNW	227.14	12

PINC - Pipeline Incidents

A search of the PINC database, dated Oct 31, 2020 has found that there are 3 PINC site(s) within approximately 0.30 kilometers of the project property.

Lower Elevation	Address	Direction	Distance (m)	Map Key
PIPELINE HIT - 1/2"	366 YONGE ST,,KINGSTON,ON,K7M 1G7,CA ON	WNW	216.67	11
GERARDO G LABERINTO	6 FORSYTHE AVE,,KINGSTON,ON, K7M 2L8,CA ON	SW	250.14	13
SOUSA READY MIX	401 YONGE ST,,KINGSTON,ON,K7M 1G2,CA ON	NW	267.83	15

SPL - Ontario Spills

A search of the SPL database, dated 1988-Mar 2020; Jul 2020 - Aug 2020 has found that there are 6 SPL site(s) within approximately 0.30 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
Air Time Express	at Sir John A McDonald Kingston ON	SSE	183.11	9

Lower Elevation	Address	Direction	Distance (m)	Map Key
Utilities Kingston	366 Yonge St Kingston ON	WNW	216.67	11
Queen's University at Kingston	950 Johnson St Kingston ON NA	NNW	227.14	12
	6 Forsythe Street, at the orner of Yonge Str Kingston ON	SW	250.14	13

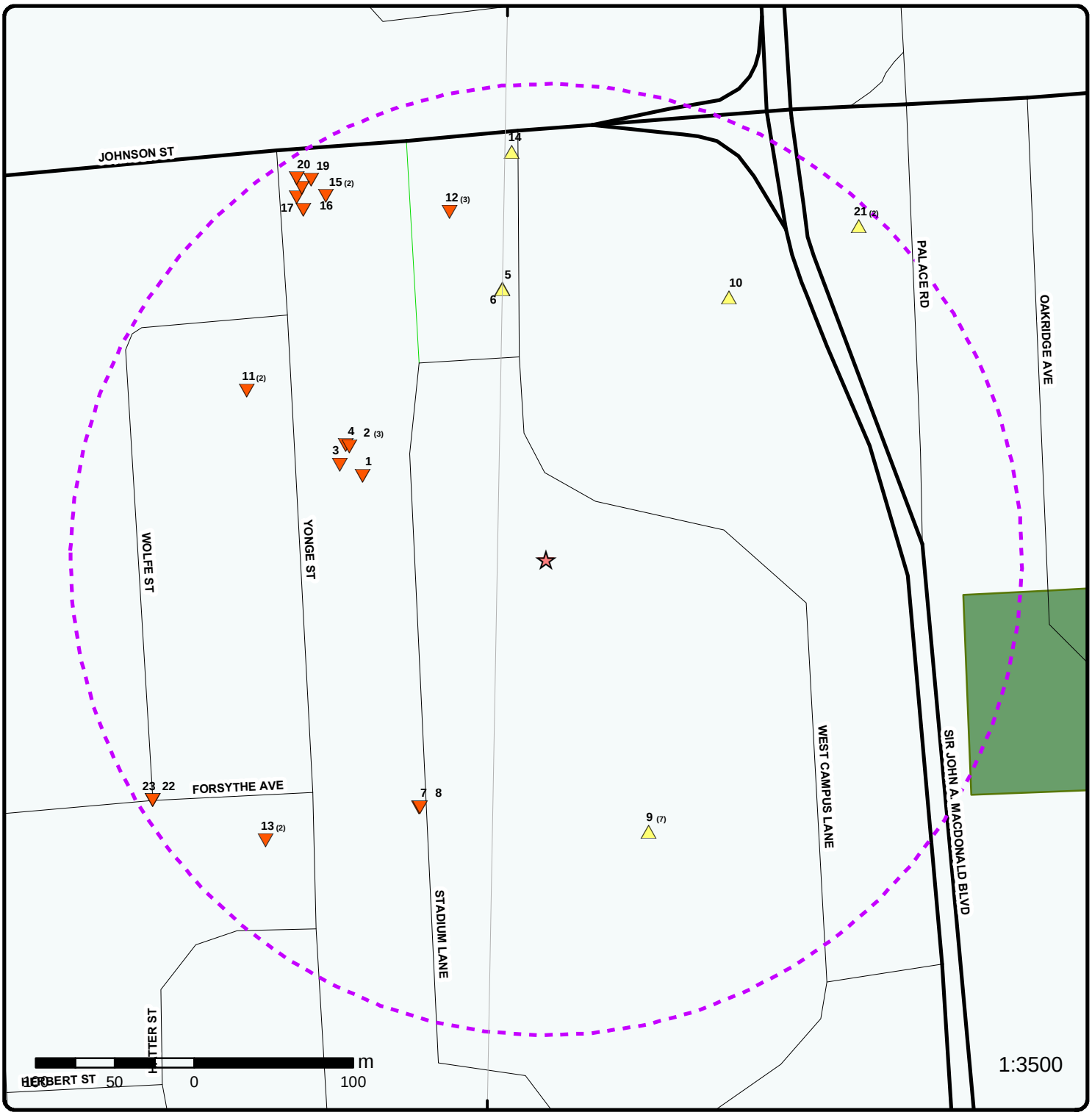
Kingston Utilities<UNOFFICIAL>	401 yonge street Kingston ON	NW	267.83	15
	Corner of Wolfe St and Forsythe Ave Kingston ON	WSW	290.79	23

WWIS - Water Well Information System

A search of the WWIS database, dated Apr 30, 2020 has found that there are 5 WWIS site(s) within approximately 0.30 kilometers of the project property.

Lower Elevation	Address	Direction	Distance (m)	Map Key
	401 YONGE ST Kingston ON ***Well ID:*** 7180707	NW	268.06	16
	401 YOUNGE ST Kingston ON ***Well ID:*** 7180706	NW	276.91	17
	401 YONGE ST Kingston ON ***Well ID:*** 7180708	NW	280.22	18
	401 YOUNGE ST Kingston ON ***Well ID:*** 7180704	NW	281.20	19
	401 YOUNGE ST Kingston ON ***Well ID:*** 7180705	NW	286.88	20

76°31'W



Map: 0.3 Kilometer Radius

Order Number: 21040100125

Address: Richardson Stadium, 938 Johnson Street, Kingston, ON

Project Property	Expressway	Industrial and Resource - Regions	National Park
Buffer Outline	Principal Highway	Main Line	Provincial or Territorial Park
Eris Sites with Higher Elevation	Secondary Highway	Sidetrack	Other Park
Eris Sites with Same Elevation	Major Road	Transit Line	Golf Course or Driving Range
Eris Sites with Lower Elevation	Local road	Abandoned Line	Park or Sports Field
Eris Sites with Unknown Elevation	Trail		Other Recreation Area
	Proposed Road		
	Ferry Route/Ice Road		

Source: © 2015 DMTI Spatial Inc.

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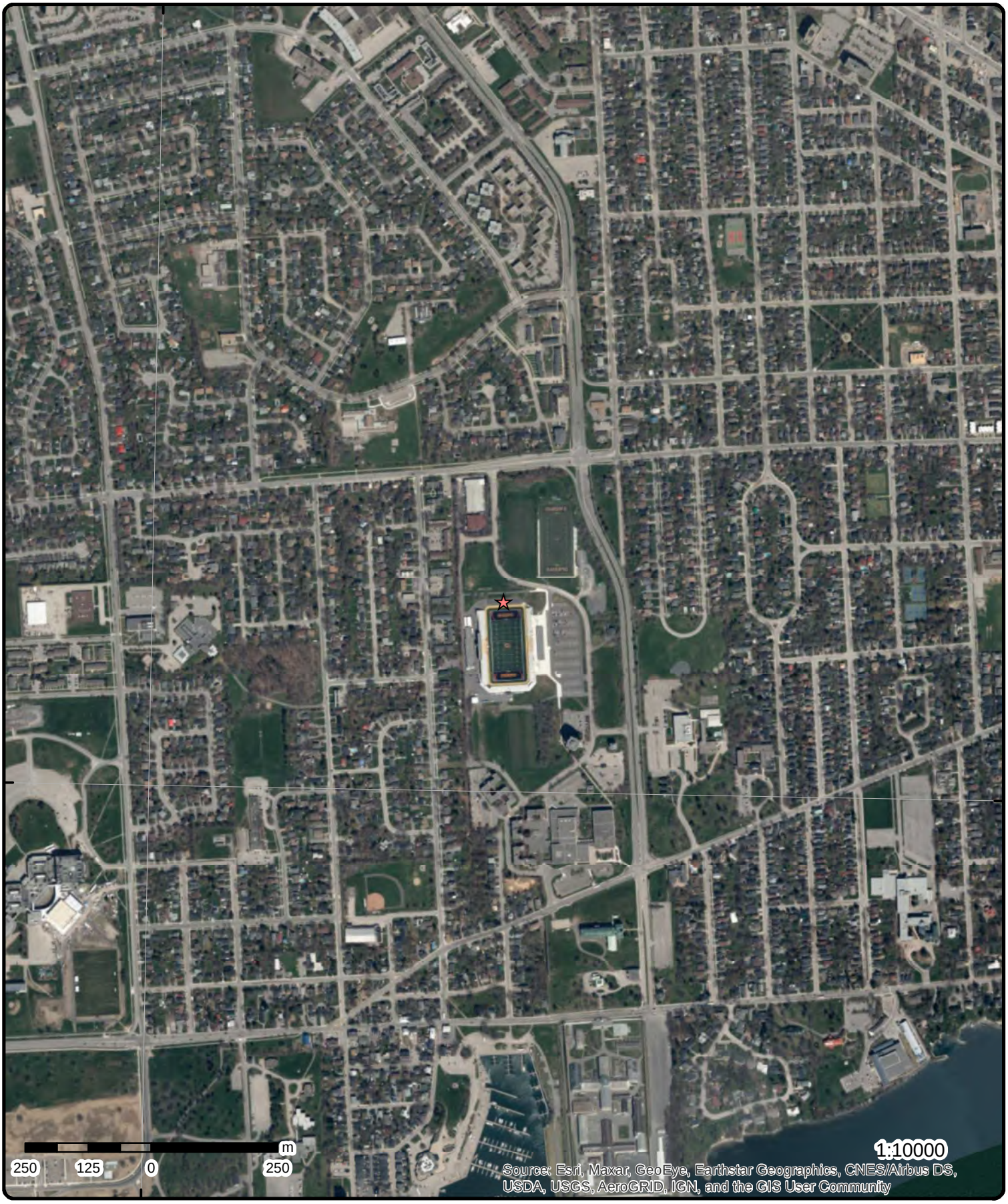
76°31'30"W



Aerial

Year: 2018

Order Number: 21040100125

Address: Richardson Stadium, 938 Johnson Street, Kingston, ON

Source: ESRI World Imagery

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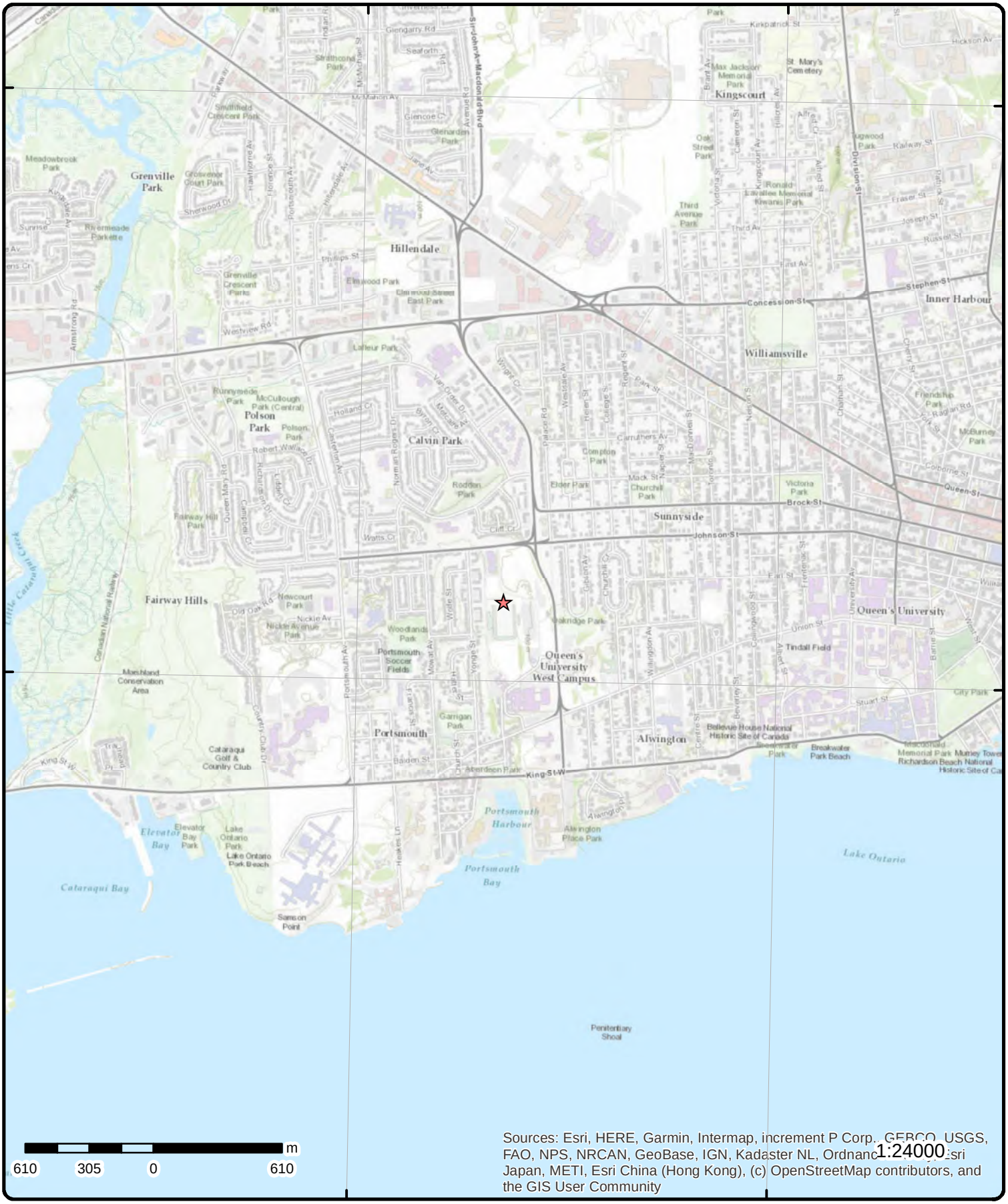

Topographic Map

Order Number: 21040100125

Address: Richardson Stadium, 938 Johnson Street, ON

Source: ESRI World Topographic Map

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Detail Report

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
1	1 of 1	WNW/127.0	94.9 / -2.23	321 - 401 Yonge Street Kingston ON K7M 1G2	EHS

Order No:	20061115016	**Nearest Intersection:**	
Status:	C	**Municipality:**	
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	11/24/2006	**Search Radius (km):**	0.3
Date Received:	11/15/2006	**X:**	-76.517732
Previous Site Name:		**Y:**	44.228854
Lot/Building Size:	5 ares		
Additional Info Ordered:			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
2	1 of 3	WNW/142.9	94.9 / -2.20	321 Yonge St Kingston ON K7M 1G2	EHS

Order No:	20200706012	**Nearest Intersection:**	
Status:	C	**Municipality:**	
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	09-JUL-20	**Search Radius (km):**	.25
Date Received:	06-JUL-20	**X:**	-76.51784079
Previous Site Name:		**Y:**	44.22901897
Lot/Building Size:			
Additional Info Ordered:			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
2	2 of 3	WNW/142.9	94.9 / -2.20	321 Yonge St Kingston ON K7M 1G2	EHS

Order No:	20200706012	**Nearest Intersection:**	
Status:	C	**Municipality:**	
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	09-JUL-20	**Search Radius (km):**	.25
Date Received:	06-JUL-20	**X:**	-76.51784079
Previous Site Name:		**Y:**	44.22901897
Lot/Building Size:			
Additional Info Ordered:			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
2	3 of 3	WNW/142.9	94.9 / -2.20	321 Yonge St Kingston ON K7M 1G2	EHS

Order No:	20200706012	**Nearest Intersection:**	
Status:	C	**Municipality:**	
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	09-JUL-20	**Search Radius (km):**	.25
Date Received:	06-JUL-20	**X:**	-76.51784079
Previous Site Name:		**Y:**	44.22901897
Lot/Building Size:			
Additional Info Ordered:			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
3	1 of 1	WNW/143.1	94.8 / -2.32	321-401Yonge St Kingston ON K7M 1G2	EHS

Order No:	20120314020	**Nearest Intersection:**	
Status:	C	**Municipality:**	Kingston
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	3/19/2012 11:27:24 AM	**Search Radius (km):**	0.25
Date Received:	3/14/2012 11:24:54 AM	**X:**	-76.517914
Previous Site Name:		**Y:**	44.228916
Lot/Building Size:			
Additional Info Ordered:			

4	1 of 1	WNW/145.5	94.8 / -2.35	371 Yonge St Kingston ON K7M1G2	EHS

Order No:	20170706035	**Nearest Intersection:**	
Status:	C	**Municipality:**	
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	11-JUL-17	**Search Radius (km):**	.25
Date Received:	06-JUL-17	**X:**	-76.517872
Previous Site Name:		**Y:**	44.229026
Lot/Building Size:			
Additional Info Ordered:			

5	1 of 1	NNW/172.6	99.3 / 2.19	PORTSMOUTH QUARRY #1 ON	MNR

MDI No:	MDI31C02NE00029	**Twp Area:**	KINGSTON
OGF ID:	205251448	**Dep Class:**	
Deposit Status:	PAST PRODUCING MINE WITHOUT RESERVES	**Zone:**	18
Claim Map:	N/A	**Easting:**	378873.503
Geological District:	SOUTHEASTERN ONTARIO	**Northing:**	4898529.469
Mining Division:	SOUTHERN ONTARIO	**Effective Dt/time:**	07-Jun-2007
Name:	PORTSMOUTH QUARRY #1	**Date Last Modified:**	
P Commod:	LIMESTONE (BUILDING STONES)	**Geo Update Dt/time:**	
S Commod:			

Class Sub Type No:	2499
Class Sub Type:	Past Producing Mine Without Reserves
Source Map:	GSC 1970, MAP 19-1970 IN PAPER 70-35
Detail:	http://www.geologyontario.mndm.gov.on.ca/mndmfiles/mdi/data/records/MDI31C02NE00029.html
All Names:	PORTSMOUTH QUARRY #1
Access Description:	N/A
Status:	PAST PRODUCING MINE WITHOUT RESERVES

Deposit Details

Deposit Year:	1991
Deposit Character:	
Commodity Desc:	LIMESTONE (BUILDING STONES)
Ranking:	1
Twp/Area:	KINGSTON
Con/Lot/Sec:	LOT: NA Con: 1
Legal Desc:	
Township Area Ranking:	1
Mndm Township Area No:	1280
Effective Date/Time:	12/7/2005 12:32:36 PM

6	1 of 1	NNW/172.9	99.3 / 2.19	PORTSMOUTH QUARRY #1	AMIS

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
				KINGSTON ON	

Site Access Code:		**Start Year:**	
AMIS Distr Code:		**End Year:**	
Abandoned Mine ID:	06849	**Prog Rehab Plan:**	NO
Old MDI ID:	SO3326	**Evid of Site Contam:**	UNK
New MDI ID:	MDI31C02NE00029	**Evid of Sulphide:**	UNK
Official Nm:	PORTSMOUTH QUARRY #1	**Evid Animals Pres:**	UNK
Mine Status:	ABANDONED	**Revegetation:**	UNK
Mine Plan/Section:	NO	**Veg Condition:**	
Site Class:	NOT APPLICABLE	**Veg Descr:**	
Clos Reason Code:		**Chemical Doc:**	UNK
Closure Plan:	NO	**Jurisdiction:**	A.R.A.
Prim Commod Code:		**Lot No:**	0
Prim Commod:	LIMESTONE (CRUSHED STONES)	**Concession:**	1
Operat Access:	N/A	**Zone:**	18
Date Entered:		**Northing:**	4898530
Date Last Modified:	25-AUG-2006	**Easting:**	378873
Effective Date:	2003-01-27.15:37:01	**Clos Reason:**	CEASING PRODUCTION - OTHER

Hyper Link: http://www.geologyontario.mndm.gov.on.ca/mndmfiles/AMIS/data/records/06849.html
AMIS District: TWEED
District Desc: TWEED
Animal Desc:
Status Type Code:
Mine Features Desc: QUARRY
AMIS Bkgrd Info: QUARRY. RESPONSIBILITY OF THE MNR AGGREGATE RESOURCES ACT.. LOCATED AT QUARRY SYMBOL 1.1KM N. OF PORTSMOUTH HARBOUR ON MAP GSC 1970, MAP 19-1970 IN PAPER 70-35.. COMMODITY: LIMESTONE STONE.THE SITE WAS NOT INCLUDED IN THE YEAR 2000 SURVEY.
Alias Name: PORTSMOUTH QUARRY #1

AMIS Features

AMIS Feature ID:	78233	**Feature Length:**	0
Effective Date:		**Eval Performed Ind:**	
Date Last Modified:	25-AUG-2006	**Soil Erosion Flag:**	
Dt Entered in AMIS:		**Txt Feature ID:**	
Mine Feat Class Desc:	FEATURE TO SURFACE	**UTM Zone:**	18
Feature Type Code:		**UTM Northing:**	4898529
Mine Feat Type Desc:	QUARRY	**UTM Easting:**	378856
Hazard Status Desc:	NOT AVAILABLE	**Lat DD Features:**	44.22992
Depth or Height:	0	**Long DD Features:**	-76.51688
Feature Width:	0		

Mine Feature Condition Desc: THE SITE WAS NOT INCLUDED IN THE YEAR 2000 SURVEY.

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
7	1 of 1	SW/175.5	91.8 / -5.29	PORTSMOUTH QUARRY #3 ON	MNR

MDI No:	MDI31C02NE00028	**Twp Area:**	KINGSTON
OGF ID:	205258973	**Dep Class:**	
Deposit Status:	PAST PRODUCING MINE WITHOUT RESERVES	**Zone:**	18
Claim Map:	N/A	**Easting:**	378821.5
Geological District:	SOUTHEASTERN ONTARIO	**Northing:**	4898202.462
Mining Division:	SOUTHERN ONTARIO	**Effective Dt/time:**	07-Jun-2007
Name:	PORTSMOUTH QUARRY #3	**Date Last Modified:**	
P Commod:	LIMESTONE (BUILDING STONES)	**Geo Update Dt/time:**	
S Commod:			

Class Sub Type No: 2499
Class Sub Type: Past Producing Mine Without Reserves
Source Map: GSC 1970, MAP 19-1970 IN PAPER 70-35
Detail: http://www.geologyontario.mndm.gov.on.ca/mndmfiles/mdi/data/records/MDI31C02NE00028.html
All Names: PORTSMOUTH QUARRY #3
Access Description: N/A

Status: PAST PRODUCING MINE WITHOUT RESERVES

Deposit Details

Deposit Year: 1991
Deposit Character:
Commodity Desc: LIMESTONE (BUILDING STONES)
Ranking: 1
Twp/Area: KINGSTON
Con/Lot/Sec: LOT: NA Con: 1
Legal Desc:
Township Area Ranking: 1
Mndm Township Area No: 1280
Effective Date/Time: 12/7/2005 12:32:36 PM

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8 | **1 of 1** | **SW/175.5** | **91.8 / -5.29** | **PORTSMOUTH QUARRY #3** | **AMIS**

KINGSTON ON

Site Access Code:		**Start Year:**	
AMIS Distr Code:		**End Year:**	
Abandoned Mine ID:	06850	**Prog Rehab Plan:**	NO
Old MDI ID:	SO3325	**Evid of Site Contam:**	UNK
New MDI ID:	MDI31C02NE00028	**Evid of Sulphide:**	UNK
Official Nm:	PORTSMOUTH QUARRY #3	**Evid Animals Pres:**	UNK
Mine Status:	ABANDONED	**Revegetation:**	UNK
Mine Plan/Section:	NO	**Veg Condition:**	
Site Class:	NOT APPLICABLE	**Veg Descr:**	
Clos Reason Code:		**Chemical Doc:**	UNK
Closure Plan:	NO	**Jurisdiction:**	A.R.A.
Prim Commod Code:		**Lot No:**	0
Prim Commod:	LIMESTONE (CRUSHED STONES)	**Concession:**	1
Operat Access:	N/A	**Zone:**	18
Date Entered:		**Northing:**	4898203
Date Last Modified:	25-AUG-2006	**Easting:**	378821
Effective Date:	2003-01-27.15:37:01	**Clos Reason:**	CEASING PRODUCTION - OTHER

Hyper Link: http://www.geologyontario.mndm.gov.on.ca/mndmfiles/AMIS/data/records/06850.html
AMIS District: TWEED
District Desc: TWEED
Animal Desc:
Status Type Code:
Mine Features Desc: QUARRY
AMIS Bkgrd Info: QUARRY. RESPONSIBILITY OF THE MNR AGGREGATE RESOURCES ACT.. LOCATED AT QUARRY SYMBOL 0.8KM N. OF PORTSMOUTH HARBOUR ON MAP GSC 1970, MAP 19-1970 IN PAPER 70-35.. COMMDOITY: LIMESTONE AGGREGATE.THE SITE WAS NOT INCLUDED IN THE YEAR 2000 SURVEY.
Alias Name: PORTSMOUTH QUARRY #3; NP-284

AMIS Features

AMIS Feature ID:	88503	**Feature Length:**	0
Effective Date:		**Eval Performed Ind:**	
Date Last Modified:	25-AUG-2006	**Soil Erosion Flag:**	
Dt Entered in AMIS:		**Txt Feature ID:**	
Mine Feat Class Desc:	FEATURE TO SURFACE	**UTM Zone:**	18
Feature Type Code:		**UTM Northing:**	4898202
Mine Feat Type Desc:	QUARRY	**UTM Easting:**	378804
Hazard Status Desc:	NOT AVAILABLE	**Lat DD Features:**	44.22697
Depth or Height:	0	**Long DD Features:**	-76.51745
Feature Width:	0		

Mine Feature Condition Desc: THE SITE WAS NOT INCLUDED IN THE YEAR 2000 SURVEY.

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9 | **1 of 7** | **SSE/183.1** | **99.0 / 1.89** | **QUEEN'S UNIVERSITY** | **OPCB**

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
				WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	

Year: 1998
Site Number: 40192A014
Name Owner:
Additional Site Information:

--Details--
Quantity: 6.00
Address Site:
Description: Number of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 1200.00
Address Site:
Description: Calculated Weight (Kg) of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 0.25
Address Site:
Description: Number of Capacitors with High Level PCBs (>1000 ppm)

Quantity: 1.00
Address Site:
Description: Number of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

Quantity: 400.00
Address Site:
Description: Calculated Weight (Kg) of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

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Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
9	2 of 7	SSE/183.1	99.0 / 1.89	QUEEN'S UNIVERSITY WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	OPCB

Year: 1999
Site Number: 40192A014
Name Owner:
Additional Site Information:

--Details--
Quantity: 18.50
Address Site:
Description: Number of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 3700.00
Address Site:
Description: Calculated Weight (Kg) of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 0.75
Address Site:
Description: Number of Capacitors with High Level PCBs (>1000 ppm)

Quantity: 1.00
Address Site:
Description: Number of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

Quantity: 400.00
Address Site:
Description: Calculated Weight (Kg) of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

---

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
9	3 of 7	SSE/183.1	99.0 / 1.89	QUEEN'S UNIVERSITY WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	OPCB

Year: 2000
Site Number: 40192A014
Name Owner:
Additional Site Information:

--Details--
Quantity: 18.50
Address Site:
Description: Number of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 1.00
Address Site:
Description: Number of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

Quantity: 3700.00
Address Site:
Description: Calculated Weight (Kg) of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 0.75
Address Site:
Description: Number of Capacitors with High Level PCBs (>1000 ppm)

Quantity: 400.00
Address Site:
Description: Calculated Weight (Kg) of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

9	4 of 7	SSE/183.1	99.0 / 1.89	QUEEN'S UNIVERSITY WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	OPCB

Year: 2003
Site Number: 40192A014
Name Owner:
Additional Site Information:

--Details--
Quantity: 2.00
Address Site:
Description: Number of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

Quantity: 800.00
Address Site:
Description: Weight of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

Quantity: 3.00
Address Site:
Description: Number of Drums of Other Material with Low Level PCBs (< 1000 ppm) kg

Quantity: 450.00
Address Site:
Description: Calculated Weight of Drums of Other Material with Low Level PCBs (< 1000 ppm) kg

Quantity: 17.00
Address Site:
Description: Number of Drums of Ballasts with High Level PCBs (>1000 ppm)

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

Quantity: 3400.00
Address Site:
Description: Calculated Weight (Kg) of Drums of Ballasts with High Level PCBs (>1000 ppm)

9	5 of 7	SSE/183.1	99.0 / 1.89	QUEEN'S UNIVERSITY WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	OPCB

Year: 1995
Site Number: 40192A014
Name Owner:
Additional Site Information:

--Details--
Quantity: 6.00
Address Site:
Description: Number of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 1200.00
Address Site:
Description: Weight of Drums of Ballasts with High Level PCBs (>1000 ppm) kg

Quantity: 1.00
Address Site:
Description: Number of Drums of Other Material with High Level PCBs (>1000 ppm)

Quantity: 150.00
Address Site:
Description: Weight of Drums of Other Material with High Level PCBs (>1000 ppm) kg

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9	6 of 7	SSE/183.1	99.0 / 1.89	QUEEN'S UNIVERSITY WEST OF SIR JOHN A MACDONALD BETWEEN UNION & JOHNSON ST KINGSTON ON	OPCB

Year: 2004
Site Number: 40192A014
Name Owner:
Additional Site Information:

--Details--
Quantity: 2
Address Site:
Description: Number of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

Quantity: 800
Address Site:
Description: Calculated Weight (Kg) of Drums of Soil with Low Level PCBs (< 1000 ppm) kg

Quantity: 14.5
Address Site:
Description: Number of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 75
Address Site:
Description: Calculated Weight (Kg) of Drums of Other Material with High Level PCBs (>1000 ppm) kg

Quantity: 2900
Address Site:
Description: Calculated Weight (Kg) of Drums of Ballasts with High Level PCBs (>1000 ppm)

Quantity: 0.5
Address Site:
Description: Number of Drums of Other Material with High Level PCBs (>1000 ppm)

9	7 of 7	SSE/183.1	99.0 / 1.89	Air Time Express at Sir John A McDonald Kingston ON	SPL

Ref No:	4378-9JVD6V	**Discharger Report:**	
Site No:	NA	**Material Group:**	
Incident Dt:	2014/05/07	**Health/Env Conseq:**	
Year:		**Client Type:**	
Incident Cause:	Collision/Accident	**Sector Type:**	Truck - Only Saddle Tanks
Incident Event:		**Agency Involved:**	
Contaminant Code:	13	**Nearest Watercourse:**	
Contaminant Name:	DIESEL FUEL	**Site Address:**	at Sir John A McDonald
Contaminant Limit 1:		**Site District Office:**	
Contam Limit Freq 1:		**Site Postal Code:**	
Contaminant UN No 1:		**Site Region:**	
Environment Impact:	Not Anticipated	**Site Municipality:**	Kingston
Nature of Impact:	Surface Water Pollution	**Site Lot:**	
Receiving Medium:		**Site Conc:**	
Receiving Env:		**Northing:**	
MOE Response:	No Field Response	**Easting:**	
Dt MOE Arvl on Scn:		**Site Geo Ref Accu:**	
MOE Reported Dt:	2014/05/07	**Site Map Datum:**	
Dt Document Closed:	2015/01/15	**SAC Action Class:**	Highway Spills (usually highway accidents)
Incident Reason:	Operator/Human Error	**Source Type:**	
Site Name:	Highway 401 W<UNOFFICIAL>		
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	Air Time Express: op fluids, 75L dsl in waterfilled ditch		
Contaminant Qty:	190 L		

10	1 of 1	NE/201.7	101.8 / 4.69	Corner of Sir John A. Macdonald Blvd and Johnson Street Kingston ON	EHS

Order No:	20110322022	**Nearest Intersection:**	
Status:	C	**Municipality:**	
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	3/29/2011	**Search Radius (km):**	0.25
Date Received:	3/22/2011 1:46:52 PM	**X:**	-76.514868
Previous Site Name:		**Y:**	44.229907
Lot/Building Size:			
Additional Info Ordered:			

11	1 of 2	WNW/216.7	93.9 / -3.22	Utilities Kingston 366 Yonge St Kingston ON	SPL

Ref No:	8517-ABUNPN	**Discharger Report:**	
Site No:	NA	**Material Group:**	
Incident Dt:	2016/05/18	**Health/Env Conseq:**	
Year:		**Client Type:**	
Incident Cause:		**Sector Type:**	Miscellaneous Industrial
Incident Event:	Leak/Break	**Agency Involved:**	
Contaminant Code:	35	**Nearest Watercourse:**	
Contaminant Name:	NATURAL GAS (METHANE)	**Site Address:**	366 Yonge St

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

Contaminant Limit 1:		**Site District Office:**	
Contam Limit Freq 1:		**Site Postal Code:**	
Contaminant UN No 1:		**Site Region:**	
Environment Impact:		**Site Municipality:**	Kingston
Nature of Impact:		**Site Lot:**	
Receiving Medium:		**Site Conc:**	
Receiving Env:	Air	**Northing:**	
MOE Response:	No	**Easting:**	
Dt MOE Arvl on Scn:		**Site Geo Ref Accu:**	
MOE Reported Dt:	2016/07/14	**Site Map Datum:**	
Dt Document Closed:	2016/08/10	**SAC Action Class:**	TSSA - Fuel Safety Branch - Hydrocarbon Fuel Release/Spill
Incident Reason:	Operator/Human Error	**Source Type:**	
Site Name:	residential property <UNOFFICIAL>		
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	TSSAfb: late report of gas srvc dmgd; ½ in pl IP; made safe		
Contaminant Qty:	0 other - see incident description		

11	2 of 2	WNW/216.7	93.9 / -3.22	**PIPELINE HIT - 1/2"** **366 YONGE ST,,KINGSTON,ON,K7M 1G7,CA** **ON**	PINC

Incident ID:		**Fuel Category:**	
Incident No:	1903782	**Health Impact:**	
Incident Reported Dt:	7/14/2016	**Environment Impact:**	
Type:	FS-Pipeline Incident	**Property Damage:**	
Status Code:		**Service Interupt:**	
Customer Acct Name:	PIPELINE HIT - 1/2"	**Enforce Policy:**	
Incident Address:	366 YONGE ST,,KINGSTON,ON,K7M 1G7,CA	**Public Relation:**	
Tank Status:	Non Mandated	**Pipeline System:**	
Task No:		**Depth:**	
Spills Action Centre:		**Pipe Material:**	
Fuel Type:		**PSIG:**	
Fuel Occurrence Tp:		**Attribute Category:**	
Date of Occurrence:		**Regulator Location:**	
Occurrence Start Dt:		**Method Details:**	
Operation Type:			
Pipeline Type:			
Regulator Type:			
Summary:			
Reported By:			
Affiliation:			
Occurrence Desc:			
Damage Reason:			
Notes:			

12	1 of 3	NNW/227.1	96.8 / -0.30	**Queen's University** **950 Johnson Street 207 Stuart Street** **(Department of Environmental Health and Safety)** **Kingston ON**	OPCB

Year:	2013
Site Number:	40192A014
Name Owner:	Queen's University
Additional Site Information:	207 Stuart Street (Department of Environmental Health and Safety)

--Details--

Quantity:	2
Address Site:	

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

Description: High Number of Drums Ballasts (Count)

Quantity: 400
Address Site:
Description: High Calculated Total Weight of Ballast (kg)

12	2 of 3	NNW/227.1	96.8 / -0.30	Queen's University 950 Johnson Street 207 Stuart Street (Department of Environmental Health and Safety) Kingston ON	OPCB

Year: 2012
Site Number: 40192A014
Name Owner: Queen's University
Additional Site Information: 207 Stuart Street (Department of Environmental Health and Safety)

12	3 of 3	NNW/227.1	96.8 / -0.30	Queen's University at Kingston 950 Johnson St Kingston ON NA	SPL

Ref No:	5780-BD9P48	**Discharger Report:**	
Site No:	1073-9TMQXM	**Material Group:**	
Incident Dt:	3/30/2019	**Health/Env Conseq:**	1 - Administrative
Year:		**Client Type:**	Corporation
Incident Cause:		**Sector Type:**	
Incident Event:		**Agency Involved:**	
Contaminant Code:		**Nearest Watercourse:**	
Contaminant Name:		**Site Address:**	950 Johnson St
Contaminant Limit 1:		**Site District Office:**	Kingston - District
Contam Limit Freq 1:		**Site Postal Code:**	NA
Contaminant UN No 1:		**Site Region:**	Eastern
Environment Impact:		**Site Municipality:**	Kingston
Nature of Impact:		**Site Lot:**	
Receiving Medium:		**Site Conc:**	NA
Receiving Env:		**Northing:**	4898592
MOE Response:	No	**Easting:**	378857
Dt MOE Arvl on Scn:		**Site Geo Ref Accu:**	GIS Software
MOE Reported Dt:	5/9/2019	**Site Map Datum:**	NAD83
Dt Document Closed:		**SAC Action Class:**	
Incident Reason:		**Source Type:**	

Site Name: 950 Johnson Street
Site County/District: County of Frontenac
Site Geo Ref Meth: NA
Incident Summary: Late reporting- failed to report annual water takings by March 31
Contaminant Qty:

13	1 of 2	SW/250.1	89.9 / -7.19	GERARDO G LABERINTO 6 FORSYTHE AVE,,KINGSTON,ON,K7M 2L8,CA ON	PINC

Incident ID:		**Fuel Category:**	Natural Gas
Incident No:	1711798	**Health Impact:**	
Incident Reported Dt:	8/31/2015	**Environment Impact:**	
Type:	FS-Pipeline Incident	**Property Damage:**	Yes
Status Code:		**Service Interupt:**	
Customer Acct Name:	GERARDO G LABERINTO	**Enforce Policy:**	Yes
Incident Address:	6 FORSYTHE AVE,,KINGSTON,ON,K7M 2L8, CA	**Public Relation:**	
Tank Status:	Pipeline Damage Reason Est	**Pipeline System:**	

Task No:	5850109	**Depth:**	
Spills Action Centre:		**Pipe Material:**	
Fuel Type:		**PSIG:**	
Fuel Occurrence Tp:		**Attribute Category:**	FS-Perform P-line Inc Invest
Date of Occurrence:		**Regulator Location:**	
Occurrence Start Dt:	2015/09/14	**Method Details:**	E-mail
Operation Type:			
Pipeline Type:			
Regulator Type:			
Summary:	6 FORSYTHE AVE, KINGSTON - PIPELINE HIT 2"		
Reported By:	HAROLD DALMAS - KINGSTON UTILITIES		
Affiliation:			
Occurrence Desc:			
Damage Reason:	Excavation practices not sufficient		
Notes:			

13	2 of 2	SW/250.1	89.9 / -7.19	6 Forsythe Street, at the orner of Yonge Str Kingston ON	SPL

Ref No:	0151-9ZWL47	**Discharger Report:**	
Site No:	NA	**Material Group:**	
Incident Dt:	8/31/2015	**Health/Env Conseq:**	
Year:		**Client Type:**	
Incident Cause:		**Sector Type:**	Miscellaneous Industrial
Incident Event:		**Agency Involved:**	
Contaminant Code:	35	**Nearest Watercourse:**	
Contaminant Name:	NATURAL GAS (METHANE)	**Site Address:**	6 Forsythe Street, at the orner of Yonge Str
Contaminant Limit 1:		**Site District Office:**	
Contam Limit Freq 1:		**Site Postal Code:**	
Contaminant UN No 1:		**Site Region:**	
Environment Impact:		**Site Municipality:**	Kingston
Nature of Impact:		**Site Lot:**	
Receiving Medium:		**Site Conc:**	
Receiving Env:		**Northing:**	
MOE Response:	No	**Easting:**	
Dt MOE Arvl on Scn:		**Site Geo Ref Accu:**	
MOE Reported Dt:	8/31/2015	**Site Map Datum:**	
Dt Document Closed:	11/27/2015	**SAC Action Class:**	TSSA - Fuel Safety Branch - Hydrocarbon Fuel Release/Spill
Incident Reason:	Operator/Human Error	**Source Type:**	
Site Name:	Road work site<UNOFFICIAL>		
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	TSSA/FSB 2 inch plastic, line damage, made safe		
Contaminant Qty:	0 other - see incident description		

14	1 of 2	N/257.8	99.1 / 1.96	M Sullivan & Son Ltd. 948 Johnson Street Kingston ON K7L 1Z2	GEN

Generator No:	ON3180013	**PO Box No:**	
Status:		**Country:**	Canada
Approval Years:	2015	**Choice of Contact:**	CO_OFFICIAL
Contam. Facility:	No	**Co Admin:**	SHAUNA MCCLELLAND
MHSW Facility:	No	**Phone No Admin:**	613.541.1013 Ext.1610
SIC Code:	541620		
SIC Description:	ENVIRONMENTAL CONSULTING SERVICES		

Detail(s)

Waste Class: 252

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

Waste Class Desc: WASTE OILS & LUBRICANTS

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15 | **1 of 2** | **NW/267.8** | **94.9 / -2.22** | **SOUSA READY MIX**
401 YONGE ST,,KINGSTON,ON,K7M 1G2,CA
ON | **PINC**

Incident ID:		**Fuel Category:**	Natural Gas
Incident No:	1903882	**Health Impact:**	
Incident Reported Dt:	7/14/2016	**Environment Impact:**	
Type:	FS-Pipeline Incident	**Property Damage:**	Yes
Status Code:		**Service Interupt:**	
Customer Acct Name:	SOUSA READY MIX	**Enforce Policy:**	Yes
Incident Address:	401 YONGE ST,,KINGSTON,ON,K7M 1G2,CA	**Public Relation:**	
Tank Status:	Pipeline Damage Reason Est	**Pipeline System:**	
Task No:	6250373	**Depth:**	
Spills Action Centre:		**Pipe Material:**	
Fuel Type:		**PSIG:**	
Fuel Occurrence Tp:		**Attribute Category:**	FS-Perform P-line Inc Invest
Date of Occurrence:		**Regulator Location:**	
Occurrence Start Dt:	2016/08/29	**Method Details:**	E-mail
Operation Type:			
Pipeline Type:			
Regulator Type:			

Summary: 401 YONGE STREET, KINGSTON - PIPELINE HIT - 1/2"
Reported By: Ben Covell - KINGSTON UTILITIES
Affiliation:
Occurrence Desc:
Damage Reason: Excavation practices not sufficient
Notes:

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15 | **2 of 2** | **NW/267.8** | **94.9 / -2.22** | **Kingston Utilities<UNOFFICIAL>**
401 yonge street
Kingston ON | **SPL**

Ref No:	6436-ABURN5	**Discharger Report:**	
Site No:	NA	**Material Group:**	
Incident Dt:	2016/07/14	**Health/Env Conseq:**	
Year:		**Client Type:**	
Incident Cause:		**Sector Type:**	Miscellaneous Communal
Incident Event:	Leak/Break	**Agency Involved:**	
Contaminant Code:	35	**Nearest Watercourse:**	
Contaminant Name:	NATURAL GAS (METHANE)	**Site Address:**	401 yonge street
Contaminant Limit 1:		**Site District Office:**	
Contam Limit Freq 1:		**Site Postal Code:**	
Contaminant UN No 1:		**Site Region:**	
Environment Impact:		**Site Municipality:**	Kingston
Nature of Impact:		**Site Lot:**	
Receiving Medium:		**Site Conc:**	
Receiving Env:	Air	**Northing:**	
MOE Response:	No	**Easting:**	
Dt MOE Arvl on Scn:		**Site Geo Ref Accu:**	
MOE Reported Dt:	2016/07/14	**Site Map Datum:**	
Dt Document Closed:	2016/08/16	**SAC Action Class:**	TSSA - Fuel Safety Branch - Hydrocarbon Fuel Release/Spill
Incident Reason:	Operator/Human Error	**Source Type:**	
Site Name:	residential<UNOFFICIAL>		
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	TSSA: 1/2" line strike - made safe-		
Contaminant Qty:	0 other - see incident description		

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
16	1 of 1	NW/268.1	94.8 / -2.34	401 YONGE ST Kingston ON	WWIS

Well ID:	7180707	**Data Entry Status:**	
Construction Date:		**Data Src:**	
Primary Water Use:	Monitoring and Test Hole	**Date Received:**	5/10/2012
Sec. Water Use:	0	**Selected Flag:**	Yes
Final Well Status:	Test Hole	**Abandonment Rec:**	
Water Type:		**Contractor:**	7241
Casing Material:		**Form Version:**	7
Audit No:	Z146496	**Owner:**	
Tag:	A126560	**Street Name:**	401 YONGE ST
Construction Method:		**County:**	FRONTENAC
Elevation (m):		**Municipality:**	KINGSTON CITY
Elevation Reliability:		**Site Info:**	
Depth to Bedrock:		**Lot:**	
Well Depth:		**Concession:**	
Overburden/Bedrock:		**Concession Name:**	
Pump Rate:		**Easting NAD83:**	
Static Water Level:		**Northing NAD83:**	
Flowing (Y/N):		**Zone:**	
Flow Rate:		**UTM Reliability:**	
Clear/Cloudy:			

PDF URL (Map): https://d2khazk8e83rdv.cloudfront.net/moe_mapping/downloads/2Water/Wells_pdfs/718\7180707.pdf

Bore Hole Information

Bore Hole ID:	1003760895	**Elevation:**	95.490776
DP2BR:		**Elevrc:**	
Spatial Status:		**Zone:**	18
Code OB:		**East83:**	378748
Code OB Desc:		**North83:**	4898579
Open Hole:		**Org CS:**	UTM83
Cluster Kind:		**UTMRC:**	3
Date Completed:	3/1/2012	**UTMRC Desc:**	margin of error : 10 - 30 m
Remarks:		**Location Method:**	wwr
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	1004304133
Layer:	2
Color:	6
General Color:	BROWN
Mat1:	05
Most Common Material:	CLAY
Mat2:	28
Mat2 Desc:	SAND
Mat3:	85
Mat3 Desc:	SOFT
Formation Top Depth:	.61
Formation End Depth:	3.96
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304132
Layer:	1
Color:	6
General Color:	BROWN
Mat1:	02
Most Common Material:	TOPSOIL
Mat2:	
Mat2 Desc:	
Mat3:	77
Mat3 Desc:	LOOSE
Formation Top Depth:	0
Formation End Depth:	.61
Formation End Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304143
Layer:	3
Plug From:	0.91
Plug To:	3.96
Plug Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304141
Layer:	1
Plug From:	0
Plug To:	0.31
Plug Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304142
Layer:	2
Plug From:	0.31
Plug To:	0.91
Plug Depth UOM:	m

Method of Construction & Well Use

Method Construction ID:	1004304140
Method Construction Code:	D
Method Construction:	Direct Push
Other Method Construction:	

Pipe Information

Pipe ID:	1004304131
Casing No:	0
Comment:	
Alt Name:	

Construction Record - Casing

Casing ID:	1004304136
Layer:	1

Material:	5
Open Hole or Material:	PLASTIC
Depth From:	0
Depth To:	.91
Casing Diameter:	4.03
Casing Diameter UOM:	cm
Casing Depth UOM:	m

Construction Record - Screen

Screen ID:	1004304137
Layer:	1
Slot:	10
Screen Top Depth:	0.91
Screen End Depth:	3.96
Screen Material:	5
Screen Depth UOM:	m
Screen Diameter UOM:	cm
Screen Diameter:	4.82

Water Details

Water ID:	1004304135
Layer:	
Kind Code:	
Kind:	
Water Found Depth:	
Water Found Depth UOM:	m

Hole Diameter

Hole ID:	1004304134
Diameter:	8.25
Depth From:	0
Depth To:	3.96
Hole Depth UOM:	m
Hole Diameter UOM:	cm

17	1 of 1	NW/276.9	94.9 / -2.18	401 YOUNGE ST Kingston ON	WWIS

Well ID:	7180706	**Data Entry Status:**	
Construction Date:		**Data Src:**	
Primary Water Use:	Monitoring and Test Hole	**Date Received:**	5/10/2012
Sec. Water Use:	0	**Selected Flag:**	Yes
Final Well Status:	Test Hole	**Abandonment Rec:**	
Water Type:		**Contractor:**	7241
Casing Material:		**Form Version:**	7
Audit No:	Z146497	**Owner:**	
Tag:	A126559	**Street Name:**	401 YOUNGE ST
Construction Method:		**County:**	FRONTENAC
Elevation (m):		**Municipality:**	KINGSTON CITY
Elevation Reliability:		**Site Info:**	
Depth to Bedrock:		**Lot:**	
Well Depth:		**Concession:**	
Overburden/Bedrock:		**Concession Name:**	
Pump Rate:		**Easting NAD83:**	
Static Water Level:		**Northing NAD83:**	
Flowing (Y/N):		**Zone:**	
Flow Rate:		**UTM Reliability:**	
Clear/Cloudy:			

PDF URL (Map): https://d2khazk8e83rdv.cloudfront.net/moe_mapping/downloads/2Water/Wells_pdfs/718\7180706.pdf

Bore Hole Information

Bore Hole ID:	1003760892	**Elevation:**	95.349182
DP2BR:		**Elevrc:**	
Spatial Status:		**Zone:**	18
Code OB:		**East83:**	378744
Code OB Desc:		**North83:**	4898587
Open Hole:		**Org CS:**	UTM83
Cluster Kind:		**UTMRC:**	3
Date Completed:	2/1/2012	**UTMRC Desc:**	margin of error : 10 - 30 m
Remarks:		**Location Method:**	wwr
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	1004304120
Layer:	2
Color:	6
General Color:	BROWN
Mat1:	05
Most Common Material:	CLAY
Mat2:	28
Mat2 Desc:	SAND
Mat3:	
Mat3 Desc:	
Formation Top Depth:	.61
Formation End Depth:	4.57
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304119
Layer:	1
Color:	6
General Color:	BROWN
Mat1:	02
Most Common Material:	TOPSOIL
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	
Formation Top Depth:	0
Formation End Depth:	.61
Formation End Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304129
Layer:	2
Plug From:	0.31
Plug To:	1.22
Plug Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304130
Layer:	3
Plug From:	1.22
Plug To:	4.57
Plug Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304128
Layer:	1
Plug From:	0
Plug To:	0.31
Plug Depth UOM:	m

Method of Construction & Well Use

Method Construction ID:	1004304127
Method Construction Code:	D
Method Construction:	Direct Push
Other Method Construction:	

Pipe Information

Pipe ID:	1004304118
Casing No:	0
Comment:	
Alt Name:	

Construction Record - Casing

Casing ID:	1004304123
Layer:	1
Material:	5
Open Hole or Material:	PLASTIC
Depth From:	0
Depth To:	1.5
Casing Diameter:	4.03
Casing Diameter UOM:	cm
Casing Depth UOM:	m

Construction Record - Screen

Screen ID:	1004304124
Layer:	1
Slot:	10
Screen Top Depth:	1.5
Screen End Depth:	4.57
Screen Material:	5
Screen Depth UOM:	m
Screen Diameter UOM:	cm
Screen Diameter:	4.82

Water Details

Water ID:	1004304122
Layer:	
Kind Code:	
Kind:	
Water Found Depth:	
Water Found Depth UOM:	m

Hole Diameter

Hole ID:	1004304121
Diameter:	8.25
Depth From:	0
Depth To:	4.57
Hole Depth UOM:	m
Hole Diameter UOM:	cm

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18 | **1 of 1** | **NW/280.2** | **95.3 / -1.82** | **401 YONGE ST Kingston ON** | **WWIS**

Well ID:	7180708	**Data Entry Status:**	
Construction Date:		**Data Src:**	
Primary Water Use:	Monitoring and Test Hole	**Date Received:**	5/10/2012
Sec. Water Use:	0	**Selected Flag:**	Yes
Final Well Status:	Test Hole	**Abandonment Rec:**	
Water Type:		**Contractor:**	7241
Casing Material:		**Form Version:**	7
Audit No:	Z146498	**Owner:**	
Tag:	A126561	**Street Name:**	401 YONGE ST
Construction Method:		**County:**	FRONTENAC
Elevation (m):		**Municipality:**	KINGSTON TOWNSHIP
Elevation Reliability:		**Site Info:**	
Depth to Bedrock:		**Lot:**	
Well Depth:		**Concession:**	
Overburden/Bedrock:		**Concession Name:**	
Pump Rate:		**Easting NAD83:**	
Static Water Level:		**Northing NAD83:**	
Flowing (Y/N):		**Zone:**	
Flow Rate:		**UTM Reliability:**	
Clear/Cloudy:			

PDF URL (Map): https://d2khazk8e83rdv.cloudfront.net/moe_mapping/downloads/2Water/Wells_pdfs/718\7180708.pdf

Bore Hole Information

Bore Hole ID:	1003760898	**Elevation:**	95.465988
DP2BR:		**Elevrc:**	
Spatial Status:		**Zone:**	18
Code OB:		**East83:**	378747
Code OB Desc:		**North83:**	4898593
Open Hole:		**Org CS:**	UTM83
Cluster Kind:		**UTMRC:**	4
Date Completed:	3/1/2012	**UTMRC Desc:**	margin of error : 30 m - 100 m
Remarks:		**Location Method:**	wwr
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	1004304148
Layer:	4
Color:	2
General Color:	GREY
Mat1:	15
Most Common Material:	LIMESTONE
Mat2:	
Mat2 Desc:	
Mat3:	73
Mat3 Desc:	HARD
Formation Top Depth:	4.88
Formation End Depth:	8.84
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304145
Layer:	1
Color:	6
General Color:	BROWN
Mat1:	02
Most Common Material:	TOPSOIL
Mat2:	
Mat2 Desc:	
Mat3:	77
Mat3 Desc:	LOOSE
Formation Top Depth:	0
Formation End Depth:	.61
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304147
Layer:	3
Color:	2
General Color:	GREY
Mat1:	28
Most Common Material:	SAND
Mat2:	11
Mat2 Desc:	GRAVEL
Mat3:	85
Mat3 Desc:	SOFT
Formation Top Depth:	4.27
Formation End Depth:	4.88
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304146
Layer:	2
Color:	6
General Color:	BROWN
Mat1:	05
Most Common Material:	CLAY
Mat2:	28
Mat2 Desc:	SAND
Mat3:	85
Mat3 Desc:	SOFT
Formation Top Depth:	.61

Formation End Depth:	4.27
Formation End Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304159
Layer:	3
Plug From:	5.49
Plug To:	8.84
Plug Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304158
Layer:	2
Plug From:	0.31
Plug To:	5.48
Plug Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304157
Layer:	1
Plug From:	0
Plug To:	0.31
Plug Depth UOM:	m

Method of Construction & Well Use

Method Construction ID:	1004304156
Method Construction Code:	5
Method Construction:	Air Percussion
Other Method Construction:	

Pipe Information

Pipe ID:	1004304144
Casing No:	0
Comment:	
Alt Name:	

Construction Record - Casing

Casing ID:	1004304152
Layer:	1
Material:	5
Open Hole or Material:	PLASTIC
Depth From:	0
Depth To:	5.79
Casing Diameter:	4.03
Casing Diameter UOM:	cm
Casing Depth UOM:	m

Construction Record - Screen

Screen ID:	1004304153

Layer:	1
Slot:	10
Screen Top Depth:	5.79
Screen End Depth:	8.84
Screen Material:	5
Screen Depth UOM:	m
Screen Diameter UOM:	cm
Screen Diameter:	4.82

Water Details

Water ID:	1004304151
Layer:	
Kind Code:	
Kind:	
Water Found Depth:	
Water Found Depth UOM:	m

Hole Diameter

Hole ID:	1004304150
Diameter:	7.62
Depth From:	4.88
Depth To:	8.84
Hole Depth UOM:	m
Hole Diameter UOM:	cm

Hole Diameter

Hole ID:	1004304149
Diameter:	11.43
Depth From:	0
Depth To:	4.88
Hole Depth UOM:	m
Hole Diameter UOM:	cm

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19 | **1 of 1** | **NW/281.2** | **95.3 / -1.79** | **401 YOUNGE ST Kingston ON** | **WWIS**

Well ID:	7180704	**Data Entry Status:**	
Construction Date:		**Data Src:**	
Primary Water Use:	Monitoring and Test Hole	**Date Received:**	5/10/2012
Sec. Water Use:	0	**Selected Flag:**	Yes
Final Well Status:	Test Hole	**Abandonment Rec:**	
Water Type:		**Contractor:**	7241
Casing Material:		**Form Version:**	7
Audit No:	Z146418	**Owner:**	
Tag:	A126556	**Street Name:**	401 YOUNGE ST
Construction Method:		**County:**	FRONTENAC
Elevation (m):		**Municipality:**	KINGSTON CITY
Elevation Reliability:		**Site Info:**	
Depth to Bedrock:		**Lot:**	
Well Depth:		**Concession:**	
Overburden/Bedrock:		**Concession Name:**	
Pump Rate:		**Easting NAD83:**	
Static Water Level:		**Northing NAD83:**	
Flowing (Y/N):		**Zone:**	
Flow Rate:		**UTM Reliability:**	
Clear/Cloudy:			

PDF URL (Map): https://d2khazk8e83rdv.cloudfront.net/moe_mapping/downloads/2Water/Wells_pdfs/718\7180704.pdf

Bore Hole Information

Bore Hole ID:	1003760886	***Elevation:***	95.700996
DP2BR:		***Elevrc:***	
Spatial Status:		***Zone:***	18
Code OB:		***East83:***	378753
Code OB Desc:		***North83:***	4898598
Open Hole:		***Org CS:***	UTM83
Cluster Kind:		***UTMRC:***	3
Date Completed:	3/1/2012	***UTMRC Desc:***	margin of error : 10 - 30 m
Remarks:		***Location Method:***	wwr
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	1004304092
Layer:	1
Color:	6
General Color:	BROWN
Mat1:	02
Most Common Material:	TOPSOIL
Mat2:	77
Mat2 Desc:	LOOSE
Mat3:	85
Mat3 Desc:	SOFT
Formation Top Depth:	0
Formation End Depth:	.61
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304093
Layer:	2
Color:	6
General Color:	BROWN
Mat1:	05
Most Common Material:	CLAY
Mat2:	28
Mat2 Desc:	SAND
Mat3:	85
Mat3 Desc:	SOFT
Formation Top Depth:	.61
Formation End Depth:	5.18
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304094
Layer:	3
Color:	2
General Color:	GREY
Mat1:	28
Most Common Material:	SAND
Mat2:	11
Mat2 Desc:	GRAVEL

Mat3: 85
Mat3 Desc: SOFT
Formation Top Depth: 5.18
Formation End Depth: 5.49
Formation End Depth UOM: m

Annular Space/Abandonment Sealing Record

Plug ID: 1004304102
Layer: 1
Plug From: 0
Plug To: 0.31
Plug Depth UOM: m

Annular Space/Abandonment Sealing Record

Plug ID: 1004304104
Layer: 3
Plug From: 2.13
Plug To: 5.49
Plug Depth UOM: m

Annular Space/Abandonment Sealing Record

Plug ID: 1004304103
Layer: 2
Plug From: 0.31
Plug To: 2.13
Plug Depth UOM: m

Method of Construction & Well Use

Method Construction ID: 1004304101
Method Construction Code: D
Method Construction: Direct Push
Other Method Construction:

Pipe Information

Pipe ID: 1004304091
Casing No: 0
Comment:
Alt Name:

Construction Record - Casing

Casing ID: 1004304097
Layer: 1
Material: 5
Open Hole or Material: PLASTIC
Depth From: 0
Depth To: 2.44
Casing Diameter: 4.03
Casing Diameter UOM: cm
Casing Depth UOM: m

Construction Record - Screen

Screen ID:	1004304098
Layer:	1
Slot:	10
Screen Top Depth:	2.44
Screen End Depth:	5.49
Screen Material:	5
Screen Depth UOM:	m
Screen Diameter UOM:	cm
Screen Diameter:	4.82

Water Details

Water ID:	1004304096
Layer:	
Kind Code:	
Kind:	
Water Found Depth:	
Water Found Depth UOM:	m

Hole Diameter

Hole ID:	1004304095
Diameter:	8.25
Depth From:	0
Depth To:	5.49
Hole Depth UOM:	m
Hole Diameter UOM:	cm

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20 ***1 of 1*** ***NW/286.9*** ***95.3 / -1.82*** ***401 YOUNGE ST Kingston ON*** ***WWIS***

Well ID:	7180705	***Data Entry Status:***	
Construction Date:		***Data Src:***	
Primary Water Use:	Monitoring and Test Hole	***Date Received:***	5/10/2012
Sec. Water Use:	0	***Selected Flag:***	Yes
Final Well Status:	Test Hole	***Abandonment Rec:***	
Water Type:		***Contractor:***	7241
Casing Material:		***Form Version:***	7
Audit No:	Z146494	***Owner:***	
Tag:	A126557	***Street Name:***	401 YOUNGE ST
Construction Method:		***County:***	FRONTENAC
Elevation (m):		***Municipality:***	KINGSTON CITY
Elevation Reliability:		***Site Info:***	
Depth to Bedrock:		***Lot:***	
Well Depth:		***Concession:***	
Overburden/Bedrock:		***Concession Name:***	
Pump Rate:		***Easting NAD83:***	
Static Water Level:		***Northing NAD83:***	
Flowing (Y/N):		***Zone:***	
Flow Rate:		***UTM Reliability:***	
Clear/Cloudy:			

PDF URL (Map): https://d2khazk8e83rdv.cloudfront.net/moe_mapping/downloads/2Water/Wells_pdfs/718\7180705.pdf

Bore Hole Information

Bore Hole ID:	1003760889	***Elevation:***	95.459281
DP2BR:		***Elevrc:***	
Spatial Status:		***Zone:***	18
Code OB:		***East83:***	378744

Code OB Desc:		***North83:***	4898599
Open Hole:		***Org CS:***	UTM83
Cluster Kind:		***UTMRC:***	3
Date Completed:	2/1/2012	***UTMRC Desc:***	margin of error : 10 - 30 m
Remarks:		***Location Method:***	wwr
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	1004304106
Layer:	1
Color:	6
General Color:	BROWN
Mat1:	02
Most Common Material:	TOPSOIL
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	
Formation Top Depth:	0
Formation End Depth:	.61
Formation End Depth UOM:	m

Overburden and Bedrock Materials Interval

Formation ID:	1004304107
Layer:	2
Color:	6
General Color:	BROWN
Mat1:	05
Most Common Material:	CLAY
Mat2:	28
Mat2 Desc:	SAND
Mat3:	
Mat3 Desc:	
Formation Top Depth:	.61
Formation End Depth:	4.57
Formation End Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304116
Layer:	2
Plug From:	0.31
Plug To:	1.22
Plug Depth UOM:	m

Annular Space/Abandonment Sealing Record

Plug ID:	1004304117
Layer:	3
Plug From:	1.22
Plug To:	4.57

Plug Depth UOM: m

Annular Space/Abandonment Sealing Record

Plug ID: 1004304115
Layer: 1
Plug From: 0
Plug To: 0.31
Plug Depth UOM: m

Method of Construction & Well Use

Method Construction ID: 1004304114
Method Construction Code: D
Method Construction: Direct Push
Other Method Construction:

Pipe Information

Pipe ID: 1004304105
Casing No: 0
Comment:
Alt Name:

Construction Record - Casing

Casing ID: 1004304110
Layer: 1
Material: 5
Open Hole or Material: PLASTIC
Depth From: 0
Depth To: 1.5
Casing Diameter: 4.03
Casing Diameter UOM: cm
Casing Depth UOM: m

Construction Record - Screen

Screen ID: 1004304111
Layer: 1
Slot: 10
Screen Top Depth: 1.5
Screen End Depth: 4.57
Screen Material: 5
Screen Depth UOM: m
Screen Diameter UOM: cm
Screen Diameter: 4.82

Water Details

Water ID: 1004304109
Layer:
Kind Code:
Kind:
Water Found Depth:
Water Found Depth UOM: m

Hole Diameter

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

Hole ID: 1004304108
Diameter: 8.25
Depth From: 0
Depth To: 4.57
Hole Depth UOM: m
Hole Diameter UOM: cm

21	1 of 2	NE/288.3	102.7 / 5.61	KINGSTON PUBLIC UTILITIES COMM. SUBSTN. #12, 876 JOHNSON ST. C/O 211 COUNTER ST. P.O.BOX 790 KINGSTON ON K7L 4X7	GEN

Generator No: ON0415407
Status:
Approval Years: 89,90
Contam. Facility:
MHSW Facility:
SIC Code: 4911
SIC Description: ELECT. POWER SYS.

PO Box No:
Country:
Choice of Contact:
Co Admin:
Phone No Admin:

Detail(s)

Waste Class: 251
Waste Class Desc: OIL SKIMMINGS & SLUDGES

21	2 of 2	NE/288.3	102.7 / 5.61	KINGSTON PUBLIC UTILITIES COMM. 23-413 SUBSTN. #12, 876 JOHNSON ST. C/O 211 COUNTER ST. P.O.BOX 790 KINGSTON ON K7L 4X7	GEN

Generator No: ON0415407
Status:
Approval Years: 92,93,94,95,96,97,98
Contam. Facility:
MHSW Facility:
SIC Code: 4911
SIC Description: ELECT. POWER SYS.

PO Box No:
Country:
Choice of Contact:
Co Admin:
Phone No Admin:

Detail(s)

Waste Class: 251
Waste Class Desc: OIL SKIMMINGS & SLUDGES

22	1 of 1	WSW/290.7	89.8 / -7.35	KINGSTON CITY WOLFE ST./FORSYTHE AVE. KINGSTON CITY ON	CA

Certificate #: 3-0990-94-
Application Year: 94
Issue Date: 8/10/1994
Approval Type: Municipal sewage
Status: Approved
Application Type:
Client Name:
Client Address:
Client City:
Client Postal Code:
Project Description:
Contaminants:
Emission Control:

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
23	1 of 1	WSW/290.8	89.8 / -7.35	Corner of Wolfe St and Forsythe Ave Kingston ON	SPL

Ref No:	6203-ALLHA4	**Discharger Report:**	
Site No:		**Material Group:**	
Incident Dt:	4/20/2017	**Health/Env Conseq:**	2 - Minor Environment
Year:		**Client Type:**	
Incident Cause:		**Sector Type:**	Unknown / N/A
Incident Event:	Leak/Break	**Agency Involved:**	
Contaminant Code:	13	**Nearest Watercourse:**	
Contaminant Name:	DIESEL FUEL	**Site Address:**	Corner of Wolfe St and Forsythe Ave
Contaminant Limit 1:		**Site District Office:**	Kingston - District
Contam Limit Freq 1:		**Site Postal Code:**	
Contaminant UN No 1:	1202	**Site Region:**	Eastern
Environment Impact:		**Site Municipality:**	Kingston
Nature of Impact:		**Site Lot:**	
Receiving Medium:		**Site Conc:**	
Receiving Env:	Surface Water	**Northing:**	4898198
MOE Response:		**Easting:**	378643
Dt MOE Arvl on Scn:		**Site Geo Ref Accu:**	
MOE Reported Dt:	4/20/2017	**Site Map Datum:**	
Dt Document Closed:		**SAC Action Class:**	
Incident Reason:	Equipment Failure	**Source Type:**	Motor Vehicle
Site Name:	Catchbasin <UNOFFICIAL>		
Site County/District:	County of Frontenac		
Site Geo Ref Meth:			
Incident Summary:	City of Kingston: 2-3L Diesel to Catchbasin. Contained & Cleaning.		
Contaminant Qty:	3 L		

Unplottable Summary

Total: 26 Unplottable sites

DB	Company Name/Site Name	Address	City	Postal
CA	P.U.C. KINGSTON	SIR JOHN A. MACDONALD BLVD.	KINGSTON CITY ON	
CA	P.U.C. KINGSTON	WATERMAIN EXT. ON YONGE ST.	KINGSTON CITY ON	
CA	CITY	YONGE ST.,HAROLD HARVEY ARENA	KINGSTON CITY ON	
CA	Johson treet	Johnson Street	Kingston ON	
CA	The Corporation of the City of Kingston	Johnson St	Kingston ON	
CA	KINGSTON P.U.C.	SIR JOHN A. MACDONALD BLVD.	KINGSTON CITY ON	
CA	KINGSTON CITY	W. OF SIR JOHN A. MACDONALD	KINGSTON CITY ON	
CONV	QUEEN'S UNIVERSITY *		KINGSTON ON	
GEN	QUEEN'S UNIVERSITY	WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD.	KINGSTON ON	K7L 1H3
GEN	QUEEN'S UNIVERSITY	WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD.	KINGSTON ON	K7L 1H3
GEN	QUEEN'S UNIVERSITY	WEST CAMPUS / MACARTHUR COLLEGE	KINGSTON ON	K7L 3N6
GEN	QUEEN'S UNIVERSITY	WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD.	KINGSTON ON	K7L 1H3
GEN	QUEEN'S UNIVERSITY	WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD.	KINGSTON ON	K7L 1H3
GEN	QUEEN'S UNIVERSITY	CANCER RESEARCH LABORATORIES 3RD FLOOR BOTTERELL HALL	KINGSTON ON	K7L 3N6
GEN	QUEEN'S UNIVERSITY	WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD.	KINGSTON ON	K7L 1H3
GEN	QUEEN'S UNIVERSITY	WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD.	KINGSTON ON	K7L 1H3
NPCB	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A MACDONALD; BETWEEN UNION & JOHN	KINGSTON ON	
NPCB	QUEENS UNIVERSITY	DIRECTOR; OCCUPATIONAL HEALTH & SAFETY	KINGSTON ON	K7L 3N6

NPCB	QUEEN'S UNIVERSITY	BETWEEN UNION & JOHNSON ST WEST OF SIR JOHN A MACDONALD	KINGSTON ON	
REC	QUEEN'S UNIVERSITY	WEST OF SIR JOHN A. MACDONALD BETWEEN UNION & JOHNSON ST.	KINGSTON ON	K7L 3N6
SPL	KINGSTON, CITY OF	CATARAQUI RIVER, FROM PALACE ROAD PUMP STATION SEWAGE PUMPING STATION	KINGSTON CITY ON	
SPL	The Corporation of the City of Kingston	Palace Rd	Kingston ON	
SPL	ONTARIO HYDRO	LOT 20, CONCESSION I TRANSFORMER	CENTRAL FRONTENAC TOWNSHIP ON	
SPL	QUEEN'S UNIVERSITY	QUEENS CENTRAL HEATING PLANT HEATING PLANT	KINGSTON CITY ON	
SPL	QUEEN'S UNIVERSITY	QUEEN'S UNIVERSITY HEATING PLANT (CATCH BASIN), KINGSTON HEATING PLANT	KINGSTON CITY ON	
SPL		Sir John A. MacDonald Blvd to Portsmouth Ave.	Kingston ON	

Unplottable Report

Site: ***P.U.C. KINGSTON***
SIR JOHN A. MACDONALD BLVD. KINGSTON CITY ON

Database: ***CA***

Certificate #:	7-0283-90-
Application Year:	90
Issue Date:	3/9/1990
Approval Type:	Municipal water
Status:	Approved
Application Type:	
Client Name:	
Client Address:	
Client City:	
Client Postal Code:	
Project Description:	
Contaminants:	
Emission Control:	

Site: ***P.U.C. KINGSTON***
WATERMAIN EXT. ON YONGE ST. KINGSTON CITY ON

Database: ***CA***

Certificate #:	7-1078-93-
Application Year:	93
Issue Date:	1/19/1994
Approval Type:	Municipal water
Status:	Approved in 1994
Application Type:	
Client Name:	
Client Address:	
Client City:	
Client Postal Code:	
Project Description:	
Contaminants:	
Emission Control:	

Site: ***CITY***
YONGE ST.,HAROLD HARVEY ARENA KINGSTON CITY ON

Database: ***CA***

Certificate #:	3-1227-85-006
Application Year:	85
Issue Date:	10/31/85
Approval Type:	Municipal sewage
Status:	Approved
Application Type:	
Client Name:	
Client Address:	
Client City:	
Client Postal Code:	
Project Description:	
Contaminants:	
Emission Control:	

Site: ***Johson treet***
Johnson Street Kingston ON

Database: ***CA***

Certificate #:	3762-56WQAS
Application Year:	02

Issue Date:	2/15/02
Approval Type:	Municipal & Private sewage
Status:	Approved
Application Type:	New Certificate of Approval
Client Name:	The Corporation of the City of Kingston
Client Address:	211 Counter Street
Client City:	Kingston
Client Postal Code:	K7L 4X7
Project Description:	This application is for approval to install combined sewers on Johnson street
Contaminants:	
Emission Control:	

Site: ***The Corporation of the City of Kingston***
Johnson St Kingston ON

Database: ***CA***

Certificate #:	5443-7M6Q2H
Application Year:	2008
Issue Date:	12/10/2008
Approval Type:	Municipal and Private Sewage Works
Status:	Approved
Application Type:	
Client Name:	
Client Address:	
Client City:	
Client Postal Code:	
Project Description:	
Contaminants:	
Emission Control:	

Site: ***KINGSTON P.U.C.***
SIR JOHN A. MACDONALD BLVD. KINGSTON CITY ON

Database: ***CA***

Certificate #:	7-0720-86-
Application Year:	86
Issue Date:	7/31/1986
Approval Type:	Municipal water
Status:	Approved
Application Type:	
Client Name:	
Client Address:	
Client City:	
Client Postal Code:	
Project Description:	
Contaminants:	
Emission Control:	

Site: ***KINGSTON CITY***
W. OF SIR JOHN A. MACDONALD KINGSTON CITY ON

Database: ***CA***

Certificate #:	3-0156-89-
Application Year:	89
Issue Date:	3/7/1989
Approval Type:	Municipal sewage
Status:	Approved
Application Type:	
Client Name:	
Client Address:	
Client City:	
Client Postal Code:	
Project Description:	
Contaminants:	
Emission Control:	

Site: ***QUEEN'S UNIVERSITY ****
KINGSTON ON

Database: ***CONV***

File No:
Crown Brief No:
Court Location:
Publication City:
Publication Title:
Act:
Act(s):
First Matter:
Second Matter:
Investigation 1:
Investigation 2:
Penalty Imposed:
Description: RECEIVING PCB WASTE AT A WASTE DISPOSAL SITE AND DISPOSING/MANAGING PCB WASTES WITHOUT MEETING THE REQUIREMENTS OF THE REGULATIONS.
Background:
URL:

Location:
Region:
Ministry District:

Additional Details

Publication Date:
Count: 1
Act: EPA
Regulation: 362
Section: 6
Act/Regulation/Section: EPA-362-6
Date of Offence:
Date of Conviction:
Date Charged: 08/23/1995
Charge Disposition:
Fine: $18000.00
Synopsis:

Additional Details

Publication Date:
Count: 1
Act: EPA
Regulation: 362
Section: 8
Act/Regulation/Section: EPA-362-8
Date of Offence:
Date of Conviction:
Date Charged: 08/23/1995
Charge Disposition:
Fine: $18000.00
Synopsis:

Site: ***QUEEN'S UNIVERSITY***
WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD. KINGSTON ON K7L 1H3

Database: ***GEN***

Generator No: ON0145601
Status:
Approval Years: 2014
Contam. Facility: No
MHSW Facility: No
SIC Code: 611110, 611710, 541990
SIC Description: ELEMENTARY AND SECONDARY SCHOOLS, EDUCATIONAL SUPPORT SERVICES, ALL OTHER PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES

PO Box No:
Country: Canada
Choice of Contact: CO_ADMIN
Co Admin: Tom T.M. Martinek
Phone No Admin: 613-533-6000 Ext.74976

Detail(s)

Waste Class: 221
Waste Class Desc: LIGHT FUELS

Waste Class: 112
Waste Class Desc: ACID WASTE - HEAVY METALS

Waste Class: 252
Waste Class Desc: WASTE OILS & LUBRICANTS

Waste Class: 121
Waste Class Desc: ALKALINE WASTES - HEAVY METALS

Waste Class: 145
Waste Class Desc: PAINT/PIGMENT/COATING RESIDUES

Waste Class: 148
Waste Class Desc: INORGANIC LABORATORY CHEMICALS

Waste Class: 264
Waste Class Desc: PHOTOPROCESSING WASTES

Waste Class: 242
Waste Class Desc: HALOGENATED PESTICIDES

Waste Class: 241
Waste Class Desc: HALOGENATED SOLVENTS

Waste Class: 263
Waste Class Desc: ORGANIC LABORATORY CHEMICALS

Waste Class: 243
Waste Class Desc: PCBS

Waste Class: 312
Waste Class Desc: PATHOLOGICAL WASTES

Waste Class: 211
Waste Class Desc: AROMATIC SOLVENTS

Site: ***QUEEN'S UNIVERSITY***
WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD. KINGSTON ON K7L 1H3

Database: ***GEN***

Generator No:	ON0145601	***PO Box No:***	
Status:		***Country:***	Canada
Approval Years:	2016	***Choice of Contact:***	CO_ADMIN
Contam. Facility:	No	***Co Admin:***	Tom T.M. Martinek
MHSW Facility:	No	***Phone No Admin:***	613-533-6000 Ext.74976
SIC Code:	611110, 611710, 541990		
SIC Description:	ELEMENTARY AND SECONDARY SCHOOLS, EDUCATIONAL SUPPORT SERVICES, ALL OTHER PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES		

Detail(s)

Waste Class: 112
Waste Class Desc: ACID WASTE - HEAVY METALS

Waste Class: 252
Waste Class Desc: WASTE OILS & LUBRICANTS

Waste Class: 263
Waste Class Desc: ORGANIC LABORATORY CHEMICALS

Waste Class: 148
Waste Class Desc: INORGANIC LABORATORY CHEMICALS

Waste Class: 145
Waste Class Desc: PAINT/PIGMENT/COATING RESIDUES

Waste Class: 241
Waste Class Desc: HALOGENATED SOLVENTS

Waste Class:	243
Waste Class Desc:	PCBS
Waste Class:	312
Waste Class Desc:	PATHOLOGICAL WASTES
Waste Class:	242
Waste Class Desc:	HALOGENATED PESTICIDES
Waste Class:	121
Waste Class Desc:	ALKALINE WASTES - HEAVY METALS
Waste Class:	264
Waste Class Desc:	PHOTOPROCESSING WASTES
Waste Class:	211
Waste Class Desc:	AROMATIC SOLVENTS
Waste Class:	221
Waste Class Desc:	LIGHT FUELS

Site: ***QUEEN'S UNIVERSITY***
WEST CAMPUS / MACARTHUR COLLEGE KINGSTON ON K7L 3N6

Database: ***GEN***

Generator No:	ON0145601	***PO Box No:***	
Status:		***Country:***	
Approval Years:	86,87,88	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:	8531		
SIC Description:	UNIVERSITY EDUCATION		

Detail(s)

Waste Class:	148
Waste Class Desc:	INORGANIC LABORATORY CHEMICALS
Waste Class:	241
Waste Class Desc:	HALOGENATED SOLVENTS
Waste Class:	263
Waste Class Desc:	ORGANIC LABORATORY CHEMICALS
Waste Class:	312
Waste Class Desc:	PATHOLOGICAL WASTES

Site: ***QUEEN'S UNIVERSITY***
WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD. KINGSTON ON K7L 1H3

Database: ***GEN***

Generator No:	ON0145601	***PO Box No:***	
Status:	Registered	***Country:***	Canada
Approval Years:	As of Jan 2021	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:			
SIC Description:			

Detail(s)

Waste Class:	121 C
Waste Class Desc:	Alkaline slutions - containing heavy metals
Waste Class:	264 T
Waste Class Desc:	Photoprocessing wastes
Waste Class:	221 L
Waste Class Desc:	Light fuels

Waste Class:	252 I
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	263 I
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	263 L
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	148 C
Waste Class Desc:	Misc. wastes and inorganic chemicals
Waste Class:	263 B
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	252 L
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	146 T
Waste Class Desc:	Other specified inorganic sludges, slurries or solids
Waste Class:	211 H
Waste Class Desc:	Aromatic solvents and residues
Waste Class:	211 T
Waste Class Desc:	Aromatic solvents and residues
Waste Class:	243 D
Waste Class Desc:	PCB
Waste Class:	112 C
Waste Class Desc:	Acid solutions - containing heavy metals
Waste Class:	145 I
Waste Class Desc:	Wastes from the use of pigments, coatings and paints
Waste Class:	242 T
Waste Class Desc:	Halogenated pesticides and herbicides
Waste Class:	264 L
Waste Class Desc:	Photoprocessing wastes
Waste Class:	252 T
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	148 L
Waste Class Desc:	Misc. wastes and inorganic chemicals

Site: ***QUEEN'S UNIVERSITY***
WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD. KINGSTON ON K7L 1H3

Database: ***GEN***

Generator No:	ON0145601	***PO Box No:***	
Status:	Registered	***Country:***	Canada
Approval Years:	As of Dec 2018	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:			
SIC Description:			

Detail(s)

Waste Class:	112 C
Waste Class Desc:	Acid solutions - containing heavy metals
Waste Class:	121 C
Waste Class Desc:	Alkaline slutions - containing heavy metals

Waste Class:	145 I
Waste Class Desc:	Wastes from the use of pigments, coatings and paints
Waste Class:	146 T
Waste Class Desc:	Other specified inorganic sludges, slurries or solids
Waste Class:	148 C
Waste Class Desc:	Misc. wastes and inorganic chemicals
Waste Class:	148 L
Waste Class Desc:	Misc. wastes and inorganic chemicals
Waste Class:	211 H
Waste Class Desc:	Aromatic solvents and residues
Waste Class:	211 T
Waste Class Desc:	Aromatic solvents and residues
Waste Class:	221 L
Waste Class Desc:	Light fuels
Waste Class:	242 T
Waste Class Desc:	Halogenated pesticides and herbicides
Waste Class:	243 D
Waste Class Desc:	PCB
Waste Class:	252 I
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	252 L
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	252 T
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	263 B
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	263 I
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	264 L
Waste Class Desc:	Photoprocessing wastes
Waste Class:	264 T
Waste Class Desc:	Photoprocessing wastes

Site: ***QUEEN'S UNIVERSITY***
CANCER RESEARCH LABORATORIES 3RD FLOOR BOTTERELL HALL KINGSTON ON K7L 3N6

Database: ***GEN***

Generator No:	ON0145604	***PO Box No:***	
Status:		***Country:***	
Approval Years:	88,89,90	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:	0000		
SIC Description:	*** NOT DEFINED ***		

Site: ***QUEEN'S UNIVERSITY***
WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD. KINGSTON ON K7L 1H3

Database: ***GEN***

Generator No:	ON0145601	***PO Box No:***	
Status:	Registered	***Country:***	Canada
Approval Years:	As of Jul 2020	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:			
SIC Description:			

Detail(s)

Waste Class:	146 T
Waste Class Desc:	Other specified inorganic sludges, slurries or solids
Waste Class:	264 L
Waste Class Desc:	Photoprocessing wastes
Waste Class:	263 I
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	211 H
Waste Class Desc:	Aromatic solvents and residues
Waste Class:	263 L
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	148 L
Waste Class Desc:	Misc. wastes and inorganic chemicals
Waste Class:	252 I
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	121 C
Waste Class Desc:	Alkaline slutions - containing heavy metals
Waste Class:	243 D
Waste Class Desc:	PCB
Waste Class:	252 L
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	112 C
Waste Class Desc:	Acid solutions - containing heavy metals
Waste Class:	221 L
Waste Class Desc:	Light fuels
Waste Class:	242 T
Waste Class Desc:	Halogenated pesticides and herbicides
Waste Class:	145 I
Waste Class Desc:	Wastes from the use of pigments, coatings and paints
Waste Class:	263 B
Waste Class Desc:	Misc. waste organic chemicals
Waste Class:	264 T
Waste Class Desc:	Photoprocessing wastes
Waste Class:	252 T
Waste Class Desc:	Waste crankcase oils and lubricants
Waste Class:	211 T
Waste Class Desc:	Aromatic solvents and residues
Waste Class:	148 C
Waste Class Desc:	Misc. wastes and inorganic chemicals

Site: ***QUEEN'S UNIVERSITY***
WEST CAMPUS (MCARTHUR COLLEGE) UNION STREET & SIR J.A. MACDONALD BLVD. KINGSTON ON K7L 1H3

Database: ***GEN***

Generator No:	ON0145601	***PO Box No:***	
Status:		***Country:***	Canada
Approval Years:	2015	***Choice of Contact:***	CO_ADMIN
Contam. Facility:	No	***Co Admin:***	Tom T.M. Martinek
MHSW Facility:	No	***Phone No Admin:***	613-533-6000 Ext.74976

SIC Code: 611110, 611710, 541990
SIC Description: ELEMENTARY AND SECONDARY SCHOOLS, EDUCATIONAL SUPPORT SERVICES, ALL OTHER PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES

Detail(s)

Waste Class: 148
Waste Class Desc: INORGANIC LABORATORY CHEMICALS

Waste Class: 264
Waste Class Desc: PHOTOPROCESSING WASTES

Waste Class: 252
Waste Class Desc: WASTE OILS & LUBRICANTS

Waste Class: 112
Waste Class Desc: ACID WASTE - HEAVY METALS

Waste Class: 211
Waste Class Desc: AROMATIC SOLVENTS

Waste Class: 121
Waste Class Desc: ALKALINE WASTES - HEAVY METALS

Waste Class: 312
Waste Class Desc: PATHOLOGICAL WASTES

Waste Class: 242
Waste Class Desc: HALOGENATED PESTICIDES

Waste Class: 243
Waste Class Desc: PCBS

Waste Class: 145
Waste Class Desc: PAINT/PIGMENT/COATING RESIDUES

Waste Class: 221
Waste Class Desc: LIGHT FUELS

Waste Class: 241
Waste Class Desc: HALOGENATED SOLVENTS

Waste Class: 263
Waste Class Desc: ORGANIC LABORATORY CHEMICALS

Site: ***QUEEN'S UNIVERSITY***
WEST OF SIR JOHN A MACDONALD; BETWEEN UNION & JOHN KINGSTON ON

Database: ***NPCB***

Company Code: F1458
Industry:
Site Status:
Transaction Date: 1/29/1996
Inspection Date:

--Details--
Label:
Serial No.:
PCB Type/Code: High > 10,000 ppm
Location:
Item/State:
No. of Items:
Manufacturer:
Status: Stored for Disposal
Contents: 300.00 KG

Label:
Serial No.:
PCB Type/Code: Askarel

Location:
Item/State:
No. of Items:
Manufacturer:
Status: Stored for Disposal
Contents: 400.00 KG

Label:
Serial No.:
PCB Type/Code: Unknown concentration
Location:
Item/State:
No. of Items:
Manufacturer:
Status: Stored for Disposal
Contents: 1084.00 KG

Label:
Serial No.:
PCB Type/Code: High > 10,000 ppm
Location:
Item/State:
No. of Items:
Manufacturer:
Status: Stored for Disposal
Contents: 4400.00 KG

Site: ***QUEENS UNIVERSITY***
DIRECTOR; OCCUPATIONAL HEALTH & SAFETY KINGSTON ON K7L 3N6

Database: ***NPCB***

Company Code: O0015
Industry: School/Care/Facility
Site Status:
Transaction Date: 7/18/1991
Inspection Date: 12/6/1991

Site: ***QUEEN'S UNIVERSITY***
BETWEEN UNION & JOHNSON ST WEST OF SIR JOHN A MACDONALD KINGSTON ON

Database: ***NPCB***

Company Code: F1305
Industry: UNDEFINED
Site Status:
Transaction Date:
Inspection Date:

Site: ***QUEEN'S UNIVERSITY***
WEST OF SIR JOHN A. MACDONALD BETWEEN UNION & JOHNSON ST. KINGSTON ON K7L 3N6

Database: ***REC***

Rec Op Div:
Co Admin:
Phone No Admin:
Rec Div:
Rec Op Name:
Choice of Contact:
Site Bldg:
Site PO Box:
Receiver #: 401-92A014
Facility Type: TRANSFER STATION
Approval Yrs: 94,95,96,97,98,99,00,01,02,03,04,05,06,07,08

--Details--
Waste Code: 243
Waste Description: PCB'S

Site: ***KINGSTON, CITY OF***
CATARAQUI RIVER, FROM PALACE ROAD PUMP STATION SEWAGE PUMPING STATION KINGSTON CITY ON

Database: ***SPL***

Ref No:	175731	***Discharger Report:***	
Site No:		***Material Group:***	
Incident Dt:	12/11/1999	***Health/Env Conseq:***	
Year:		***Client Type:***	
Incident Cause:	CONTAINER OVERFLOW	***Sector Type:***	
Incident Event:		***Agency Involved:***	
Contaminant Code:		***Nearest Watercourse:***	
Contaminant Name:		***Site Address:***	
Contaminant Limit 1:		***Site District Office:***	
Contam Limit Freq 1:		***Site Postal Code:***	
Contaminant UN No 1:		***Site Region:***	
Environment Impact:	POSSIBLE	***Site Municipality:***	46102
Nature of Impact:	Water course or lake	***Site Lot:***	
Receiving Medium:	WATER	***Site Conc:***	
Receiving Env:		***Northing:***	
MOE Response:		***Easting:***	
Dt MOE Arvl on Scn:		***Site Geo Ref Accu:***	
MOE Reported Dt:	12/11/1999	***Site Map Datum:***	
Dt Document Closed:		***SAC Action Class:***	
Incident Reason:	OTHER	***Source Type:***	
Site Name:			
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	KINGSTON PUMP STN- UNK QTY RAW SEWAGE TO RIVER, PUMPS PLUGGED.		
Contaminant Qty:			

Site: ***The Corporation of the City of Kingston***
Palace Rd Kingston ON

Database: ***SPL***

Ref No:	0652-97R66L	***Discharger Report:***	
Site No:		***Material Group:***	
Incident Dt:	15-MAY-13	***Health/Env Conseq:***	
Year:		***Client Type:***	
Incident Cause:	Process Upset/Malfunction	***Sector Type:***	Sewer (Private or Municipal)
Incident Event:		***Agency Involved:***	
Contaminant Code:	44	***Nearest Watercourse:***	
Contaminant Name:	SEWAGE,RAW UNCHLORINATED	***Site Address:***	Palace Rd
Contaminant Limit 1:		***Site District Office:***	
Contam Limit Freq 1:		***Site Postal Code:***	
Contaminant UN No 1:		***Site Region:***	
Environment Impact:	Confirmed	***Site Municipality:***	Kingston
Nature of Impact:	Surface Water Pollution	***Site Lot:***	
Receiving Medium:		***Site Conc:***	
Receiving Env:		***Northing:***	
MOE Response:	Deferred Field Response	***Easting:***	
Dt MOE Arvl on Scn:		***Site Geo Ref Accu:***	
MOE Reported Dt:	15-MAY-13	***Site Map Datum:***	
Dt Document Closed:		***SAC Action Class:***	Watercourse Spills
Incident Reason:	Power Interruption/Loss	***Source Type:***	
Site Name:	Palace Rd Pumping Stn<UNOFFICIAL>		
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	BP: Palace Road P Stn raw unchlor swg to l ont		
Contaminant Qty:	0 L		

Site: ***ONTARIO HYDRO***
LOT 20, CONCESSION I TRANSFORMER CENTRAL FRONTENAC TOWNSHIP ON

Database: ***SPL***

Ref No:	70846	***Discharger Report:***	
Site No:		***Material Group:***	
Incident Dt:	5/19/1992	***Health/Env Conseq:***	
Year:		***Client Type:***	

Incident Cause:	COOLING SYSTEM LEAK	***Sector Type:***	
Incident Event:		***Agency Involved:***	
Contaminant Code:		***Nearest Watercourse:***	
Contaminant Name:		***Site Address:***	
Contaminant Limit 1:		***Site District Office:***	
Contam Limit Freq 1:		***Site Postal Code:***	
Contaminant UN No 1:		***Site Region:***	
Environment Impact:	CONFIRMED	***Site Municipality:***	46616
Nature of Impact:	Soil contamination	***Site Lot:***	
Receiving Medium:	LAND	***Site Conc:***	
Receiving Env:		***Northing:***	
MOE Response:		***Easting:***	
Dt MOE Arvl on Scn:		***Site Geo Ref Accu:***	
MOE Reported Dt:	5/19/1992	***Site Map Datum:***	
Dt Document Closed:		***SAC Action Class:***	
Incident Reason:	EQUIPMENT FAILURE	***Source Type:***	
Site Name:			
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	ONTARIO HYDRO: 15 L OIL TO LAND FROM TRANSFORMER		
Contaminant Qty:			

Site: ***QUEEN'S UNIVERSITY***
QUEENS CENTRAL HEATING PLANT HEATING PLANT KINGSTON CITY ON

Database: ***SPL***

Ref No:	83409	***Discharger Report:***	
Site No:		***Material Group:***	
Incident Dt:	3/2/1993	***Health/Env Conseq:***	
Year:		***Client Type:***	
Incident Cause:	PIPE/HOSE LEAK	***Sector Type:***	
Incident Event:		***Agency Involved:***	
Contaminant Code:		***Nearest Watercourse:***	
Contaminant Name:		***Site Address:***	
Contaminant Limit 1:		***Site District Office:***	
Contam Limit Freq 1:		***Site Postal Code:***	
Contaminant UN No 1:		***Site Region:***	
Environment Impact:	NOT ANTICIPATED	***Site Municipality:***	46102
Nature of Impact:		***Site Lot:***	
Receiving Medium:	LAND	***Site Conc:***	
Receiving Env:		***Northing:***	
MOE Response:		***Easting:***	MOE.CITY WORKS.
Dt MOE Arvl on Scn:		***Site Geo Ref Accu:***	
MOE Reported Dt:	3/2/1993	***Site Map Datum:***	
Dt Document Closed:		***SAC Action Class:***	
Incident Reason:	ERROR	***Source Type:***	
Site Name:			
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	QUEEN'S UNIVERSITY-13.6 M3 BUNKER "C" TO GROUND, CONTAINED,CLEANED-UP.		
Contaminant Qty:			

Site: ***QUEEN'S UNIVERSITY***
QUEEN'S UNIVERSITY HEATING PLANT (CATCH BASIN), KINGSTON HEATING PLANT KINGSTON CITY ON

Database: ***SPL***

Ref No:	43301	***Discharger Report:***	
Site No:		***Material Group:***	
Incident Dt:	11/8/1990	***Health/Env Conseq:***	
Year:		***Client Type:***	
Incident Cause:	CONTAINER OVERFLOW	***Sector Type:***	
Incident Event:		***Agency Involved:***	
Contaminant Code:		***Nearest Watercourse:***	
Contaminant Name:		***Site Address:***	
Contaminant Limit 1:		***Site District Office:***	
Contam Limit Freq 1:		***Site Postal Code:***	
Contaminant UN No 1:		***Site Region:***	
Environment Impact:	POSSIBLE	***Site Municipality:***	46102
Nature of Impact:	Soil contamination	***Site Lot:***	

Receiving Medium:	LAND	***Site Conc:***	
Receiving Env:		***Northing:***	
MOE Response:		***Easting:***	
Dt MOE Arvl on Scn:		***Site Geo Ref Accu:***	
MOE Reported Dt:	11/12/1990	***Site Map Datum:***	
Dt Document Closed:		***SAC Action Class:***	
Incident Reason:	ERROR	***Source Type:***	
Site Name:			
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	QUEEN'S UNIVERSITY: 180 LDIESEL INTO CATCH BASIN. TANK OVERFILLING.		
Contaminant Qty:			

Site:

Sir John A. MacDonald Blvd to Portsmouth Ave. Kingston ON

Database: ***SPL***

Ref No:	5787-AAZUY3	***Discharger Report:***	
Site No:	NA	***Material Group:***	
Incident Dt:	2016/06/17	***Health/Env Conseq:***	
Year:		***Client Type:***	
Incident Cause:		***Sector Type:***	Electric Power Generation
Incident Event:	Leak/Break	***Agency Involved:***	
Contaminant Code:	13	***Nearest Watercourse:***	
Contaminant Name:	MINERAL OIL	***Site Address:***	Sir John A. MacDonald Blvd to Portsmouth Ave.
Contaminant Limit 1:		***Site District Office:***	
Contam Limit Freq 1:		***Site Postal Code:***	
Contaminant UN No 1:		***Site Region:***	
Environment Impact:		***Site Municipality:***	Kingston
Nature of Impact:		***Site Lot:***	
Receiving Medium:		***Site Conc:***	
Receiving Env:	Land	***Northing:***	
MOE Response:	No	***Easting:***	
Dt MOE Arvl on Scn:		***Site Geo Ref Accu:***	
MOE Reported Dt:	2016/06/17	***Site Map Datum:***	
Dt Document Closed:	2016/08/19	***SAC Action Class:***	Land Spills
Incident Reason:	Equipment Failure	***Source Type:***	
Site Name:	John Counter Blvd<UNOFFICIAL>		
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	30L of transformer oil (Non PCBs) to ground _ Kingston ON		
Contaminant Qty:	30 other - see incident description		

Appendix: Database Descriptions

Environmental Risk Information Services (ERIS) can search the following databases. The extent of historical information varies with each database and current information is determined by what is publicly available to ERIS at the time of update. ***Note:*** *Databases denoted with " * " indicates that the database will no longer be updated. See the individual database description for more information.*

Abandoned Aggregate Inventory: Provincial AAGR

The MAAP Program maintains a database of abandoned pits and quarries. Please note that the database is only referenced by lot and concession and city/town location. The database provides information regarding the location, type, size, land use, status and general comments.*

Government Publication Date: Sept 2002*

Aggregate Inventory: Provincial AGR

The Ontario Ministry of Natural Resources maintains a database of all active pits and quarries. The database provides information regarding the registered owner/operator, location name, operation type, approval type, and maximum annual tonnage.

Government Publication Date: Up to Sep 2020

Abandoned Mine Information System: Provincial AMIS

The Abandoned Mines Information System contains data on known abandoned and inactive mines located on both Crown and privately held lands. The information was provided by the Ministry of Northern Development and Mines (MNDM), with the following disclaimer: "the database provided has been compiled from various sources, and the Ministry of Northern Development and Mines makes no representation and takes no responsibility that such information is accurate, current or complete". Reported information includes official mine name, status, background information, mine start/end date, primary commodity, mine features, hazards and remediation.

Government Publication Date: 1800-Oct 2018

Anderson's Waste Disposal Sites: Private ANDR

The information provided in this database was collected by examining various historical documents which aimed to characterize the likely position of former waste disposal sites from 1860 to present. The research initiative behind the creation of this database was to identify those sites that are missing from the Ontario MOE Waste Disposal Site Inventory, as well as to provide revisions and corrections to the positions and descriptions of sites currently listed in the MOE inventory. In addition to historic waste disposal facilities, the database also identifies certain auto wreckers and scrap yards that have been extrapolated from documentary sources. Please note that the data is not warranted to be complete, exhaustive or authoritative. The information was collected for research purposes only.

Government Publication Date: 1860s-Present

Aboveground Storage Tanks: Provincial AST

Historical listing of aboveground storage tanks made available by the Department of Natural Resources and Forestry. Includes tanks used to hold water or petroleum. This dataset has been retired as of September 25, 2014 and will no longer be updated.

Government Publication Date: May 31, 2014

Automobile Wrecking & Supplies: Private AUWR

This database provides an inventory of known locations that are involved in the scrap metal, automobile wrecking/recycling, and automobile parts & supplies industry. Information is provided on the company name, location and business type.

Government Publication Date: 1999-Dec 31, 2020

Borehole: Provincial BORE

A borehole is the generalized term for any narrow shaft drilled in the ground, either vertically or horizontally. The information here includes geotechnical investigations or environmental site assessments, mineral exploration, or as a pilot hole for installing piers or underground utilities. Information is from many sources such as the Ministry of Transportation (MTO) boreholes from engineering reports and projects from the 1950 to 1990's in Southern Ontario. Boreholes from the Ontario Geological Survey (OGS) including The Urban Geology Analysis Information System (UGAIS) and the York Peel Durham Toronto (YPDT) database of the Conservation Authority Moraine Coalition. This database will include fields such as location, stratigraphy, depth, elevation, year drilled, etc. For all water well data or oil and gas well data for Ontario please refer to WWIS and OOGW.

Government Publication Date: 1875-Jul 2018

Certificates of Approval: Provincial CA

This database contains the following types of approvals: Air & Noise, Industrial Sewage, Municipal & Private Sewage, Waste Management Systems and Renewable Energy Approvals. The MOE in Ontario states that any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste, must have a Certificate of Approval before it can operate lawfully. Fields include approval number, business name, address, approval date, approval type and status. This database will no longer be updated, as CofA's have been replaced by either Environmental Activity and Sector Registry (EASR) or Environmental Compliance Approval (ECA). Please refer to those individual databases for any information after Oct.31, 2011.

Government Publication Date: 1985-Oct 30, 2011*

Dry Cleaning Facilities: Federal CDRY

List of dry cleaning facilities made available by Environment and Climate Change Canada. Environment and Climate Change Canada's Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations (SOR/2003-79) are intended to reduce releases of tetrachloroethylene to the environment from dry cleaning facilities.

Government Publication Date: Jan 2004-Dec 2018

Commercial Fuel Oil Tanks: Provincial CFOT

Locations of commercial underground fuel oil tanks. This is not a comprehensive or complete inventory of commercial fuel tanks in the province; this listing is a copy of records of registered commercial underground fuel oil tanks obtained under Access to Public Information.
Note that the following types of tanks do not require registration: waste oil tanks in apartments, office buildings, residences, etc.; aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Chemical Manufacturers and Distributors: Private CHEM

This database includes information from both a one time study conducted in 1992 and private source and is a listing of facilities that manufacture or distribute chemicals. The production of these chemical substances may involve one or more chemical reactions and/or chemical separation processes (i.e. fractionation, solvent extraction, crystallization, etc.).

Government Publication Date: 1999-Jan 31, 2020

Chemical Register: Private CHM

This database includes a listing of locations of facilities within the Province or Territory that either manufacture and/or distributes chemicals.

Government Publication Date: 1999-Dec 31, 2020

Compressed Natural Gas Stations: Private CNG

Canada has a network of public access compressed natural gas (CNG) refuelling stations. These stations dispense natural gas in compressed form at 3,000 pounds per square inch (psi), the pressure which is allowed within the current Canadian codes and standards. The majority of natural gas refuelling is located at existing retail gasoline that have a separate refuelling island for natural gas. This list of stations is made available by the Canadian Natural Gas Vehicle Alliance.

Government Publication Date: Dec 2012 -Dec 2020

Inventory of Coal Gasification Plants and Coal Tar Sites: Provincial COAL

This inventory includes both the "Inventory of Coal Gasification Plant Waste Sites in Ontario-April 1987" and the Inventory of Industrial Sites Producing or Using Coal Tar and Related Tars in Ontario-November 1988) collected by the MOE. It identifies industrial sites that produced and continue to produce or use coal tar and other related tars. Detailed information is available and includes: facility type, size, land use, information on adjoining properties, soil condition, site operators/occupants, site description, potential environmental impacts and historic maps available. This was a one-time inventory.*

Government Publication Date: Apr 1987 and Nov 1988*

Compliance and Convictions: Provincial CONV

This database summarizes the fines and convictions handed down by the Ontario courts beginning in 1989. Companies and individuals named here have been found guilty of environmental offenses in Ontario courts of law.

Government Publication Date: 1989-Nov 2020

Certificates of Property Use: Provincial CPU

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include all CPU's on the registry such as (EPA s. 168.6) - Certificate of Property Use.

Government Publication Date: 1994-Feb 28, 2021

Drill Hole Database: Provincial DRL

The Ontario Drill Hole Database contains information on more than 113,000 percussion, overburden, sonic and diamond drill holes from assessment files on record with the department of Mines and Minerals. Please note that limited data is available for southern Ontario, as it was the last area to be completed. The database was created when surveys submitted to the Ministry were converted in the Assessment File Research Image Database (AFRI) project. However, the degree of accuracy (coordinates) as to the exact location of drill holes is dependent upon the source document submitted to the MNDM. Levels of accuracy used to locate holes are: centering on the mining claim; a sketch of the mining claim; a 1:50,000 map; a detailed company map; or from submitted a "Report of Work".

Government Publication Date: 1886 - Sep 2020

Delisted Fuel Tanks: Provincial DTNK

List of fuel storage tank sites that were once found in - and have since been removed from - the list of fuel storage tanks made available by the regulatory agency under Access to Public Information.

Government Publication Date: Jul 31, 2020

Environmental Activity and Sector Registry: Provincial EASR

On October 31, 2011, a smarter, faster environmental approvals system came into effect in Ontario. The EASR allows businesses to register certain activities with the ministry, rather than apply for an approval. The registry is available for common systems and processes, to which preset rules of operation can be applied. The EASR is currently available for: heating systems, standby power systems and automotive refinishing. Businesses whose activities aren't subject to the EASR may apply for an ECA (Environmental Compliance Approval), Please see our ECA database.

Government Publication Date: Oct 2011-Jan 31, 2021

Environmental Registry: Provincial EBR

The Environmental Registry lists proposals, decisions and exceptions regarding policies, Acts, instruments, or regulations that could significantly affect the environment. Through the Registry, thirteen provincial ministries notify the public of upcoming proposals and invite their comments. For example, if a local business is requesting a permit, license, or certificate of approval to release substances into the air or water; these are notified on the registry. Data includes: Approval for discharge into the natural environment other than water (i.e. Air) - EPA s. 9, Approval for sewage works - OWRA s. 53(1), and EPA s. 27 - Approval for a waste disposal site. For information regarding Permit to Take Water (PTTW), Certificate of Property Use (CPU) and (ORD) Orders please refer to those individual databases.

Government Publication Date: 1994-Feb 28, 2021

Environmental Compliance Approval: Provincial ECA

On October 31, 2011, a smarter, faster environmental approvals system came into effect in Ontario. In the past, a business had to apply for multiple approvals (known as certificates of approval) for individual processes and pieces of equipment. Today, a business either registers itself, or applies for a single approval, depending on the types of activities it conducts. Businesses whose activities aren't subject to the EASR may apply for an ECA. A single ECA addresses all of a business's emissions, discharges and wastes. Separate approvals for air, noise and waste are no longer required. This database will also include Renewable Energy Approvals. For certificates of approval prior to Nov 1st, 2011, please refer to the CA database. For all Waste Disposal Sites please refer to the WDS database.

Government Publication Date: Oct 2011- Jan 31, 2021

Environmental Effects Monitoring: Federal EEM

The Environmental Effects Monitoring program assesses the effects of effluent from industrial or other sources on fish, fish habitat and human usage of fisheries resources. Since 1992, pulp and paper mills have been required to conduct EEM studies under the Pulp and Paper Effluent Regulations. This database provides information on the mill name, geographical location and sub-lethal toxicity data.

Government Publication Date: 1992-2007*

ERIS Historical Searches: Private EHS

ERIS has compiled a database of all environmental risk reports completed since March 1999. Available fields for this database include: site location, date of report, type of report, and search radius. As per all other databases, the ERIS database can be referenced on both the map and "Statistical Profile" page.

Government Publication Date: 1999-Jan 31, 2021

Environmental Issues Inventory System: Federal EIIS

The Environmental Issues Inventory System was developed through the implementation of the Environmental Issues and Remediation Plan. This plan was established to determine the location and severity of contaminated sites on inhabited First Nation reserves, and where necessary, to remediate those that posed a risk to health and safety; and to prevent future environmental problems. The EIIS provides information on the reserve under investigation, inventory number, name of site, environmental issue, site action (Remediation, Site Assessment), and date investigation completed.

Government Publication Date: 1992-2001*

Emergency Management Historical Event: Provincial EMHE

List of locations of historical occurrences of emergency events, including those assigned to the Ministry of Natural Resources by Order-In-Council (OIC) under the Emergency Management and Civil Protection Act, as well as events where MNR provided requested emergency response assistance. Many of these events will have involved community evacuations, significant structural loss, and/or involvement of MNR emergency response staff. These events fall into one of ten (10) type categories: Dam Failure; Drought / Low Water; Erosion; Flood; Forest Fire; Soil and Bedrock Instability; Petroleum Resource Center Event, EMO Requested Assistance, Continuity of Operations Event, Other Requested Assistance. EMHE record details are reproduced by ERIS under License with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2017.

Government Publication Date: Dec 31, 2016

Environmental Penalty Annual Report: Provincial EPAR

This database contains data from Ontario's annual environmental penalty report published by the Ministry of the Environment and Climate Change. These reports provide information on environmental penalties for land or water violations issued to companies in one of the nine industrial sectors covered by the Municipal Industrial Strategy for Abatement (MISA) regulations.

Government Publication Date: Jan 1, 2011 - Dec 31, 2019

List of Expired Fuels Safety Facilities: Provincial EXP

List of facilities and tanks for which there was once a fuel registration. This is not a comprehensive or complete inventory of expired tanks/tank facilities in the province; this listing is a copy of previously registered tanks and facilities obtained under Access to Public Information. Includes private fuel outlets, bulk plants, fuel oil tanks, gasoline stations, marinas, propane filling stations, liquid fuel tanks, piping systems, etc; includes tanks which have been removed from the ground.
Notes: registration was not required for private fuel underground/aboveground storage tanks prior to January 1990, nor for furnace oil tanks prior to May 1, 2002; registration is not required for waste oil tanks in apartments, office buildings, residences, etc., or aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Federal Convictions: Federal FCON

Environment Canada maintains a database referred to as the "Environmental Registry" that details prosecutions under the Canadian Environmental Protection Act (CEPA) and the Fisheries Act (FA). Information is provided on the company name, location, charge date, offence and penalty.

Government Publication Date: 1988-Jun 2007*

Contaminated Sites on Federal Land: Federal FCS

The Federal Contaminated Sites Inventory includes information on known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government. Includes fire training sites and sites at which Per- and Polyfluoroalkyl Substances (PFAS) are a concern.

Government Publication Date: Jun 2000-Jan 2021

Fisheries & Oceans Fuel Tanks: Federal FOFT

Fisheries & Oceans Canada maintains an inventory of aboveground & underground fuel storage tanks located on Fisheries & Oceans property or controlled by DFO. Our inventory provides information on the site name, location, tank owner, tank operator, facility type, storage tank location, tank contents & capacity, and date of tank installation.

Government Publication Date: 1964-Sep 2019

Federal Identification Registry for Storage Tank Systems (FIRSTS): Federal FRST

A list of federally regulated Storage tanks from the Federal Identification Registry for Storage Tank Systems (FIRSTS). FIRSTS is Environment and Climate Change Canada's database of storage tank systems subject to the Storage Tank for Petroleum Products and Allied Petroleum Products Regulations. The main objective of the Regulations is to prevent soil and groundwater contamination from storage tank systems located on federal and aboriginal lands. Storage tank systems that do not have a valid identification number displayed in a readily visible location on or near the storage tank system may be refused product delivery.

Government Publication Date: May 31, 2018

Fuel Storage Tank: Provincial FST

List of registered private and retail fuel storage tanks. This is not a comprehensive or complete inventory of private and retail fuel storage tanks in the province; this listing is a copy of registered private and retail fuel storage tanks, obtained under Access to Public Information.
Notes: registration was not required for private fuel underground/aboveground storage tanks prior to January 1990, nor for furnace oil tanks prior to May 1, 2002; registration is not required for waste oil tanks in apartments, office buildings, residences, etc., or aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Fuel Storage Tank - Historic: Provincial FSTH

The Fuels Safety Branch of the Ontario Ministry of Consumer and Commercial Relations maintained a database of all registered private fuel storage tanks. Public records of private fuel storage tanks are only available since the registration became effective in September 1989. This information is now collected by the Technical Standards and Safety Authority.

Government Publication Date: Pre-Jan 2010*

Ontario Regulation 347 Waste Generators Summary: Provincial GEN

Regulation 347 of the Ontario EPA defines a waste generation site as any site, equipment and/or operation involved in the production, collection, handling and/or storage of regulated wastes. A generator of regulated waste is required to register the waste generation site and each waste produced, collected, handled, or stored at the site. This database contains the registration number, company name and address of registered generators including the types of hazardous wastes generated. It includes data on waste generating facilities such as: drycleaners, waste treatment and disposal facilities, machine shops, electric power distribution etc. This information is a summary of all years from 1986 including the most currently available data. Some records may contain, within the company name, the phrase "See & Use..." followed by a series of letters and numbers. This occurs when one company is amalgamated with or taken over by another registered company. The number listed as "See & Use", refers to the new ownership and the other identification number refers to the original ownership. This phrase serves as a link between the 2 companies until operations have been fully transferred.

Government Publication Date: 1986-Jan 31, 2021

Greenhouse Gas Emissions from Large Facilities: Federal GHG

List of greenhouse gas emissions from large facilities made available by Environment Canada. Greenhouse gas emissions in kilotonnes of carbon dioxide equivalents (kt CO2 eq).

Government Publication Date: 2013-Dec 2018

TSSA Historic Incidents: Provincial HINC

List of historic incidences of spills and leaks of diesel, fuel oil, gasoline, natural gas, propane, and hydrogen recorded by the TSSA in their previous incident tracking system. The TSSA's Fuels Safety Program administers the Technical Standards & Safety Act 2000, providing fuel-related safety services associated with the safe transportation, storage, handling and use of fuels such as gasoline, diesel, propane, natural gas and hydrogen. Under this Act, the TSSA regulates fuel suppliers, storage facilities, transport trucks, pipelines, contractors and equipment or appliances that use fuels. Records are not verified for accuracy or completeness. This is not a comprehensive or complete inventory of historical fuel spills and leaks in the province. This listing is a copy of the data captured at one moment in time and is hence limited by the record date provided here.

Government Publication Date: 2006-June 2009*

Indian & Northern Affairs Fuel Tanks: Federal IAFT

The Department of Indian & Northern Affairs Canada (INAC) maintains an inventory of aboveground & underground fuel storage tanks located on both federal and crown land. Our inventory provides information on the reserve name, location, facility type, site/facility name, tank type, material & ID number, tank contents & capacity, and date of tank installation.

Government Publication Date: 1950-Aug 2003*

Fuel Oil Spills and Leaks: Provincial INC

Listing of spills and leaks of diesel, fuel oil, gasoline, natural gas, propane, and hydrogen reported to the Spills Action Centre (SAC). This is not a comprehensive or complete inventory of fuel-related leaks, spills, and incidents in the province; this listing in a copy of incidents reported to the SAC, obtained under Access to Public Information. Includes incidents from fuel-related hazards such as spills, fires, and explosions. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Landfill Inventory Management Ontario: Provincial LIMO

The Landfill Inventory Management Ontario (LIMO) database is updated every year, as the Ministry of the Environment, Conservation and Parks compiles new and updated information. Includes small and large landfills currently operating as well as those which are closed and historic. Operators of larger landfills provide landfill information for the previous operating year to the ministry for LIMO including: estimated amount of total waste received, landfill capacity, estimated total remaining landfill capacity, fill rates, engineering designs, reporting and monitoring details, size of location, service area, approved waste types, leachate of site treatment, contaminant attenuation zone and more. The small landfills include information such as site owner, site location and certificate of approval # and status.

Government Publication Date: Feb 28, 2019

Canadian Mine Locations: Private MINE

This information is collected from the Canadian & American Mines Handbook. The Mines database is a national database that provides over 290 listings on mines (listed as public companies) dealing primarily with precious metals and hard rocks. Listed are mines that are currently in operation, closed, suspended, or are still being developed (advanced projects). Their locations are provided as geographic coordinates (x, y and/or longitude, latitude). As of 2002, data pertaining to Canadian smelters and refineries has been appended to this database.

Government Publication Date: 1998-2009*

Mineral Occurrences: Provincial MNR

In the early 70's, the Ministry of Northern Development and Mines created an inventory of approximately 19,000 mineral occurrences in Ontario, in regard to metallic and industrial minerals, as well as some information on building stones and aggregate deposits. Please note that the "Horizontal Positional Accuracy" is approximately +/- 200 m. Many reference elements for each record were derived from field sketches using pace or chain/tape measurements against claim posts or topographic features in the area. The primary limiting factor for the level of positional accuracy is the scale of the source material. The testing of horizontal accuracy of the source materials was accomplished by comparing the plan metric (X and Y) coordinates of that point with the coordinates of the same point as defined from a source of higher accuracy.

Government Publication Date: 1846-Dec 2020

National Analysis of Trends in Emergencies System (NATES): Federal NATE

In 1974 Environment Canada established the National Analysis of Trends in Emergencies System (NATES) database, for the voluntary reporting of significant spill incidents. The data was to be used to assist in directing the work of the emergencies program. NATES ran from 1974 to 1994. Extensive information is available within this database including company names, place where the spill occurred, date of spill, cause, reason and source of spill, damage incurred, and amount, concentration, and volume of materials released.

Government Publication Date: 1974-1994*

Non-Compliance Reports: Provincial NCPL

The Ministry of the Environment provides information about non-compliant discharges of contaminants to air and water that exceed legal allowable limits, from regulated industrial and municipal facilities. A reported non-compliance failure may be in regard to a Control Order, Certificate of Approval, Sectoral Regulation or specific regulation/act.

Government Publication Date: Dec 31, 2018

National Defense & Canadian Forces Fuel Tanks: Federal NDFT

The Department of National Defense and the Canadian Forces maintains an inventory of all aboveground & underground fuel storage tanks located on DND lands. Our inventory provides information on the base name, location, tank type & capacity, tank contents, tank class, date of tank installation, date tank last used, and status of tank as of May 2001. This database will no longer be updated due to the new National Security protocols which have prohibited any release of this database.

Government Publication Date: Up to May 2001*

National Defense & Canadian Forces Spills: Federal NDSP

The Department of National Defense and the Canadian Forces maintains an inventory of spills to land and water. All spill sites have been classified under the "Transportation of Dangerous Goods Act - 1992". Our inventory provides information on the facility name, location, spill ID #, spill date, type of spill, as well as the quantity of substance spilled & recovered.

Government Publication Date: Mar 1999-Apr 2018

National Defence & Canadian Forces Waste Disposal Sites: Federal NDWD

The Department of National Defence and the Canadian Forces maintains an inventory of waste disposal sites located on DND lands. Where available, our inventory provides information on the base name, location, type of waste received, area of site, depth of site, year site opened/closed and status.

Government Publication Date: 2001-Apr 2007*

National Energy Board Pipeline Incidents: Federal NEBI

Locations of pipeline incidents from 2008 to present, made available by the Canada Energy Regulator (CER) - previously the National Energy Board (NEB). Includes incidents reported under the Onshore Pipeline Regulations and the Processing Plant Regulations related to pipelines under federal jurisdiction, does not include incident data related to pipelines under provincial or territorial jurisdiction.

Government Publication Date: 2008-Dec 31, 2020

National Energy Board Wells: Federal NEBP

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Environmental Emergencies System (NEES): Federal NEES

In 2000, the Emergencies program implemented NEES, a reporting system for spills of hazardous substances. For the most part, this system only captured data from the Atlantic Provinces, some from Quebec and Ontario and a portion from British Columbia. Data for Alberta, Saskatchewan, Manitoba and the Territories was not captured. However, NEES is also a repository for previous Environment Canada spill datasets. NEES is composed of the historic datasets ' or Trends ' which dates from approximately 1974 to present. NEES Trends is a compilation of historic databases, which were merged and includes data from NATES (National Analysis of Trends in Emergencies System), ARTS (Atlantic Regional Trends System), and NEES. In 2001, the Emergencies Program determined that variations in reporting regimes and requirements between federal and provincial agencies made national spill reporting and trend analysis difficult to achieve. As a consequence, the department has focused efforts on capturing data on spills of substances which fall under its legislative authority only (CEPA and FA). As such, the NEES database will be decommissioned in December 2004.

Government Publication Date: 1974-2003*

National PCB Inventory: Federal NPCB

Environment Canada's National PCB inventory includes information on in-use PCB containing equipment in Canada including federal, provincial and private facilities. Federal out-of-service PCB containing equipment and PCB waste owned by the federal government or by federally regulated industries such as airlines, railway companies, broadcasting companies, telephone and telecommunications companies, pipeline companies, etc. are also listed. Although it is not Environment Canada's mandate to collect data on non-federal PCB waste, the National PCB inventory includes some information on provincial and private PCB waste and storage sites. Some addresses provided may be Head Office addresses and are not necessarily the location of where the waste is being used or stored.

Government Publication Date: 1988-2008*

National Pollutant Release Inventory: Federal NPRI

Environment Canada has defined the National Pollutant Release Inventory ("NPRI") as a federal government initiative designed to collect comprehensive national data regarding releases to air, water, or land, and waste transfers for recycling for more than 300 listed substances.

Government Publication Date: 1993-May 2017

Oil and Gas Wells: Private OGWE

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-Feb 28, 2021

Ontario Oil and Gas Wells: Provincial OOGW

In 1998, the MNR handed over to the Ontario Oil, Gas and Salt Resources Corporation, the responsibility of maintaining a database of oil and gas wells drilled in Ontario. The OGSR Library has over 20,000+ wells in their database. Information available for all wells in the ERIS database include well owner/operator, location, permit issue date, and well cap date, license No., status, depth and the primary target (rock unit) of the well being drilled. All geology/stratigraphy table information, plus all water table information is also provide for each well record.

Government Publication Date: 1800-Jun 2020

Inventory of PCB Storage Sites: Provincial OPCB

The Ontario Ministry of Environment, Waste Management Branch, maintains an inventory of PCB storage sites within the province. Ontario Regulation 11/82 (Waste Management - PCB) and Regulation 347 (Generator Waste Management) under the Ontario EPA requires the registration of inactive PCB storage equipment and/or disposal sites of PCB waste with the Ontario Ministry of Environment. This database contains information on: 1) waste quantities; 2) major and minor sites storing liquid or solid waste; and 3) a waste storage inventory.

Government Publication Date: 1987-Oct 2004; 2012-Dec 2013

Orders: Provincial ORD

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include all Orders on the registry such as (EPA s. 17) - Order for remedial work, (EPA s. 18) - Order for preventative measures, (EPA s. 43) - Order for removal of waste and restoration of site, (EPA s. 44) - Order for conformity with Act for waste disposal sites, (EPA s. 136) - Order for performance of environmental measures.

Government Publication Date: 1994-Feb 28, 2021

Canadian Pulp and Paper: Private PAP

This information is part of the Pulp and Paper Canada Directory. The Directory provides a comprehensive listing of the locations of pulp and paper mills and the products that they produce.

Government Publication Date: 1999, 2002, 2004, 2005, 2009-2014

Parks Canada Fuel Storage Tanks: Federal PCFT

Canadian Heritage maintains an inventory of known fuel storage tanks operated by Parks Canada, in both National Parks and at National Historic Sites. The database details information on site name, location, tank install/removal date, capacity, fuel type, facility type, tank design and owner/operator.

Government Publication Date: 1920-Jan 2005*

Pesticide Register: Provincial PES

The Ontario Ministry of the Environment and Climate Change maintains a database of licensed operators and vendors of registered pesticides.

Government Publication Date: Oct 2011-Jan 31, 2021

Pipeline Incidents: Provincial PINC

List of pipeline incidents (strikes, leaks, spills). This is not a comprehensive or complete inventory of pipeline incidents in the province; this listing in an historical copy of records previously obtained under Access to Public Information. Records are not verified for accuracy or completeness.

Government Publication Date: Oct 31, 2020

Private and Retail Fuel Storage Tanks: Provincial PRT

The Fuels Safety Branch of the Ontario Ministry of Consumer and Commercial Relations maintained a database of all registered private fuel storage tanks and licensed retail fuel outlets. This database includes an inventory of locations that have gasoline, oil, waste oil, natural gas and/or propane storage tanks on their property. The MCCR no longer collects this information. This information is now collected by the Technical Standards and Safety Authority (TSSA).

Government Publication Date: 1989-1996*

Permit to Take Water: Provincial PTTW

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include all PTTW's on the registry such as OWRA s. 34 - Permit to take water.

Government Publication Date: 1994-Feb 28, 2021

Ontario Regulation 347 Waste Receivers Summary: Provincial REC

Part V of the Ontario Environmental Protection Act ("EPA") regulates the disposal of regulated waste through an operating waste management system or a waste disposal site operated or used pursuant to the terms and conditions of a Certificate of Approval or a Provisional Certificate of Approval. Regulation 347 of the Ontario EPA defines a waste receiving site as any site or facility to which waste is transferred by a waste carrier. A receiver of regulated waste is required to register the waste receiving facility. This database represents registered receivers of regulated wastes, identified by registration number, company name and address, and includes receivers of waste such as: landfills, incinerators, transfer stations, PCB storage sites, sludge farms and water pollution control plants. This information is a summary of all years from 1986 including the most currently available data.

Government Publication Date: 1986-2016

Record of Site Condition: Provincial RSC

The Record of Site Condition (RSC) is part of the Ministry of the Environment's Brownfields Environmental Site Registry. Protection from environmental cleanup orders for property owners is contingent upon documentation known as a record of site condition (RSC) being filed in the Environmental Site Registry. In order to file an RSC, the property must have been properly assessed and shown to meet the soil, sediment and groundwater standards appropriate for the use (such as residential) proposed to take place on the property. The Record of Site Condition Regulation (O. Reg. 153/04) details requirements related to site assessment and clean up.
RSCs filed after July 1, 2011 will also be included as part of the new (O.Reg. 511/09).

Government Publication Date: 1997-Sept 2001, Oct 2004-Jan 2021

Retail Fuel Storage Tanks: Private RST

This database includes an inventory of retail fuel outlet locations (including marinas) that have on their property gasoline, oil, waste oil, natural gas and / or propane storage tanks.

Government Publication Date: 1999-Dec 31, 2020

Scott's Manufacturing Directory: Private SCT

Scott's Directories is a data bank containing information on over 200,000 manufacturers across Canada. Even though Scott's listings are voluntary, it is the most comprehensive database of Canadian manufacturers available. Information concerning a company's address, plant size, and main products are included in this database.

Government Publication Date: 1992-Mar 2011*

Ontario Spills: Provincial SPL

List of spills and incidents made available the Ministry of the Environment, Conservation and Parks. This database identifies information such as location (approximate), type and quantity of contaminant, date of spill, environmental impact, cause, nature of impact, etc. Information from 1988-2002 was part of the ORIS (Occurrence Reporting Information System). The SAC (Spills Action Centre) handles all spills reported in Ontario. Regulations for spills in Ontario are part of the MOE's Environmental Protection Act, Part X.

Government Publication Date: 1988-Mar 2020; Jul 2020 - Aug 2020

Wastewater Discharger Registration Database: Provincial SRDS

Information under this heading is combination of the following 2 programs. The Municipal/Industrial Strategy for Abatement (MISA) division of the Ontario Ministry of Environment maintained a database of all direct dischargers of toxic pollutants within nine sectors including: Electric Power Generation; Mining; Petroleum Refining; Organic Chemicals; Inorganic Chemicals; Pulp & Paper; Metal Casting; Iron & Steel; and Quarries. All sampling information is now collected and stored within the Sample Result Data Store (SRDS).

Government Publication Date: 1990-Dec 31, 2017

Anderson's Storage Tanks: Private TANK

The information provided in this database was collected by examining various historical documents, which identified the location of former storage tanks, containing substances such as fuel, water, gas, oil, and other various types of miscellaneous products. Information is available in regard to business operating at tank site, tank location, permit year, permit & installation type, no. of tanks installed & configuration and tank capacity. Data contained within this database pertains only to the city of Toronto and is not warranted to be complete, exhaustive or authoritative. The information was collected for research purposes only.

Government Publication Date: 1915-1953*

Transport Canada Fuel Storage Tanks: Federal TCFT

List of fuel storage tanks currently or previously owned or operated by Transport Canada. This inventory also includes tanks on The Pickering Lands, which refers to 7,530 hectares (18,600 acres) of land in Pickering, Markham, and Uxbridge owned by the Government of Canada since 1972; properties on this land has been leased by the government since 1975, and falls under the Site Management Policy of Transport Canada, but is administered by Public Works and Government Services Canada. This inventory provides information on the site name, location, tank age, capacity and fuel type.

Government Publication Date: 1970 - Dec 2020

Variances for Abandonment of Underground Storage Tanks: Provincial VAR

Listing of variances granted for storage tank abandonment. This is not a comprehensive or complete inventory of tank abandonment variances in the province; this listing is a copy of tank abandonment variance records previously obtained under Access to Public Information. In Ontario, registered underground storage tanks must be removed within two years of disuse; if removal of a tank is not feasible, an application may be sought for a variance from this code requirement.
Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Waste Disposal Sites - MOE CA Inventory: Provincial WDS

The Ontario Ministry of Environment, Waste Management Branch, maintains an inventory of known open (active or inactive) and closed disposal sites in the Province of Ontario. Active sites maintain a Certificate of Approval, are approved to receive and are receiving waste. Inactive sites maintain Certificate(s) of Approval but are not receiving waste. Closed sites are not receiving waste. The data contained within this database was compiled from the MOE's Certificate of Approval database. Locations of these sites may be cross-referenced to the Anderson database described under ERIS's Private Source Database section, by the CA number. All new Environmental Compliance Approvals handed out after Oct 31, 2011 for Waste Disposal Sites will still be found in this database.

Government Publication Date: Oct 2011-Jan 31, 2021

Waste Disposal Sites - MOE 1991 Historical Approval Inventory: Provincial WDSH

In June 1991, the Ontario Ministry of Environment, Waste Management Branch, published the "June 1991 Waste Disposal Site Inventory", of all known active and closed waste disposal sites as of October 30st, 1990. For each "active" site as of October 31st 1990, information is provided on site location, site/CA number, waste type, site status and site classification. For each "closed" site as of October 31st 1990, information is provided on site location, site/CA number, closure date and site classification. Locations of these sites may be cross-referenced to the Anderson database described under ERIS's Private Source Database section, by the CA number.

Government Publication Date: Up to Oct 1990*

Water Well Information System: Provincial WWIS

This database describes locations and characteristics of water wells found within Ontario in accordance with Regulation 903. It includes such information as coordinates, construction date, well depth, primary and secondary use, pump rate, static water level, well status, etc. Also included are detailed stratigraphy information, approximate depth to bedrock and the approximate depth to the water table.

Government Publication Date: Apr 30, 2020

Definitions

Database Descriptions: This section provides a detailed explanation for each database including: source, information available, time coverage, and acronyms used. They are listed in alphabetic order.

Detail Report: This is the section of the report which provides the most detail for each individual record. Records are summarized by location, starting with the project property followed by records in closest proximity.

Distance: The distance value is the distance between plotted points, not necessarily the distance between the sites' boundaries. All values are an approximation.

Direction: The direction value is the compass direction of the site in respect to the project property and/or center point of the report.

Elevation: The elevation value is taken from the location at which the records for the site address have been plotted. All values are an approximation. Source: Google Elevation API.

Executive Summary: This portion of the report is divided into 3 sections:

'Report Summary'- Displays a chart indicating how many records fall on the project property and, within the report search radii.

'Site Report Summary'-Project Property'- This section lists all the records which fall on the project property. For more details, see the 'Detail Report' section.

'Site Report Summary-Surrounding Properties'- This section summarizes all records on adjacent properties, listing them in order of proximity from the project property. For more details, see the 'Detail Report' section.

Map Key: The map key number is assigned according to closest proximity from the project property. Map Key numbers always start at #1. The project property will always have a map key of '1' if records are available. If there is a number in brackets beside the main number, this will indicate the number of records on that specific property. If there is no number in brackets, there is only one record for that property.

The symbol and colour used indicates 'elevation': the red inverted triangle will dictate 'ERIS Sites with Lower Elevation', the yellow triangle will dictate 'ERIS Sites with Higher Elevation' and the orange square will dictate 'ERIS Sites with Same Elevation.'

Unplottables: These are records that could not be mapped due to various reasons, including limited geographic information. These records may or may not be in your study area, and are included as reference.

Appendix F
Aerial Photos

1953

4/8/2021, 1:43:59 PM

approximate project area

1:4,514

0 0.03 0.06 0.11 mi

0 0.04 0.09 0.17 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Corporation of the City of Kingston

Corporation of the City of Kingston

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1957

4/8/2021, 1:45:03 PM

approximate project area

1:4,514

0 0.03 0.06 0.11 mi

0 0.04 0.09 0.17 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Corporation of the City of Kingston

Corporation of the City of Kingston

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1970

4/8/2021, 1:48:56 PM

approximate project area

1:9,028

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Corporation of the City of Kingston, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors.

Corporation of the City of Kingston

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1978

4/8/2021, 1:50:14 PM

approximate project area

1:9,028

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Corporation of the City of Kingston, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors.

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1990

4/8/2021, 1:52:37 PM

approximate project area

1:9,028

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Corporation of the City of Kingston, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors.

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2008

4/8/2021, 1:57:57 PM

approximate project area

1:9,028

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Corporation of the City of Kingston, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors.

Corporation of the City of Kingston

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2018

4/8/2021, 1:42:04 PM

approximate project area

1:4,514

0 0.03 0.06 0.11 mi

0 0.04 0.09 0.17 km

Esri Community Maps Contributors, Province of Ontario, Esri Canada, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada, Corporation of the City of Kingston

Corporation of the City of Kingston

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Appendix G
Borehole Logs

KEY TO SYMBOLS

Malroz Engineering Inc.
308 Wellington Street, Kingston ON
K7K 7A8
Telephone: 613-548-3446

CLIENT Queen's University

PROJECT NAME Geotechnical Investigation - Proposed New CFI Facility

PROJECT NUMBER 1591.00-101

PROJECT LOCATION Queen's University, Kingston, ON

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

- Silty Clay
- Sandy Silt
- Asphalt
- Limestone
- Fill
- Topsoil

SAMPLER SYMBOLS

- Rock Core
- Split Spoon

WELL CONSTRUCTION SYMBOLS

- Bentonite Seal
- Filter Pack
- Slotted Pipe

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION

Water Level at Time Drilling, or as Shown

Water Level at End of Drilling, or as Shown

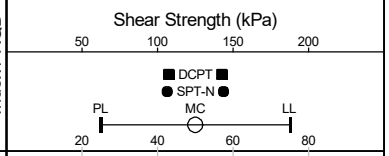
Water Level After 24 Hours, or as Shown

BOREHOLE LOG

Enclosure No.: 1

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH01**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.2 m**
Drilling Equipment: **CME 55**	Easting: **378866.0 m**	Northing: **4898445.7 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
	97.2		**TOPSOIL** sandy, brown.				
0.2			**FILL** sand and gravel, light brown, dense, becoming silty sand, some gravel.		SS1	50	34
0.4							
0.6							
0.8							
1.0					SS2	38	20
1.2							
1.4							
1.6	95.7		**SILTY CLAY** trace sand, trace organics in upper layer, brown, moist, very stiff.				
1.8					SS3	54	13
2.0							
2.2			Becoming blocky.				
2.4							
2.6					SS4	100	16
2.8	94.3		Borehole terminated with auger refusal at 2.8m.				
3.0							
3.2							
3.4							
3.6							
3.8							
4.0							
4.2							
4.4							
4.6							
4.8							
5.0							
5.2							
5.4							
5.6							
5.8							



NOTES:

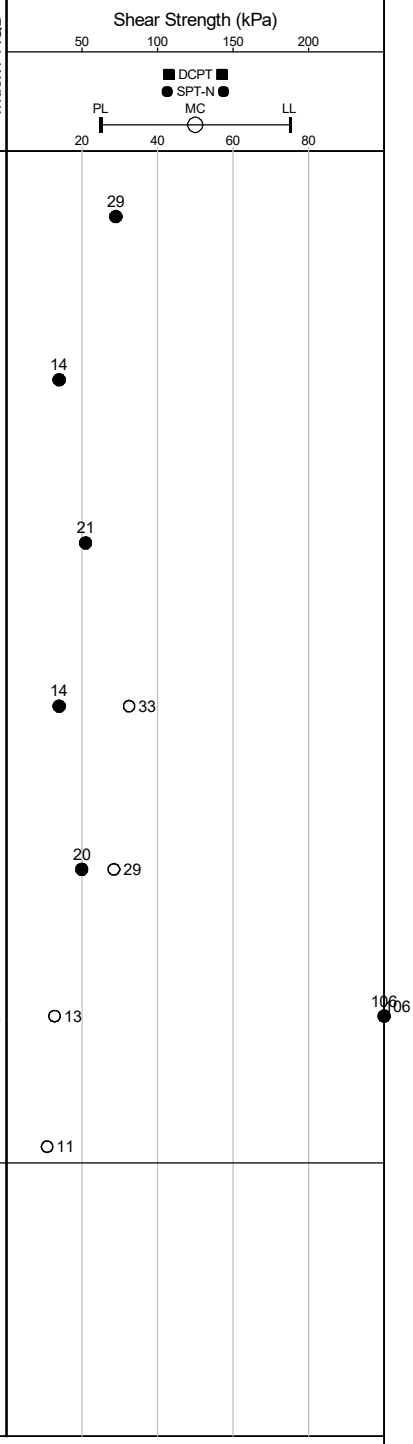
BOREHOLE LOG 1591 - BOREHOLE LOGS - 2-17-2022 - MS.GPJ MALROZ ENGINEERING.GDT 6/6/22

BOREHOLE LOG

Enclosure No.: 2

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH02**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.1 m**
Drilling Equipment: **CME 55**	Easting: **378877.3 m**	Northing: **4898425.8 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
	97.0		**TOPSOIL** sandy, brown.				
0.2			**FILL** silty clay and sand, some gravel, brown, moist.		SS1	42	29
0.4							
0.6							
0.8	96.3		**SILTY CLAY** trace sand, blocky, brown, moist, very stiff.				
1.0					SS2	100	14
1.2							
1.4							
1.6							
1.8					SS3	42	21
2.0							
2.2	94.8		**CLAYEY SANDY SILT** trace to some gravel, brown, moist, compact to dense.				
2.4							
2.6					SS4	92	14
2.8							
3.0							
3.2							
3.4					SS5	92	20
3.6							
3.8							
4.0					SS6	45	106
4.2							
4.4							
4.6					SS7	100	R
4.8	92.4		Borehole terminated with auger refusal at 4.7m.				
5.0							
5.2							
5.4							
5.6							
5.8							



NOTES:

BOREHOLE LOG 1591 - BOREHOLE LOGS - 2-17-2022 - MS.GPJ MALROZ ENGINEERING.GDT 6/6/22

BOREHOLE LOG

Enclosure No.: 3

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH03**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378848.5 m**	Northing: **4898423.6 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (50, 100, 150, 200; DCPT, SPT-N; PL, MC, LL; 20, 40, 60, 80)
	97.0		**TOPSOIL** sandy, brown. **FILL** silty clay with organics throughout, some sand, brown, moist.		SS1	59	17	17 (SPT-N), 39 (MC)
0.2								
0.4								
0.6								
0.8	96.3		Borehole terminated with auger refusal at 0.8m.					
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES: Borehole attempted in 3 locations, auger refusal at each location between 0.6m - 0.8m

BOREHOLE LOG

Enclosure No.: 4

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH04**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **96.9 m**
Drilling Equipment: **CME 55**	Easting: **378829.1 m**	Northing: **4898442.9 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (DCPT / SPT-N; PL, MC, LL)
	96.9		**TOPSOIL** some sand, brown.					
0.2			**FILL** silty sand, some gravel, some clay, trace asphalt, organics throughout.					
0.4					SS1	50	10	10, 33
0.6								
0.8								
1.0					SS2	25	19	19
1.2								
1.4								
1.6	95.3				SS3	40	R	19
			Borehole terminated with auger refusal at 1.7m.					
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 6

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH05**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **96.1 m**
Drilling Equipment: **CME 55**	Easting: **378828.8 m**	Northing: **4898471.3 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (DCPT ■, SPT-N ●; PL, MC, LL)
	96.1		**TOPSOIL** sandy, brown.					
0.2			**FILL** silty sand and gravel, some organics, trace asphalt, brown, moist.		SS1	75	18	18 ● 28 ○
0.4								
0.6								
0.8								
1.0					SS2	25	7	7 ● 9 ○
1.2								
1.4								
1.6								
1.8					SS3	17	3	3 ● 7 ○
2.0								
2.2								
	93.8		**FILL** silty clay, some gravel, trace sand, brown, moist.					
2.4								
2.6					SS4	59	9	9 ● 37 ○
2.8								
	93.2		**SILTY CLAY** some sand, brown, moist, stiff.					
3.0								
3.2								
3.4					SS5	75	8	8 ● 34 ○
3.6								
3.8			Becoming sandy, some gravel.					
4.0					SS6		R	26 ○
4.2	92.0		Borehole terminated with auger refusal at 4.2m.					
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

WELL LOG

Enclosure No.: 7

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Well Number: **BH06**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.7 m**
Drilling Equipment: **CME 55**	Easting: **378864.3 m**	Northing: **4898473.4 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (DCPT / SPT-N; PL, MC, LL)
	97.7		**TOPSOIL** sandy, brown.					
0.2			**FILL** silty sand, some gravel, trace asphalt in upper layer, brown, moist.		SS1	75	57	20, 57
0.4								
0.6								
0.8								
1.0								
1.2					SS2	79	4	4, 14
1.4								
1.6								
1.8								
2.0					SS3	59	5	5, 18
2.2								
	95.4		**SILTY CLAY** trace to some sand, some gravel, brown, moist, very stiff.					
2.4								
2.6								
2.8					SS4	100	17	8, 17
3.0								
3.2								
	94.4		**CLAYEY SANDY SILT** some gravel, brown, moist, compact to very dense.					
3.4					SS5	50	8	8, 13
3.6								
3.8								
4.0					SS6	100	79	11, 79
4.2								
4.4	93.3		Borehole terminated with auger refusal at 4.4m.					
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

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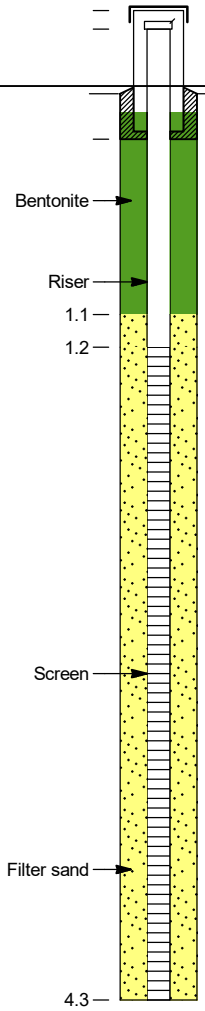
BOREHOLE LOG

Enclosure No.: 8

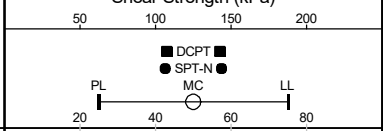
Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH07**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378845.0 m**	Northing: **4898461.3 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

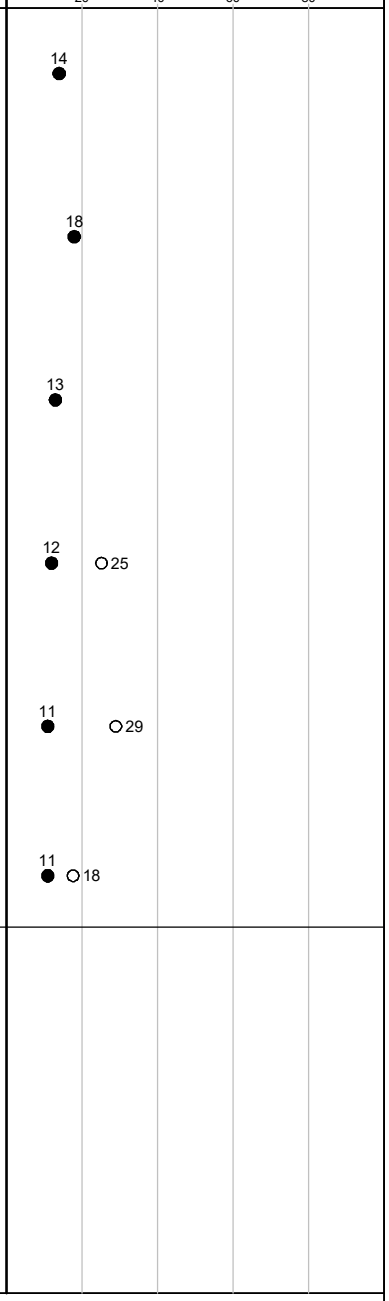
Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
0.0	97.0		**TOPSOIL** clayey, brown.				
0.2–0.8			**FILL** gravel, some sand and silt, trace clay, brown, moist.		SS1	42	14
1.0–1.8					SS2	59	18
1.8–2.4					SS3	25	13
2.4	94.7		**FILL** silty clay, trace sand, brown, moist.				
2.6–3.4					SS4	100	12
3.4	93.7		**SILTY CLAY** trace sand, trace organics, brown, stiff to very stiff.		SS5	79	11
4.0–4.2					SS6		11
4.3	92.7		Borehole terminated with auger refusal at 4.3m.				

Monitoring Well



Shear Strength (kPa)





NOTES: Well Construction Details
stick-up with aluminum monument
Sch. 40 PVC
slotted screen
screen
#1 sand

Groundwater Monitoring Details
monitored on
DTW[1]:
DTB[1]: 4.3 m
[1]depths are reported from TOP

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BOREHOLE LOG

Enclosure No.: 9

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH08**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **January 31, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **January 31, 2022**	Elevation: **98.7 m**
Drilling Equipment: **CME 55**	Easting: **378870.2 m**	Northing: **4898482.5 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (DCPT ■, SPT-N ●; PL, MC, LL)
	98.6		**ASPHALT** approx. 25 mm.					
0.2			**FILL** sand and gravel, some silt, over rock rubble, some sand and silt, grey.		SS1	88	85	2, 85
0.4								
0.6								
0.8								
1.0					SS2	9	54	54
1.2								
1.4								
1.6								
1.8					SS3	42	10	10
2.0								
2.2	96.4		Borehole terminated with auger refusal at 2.3m.					
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

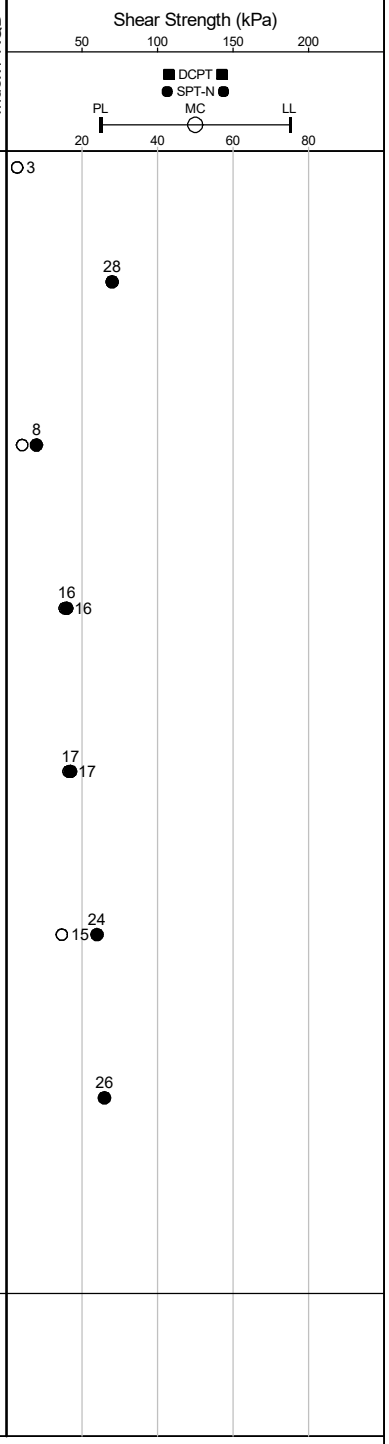
NOTES:

BOREHOLE LOG

Enclosure No.: 10

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH09**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **96.5 m**
Drilling Equipment: **CME 55**	Easting: **378842.5 m**	Northing: **4898484.1 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Description	Sample Number	Recovery (%)	Penetration Index / RQD
	96.5	**ASPHALT** approx. 50 mm.	SS1	100	R
0.2		**FILL** sand and gravel, some silt, over rock rubble, some sand and silt.			
0.4					
0.6			SS2	67	28
0.8					
1.0					
1.2					
1.4			SS3	34	8
1.6					
1.8	94.7	**SILTY CLAY** trace sand, brown, very stiff.			
2.0					
2.2			SS4	100	16
2.4					
2.6					
2.8			SS5	59	17
3.0					
3.2					
3.4	93.2	**CLAYEY SANDY SILT** trace to some gravel, brown, dense.			
3.6			SS6	84	24
3.8					
4.0					
4.2					
4.4			SS7	34	26
4.6					
4.8					
5.0					
5.2					
5.4	91.2	Borehole terminated with auger refusal at 5.33.			
5.6					
5.8					



NOTES:

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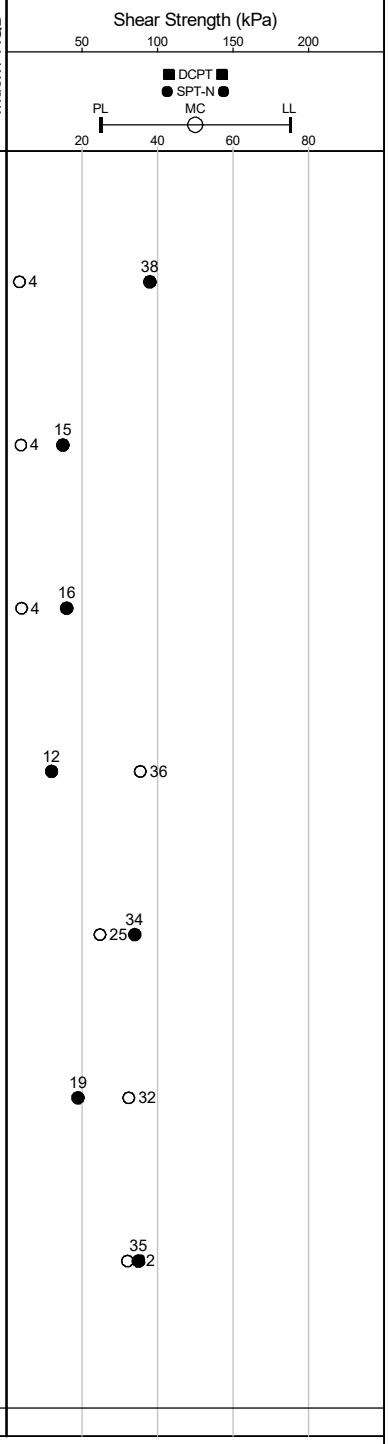
BOREHOLE LOG

Enclosure No.: 11

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH10**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **95.4 m**
Drilling Equipment: **CME 55**	Easting: **378822.0 m**	Northing: **4898487.6 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **A. Superville**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
	95.4		**ASPHALT** approx. 50 mm.		SS1	100	R
0.2			**FILL** silty sand and gravel over rock rubble, some silt and sand, trace organics.				
0.4							
0.6					SS2	25	38
0.8							
1.0							
1.2							
1.4					SS3	50	15
1.6							
1.8							
2.0							
2.2					SS4	50	16
2.4							
2.6	92.8		**SILTY CLAY** trace sand, brown, moist, very stiff.				
2.8							
3.0					SS5	25	12
3.2							
3.4			Trace gravel, becoming blocky, hard.				
3.6					SS6	100	34
3.8							
4.0							
4.2							
4.4					SS7	50	19
4.6							
4.8							
5.0			Faintly varved.				
5.2					SS8	59	35
5.4							
5.6							
5.8	89.6		Borehole terminated with auger refusal at 5.9m.				



NOTES:

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BOREHOLE LOG

Enclosure No.: 12

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH11**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **96.8 m**
Drilling Equipment: **CME 55**	Easting: **378829.2 m**	Northing: **4898452.8 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **J. Payeur**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
0.2			Augered to refusal, no sampling.					
0.4								
0.6								
0.8								
1.0								
1.2								
1.4			Possible weathered bedrock.					
1.6								
1.8								
2.0								
2.2								
2.4								
2.6	94.2		Borehole terminated with auger refusal at 2.6m.					
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 13

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH12**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **97.3 m**
Drilling Equipment: **CME 55**	Easting: **378866.9 m**	Northing: **4898454.2 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **J. Payeur**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
			Augered to refusal, no sampling.					
0.2								
0.4								
0.6								
0.8								
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8			Borehole terminated with auger refusal at 2.8m.					
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 14

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH13**	Page: **1** of **1**
Location: **Queen's University, Kingston, ON**	Date Started: **February 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **February 1, 2022**	Elevation: **97.1 m**
Drilling Equipment: **CME 55**	Easting: **378846.3 m**	Northing: **4898440.8 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **J. Payeur**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) 50 100 150 200 ■ DCPT ● SPT-N ● PL MC LL 20 40 60 80
			Augered to refusal, no sampling.					
0.2								
0.4								
0.6								
0.8								
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2			Borehole terminated with auger refusal at 3.2m.					
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

BOREHOLE LOG

Enclosure No.: 15

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH14**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378880.8 m**	Northing: **4898403.5 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (DCPT / SPT-N; PL, MC, LL)
	96.9		**TOPSOIL** sandy, brown.					
0.2			**FILL** silty sand, some gravel, brown, moist.					
0.4					SS1	34	50	50
0.6								
0.8								
1.0					SS2	25	18	18
1.2								
1.4								
1.6								
1.8					SS3	0	6	6
2.0								
2.2								
	94.7		**SILTY CLAY** trace to some sand, some gravel, brown, moist, very stiff.					
2.4								
2.6					SS4	100	27	27
2.8								
3.0								
3.2					SS5	100	28	28
3.4								
3.6								
3.8								
4.0					SS6	100	30	30
4.2								
4.4	92.6		Borehole terminated at 4.4m.					
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

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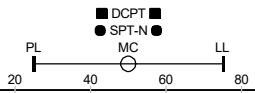
BOREHOLE LOG

Enclosure No.: 16

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH15**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **96.9 m**
Drilling Equipment: **CME 55**	Easting: **378862.6 m**	Northing: **4898403.2 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD
	96.8		**TOPSOIL**.				
0.2			**SILTY CLAY** trace sand, brown, moist.		SS1	47	R
0.4	96.5		Borehole terminated with auger refusal at 0.4m.				
0.6							
0.8							
1.0							
1.2							
1.4							
1.6							
1.8							
2.0							
2.2							
2.4							
2.6							
2.8							
3.0							
3.2							
3.4							
3.6							
3.8							
4.0							
4.2							
4.4							
4.6							
4.8							
5.0							
5.2							
5.4							
5.6							
5.8							

Shear Strength (kPa)



NOTES:

BOREHOLE LOG

Enclosure No.: 17

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH16**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **97.0 m**
Drilling Equipment: **CME 55**	Easting: **378843.4 m**	Northing: **4898399.7 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (DCPT / SPT-N; PL, MC, LL)
	96.9		**TOPSOIL**.					
0.2			**SILTY CLAY** some gravel, trace sand, brown, moist.		SS1	50	13	13
0.4								
0.6								
0.8								
1.0					SS2	33	21	21
1.2	95.8		Borehole terminated with auger refusal at 1.2m.					
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

Shear Strength (kPa): 50, 100, 150, 200; 20, 40, 60, 80

NOTES:

BOREHOLE LOG

Enclosure No.: 18

Project Name: **Geotechnical Investigation - Proposed New CFI Facility**		Project Number: **1591.00-101**
Client: **Queen's University**	Borehole Number: **BH17**	Page: **1 of 1**
Location: **Queen's University, Kingston, ON**	Date Started: **April 1, 2022**	Datum: **NAD 83 Z18N**
Drilling Contractor: **G.E.T. Drilling Ltd.**	Date Finished: **April 1, 2022**	Elevation: **96.9 m**
Drilling Equipment: **CME 55**	Easting: **378826.7 m**	Northing: **4898393.4 m**
Drilling and Sampling Method: **100mm Solid-Stem Augers, 50mm Split Spoons**	Logged By: **T.Brundridge**	Checked By: **D. Hill**

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	Penetration Index / RQD	Shear Strength (kPa) (50, 100, 150, 200; DCPT, SPT-N; PL, MC, LL; 20, 40, 60, 80)
	96.8		**TOPSOIL**.					
0.2			**SILTY CLAY** trace sand, brown, moist.		SS1	50	25	25
0.4	96.4		Borehole terminated with auger refusal at 0.4m.					
0.6								
0.8								
1.0								
1.2								
1.4								
1.6								
1.8								
2.0								
2.2								
2.4								
2.6								
2.8								
3.0								
3.2								
3.4								
3.6								
3.8								
4.0								
4.2								
4.4								
4.6								
4.8								
5.0								
5.2								
5.4								
5.6								
5.8								

NOTES:

Appendix H
Tables

Table H1
Sample Submission Summary

Location	Sample ID	Depth to Sample (mbg)	Soil Type	Soil Vapour Concentrations - Headspace [1]		Analyses								Rationale for Submittal
				Full Gas Combustible (ppm)	Organic (ppm)	PHCs	BTEX	PAHs	EC/SAR	Metals	pH	PCBs	TCLP	
Borehole Samples														
BH01	BH01-S01	0-0.6	silty sand	75	1	X	X	X	X	X				Dark staining observed. Investigate APEC C.
	BH01-S02	0.8-1.4	silty sand	65	1									
	BH01-S03	1.5-2.1	silty clay	70	nr									
	BH01-S04	2.3-2.9	silty clay	75	1									
BH02	BH02-S01	0-0.6	silty clay and sand	65	1									
	BH02-S02	0.8-1.4	silty clay	60	nr									
	BH02-S03	1.5-2.1	silty clay	70	nr	X	X	X	X	X				Elevated vapour readings. Investigate APEC A and C.
	BH02-S04	2.3-2.9	clayey sandy silt	75	nr									
	BH02-S05	3.1-3.7	clayey sandy silt	70	1									
	BH02-S06	3.8-4.3	clayey sandy silt	70	1									
	BH02-S07	4.6-4.7	clayey sandy silt	60	nr									
BH03	BH03-S01	0.0-0.6	silty clay	60	2	X	X	X	X	X				Provide lateral coverage. Investigate APEC A and C.
	BH03-S02	0.0-0.6	silty clay	60	2	X	X	X	X	X				Duplicate of BH03-S01
BH04	BH04-S01	0.0-0.6	silty sand	75	1									
	BH04-S02	0.8-1.4	silty sand	75	1	X	X	X	X	X				Asphalt fragments observed. Investigate APEC C.
	BH04-S03	1.5-1.7	silty sand	45	140									
BH05	BH05-S01	0.0-0.6	silty sand and gravel	55	9					X				Delineate lead exceedance in BH05-S02.
	BH05-S02	0.8-1.4	silty sand	50	1	X	X	X	X	X	X		X	Investigate APEC C.
	BH05-S03	1.5-2.1	silty sand	35	1					X				Delineate lead exccedance in BH05-S02.
	BH05-S04	2.3-2.9	silty clay	50	1									
	BH05-S05	3.1-3.7	silty clay	45	nr									
	BH05-S06	3.8-4.3	silty sandy clay	50	1									
BH06	BH06-S01	0.0-0.6	silty sand	35	nr	X (F2-F4)								Delineate PHC exceedance in BH08-S02.
	BH06-S02	0.9-1.5	silty sand	55	4	X	X	X	X	X				Elevated vapour readings. Investigate APEC C.
	BH06-S03	1.7-2.3	silty sand	45	nr									
	BH06-S04	2.4-3.1	silty clay	50	1									
	BH06-S05	3.2-3.8	clayey sandy silt	40	nr									
	BH06-S06	3.8-4.4	clayey sandy silt	55	6									
BH07	BH07-S01	0.0-0.6	sandy clayey gravel	35	nr									
	BH07-S02	0.8-1.4	sandy clayey gravel	40	1	X	X	X	X	X				Elevated vapour reafdings. Investigate APEC C.
	BH07-S03	1.5-2.1	sandy clayey gravel	50	nr									
	BH07-S04	2.3-2.9	silty clay	35	1					X				Delineate lead exceedance in BH05-S02
	BH07-S05	3.1-3.7	silty clay	25	nr									
	BH07-S06	3.8-4.3	silty clay	40	4									
BH08	BH08-S01	0.0-0.6	sand and gravel	20	1	X	X	X	X	X				Investigate APEC C and D.
	BH08-S02	0.8-1.4	sand and gravel	nr	nr									
	BH08-S03	1.5-2.1	sandy clayey gravel	15	1	X (F2-F4)								Delineate PHC exceedance in BH08-S01.
BH09	BH09-S01	0.0-0.2	sand and gravel	10	1	X (F2-F4)								
	BH09-S02	0.3-0.9	silty sand	nr	nr					X				Delineate lead exceedance in BH05-S02.
	BH09-S03	1.1-1.7	sandy clayey gravel	nr	nr									
	BH09-S04	1.8-2.4	silty clay	35	1	X	X	X	X	X		X		Investigate APEC B, C, and D
	BH09-S05	1.8-2.4	silty clay	35	1	X	X	X	X	X	X			Duplicate of BH09-S04
	BH09-S06	2.6-3.2	clayey sandy silt	20	1									
	BH09-S07	3.4-4.0	clayey sandy silt	45	2									
	BH09-S08	4.1-4.7	clayey sandy silt	nr	nr									
BH10	BH10-S01	0.0-0.2	sandy gravel	140	1									
	BH10-S02	0.3-0.9	silty sand	15	2					X				Delineate lead exceedance in BH05-S02.
	BH10-S03	1.1-1.7	silty sand	25	2	X	X	X	X	X		X		Investigate APEC B, C and D.
	BH10-S04	1.8-2.4	silty sand	nr	nr									
	BH10-S05	2.6-3.2	silty clay	15	1									
	BH10-S06	3.4-4.0	silty clay	25	1									
	BH10-S07	4.1-4.7	silty clay	35	2									
	BH10-S08	4.9-5.5	silty clay	45	3									
BH14	BH14-SS1	0.0-0.6	silty sand	nr	nr	X	X		X	X				Investigate APEC A and C.
	BH14-SS2	0.8-1.4	silty sand	nr	nr			X						Investigate APEC A and C.
	BH14-SS3	2.3-2.9	silty sand	nr	nr									
	BH14-SS3a	2.3-2.9	silty sand	nr	nr									
	BH14-SS4	3.1-3.7	silty clay	nr	nr									
	BH14-SS5	3.8-4.4	silty clay	nr	nr									
BH15	BH15-SS1	0.0-0.6	silty clay	nr	nr	X	X	X	X	X				Investigate APEC A and C.
BH16	BH16-SS1	0.0-0.6	silty clay	nr	nr	X	X	X	X	X				Delineate mercury exceedance from previous investigation.
	BH16-SS2	0.8-1.4	silty clay	nr	nr					X (Hg)				
BH17	BH17-SS1	0.0-0.6	silty clay	nr	nr	X	X	X	X	X				Investigate APEC A and C.

Notes:

[1] vapours measured using an RKI Eagle 2 equipped with a combustible gas indicator and photoionization detector; measurements collected from headspace vapours

ppm parts per million
mbg metres below grade
nr no response on instrument

Data Input: JeMP
Data Check: ZL

Table H2
Soil Analytical Results

Parameter	Location		BH01	BH02	BH03	BH04	BH05			BH06		BH07		BH08		QA/QC	2019 "Table 2.1": Volume Independent, Industrial / Commercial / Community Property Use		2019 "Table 2.1": Volume Independent, Residential / Parkland / Institutional Property Use		2011 "TABLE 1": Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use	
	Sample ID		BH01-S01	BH02-S03	BH03-S01	BH04-S02	BH05-S01	BH05-S02	BH05-S03	BH06-S01	BH06-S02	BH07-S02	BH07-S04	BH08-S01	BH08-S03	BH03-S02						
	Date Sampled		2022-01-31	2022-01-31	2022-01-31	2022-01-31	2022-01-31	2022-01-31	2022-01-31	2022-01-31	2022-01-31	2022-01-31	2022-02-01	2022-02-01	2022-02-01	2022-01-31						
	Date Analyzed [b]		2022-02-08	2022-02-08	2022-02-08	2022-02-08	2022-02-23	2022-02-08	2022-02-23	2022-02-22	2022-02-08	2022-02-08	2022-02-23	2022-02-08	2022-02-22	2022-02-08						
	Lab Report ID		2206070-01	2206070-02	2206070-03	2206231-01	2208334-04	2206070-06	2208334-05	2208334-02	2206070-08	2206070-09	2208334-06	2206231-04	2208334-01	2206070-04						
	Depth (m)		0.0-0.6	1.5-2.1	0.0-0.6	0.8-1.4	0.0-0.6	0.8-1.4	1.5-2.1	0.0-0.6	0.9-1.5	0.8-1.4	2.3-2.9	0.0-0.6	1.5-2.1	0.0-0.6						
	Soil Type		silty sand	silty clay	silty clay	silty sand	ty sand and gra	silty sand	silty sand	silty sand	silty sand	ndy clayey grav	silty clay	sand and gravel	ndy clayey grav	silty clay						
	Units	MDL																				
PHCs																						
PHC F1(C6-C10)	µg/g	7	<	<	<	<	-	<	-	-	<	<	-	<	-	<	25		25		25	
PHC F2(>C10-C16)	µg/g	4	<	<	<	<	-	<	-	<	<	<	-	13	<	<	26		10		10	RL
PHC F3(>C16-C34)	µg/g	8	<	<	<	<	-	<	-	33	<	<	-	28	<	<	240		240		240	
PHC F4(>C34-C50)	µg/g	6	<	<	<	<	-	<	-	22	<	<	-	30	<	<	3300		2800		120	
BTEX																						
Benzene	µg/g	0.02	<	<	<	<	-	<	-	-	<	<	-	<	-	<	0.02		0.02		0.02	RL
Ethylbenzene	µg/g	0.05	<	<	<	<	-	<	-	-	<	<	-	<	-	<	0.05		0.05		0.05	RL
Toluene	µg/g	0.05	<	<	<	<	-	<	-	-	<	<	-	<	-	<	0.2		0.2		0.2	RL
Xylene m,p-	µg/g	0.05	<	<	<	<	-	<	-	-	<	<	-	<	-	<						
Xylene, o-	µg/g	0.05	<	<	<	<	-	<	-	-	<	<	-	<	-	<						
Xylene (total)	µg/g	0.05	<	<	<	<	-	<	-	-	<	<	-	<	-	<	0.091		0.091		0.05	RL
Polycyclic Aromatic Hydrocarbons																						
Acenaphthene	µg/g	0.02	<	<	<	<	-	<	-	-	<	<	-	<	-	<	2.5		2.5		0.072	
Acenaphthylene	µg/g	0.02	<	<	<	<	-	<	-	-	<	<	-	<	-	<	0.093		0.093		0.093	
Anthracene	µg/g	0.02	<	<	<	<	-	0.02	-	-	<	<	-	<	-	<	0.16		0.16		0.16	
Benzo(a)anthracene	µg/g	0.02	0.08	<	<	<	-	0.08	-	-	<	<	-	<	-	<	0.92		0.5		0.36	
Benzo(a)pyrene	µg/g	0.02	0.13	<	<	0.02	-	0.09	-	-	<	<	-	<	-	<	0.31		0.31		0.3	
Benzo(b/j)fluoranthene	µg/g	0.02	0.19	<	<	0.03	-	0.11	-	-	<	<	-	<	-	<	3.2		3.2		0.47	
Benzo(g,h,i)perylene	µg/g	0.02	0.10	<	<	0.02	-	0.06	-	-	<	<	-	<	-	<	13		6.6		0.68	
Benzo(k)fluoranthene	µg/g	0.02	0.09	<	<	<	-	0.06	-	-	<	<	-	<	-	<	3.1		3.1		0.48	
Chrysene	µg/g	0.02	0.15	<	<	0.03	-	0.10	-	-	<	<	-	<	-	<	9.4		7		2.8	
Dibenzo(a h)anthracene	µg/g	0.02	0.02	<	<	<	-	<	-	-	<	<	-	<	-	<	0.7		0.57		0.1	RL
Fluoranthene	µg/g	0.02	0.13	<	<	0.04	-	0.16	-	-	<	0.03	-	<	-	<	2.8		0.69		0.56	
Fluorene	µg/g	0.02	<	<	<	<	-	<	-	-	<	<	-	<	-	<	6.8		6.8		0.12	
Indeno[1 2 3-cd]pyrene	µg/g	0.02	0.08	<	<	<	-	0.05	-	-	<	<	-	<	-	<	0.76		0.38		0.23	
Methylnaphthalene,1-	µg/g	0.02	<	<	<	<	-	0.04	-	-	<	<	-	<	-	<					0.59	
Methlynaphthalene, 2-	µg/g	0.02	<	<	<	<	-	0.05	-	-	<	<	-	<	-	<					0.59	
Methlynaphthalene, 2-(1-)	µg/g	0.04	<	<	<	<	-	0.10	-	-	<	<	-	<	-	<	0.59		0.59		0.59	
Naphthalene	µg/g	0.01	<	<	<	<	-	0.03	-	-	<	<	-	<	-	<	0.2		0.2		0.09	
Phenanthrene	µg/g	0.02	0.06	<	<	<	-	0.09	-	-	<	<	-	<	-	<	12		6.2		0.69	
Pyrene	µg/g	0.02	0.13	<	<	0.04	-	0.14	-	-	<	0.03	-	<	-	<	28		28		1	
Metals and Inorganics																						
Antimony	µg/g	1.0	<	<	<	<	2.8	<	1.2	-	<	<	<	<	-	<	40	a	7.5	a	1.3	
Arsenic	µg/g	1.0	5.7	4.6	3.9	4.2	3.9	6.1	3.8	-	4.8	6.8	4.6	1.4	-	3.8	18		18		18	
Barium	µg/g	1.0	149	435	381	146	107	190	168	-	196	239	455	56.6	-	327	670	a	390	a	220	
Beryllium	µg/g	0.5	0.7	1.3	1.4	0.8	0.6	0.8	0.7	-	1.3	1.0	1.6	<	-	1.1	8	a	4	a	2.5	
Boron (Hot Water Soluble)	µg/g	0.5	0.8	<	<	<	-	<	-	-	<	0.7	-	<	-	<	2		1.5		NA	
Boron (total)	µg/g	5.0	11.2	11.7	9.7	9.3	6.2	10.5	12.1	-	14.5	15.2	11.2	10.7	-	11.3	120	a	120	a	36	
Cadmium	µg/g	0.5	<	<	<	<	<	<	<	-	<	0.6	<	<	-	<	1.9	a	1.2		1.2	
Chromium (total)	µg/g	5.0	36.7	64.9	67.7	30.4	21.3	36.8	27.4	-	47.1	35.8	77.6	10.9	-	53.5	160	a	160	a	70	
Chromium VI	µg/g	0.2	<	<	<	<	-	<	-	-	<	<	-	<	-	<	8		8		0.66	
Cobalt	µg/g	1.0	11.0	21.3	19.4	9.1	7.7	11.2	8.9	-	14.9	12.0	23.5	3.5	-	16.7	80	a	22	a	21	
Copper	µg/g	5.0	35.9	41.2	34.3	20.0	37.2	45.1	12.5	-	23.9	27.9	42.9	6.6	-	43.9	230	a	140	a	92	
Lead	µg/g	1.0	43.9	11.3	14.0	18.4	70.4	136	19.2	-	11.2	52.4	16.5	8.9	-	16.0	120		120		120	
Mercury	µg/g	0.1	<	<	<	<	-	0.2	-	-	<	<	-	<	-	<	0.27		0.27		0.27	
Molybdenum	µg/g	1.0	<	<	<	<	<	1.1	<	-	<	<	<	<	-	<	40	a	6.9	a	2	a,RL
Nickel	µg/g	5.0	20.0	46.1	37.3	18.0	14.6	23.5	18.0	-	30.1	24.3	47.5	9.6	-	34.8	270	a	100	a	82	
Selenium	µg/g	1.0	<	<	<	<	<	<	<	-	<	<	<	<	-	<	5.5	a	2.4	a	1.5	
Silver	µg/g	0.3	<	<	<	<	<	<	<	-	<	<	<	<	-	<	40	a	20	a	0.5	a,RL
Thallium	µg/g	1.0	<	<	<	<	<	<	<	-	<	<	<	<	-	<	3.3	a	1	a	1	a,RL
Uranium	µg/g	1.0	<	<	<	<	<	<	<	-	<	<	<	<	-	<	33	a	23	a	2.5	
Vanadium	µg/g	10.0	46.6	87.0	89.8	38.0	32.4	46.3	29.7	-	60.1	41.5	98.4	11.1	-	68.6	86		86		86	
Zinc	µg/g	20.0	95.7	116	97.5	55.0	88.2	106	60.6	-	50.9	117	123	<	-	101	340	a	340	a	290	
General Chemistry																						
Conductivity	µS/cm	5	286	264	190	440	-	213	-	-	342	212	-	3780	-	154	1400		700		570	
pH	pH Units	0.05	-	-	-	-	-	7.52	-	-	-	-	-	-	-	-						
Sodium Adsorption Ratio (SAR)	na	0.01	0.07	1.59	0.11	0.06	-	0.20	-	-	1.71	0.07	-	28.2	-	0.09	12		5		2.4	
Pesticides, PCBs, and Other Regulated Parameters																						
Polychlorinated Biphenyls (PCBs)	µg/g	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.78		0.35		0.3	RL

Table Cont'd

Table H2 Continued
Soil Analytical Results

Parameter	Location		BH09			BH10		BH14		BH15	BH16		BH17	QA/QC	2019 "Table 2.1": Volume Independent, Industrial / Commercial / Community Property Use		2019 "Table 2.1": Volume Independent, Residential / Parkland / Institutional Property Use		2011 "TABLE 1": Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use	
	Sample ID		BH09-S01	BH09-S02	BH09-S04	BH10-S02	BH10-S03	BH14-SS1	BH14-SS2	BH15-SS1	BH16-SS1	BH16-SS2	BH17-SS1	BH09-S05						
	Date Sampled		2022-02-01	2022-02-01	2022-02-01	2022-02-01	2022-02-01	2022-04-01	2022-04-01	2022-04-01	2022-04-01	2022-04-01	2022-04-01	2022-02-01						
	Date Analyzed [b]		2022-02-22	2022-02-23	2022-02-08	2022-02-23	2022-02-08	2022-04-12	2022-04-12	2022-04-12	2022-04-12	2022-04-12	2022-04-12	2022-02-08						
	Lab Report ID		2208334-03	2208334-07	2206231-05	2208334-08	2206231-07	2214529-01	2214529-02	2214529-03	2214529-04	2214529-05	2214529-06	2206231-06						
	Depth (m)		0.0-0.2	0.3-0.9	1.8-2.4	0.3-0.9	1.1-1.7	0.0-0.6	0.8-1.4	0.0-0.6	0.0-0.6	0.8-1.4	0.0-0.6	1.8-2.4						
	Soil Type		sand and grave	silty sand	silty clay	silty sand	silty sand	silty sand	sandy gravel	silty clay	silty clay	silty clay	silty clay	silty clay						
	Units	MDL																		
PHCs																				
PHC F1(C6-C10)	µg/g	7	-	-	<	-	<	<	-	<	<	-	<	<	25		25		25	
PHC F2(>C10-C16)	µg/g	4	5	-	<	-	<	<	-	<	<	-	<	<	26		10		10	RL
PHC F3(>C16-C34)	µg/g	8	16	-	<	-	<	<	-	<	<	-	<	<	240		240		240	
PHC F4(>C34-C50)	µg/g	6	25	-	<	-	<	<	-	<	<	-	<	<	3300		2800		120	
BTEX																				
Benzene	µg/g	0.02	-	-	<	-	<	<	-	<	<	-	<	<	0.02		0.02		0.02	RL
Ethylbenzene	µg/g	0.05	-	-	<	-	<	<	-	<	<	-	<	<	0.05		0.05		0.05	RL
Toluene	µg/g	0.05	-	-	<	-	<	<	-	<	<	-	<	<	0.2		0.2		0.2	RL
Xylene m,p-	µg/g	0.05	-	-	<	-	<	<	-	<	<	-	<	<						
Xylene, o-	µg/g	0.05	-	-	<	-	<	<	-	<	<	-	<	<						
Xylene (total)	µg/g	0.05	-	-	<	-	<	<	-	<	<	-	<	<	0.091		0.091		0.05	RL
Polycyclic Aromatic Hydrocarbons																				
Acenaphthene	µg/g	0.02	-	-	<	-	0.03	-	<	<	<	-	<	<	2.5		2.5		0.072	
Acenaphthylene	µg/g	0.02	-	-	<	-	<	-	<	0.03	<	-	<	<	0.093		0.093		0.093	
Anthracene	µg/g	0.02	-	-	<	-	0.09	-	<	0.06	<	-	<	<	0.16		0.16		0.16	
Benzo(a)anthracene	µg/g	0.02	-	-	<	-	0.15	-	0.02	0.11	<	-	0.07	<	0.92		0.5		0.36	
Benzo(a)pyrene	µg/g	0.02	-	-	<	-	0.17	-	0.03	0.16	<	-	0.07	<	0.31		0.31		0.3	
Benzo(b/j)fluoranthene	µg/g	0.02	-	-	<	-	0.17	-	0.03	0.13	<	-	0.07	<	3.2		3.2		0.47	
Benzo(g,h,i)perylene	µg/g	0.02	-	-	<	-	0.10	-	0.03	0.11	<	-	0.05	<	13		6.6		0.68	
Benzo(k)fluoranthene	µg/g	0.02	-	-	<	-	0.09	-	0.02	0.07	<	-	0.04	<	3.1		3.1		0.48	
Chrysene	µg/g	0.02	-	-	<	-	0.19	-	0.03	0.14	<	-	0.08	<	9.4		7		2.8	
Dibenzo(a h)anthracene	µg/g	0.02	-	-	<	-	0.02	-	<	0.02	<	-	<	<	0.7		0.57		0.1	RL
Fluoranthene	µg/g	0.02	-	-	<	-	0.40	-	0.04	0.29	0.02	-	0.17	<	2.8		0.69		0.56	
Fluorene	µg/g	0.02	-	-	<	-	0.04	-	<	<	<	-	<	<	6.8		6.8		0.12	
Indeno[1 2 3-cd]pyrene	µg/g	0.02	-	-	<	-	0.08	-	0.02	0.08	<	-	0.04	<	0.76		0.38		0.23	
Methylnaphthalene,1-	µg/g	0.02	-	-	<	-	0.04	-	<	0.04	<	-	<	<					0.59	
Methlynaphthalene, 2-	µg/g	0.02	-	-	<	-	0.06	-	<	0.06	<	-	<	<					0.59	
Methlynaphthalene, 2-(1-)	µg/g	0.04	-	-	<	-	0.10	-	<	0.10	<	-	<	<	0.59		0.59		0.59	
Naphthalene	µg/g	0.01	-	-	<	-	0.06	-	<	0.05	<	-	<	<	0.2		0.2		0.09	
Phenanthrene	µg/g	0.02	-	-	<	-	0.34	-	0.03	0.24	<	-	<	<	12		6.2		0.69	
Pyrene	µg/g	0.02	-	-	<	-	0.32	-	0.04	0.25	0.02	-	0.15	<	28		28		1	
Metals and Inorganics																				
Antimony	µg/g	1.0	-	<	<	<	<	**3.0**	-	1.1	<	-	<	<	40	a	7.5	a	1.3	
Arsenic	µg/g	1.0	-	3.8	4.4	3.9	4.9	5.8	-	5.2	5.3	-	4.0	4.6	18		18		18	
Barium	µg/g	1.0	-	149	**312**	124	212	189	-	**301**	**242**	-	**268**	**347**	670	a	390	a	220	
Beryllium	µg/g	0.5	-	0.8	1.2	<	0.8	0.9	-	1.1	1.0	-	1.0	1.5	8	a	4	a	2.5	
Boron (Hot Water Soluble)	µg/g	0.5	-	-	<	-	<	<	-	<	<	-	<	<	2		1.5		NA	
Boron (total)	µg/g	5.0	-	15.5	9.8	21.3	13.3	14.7	-	13.8	9.4	-	10.4	10.0	120	a	120	a	36	
Cadmium	µg/g	0.5	-	<	<	<	<	<	-	<	<	-	<	<	1.9	a	1.2		1.2	
Chromium (total)	µg/g	5.0	-	32.6	49.5	17.1	30.3	38.2	-	53.1	41.4	-	45.9	56.6	160	a	160	a	70	
Chromium VI	µg/g	0.2	-	-	<	-	<	<	-	<	<	-	<	<	8		8		0.66	
Cobalt	µg/g	1.0	-	10.3	15.7	7.1	11.4	11.6	-	16.8	13.9	-	14.5	18.5	80	a	22	a	21	
Copper	µg/g	5.0	-	38.8	33.5	25.9	23.5	30.1	-	33.0	29.9	-	28.9	35.7	230	a	140	a	92	
Lead	µg/g	1.0	-	23.4	9.8	**165**	82.7	50.0	-	26.9	24.0	-	15.2	12.6	120		120		120	
Mercury	µg/g	0.1	-	-	<	-	0.1	<	<	<	<	<	0.2	<	0.27		0.27		0.27	
Molybdenum	µg/g	1.0	-	<	<	<	<	<	-	<	<	-	<	<	40	a	6.9	a	2	a,RL
Nickel	µg/g	5.0	-	21.0	33.9	13.8	22.0	23.7	-	34.4	27.7	-	30.6	38.8	270	a	100	a	82	
Selenium	µg/g	1.0	-	<	<	<	<	<	-	<	<	-	<	<	5.5	a	2.4	a	1.5	
Silver	µg/g	0.3	-	<	<	<	<	<	-	<	<	-	<	<	40	a	20	a	0.5	a,RL
Thallium	µg/g	1.0	-	<	<	<	<	<	-	<	<	-	<	<	3.3	a	1	a	1	a,RL
Uranium	µg/g	1.0	-	<	<	<	<	<	-	<	<	-	<	<	33	a	23	a	2.5	
Vanadium	µg/g	10.0	-	38.1	69.9	19.3	40.0	44.8	-	64.9	56.3	-	59.8	75.3	86		86		86	
Zinc	µg/g	20.0	-	70.5	86.6	51.7	85.5	105	-	100	88.4	-	88.4	98.0	340	a	340	a	290	
General Chemistry																				
Conductivity	µS/cm	5	-	-	**1050**	-	**2590**	217	-	174	150	-	138	**871**	1400		700		570	
pH	pH Units	0.05	-	-	-	-	-	-	-	-	-	-	-	7.68						
Sodium Adsorption Ratio (SAR)	na	0.01	-	-	**9.07**	-	**14.3**	0.14	-	0.14	0.08	-	0.1	**6.38**	12		5		2.4	
Pesticides, PCBs, and Other Regulated Parameters																				
Polychlorinated Biphenyls (PCBs)	µg/g	0.05	-	-	<	-	<	-	-	-	-	-	-	-	0.78		0.35		0.3	RL

Notes:

BH##-S##/SS#	borehole and sample ID
MDL	method detection limit
<	result below method detection limit
-	not analyzed
a	'leachate analysis is required if paramater is a contaminant of potential concern in excess soil volumes >350 m^3 or for environmentally sensitive receiving sites
b	date analyzed between February 2 and April 12, 2022
na	not applicable

Red, bold and underline indicates value exceeds MECP (2019) Table 2.1 Volume Independent, Industrial / Commercial / Community Property Use
Orange, bold and underline indicates value exceeds MECP (2019) Table 2.1 Volume Independent, Residential / Parkland / Institutional
Blue, bold and underline indicates value exceeds MECP (2011) Table 1 Full Depth Background Site Condition Standards

Data Input: JeMP
Data Check: ZL

Appendix I
Laboratory Certificates of Analysis

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Malroz Engineering Incorporated

308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Jessie Payeur

Client PO:
Project: 1591
Custody: 134932

Report Date: 7-Feb-2022
Order Date: 1-Feb-2022

Order #: 2206070

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2206070-01	BH01-S01
2206070-02	BH02-S03
2206070-03	BH03-S01
2206070-04	BH03-S02
2206070-06	BH05-S02
2206070-08	BH06-S02
2206070-09	BH07-S02

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	3-Feb-22	3-Feb-22
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	2-Feb-22	2-Feb-22
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	2-Feb-22	4-Feb-22
Conductivity	MOE E3138 - probe @25 °C, water ext	3-Feb-22	3-Feb-22
Mercury by CVAA	EPA 7471B - CVAA, digestion	3-Feb-22	3-Feb-22
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	2-Feb-22	3-Feb-22
PHC F1	CWS Tier 1 - P&T GC-FID	2-Feb-22	2-Feb-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	2-Feb-22	3-Feb-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	3-Feb-22	3-Feb-22
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	2-Feb-22	5-Feb-22
SAR	Calculated	3-Feb-22	3-Feb-22
Solids, %	Gravimetric, calculation	2-Feb-22	2-Feb-22

PARACEL LABORATORIES LTD.

Order #: 2206070

Certificate of Analysis

Report Date: 07-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 1-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH01-S01	BH02-S03	BH03-S01	BH03-S02
	Sample Date:	31-Jan-22 09:00	31-Jan-22 09:00	31-Jan-22 09:00	31-Jan-22 09:00
	Sample ID:	2206070-01	2206070-02	2206070-03	2206070-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	80.2	77.4	76.6	77.8
General Inorganics					
SAR	0.01 N/A	0.07	1.59	0.11	0.09
Conductivity	5 uS/cm	286	264	190	154
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	5.7	4.6	3.9	3.8
Barium	1.0 ug/g dry	149	435	381	327
Beryllium	0.5 ug/g dry	0.7	1.3	1.4	1.1
Boron	5.0 ug/g dry	11.2	11.7	9.7	11.3
Boron, available	0.5 ug/g dry	0.8	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	36.7	64.9	67.7	53.5
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.0	21.3	19.4	16.7
Copper	5.0 ug/g dry	35.9	41.2	34.3	43.9
Lead	1.0 ug/g dry	43.9	11.3	14.0	16.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	20.0	46.1	37.3	34.8
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	46.6	87.0	89.8	68.6
Zinc	20.0 ug/g dry	95.7	116	97.5	101
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	83.6%	86.5%	86.9%	84.7%
Hydrocarbons					

PARACEL LABORATORIES LTD.

Order #: 2206070

Certificate of Analysis

Report Date: 07-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 1-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH01-S01	BH02-S03	BH03-S01	BH03-S02
	Sample Date:	31-Jan-22 09:00	31-Jan-22 09:00	31-Jan-22 09:00	31-Jan-22 09:00
	Sample ID:	2206070-01	2206070-02	2206070-03	2206070-04
	MDL/Units	Soil	Soil	Soil	Soil
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	0.08	<0.02	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	0.13	<0.02	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	0.19	<0.02	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	0.10	<0.02	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	0.09	<0.02	<0.02	<0.02
Chrysene	0.02 ug/g dry	0.15	<0.02	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.02	<0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	0.13	<0.02	<0.02	<0.02
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.08	<0.02	<0.02	<0.02
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	<0.04
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	0.06	<0.02	<0.02	<0.02
Pyrene	0.02 ug/g dry	0.13	<0.02	<0.02	<0.02
2-Fluorobiphenyl	Surrogate	115%	64.5%	59.1%	86.8%
Terphenyl-d14	Surrogate	173% [3]	71.7%	80.1%	104%

PARACEL LABORATORIES LTD.

Order #: 2206070

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 07-Feb-2022

Order Date: 1-Feb-2022

Project Description: 1591

	Client ID:	BH05-S02	BH06-S02	BH07-S02	-
	Sample Date:	31-Jan-22 09:00	31-Jan-22 09:00	31-Jan-22 09:00	-
	Sample ID:	2206070-06	2206070-08	2206070-09	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	89.8	84.3	81.0	-
General Inorganics					
SAR	0.01 N/A	0.20	1.71	0.07	-
Conductivity	5 uS/cm	213	342	212	-
pH	0.05 pH Units	7.52	-	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	6.1	4.8	6.8	-
Barium	1.0 ug/g dry	190	196	239	-
Beryllium	0.5 ug/g dry	0.8	1.3	1.0	-
Boron	5.0 ug/g dry	10.5	14.5	15.2	-
Boron, available	0.5 ug/g dry	<0.5	<0.5	0.7	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	0.6	-
Chromium	5.0 ug/g dry	36.8	47.1	35.8	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	11.2	14.9	12.0	-
Copper	5.0 ug/g dry	45.1	23.9	27.9	-
Lead	1.0 ug/g dry	136	11.2	52.4	-
Mercury	0.1 ug/g dry	0.2	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	1.1	<1.0	<1.0	-
Nickel	5.0 ug/g dry	23.5	30.1	24.3	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	46.3	60.1	41.5	-
Zinc	20.0 ug/g dry	106	50.9	117	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene-d8	Surrogate	80.7%	84.3%	83.9%	-

PARACEL LABORATORIES LTD.

Order #: 2206070

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 07-Feb-2022

Order Date: 1-Feb-2022

Project Description: 1591

	Client ID:	BH05-S02	BH06-S02	BH07-S02	-
	Sample Date:	31-Jan-22 09:00	31-Jan-22 09:00	31-Jan-22 09:00	-
	Sample ID:	2206070-06	2206070-08	2206070-09	-
	MDL/Units	Soil	Soil	Soil	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Anthracene	0.02 ug/g dry	0.02	<0.02	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	0.08	<0.02	<0.02	-
Benzo [a] pyrene	0.02 ug/g dry	0.09	<0.02	<0.02	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.11	<0.02	<0.02	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.06	<0.02	<0.02	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.06	<0.02	<0.02	-
Chrysene	0.02 ug/g dry	0.10	<0.02	<0.02	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Fluoranthene	0.02 ug/g dry	0.16	<0.02	0.03	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.05	<0.02	<0.02	-
1-Methylnaphthalene	0.02 ug/g dry	0.04	<0.02	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	0.05	<0.02	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.10	<0.04	<0.04	-
Naphthalene	0.01 ug/g dry	0.03	<0.01	<0.01	-
Phenanthrene	0.02 ug/g dry	0.09	<0.02	<0.02	-
Pyrene	0.02 ug/g dry	0.14	<0.02	0.03	-
2-Fluorobiphenyl	Surrogate	85.4%	85.8%	107%	-
Terphenyl-d14	Surrogate	121%	96.0%	124%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.10*		*ug/g*		*82.8*	*50-140*			
Surrogate: Terphenyl-d14	*1.43*		*ug/g*		*107*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*6.13*		*ug/g*		*76.7*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.12	0.01	N/A	0.11			8.7	30	
Conductivity	189	5	uS/cm	190			0.5	5	
pH	7.58	0.05	pH Units	7.58			0.0	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	34	8	ug/g dry	40			15.9	30	
F4 PHCs (C34-C50)	11	6	ug/g dry	14			25.3	30	
Metals									
Antimony	2.7	1.0	ug/g dry	ND			NC	30	
Arsenic	4.8	1.0	ug/g dry	5.7			16.8	30	
Barium	127	1.0	ug/g dry	149			16.5	30	
Beryllium	0.7	0.5	ug/g dry	0.7			10.9	30	
Boron, available	ND	0.5	ug/g dry	ND			NC	35	
Boron	10.5	5.0	ug/g dry	11.2			6.7	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	31.9	5.0	ug/g dry	36.7			13.9	30	
Cobalt	9.2	1.0	ug/g dry	11.0			18.2	30	
Copper	30.2	5.0	ug/g dry	35.9			17.5	30	
Lead	52.3	1.0	ug/g dry	43.9			17.4	30	
Mercury	ND	0.1	ug/g dry	ND			NC	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	17.3	5.0	ug/g dry	20.0			14.2	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	39.2	10.0	ug/g dry	46.6			17.2	30	
Zinc	81.6	20.0	ug/g dry	95.7			15.9	30	
Physical Characteristics									
% Solids	92.5	0.1	% by Wt.	91.5			1.0	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			NC	40	
Anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] anthracene	0.023	0.02	ug/g dry	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [g,h,i] perylene	0.024	0.02	ug/g dry	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Chrysene	0.039	0.02	ug/g dry	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Fluoranthene	0.071	0.02	ug/g dry	0.046			NC	40	
Fluorene	ND	0.02	ug/g dry	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
Naphthalene	0.081	0.01	ug/g dry	0.069			15.8	40	
Phenanthrene	0.042	0.02	ug/g dry	0.026			NC	40	
Pyrene	0.060	0.02	ug/g dry	0.038			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.59*		*ug/g dry*		*80.0*	*50-140*			
Surrogate: Terphenyl-d14	*2.19*		*ug/g dry*		*110*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*7.50*		*ug/g dry*		*81.4*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	188	7	ug/g	ND	93.8	80-120			
F2 PHCs (C10-C16)	117	4	ug/g	ND	97.8	60-140			
F3 PHCs (C16-C34)	317	8	ug/g	40	94.8	60-140			
F4 PHCs (C34-C50)	202	6	ug/g	14	102	60-140			
Metals									
Antimony	51.9	1.0	ug/g	ND	103	70-130			
Arsenic	58.8	1.0	ug/g	2.3	113	70-130			
Barium	118	1.0	ug/g	59.7	117	70-130			
Beryllium	54.5	0.5	ug/g	ND	108	70-130			
Boron, available	3.82	0.5	ug/g	ND	76.5	70-122			
Boron	55.0	5.0	ug/g	ND	101	70-130			
Cadmium	54.6	0.5	ug/g	ND	109	70-130			
Chromium (VI)	3.7	0.2	ug/g	ND	50.0	70-130			QM-05
Chromium	70.7	5.0	ug/g	14.7	112	70-130			
Cobalt	59.4	1.0	ug/g	4.4	110	70-130			
Copper	66.7	5.0	ug/g	14.4	105	70-130			
Lead	78.6	1.0	ug/g	17.6	122	70-130			
Mercury	1.50	0.1	ug/g	ND	100	70-130			
Molybdenum	54.6	1.0	ug/g	ND	109	70-130			
Nickel	62.6	5.0	ug/g	8.0	109	70-130			
Selenium	53.5	1.0	ug/g	ND	107	70-130			
Silver	47.9	0.3	ug/g	ND	95.6	70-130			
Thallium	53.5	1.0	ug/g	ND	107	70-130			
Uranium	56.7	1.0	ug/g	ND	113	70-130			
Vanadium	74.2	10.0	ug/g	18.6	111	70-130			
Zinc	89.0	20.0	ug/g	38.3	101	70-130			
Semi-Volatiles									
Acenaphthene	0.214	0.02	ug/g	ND	86.1	50-140			
Acenaphthylene	0.174	0.02	ug/g	ND	69.9	50-140			
Anthracene	0.203	0.02	ug/g	ND	81.6	50-140			
Benzo [a] anthracene	0.194	0.02	ug/g	ND	78.0	50-140			
Benzo [a] pyrene	0.224	0.02	ug/g	ND	90.1	50-140			
Benzo [b] fluoranthene	0.200	0.02	ug/g	ND	80.5	50-140			
Benzo [g,h,i] perylene	0.196	0.02	ug/g	ND	78.7	50-140			
Benzo [k] fluoranthene	0.207	0.02	ug/g	ND	83.2	50-140			
Chrysene	0.243	0.02	ug/g	ND	97.7	50-140			
Dibenzo [a,h] anthracene	0.207	0.02	ug/g	ND	83.3	50-140			
Fluoranthene	0.234	0.02	ug/g	0.046	75.6	50-140			
Fluorene	0.221	0.02	ug/g	ND	89.0	50-140			
Indeno [1,2,3-cd] pyrene	0.201	0.02	ug/g	ND	80.9	50-140			
1-Methylnaphthalene	0.262	0.02	ug/g	ND	106	50-140			
2-Methylnaphthalene	0.285	0.02	ug/g	ND	114	50-140			
Naphthalene	0.332	0.01	ug/g	0.069	105	50-140			
Phenanthrene	0.211	0.02	ug/g	0.026	74.4	50-140			
Pyrene	0.231	0.02	ug/g	0.038	77.5	50-140			
Surrogate: 2-Fluorobiphenyl	*1.71*		*ug/g*		*86.0*	*50-140*			
Surrogate: Terphenyl-d14	*2.08*		*ug/g*		*105*	*50-140*			
Volatiles									

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	4.15	0.02	ug/g	ND	104	60-130			
Ethylbenzene	3.99	0.05	ug/g	ND	99.7	60-130			
Toluene	3.87	0.05	ug/g	ND	96.7	60-130			
m,p-Xylenes	7.72	0.05	ug/g	ND	96.4	60-130			
o-Xylene	3.56	0.05	ug/g	ND	89.0	60-130			
Surrogate: Toluene-d8	*5.09*		*ug/g*		*63.7*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

3 : The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.

QC Qualifiers :

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 2206070

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2206070	№ 134932

Client Name: Malroz Engineering Inc.
Contact Name: Jessie Payeur
Address: 308 Wellington St. Kingston ON
Telephone: 613 305 4468

Project Ref: 1591
Quote #:
PO #:
E-mail: payeur@malroz.com hodgson@malroz.com superville@malroz.com

Page 1 of 1

Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular
Date Required:

☐ REG 153/04 ☑ REG 406/19
☐ Table 1 ☐ Res/Park ☑ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table 2.1
For RSC: ☐ Yes ☑ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	~~VOCs~~ EC + SAR	PAHs	Metals ~~incl. Hg~~ Grill 8, 29, 4, 5, 6	~~Hg~~ pH	~~CrVI~~ PCBs	~~B (HWS)~~ HOLD					
1	BH01-S01	S		2	Jan 31-22		✓	✓	✓	✓								✓
2	BH02-S03	↓		↓	↓		✓	✓	✓	✓								✓
3	BH03-S01	↓		↓	↓		✓	✓	✓	✓								✓
4	BH03-S02	↓		↓	↓		✓	✓	✓	✓								✓
5	BH04-S01	↓		↓	↓		✓	✓	✓	✓								✓
6	BH05-S02	↓		↓	↓		✓	✓	✓	✓	✓							✓
7	BH05-S06	↓		↓	↓								✓					✓
8	BH06-S02	↓		↓	↓		✓	✓	✓	✓								✓
9	BH07-S02	↓		↓	↓		✓	✓	✓	✓								✓
10	BH07-S06	↓		↓	↓								✓					✓

Comments:

Method of Delivery: DROP BOX

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Shreyam Dokmai	Verified By: Kacey Capes
Relinquished By (Print): JESSIE PAYEUR	Date/Time: 01 FEB 22 9:30	Date/Time: Feb 02, 2022 10.10	Date/Time: Feb 01 14:53
Date/Time: Jan 31-22 @ 18:00	Temperature: 12.5 °C	Temperature: 6.6 °C	pH Verified: ☐ By:

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Certificate of Analysis

Malroz Engineering Incorporated

308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Jessie Payeur

Client PO:
Project: 1591
Custody: 134950

Report Date: 8-Feb-2022
Order Date: 2-Feb-2022

Order #: 2206231

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2206231-01	BH04-S02
2206231-04	BH08-S01
2206231-05	BH09-S04
2206231-06	BH09-S05
2206231-07	BH10-S03

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	8-Feb-22	8-Feb-22
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	4-Feb-22	4-Feb-22
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	3-Feb-22	7-Feb-22
Conductivity	MOE E3138 - probe @25 °C, water ext	7-Feb-22	8-Feb-22
Mercury by CVAA	EPA 7471B - CVAA, digestion	8-Feb-22	8-Feb-22
PCBs, total	SW846 8082A - GC-ECD	3-Feb-22	4-Feb-22
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	3-Feb-22	4-Feb-22
PHC F1	CWS Tier 1 - P&T GC-FID	4-Feb-22	4-Feb-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	3-Feb-22	5-Feb-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	7-Feb-22	7-Feb-22
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	3-Feb-22	6-Feb-22
SAR	Calculated	8-Feb-22	8-Feb-22
Solids, %	Gravimetric, calculation	4-Feb-22	5-Feb-22

PARACEL LABORATORIES LTD.

Order #: 2206231

Certificate of Analysis

Report Date: 08-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 2-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH04-S02	BH08-S01	BH09-S04	BH09-S05
	Sample Date:	31-Jan-22 09:00	01-Feb-22 09:00	01-Feb-22 09:00	01-Feb-22 09:00
	Sample ID:	2206231-01	2206231-04	2206231-05	2206231-06
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	87.9	96.0	73.2	73.6
General Inorganics					
SAR	0.01 N/A	0.06	28.2	9.07	6.38
Conductivity	5 uS/cm	440	3780	1050	871
pH	0.05 pH Units	-	-	-	7.68
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	4.2	1.4	4.4	4.6
Barium	1.0 ug/g dry	146	56.6	312	347
Beryllium	0.5 ug/g dry	0.8	<0.5	1.2	1.5
Boron	5.0 ug/g dry	9.3	10.7	9.8	10.0
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	30.4	10.9	49.5	56.6
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	9.1	3.5	15.7	18.5
Copper	5.0 ug/g dry	20.0	6.6	33.5	35.7
Lead	1.0 ug/g dry	18.4	8.9	9.8	12.6
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	18.0	9.6	33.9	38.8
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	38.0	11.1	69.9	75.3
Zinc	20.0 ug/g dry	55.0	<20.0	86.6	98.0
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	114%	105%	125%	126%

PARACEL LABORATORIES LTD.

Order #: 2206231

Certificate of Analysis

Report Date: 08-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 2-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH04-S02	BH08-S01	BH09-S04	BH09-S05
	Sample Date:	31-Jan-22 09:00	01-Feb-22 09:00	01-Feb-22 09:00	01-Feb-22 09:00
	Sample ID:	2206231-01	2206231-04	2206231-05	2206231-06
	MDL/Units	Soil	Soil	Soil	Soil
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	13	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	28	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	30	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	0.02	<0.02	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	0.03	<0.02	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	0.02	<0.02	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Chrysene	0.02 ug/g dry	0.03	<0.02	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	0.04	<0.02	<0.02	<0.02
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	<0.04
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Pyrene	0.02 ug/g dry	0.04	<0.02	<0.02	<0.02
2-Fluorobiphenyl	Surrogate	91.0%	94.0%	64.7%	58.9%
Terphenyl-d14	Surrogate	105%	109%	80.0%	67.4%
PCBs					
PCBs, total	0.05 ug/g dry	-	-	<0.05	-
Decachlorobiphenyl	Surrogate	-	-	131%	-

PARACEL LABORATORIES LTD.

Order #: 2206231

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 08-Feb-2022

Order Date: 2-Feb-2022

Project Description: 1591

	Client ID:	BH10-S03	-	-	-
	Sample Date:	01-Feb-22 09:00	-	-	-
	Sample ID:	2206231-07	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	93.3	-	-	-
General Inorganics					
SAR	0.01 N/A	14.3	-	-	-
Conductivity	5 uS/cm	2590	-	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	4.9	-	-	-
Barium	1.0 ug/g dry	212	-	-	-
Beryllium	0.5 ug/g dry	0.8	-	-	-
Boron	5.0 ug/g dry	13.3	-	-	-
Boron, available	0.5 ug/g dry	<0.5	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	30.3	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	11.4	-	-	-
Copper	5.0 ug/g dry	23.5	-	-	-
Lead	1.0 ug/g dry	82.7	-	-	-
Mercury	0.1 ug/g dry	0.1	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	22.0	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	40.0	-	-	-
Zinc	20.0 ug/g dry	85.5	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	111%	-	-	-
Hydrocarbons					

Certificate of Analysis

Report Date: 08-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 2-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH10-S03	-	-	-
	Sample Date:	01-Feb-22 09:00	-	-	-
	Sample ID:	2206231-07	-	-	-
	MDL/Units	Soil	-	-	-
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	0.03	-	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	-	-	-
Anthracene	0.02 ug/g dry	0.09	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.15	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.17	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.17	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.10	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.09	-	-	-
Chrysene	0.02 ug/g dry	0.19	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.02	-	-	-
Fluoranthene	0.02 ug/g dry	0.40	-	-	-
Fluorene	0.02 ug/g dry	0.04	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.08	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	0.04	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	0.06	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.10	-	-	-
Naphthalene	0.01 ug/g dry	0.06	-	-	-
Phenanthrene	0.02 ug/g dry	0.34	-	-	-
Pyrene	0.02 ug/g dry	0.32	-	-	-
2-Fluorobiphenyl	Surrogate	81.8%	-	-	-
Terphenyl-d14	Surrogate	94.0%	-	-	-
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	-	-	-
Decachlorobiphenyl	Surrogate	123%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
PCBs									
PCBs, total	ND	0.05	ug/g						
Surrogate: Decachlorobiphenyl	*0.119*		*ug/g*		*119*	*60-140*			
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.12*		*ug/g*		*84.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.42*		*ug/g*		*107*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.31*		*ug/g*		*104*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	8.95	0.01	N/A	9.07			1.3	30	
Conductivity	1060	5	uS/cm	1050			1.6	5	
pH	7.54	0.05	pH Units	7.58			0.5	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	4.0	1.0	ug/g dry	4.2			5.0	30	
Barium	137	1.0	ug/g dry	146			6.3	30	
Beryllium	0.8	0.5	ug/g dry	0.8			6.7	30	
Boron, available	ND	0.5	ug/g dry	ND			NC	35	
Boron	9.3	5.0	ug/g dry	9.3			0.1	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	30.0	5.0	ug/g dry	30.4			1.4	30	
Cobalt	8.5	1.0	ug/g dry	9.1			6.7	30	
Copper	19.7	5.0	ug/g dry	20.0			1.7	30	
Lead	16.8	1.0	ug/g dry	18.4			9.0	30	
Mercury	ND	0.1	ug/g dry	ND			NC	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	17.2	5.0	ug/g dry	18.0			4.3	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	35.3	10.0	ug/g dry	38.0			7.3	30	
Zinc	53.2	20.0	ug/g dry	55.0			3.4	30	
PCBs									
PCBs, total	ND	0.05	ug/g dry	ND			NC	40	
Surrogate: Decachlorobiphenyl	*0.183*		*ug/g dry*		*134*	*60-140*			
Physical Characteristics									
% Solids	85.3	0.1	% by Wt.	87.2			2.2	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	0.240	0.02	ug/g dry	0.188			24.3	40	
Anthracene	0.166	0.02	ug/g dry	0.132			23.4	40	
Benzo [a] anthracene	0.324	0.02	ug/g dry	0.264			20.6	40	
Benzo [a] pyrene	0.466	0.02	ug/g dry	0.353			27.5	40	
Benzo [b] fluoranthene	0.279	0.02	ug/g dry	0.247			12.4	40	
Benzo [g,h,i] perylene	0.301	0.02	ug/g dry	0.231			26.3	40	
Benzo [k] fluoranthene	0.168	0.02	ug/g dry	0.123			30.8	40	
Chrysene	0.448	0.02	ug/g dry	0.410			8.8	40	
Dibenzo [a,h] anthracene	0.074	0.02	ug/g dry	0.060			22.0	40	
Fluoranthene	0.521	0.02	ug/g dry	0.423			20.8	40	
Fluorene	0.050	0.02	ug/g dry	0.036			33.4	40	
Indeno [1,2,3-cd] pyrene	0.231	0.02	ug/g dry	0.180			24.7	40	
1-Methylnaphthalene	0.049	0.02	ug/g dry	0.036			30.1	40	
2-Methylnaphthalene	0.031	0.02	ug/g dry	0.023			32.8	40	
Naphthalene	0.020	0.01	ug/g dry	0.016			22.5	40	
Phenanthrene	0.458	0.02	ug/g dry	0.335			30.9	40	
Pyrene	0.778	0.02	ug/g dry	0.616			23.2	40	
Surrogate: 2-Fluorobiphenyl	*1.30*		*ug/g dry*		*82.1*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Terphenyl-d14	*1.61*		*ug/g dry*		*101*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*4.96*		*ug/g dry*		*120*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	227	7	ug/g	ND	114	80-120			
F2 PHCs (C10-C16)	91	4	ug/g	ND	99.1	60-140			
F3 PHCs (C16-C34)	226	8	ug/g	ND	101	60-140			
F4 PHCs (C34-C50)	143	6	ug/g	ND	100	60-140			
Metals									
Antimony	46.8	1.0	ug/g	ND	93.0	70-130			
Arsenic	52.0	1.0	ug/g	1.7	101	70-130			
Barium	113	1.0	ug/g	58.6	108	70-130			
Beryllium	49.2	0.5	ug/g	ND	97.7	70-130			
Boron, available	4.02	0.5	ug/g	ND	80.5	70-122			
Boron	49.0	5.0	ug/g	ND	90.6	70-130			
Cadmium	48.3	0.5	ug/g	ND	96.4	70-130			
Chromium (VI)	0.1	0.2	ug/g	ND	67.5	70-130			QM-05
Chromium	61.3	5.0	ug/g	12.2	98.4	70-130			
Cobalt	51.0	1.0	ug/g	3.6	94.8	70-130			
Copper	54.8	5.0	ug/g	8.0	93.5	70-130			
Lead	54.3	1.0	ug/g	7.4	93.9	70-130			
Mercury	1.58	0.1	ug/g	ND	106	70-130			
Molybdenum	48.9	1.0	ug/g	ND	97.1	70-130			
Nickel	54.5	5.0	ug/g	7.2	94.7	70-130			
Selenium	48.9	1.0	ug/g	ND	97.4	70-130			
Silver	41.9	0.3	ug/g	ND	83.6	70-130			
Thallium	50.1	1.0	ug/g	ND	100	70-130			
Uranium	51.7	1.0	ug/g	ND	103	70-130			
Vanadium	64.3	10.0	ug/g	15.2	98.1	70-130			
Zinc	69.3	20.0	ug/g	22.0	94.6	70-130			
PCBs									
PCBs, total	0.583	0.05	ug/g	ND	107	60-140			
Surrogate: Decachlorobiphenyl	*0.189*		*ug/g*		*139*	*60-140*			
Semi-Volatiles									
Acenaphthene	0.169	0.02	ug/g	ND	85.4	50-140			
Acenaphthylene	0.374	0.02	ug/g	0.188	93.7	50-140			
Anthracene	0.325	0.02	ug/g	0.132	97.7	50-140			
Benzo [a] anthracene	0.502	0.02	ug/g	0.264	120	50-140			
Benzo [a] pyrene	0.646	0.02	ug/g	0.353	147	50-140			QM-06
Benzo [b] fluoranthene	0.558	0.02	ug/g	0.247	157	50-140			QM-06
Benzo [g,h,i] perylene	0.470	0.02	ug/g	0.231	120	50-140			
Benzo [k] fluoranthene	0.455	0.02	ug/g	0.123	167	50-140			QM-06
Chrysene	0.479	0.02	ug/g	0.410	34.6	50-140			QM-06
Dibenzo [a,h] anthracene	0.275	0.02	ug/g	0.060	109	50-140			
Fluoranthene	0.655	0.02	ug/g	0.423	117	50-140			
Fluorene	0.195	0.02	ug/g	0.036	80.4	50-140			
Indeno [1,2,3-cd] pyrene	0.420	0.02	ug/g	0.180	121	50-140			
1-Methylnaphthalene	0.233	0.02	ug/g	0.036	99.2	50-140			
2-Methylnaphthalene	0.219	0.02	ug/g	0.023	98.9	50-140			
Naphthalene	0.203	0.01	ug/g	0.016	94.2	50-140			
Phenanthrene	0.559	0.02	ug/g	0.335	113	50-140			
Pyrene	0.892	0.02	ug/g	0.616	139	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: 2-Fluorobiphenyl	*1.33*		*ug/g*		*83.8*	*50-140*			
Surrogate: Terphenyl-d14	*1.64*		*ug/g*		*103*	*50-140*			
Volatiles									
Benzene	2.64	0.02	ug/g	ND	66.0	60-130			
Ethylbenzene	3.46	0.05	ug/g	ND	86.5	60-130			
Toluene	3.02	0.05	ug/g	ND	75.4	60-130			
m,p-Xylenes	6.76	0.05	ug/g	ND	84.5	60-130			
o-Xylene	2.67	0.05	ug/g	ND	66.6	60-130			
Surrogate: Toluene-d8	*2.91*		*ug/g*		*91.0*	*50-140*			

Qualifier Notes:

QC Qualifiers :

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

QM-06 : Due to noted non-homogeneity of the QC sample matrix, the spike recoveries were out side the accepted range. Batch data accepted based on other QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 2206231

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
BH05-S05 – 2206241 2206231	№ 134950

Page 1 of 1

Client Name:	MalRoz Engineering Inc.
Contact Name:	Jessie Payeur
Address:	308 Wellington St. Kingston ON
Telephone:	
Project Ref:	1591
Quote #:	
PO #:	
E-mail:	payeur@malroz.com hodgson@malroz.com superville@malroz.com hill@malroz.com

Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular

Date Required:

☐ REG 153/04 ☑ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table 2.1
For RSC: ☐ Yes ☑ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	~~VOCs~~ EC+SAR	PAHs	Metals ~~Reg 406/19~~ Full	~~Hg~~ pH	~~CN~~ HOLD	~~B (HWS)~~ redox potential	sulphate	sulphide	resistivity	~~Pesticides~~ PCBs
1	BH04-S02	S		2	Jan 31-22		✓	✓	✓	✓							
2	BH01-S02	↓		↑	↓							✓					
3	~~BH03~~ BH01-S03				↓							✓					
4	BH08-S01				Feb 01-22		✓	✓	✓	✓							
5	BH09-S04				↓		✓	✓	✓	✓							✓
6	BH09-S05						✓	✓	✓	✓	✓						
7	BH10-S03	↓		↓	↓		✓	✓	✓	✓							✓
8	BH05-S05	S		3	Jan 31-22						✓		✓	✓	✓	✓	
9																	
10																	

Comments:

Method of Delivery: DROP BOX

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By: Kacey Cooper
Relinquished By (Print): JESSIE PAYEUR	Date/Time: 02 FEB 22 8:30	Date/Time: Feb 01, 22 10:15	Date/Time: Feb 02 12:51
Date/Time: Feb 01-22 @ 17:25	Temperature: 11.9 °C	Temperature: 6.6 °C	pH Verified: ☐ By:

300 - 2319 St. Laurent Blvd
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www.paracellabs.com

Certificate of Analysis

Malroz Engineering Incorporated

308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Jessie Payeur

Client PO:
Project: 1591
Custody: 134950

Report Date: 9-Feb-2022
Order Date: 2-Feb-2022

Order #: 2206241

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2206241-01	BH05-S05

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Certificate of Analysis

Client: Malroz Engineering Incorporated

Client PO:

Report Date: 09-Feb-2022

Order Date: 2-Feb-2022

Project Description: 1591

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC, water extraction	8-Feb-22	8-Feb-22
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	3-Feb-22	4-Feb-22
Resistivity	EPA 120.1 - probe, water extraction	7-Feb-22	8-Feb-22
Solids, %	Gravimetric, calculation	4-Feb-22	5-Feb-22

PARACEL LABORATORIES LTD.

Order #: 2206241

Certificate of Analysis

Report Date: 09-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 2-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH05-S05	-	-	-
	Sample Date:	31-Jan-22 09:00	-	-	-
	Sample ID:	2206241-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	73.8	-	-	-
General Inorganics					
pH	0.05 pH Units	7.30	-	-	-
Resistivity	0.10 Ohm.m	33.7	-	-	-
Anions					
Sulphate	5 ug/g dry	56	-	-	-

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 09-Feb-2022

Order Date: 2-Feb-2022

Project Description: 1591

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	ND	5	ug/g						
General Inorganics									
Resistivity	ND	0.10	Ohm.m						

Certificate of Analysis

Report Date: 09-Feb-2022

Client: Malroz Engineering Incorporated

Order Date: 2-Feb-2022

Client PO:

Project Description: 1591

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	55.2	5	ug/g dry	56.0			1.6	20	
General Inorganics									
pH	7.54	0.05	pH Units	7.58			0.5	2.3	
Resistivity	9.40	0.10	Ohm.m	9.55			1.6	20	
Physical Characteristics									
% Solids	85.3	0.1	% by Wt.	87.2			2.2	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	156	5	ug/g	56.0	100	80-120			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL LABORATORIES LTD.

Paracel ID: 2206241

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
~~BH05-S05~~ – 2206241 2206231	№ 134950

nt Name: Malroz Engineering Inc.
tact Name: Jessie Payeur
ress: 308 Wellington St. Kingston ON
phone:

Project Ref: 1591
Quote #:
PO #:
E-mail: payeur@malroz.com hodgson@malroz.com superville@malroz.com hill@malroz.com

Page 1 of 1

Turnaround Time
☐ 1 day ☐ 3 day
☐ 2 day ☑ Regular
Date Required:

☐ REG 153/04 ☑ REG 406/19
Table 1 ☐ Res/Park ☐ Med/Fine
Table 2 ☐ Ind/Comm ☐ Coarse
Table 3 ☐ Agri/Other
Table 2.1
For RSC: ☐ Yes ☑ No

Other Regulation
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	~~VOCs~~ EC+SAR	PAHs	Metals ~~by ICP~~ Full Reg 406/19	~~Hg~~ pH	~~CrVI~~ HOLD	~~B(HWS)~~ redox potential	sulphate	sulphide	resistivity ~~for corrosion~~	PCBs	
BH04-S02	S		2	Jan 31-22		✓	✓	✓	✓								
BH01-S02	↓		↑	↓							✓						
~~BH03~~ BH01-S03				↓							✓						
BH08-S01				Feb 01-22		✓	✓	✓	✓								
BH09-S04				↓		✓	✓	✓	✓							✓	
BH09-S05						✓	✓	✓	✓	✓							
BH10-S03	↓		↓	↓		✓	✓	✓	✓							✓	
BH05-S05	S		3	Jan 31-22						✓		✓	✓	✓	✓		

ments:

Method of Delivery: DROP BOX

quished By (Sign):
quished By (Print): JESSIE PAYEUR
/Time: Feb 01-22 @ 17:25

Received By Driver/Depot:
Date/Time: 02 FEB 22 8:30
Temperature: 11.9 °C

Received at Lab:
Date/Time: Feb 03, 22 10:15
Temperature: 6.6 °C

Verified By: Kacey Cooper
Date/Time: Feb 02 12:58
pH Verified: ☐ By:

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Certificate of Analysis

Malroz Engineering Incorporated

308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Jessie Payeur

Client PO:
Project: 1591
Custody: 133937

Report Date: 23-Feb-2022
Order Date: 17-Feb-2022

Order #: 2208334

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2208334-01	BH08-S03
2208334-02	BH06-S01
2208334-03	BH09-S01
2208334-04	BH05-S01
2208334-05	BH05-S03
2208334-06	BH07-S04
2208334-07	BH09-S02
2208334-08	BH10-S02

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Certificate of Analysis

Client: Malroz Engineering Incorporated

Client PO:

Report Date: 23-Feb-2022

Order Date: 17-Feb-2022

Project Description: 1591

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	18-Feb-22	22-Feb-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	23-Feb-22	23-Feb-22
Solids, %	Gravimetric, calculation	18-Feb-22	19-Feb-22

PARACEL LABORATORIES LTD.

Order #: 2208334

Certificate of Analysis

Report Date: 23-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 17-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH08-S03	BH06-S01	BH09-S01	BH05-S01
	Sample Date:	01-Feb-22 09:00	31-Jan-22 09:00	01-Feb-22 09:00	31-Jan-22 09:00
	Sample ID:	2208334-01	2208334-02	2208334-03	2208334-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	81.0	86.9	97.3	83.5
Metals					
Antimony	1.0 ug/g dry	-	-	-	2.8
Arsenic	1.0 ug/g dry	-	-	-	3.9
Barium	1.0 ug/g dry	-	-	-	107
Beryllium	0.5 ug/g dry	-	-	-	0.6
Boron	5.0 ug/g dry	-	-	-	6.2
Cadmium	0.5 ug/g dry	-	-	-	<0.5
Chromium	5.0 ug/g dry	-	-	-	21.3
Cobalt	1.0 ug/g dry	-	-	-	7.7
Copper	5.0 ug/g dry	-	-	-	37.2
Lead	1.0 ug/g dry	-	-	-	70.4
Molybdenum	1.0 ug/g dry	-	-	-	<1.0
Nickel	5.0 ug/g dry	-	-	-	14.6
Selenium	1.0 ug/g dry	-	-	-	<1.0
Silver	0.3 ug/g dry	-	-	-	<0.3
Thallium	1.0 ug/g dry	-	-	-	<1.0
Uranium	1.0 ug/g dry	-	-	-	<1.0
Vanadium	10.0 ug/g dry	-	-	-	32.4
Zinc	20.0 ug/g dry	-	-	-	88.2
Hydrocarbons					
F2 PHCs (C10-C16)	4 ug/g dry	<4 [1]	<4 [1]	5 [1]	-
F3 PHCs (C16-C34)	8 ug/g dry	<8 [1]	33 [1]	16 [1]	-
F4 PHCs (C34-C50)	6 ug/g dry	<6 [1]	22 [1]	25 [1]	-

PARACEL LABORATORIES LTD.

Order #: 2208334

Certificate of Analysis

Report Date: 23-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 17-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH05-S03	BH07-S04	BH09-S02	BH10-S02
	Sample Date:	31-Jan-22 09:00	31-Jan-22 09:00	01-Feb-22 09:00	01-Feb-22 09:00
	Sample ID:	2208334-05	2208334-06	2208334-07	2208334-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	77.9	73.4	89.8	96.0
Metals					
Antimony	1.0 ug/g dry	1.2	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.8	4.6	3.8	3.9
Barium	1.0 ug/g dry	168	455	149	124
Beryllium	0.5 ug/g dry	0.7	1.6	0.8	<0.5
Boron	5.0 ug/g dry	12.1	11.2	15.5	21.3
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	27.4	77.6	32.6	17.1
Cobalt	1.0 ug/g dry	8.9	23.5	10.3	7.1
Copper	5.0 ug/g dry	12.5	42.9	38.8	25.9
Lead	1.0 ug/g dry	19.2	16.5	23.4	165
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	18.0	47.5	21.0	13.8
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	29.7	98.4	38.1	19.3
Zinc	20.0 ug/g dry	60.6	123	70.5	51.7

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	2.7	1.0	ug/g dry	2.8			3.8	30	
Arsenic	4.7	1.0	ug/g dry	3.9			19.3	30	
Barium	141	1.0	ug/g dry	107			27.8	30	
Beryllium	0.8	0.5	ug/g dry	0.6			NC	30	
Boron	7.5	5.0	ug/g dry	6.2			18.8	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium	27.9	5.0	ug/g dry	21.3			26.9	30	
Cobalt	9.9	1.0	ug/g dry	7.7			25.5	30	
Copper	45.1	5.0	ug/g dry	37.2			19.1	30	
Lead	85.8	1.0	ug/g dry	70.4			19.8	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	19.0	5.0	ug/g dry	14.6			26.3	30	
Selenium	1.0	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	43.1	10.0	ug/g dry	32.4			28.3	30	
Zinc	118	20.0	ug/g dry	88.2			28.6	30	
Physical Characteristics									
% Solids	81.8	0.1	% by Wt.	81.0			0.9	25	

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 23-Feb-2022

Order Date: 17-Feb-2022

Project Description: 1591

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	96	4	ug/g	ND	97.5	60-140			
F3 PHCs (C16-C34)	286	8	ug/g	ND	118	60-140			
F4 PHCs (C34-C50)	196	6	ug/g	ND	128	60-140			
Metals									
Antimony	48.7	1.0	ug/g	1.1	95.1	70-130			
Arsenic	53.5	1.0	ug/g	1.6	104	70-130			
Barium	107	1.0	ug/g	42.6	128	70-130			
Beryllium	50.2	0.5	ug/g	ND	100	70-130			
Boron	47.8	5.0	ug/g	ND	90.6	70-130			
Cadmium	51.6	0.5	ug/g	ND	103	70-130			
Chromium	63.4	5.0	ug/g	8.5	110	70-130			
Cobalt	55.1	1.0	ug/g	3.1	104	70-130			
Copper	68.2	5.0	ug/g	14.9	107	70-130			
Lead	81.2	1.0	ug/g	28.2	106	70-130			
Molybdenum	51.2	1.0	ug/g	ND	102	70-130			
Nickel	58.2	5.0	ug/g	5.8	105	70-130			
Selenium	49.1	1.0	ug/g	ND	97.5	70-130			
Silver	45.2	0.3	ug/g	ND	90.3	70-130			
Thallium	50.3	1.0	ug/g	ND	100	70-130			
Uranium	50.5	1.0	ug/g	ND	101	70-130			
Vanadium	69.1	10.0	ug/g	12.9	112	70-130			
Zinc	94.6	20.0	ug/g	35.3	119	70-130			

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time - PHCs F2-F4

Applies to samples: BH08-S03, BH06-S01, BH09-S01

Sample Qualifiers :

1 : Holding time had been exceeded upon receipt of the sample at the laboratory or prior to the analysis being requested.

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 2208334

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2208334 TCLP-2208338	№ 133937

Client Name: Malroz Engineering Inc.	Project Ref: 1591	Page 1 of 1
Contact Name: Jessie Payeur	Quote #:	Turnaround Time
Address: 308 Wellington St. Kingston ON	PO #:	☐ 1 day ☐ 3 day
	E-mail: payeur@malroz.com hodgson@malroz.com superville@malroz.com	☐ 2 day ☑ Regular
Telephone: 613 305 4468		Date Required:

☐ REG 153/04 ☑ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☑ Table 2.1
For RSC: ☐ Yes ☑ No

Other Regulation: ☑ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F2-F4 ~~F1-F4, BTEX~~	~~VOCs~~	~~PAHs~~	Metals by ICP	~~Hg~~	~~CrVI~~	~~B(HWS)~~	TCLP Full Metals O.Reg 558				
1	BH08-S03	S		2	Feb 1-22		✓											
2	BH06-S01	↓		↓	Jan 31-22		✓											
3	BH09-S01	↓		↓	Feb 1-22		✓											
4	BH05-S01	↓		↓	Jan 31-22					✓								
5	BH05-S03	↓		↓	Jan 31-22					✓								
6	BH07-S04	↓		↓	Jan 31-22					✓								
7	BH09-S02	↓		↓	Feb 1-22					✓								
8	BH10-S02	↓		↓	Feb 1-22					✓								
9	BH05-S02	↓		1	Jan 31-22									✓				
10																		

Comments:

Method of Delivery: PROPBOX

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Jonesparm Dokmai	Verified By: Kacey Cooper
Relinquished By (Print): JESSIE PAYEUR	Date/Time: 17 Feb 22 9:30	Date/Time: Feb 18, 2022 11:50	Date/Time: Feb 17 14:26
Date/Time: Feb 17-22 @ 9:27	Temperature: 16.1 °C	Temperature: 9.8 °C	pH Verified: ☐ By:

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1-800-749-1947
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Certificate of Analysis

Malroz Engineering Incorporated

308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Jessie Payeur

Client PO:
Project: 1591
Custody: 134932, 133937

Report Date: 24-Feb-2022
Order Date: 1-Feb-2022

Order #: 2208338

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2208338-01	BH05-S02

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Certificate of Analysis

Client: Malroz Engineering Incorporated

Client PO:

Report Date: 24-Feb-2022

Order Date: 1-Feb-2022

Project Description: 1591

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-MS	TCLP EPA 6020 - Digestion - ICP-MS	23-Feb-22	23-Feb-22
REG 558 - Mercury by CVAA	TCLP EPA 7470A, CVAA	23-Feb-22	24-Feb-22
Solids, %	Gravimetric, calculation	22-Feb-22	23-Feb-22

PARACEL LABORATORIES LTD.

Order #: 2208338

Certificate of Analysis

Report Date: 24-Feb-2022

Client: **Malroz Engineering Incorporated**

Order Date: 1-Feb-2022

Client PO:

Project Description: 1591

	Client ID:	BH05-S02	-	-	-
	Sample Date:	31-Jan-22 09:00	-	-	-
	Sample ID:	2208338-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	93.0	-	-	-
EPA 1311 - TCLP Leachate Metals					
Arsenic	0.05 mg/L	<0.05	-	-	-
Barium	0.05 mg/L	0.71	-	-	-
Boron	0.05 mg/L	0.06	-	-	-
Cadmium	0.01 mg/L	<0.01	-	-	-
Chromium	0.05 mg/L	<0.05	-	-	-
Lead	0.05 mg/L	<0.05	-	-	-
Mercury	0.005 mg/L	<0.005	-	-	-
Selenium	0.05 mg/L	<0.05	-	-	-
Silver	0.05 mg/L	<0.05	-	-	-
Uranium	0.05 mg/L	<0.05	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Metals									
Arsenic	ND	0.05	mg/L						
Barium	ND	0.05	mg/L						
Boron	ND	0.05	mg/L						
Cadmium	ND	0.01	mg/L						
Chromium	ND	0.05	mg/L						
Lead	ND	0.05	mg/L						
Mercury	ND	0.005	mg/L						
Selenium	ND	0.05	mg/L						
Silver	ND	0.05	mg/L						
Uranium	ND	0.05	mg/L						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Metals									
Arsenic	ND	0.05	mg/L	ND			NC	29	
Barium	0.756	0.05	mg/L	0.714			5.7	34	
Boron	0.065	0.05	mg/L	0.061			6.8	33	
Cadmium	ND	0.01	mg/L	ND			NC	33	
Chromium	ND	0.05	mg/L	ND			NC	32	
Lead	ND	0.05	mg/L	ND			NC	32	
Mercury	ND	0.005	mg/L	ND			NC	30	
Selenium	ND	0.05	mg/L	ND			NC	28	
Silver	ND	0.05	mg/L	ND			NC	28	
Uranium	ND	0.05	mg/L	ND			NC	27	
Physical Characteristics									
% Solids	76.2	0.1	% by Wt.	81.3			6.6	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Metals									
Arsenic	50.7	0.05	mg/L	0.100	101	83-119			
Barium	141	0.05	mg/L	71.4	139	80-120			QS-02
Boron	47.7	0.05	mg/L	6.07	83.3	71-128			
Cadmium	48.6	0.01	mg/L	0.066	97.1	78-119			
Chromium	55.7	0.05	mg/L	0.106	111	80-124			
Lead	45.6	0.05	mg/L	0.056	91.2	77-126			
Mercury	0.0312	0.005	mg/L	ND	104	70-130			
Selenium	43.3	0.05	mg/L	0.144	86.3	75-125			
Silver	50.1	0.05	mg/L	0.059	100	70-128			
Uranium	47.6	0.05	mg/L	0.077	95.0	70-131			

Qualifier Notes:

QC Qualifiers :

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL LABORATORIES LTD.

Paracel ID: 2208338

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2208334 TCLP - 2208338	№ 133937

Client Name: Malroz Engineering Inc.	Project Ref: 1591	Page 1 of 1
Contact Name: Jessie Payeur	Quote #:	Turnaround Time
Address: 308 Wellington St. Kingston ON	PO #:	☐ 1 day ☐ 3 day
	E-mail: payeur@malroz.com hodgson@malroz.com superville@malroz.com	☐ 2 day ☑ Regular
Telephone: 613 305 4468		Date Required:

☐ REG 153/04 ☑ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine

☐ Table 2 ☐ Ind/Comm ☐ Coarse

☐ Table 3 ☐ Agri/Other

☑ Table 2.1

For RSC: ☐ Yes ☑ No

Other Regulation: ☑ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm

Mun:

☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F2-F4 ~~F1-F4, BTEX~~	~~VOCs~~	~~PAHs~~	Metals by ICP	~~Hg~~	~~GrAl~~	~~B(HWS)~~	TCLP full metals O.REG 558				
1	BH08-S03	S		2	Feb 1-22		✓											
2	BH06-S01				Jan 31-22		✓											
3	BH09-S01				Feb 1-22		✓											
4	BH05-S01				Jan 31-22					✓								
5	BH05-S03				Jan 31-22					✓								
6	BH07-S04				Jan 31-22					✓								
7	BH09-S02				Feb 1-22					✓								
8	BH10-S02			✓	Feb 1-22					✓								
9	BH05-S02	✓		1	Jan 31-22									✓				
10																		

Comments:

Method of Delivery: DROPBOX

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Juneyoung Dohmai	Verified By: Kacey Cupp
Relinquished By (Print): JESSIE PAYEUR	Date/Time: 17 Feb 22 9.30	Date/Time: Feb 18, 2022 11.50	Date/Time: Feb 17 14:33
Date/Time: Feb 17-22 @ 9:27	Temperature: 16.1 °C	Temperature: 9.8 °C	pH Verified: ☐ By:

Revision 4.0

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Malroz Engineering Incorporated

308 Wellington Street 2nd Floor
Kingston, ON K7K 7A8
Attn: Tristan Brundridge

Client PO:
Project: 1591
Custody: 135847

Report Date: 13-Apr-2022
Order Date: 1-Apr-2022

Order #: 2214529

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2214529-01	BH14-SS1
2214529-02	BH14-SS2
2214529-03	BH15-SS1
2214529-04	BH16-SS1
2214529-05	BH16-SS2
2214529-06	BH17-SS1

Approved By:

Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	8-Apr-22	8-Apr-22
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Apr-22	9-Apr-22
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	7-Apr-22	8-Apr-22
Conductivity	MOE E3138 - probe @25 °C, water ext	8-Apr-22	8-Apr-22
Mercury by CVAA	EPA 7471B - CVAA, digestion	8-Apr-22	8-Apr-22
PHC F1	CWS Tier 1 - P&T GC-FID	8-Apr-22	9-Apr-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	6-Apr-22	9-Apr-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	8-Apr-22	8-Apr-22
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	7-Apr-22	12-Apr-22
SAR	Calculated	8-Apr-22	8-Apr-22
Solids, %	Gravimetric, calculation	7-Apr-22	7-Apr-22

PARACEL LABORATORIES LTD.

Order #: 2214529

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 13-Apr-2022

Order Date: 1-Apr-2022

Project Description: 1591

	Client ID:	BH14-SS1	BH14-SS2	BH15-SS1	BH16-SS1
	Sample Date:	01-Apr-22 09:00	01-Apr-22 09:00	01-Apr-22 09:00	01-Apr-22 09:00
	Sample ID:	2214529-01	2214529-02	2214529-03	2214529-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	83.1	95.5	82.0	82.7
General Inorganics					
SAR	0.01 N/A	0.14	-	0.14	0.08
Conductivity	5 uS/cm	217	-	174	150
Metals					
Antimony	1.0 ug/g dry	3.0	-	1.1	<1.0
Arsenic	1.0 ug/g dry	5.8	-	5.2	5.3
Barium	1.0 ug/g dry	189	-	301	242
Beryllium	0.5 ug/g dry	0.9	-	1.1	1.0
Boron	5.0 ug/g dry	14.7	-	13.8	9.4
Boron, available	0.5 ug/g dry	<0.5	-	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	<0.5
Chromium	5.0 ug/g dry	38.2	-	53.1	41.4
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.6	-	16.8	13.9
Copper	5.0 ug/g dry	30.1	-	33.0	29.9
Lead	1.0 ug/g dry	50.0	-	26.9	24.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Nickel	5.0 ug/g dry	23.7	-	34.4	27.7
Selenium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	-	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Vanadium	10.0 ug/g dry	44.8	-	64.9	56.3
Zinc	20.0 ug/g dry	105	-	100	88.4
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	-	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene-d8	Surrogate	62.1%	-	63.0%	59.4%
Hydrocarbons					

Certificate of Analysis

Report Date: 13-Apr-2022

Client: **Malroz Engineering Incorporated**

Order Date: 1-Apr-2022

Client PO:

Project Description: 1591

	Client ID:	BH14-SS1	BH14-SS2	BH15-SS1	BH16-SS1
	Sample Date:	01-Apr-22 09:00	01-Apr-22 09:00	01-Apr-22 09:00	01-Apr-22 09:00
	Sample ID:	2214529-01	2214529-02	2214529-03	2214529-04
	MDL/Units	Soil	Soil	Soil	Soil
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	<0.02	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	-	<0.02	0.03	<0.02
Anthracene	0.02 ug/g dry	-	<0.02	0.06	<0.02
Benzo [a] anthracene	0.02 ug/g dry	-	0.02	0.11	<0.02
Benzo [a] pyrene	0.02 ug/g dry	-	0.03	0.16	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	-	0.03	0.13	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	-	0.03	0.11	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	-	0.02	0.07	<0.02
Chrysene	0.02 ug/g dry	-	0.03	0.14	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	<0.02	0.02	<0.02
Fluoranthene	0.02 ug/g dry	-	0.04	0.29	0.02
Fluorene	0.02 ug/g dry	-	<0.02	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	0.02	0.08	<0.02
1-Methylnaphthalene	0.02 ug/g dry	-	<0.02	0.04	<0.02
2-Methylnaphthalene	0.02 ug/g dry	-	<0.02	0.06	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	-	<0.04	0.10	<0.04
Naphthalene	0.01 ug/g dry	-	<0.01	0.05	<0.01
Phenanthrene	0.02 ug/g dry	-	0.03	0.24	<0.02
Pyrene	0.02 ug/g dry	-	0.04	0.25	0.02
2-Fluorobiphenyl	Surrogate	-	117%	78.1%	62.6%
Terphenyl-d14	Surrogate	-	109%	102%	74.0%

PARACEL LABORATORIES LTD.

Order #: 2214529

Certificate of Analysis

Client: **Malroz Engineering Incorporated**

Client PO:

Report Date: 13-Apr-2022

Order Date: 1-Apr-2022

Project Description: 1591

	Client ID:	BH16-SS2	BH17-SS1	-	-
	Sample Date:	01-Apr-22 09:00	01-Apr-22 09:00	-	-
	Sample ID:	2214529-05	2214529-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	88.8	82.8	-	-
General Inorganics					
SAR	0.01 N/A	-	0.10	-	-
Conductivity	5 uS/cm	-	138	-	-
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	4.0	-	-
Barium	1.0 ug/g dry	-	268	-	-
Beryllium	0.5 ug/g dry	-	1.0	-	-
Boron	5.0 ug/g dry	-	10.4	-	-
Boron, available	0.5 ug/g dry	-	<0.5	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5.0 ug/g dry	-	45.9	-	-
Chromium (VI)	0.2 ug/g dry	-	<0.2	-	-
Cobalt	1.0 ug/g dry	-	14.5	-	-
Copper	5.0 ug/g dry	-	28.9	-	-
Lead	1.0 ug/g dry	-	15.2	-	-
Mercury	0.1 ug/g dry	<0.1	0.2	-	-
Molybdenum	1.0 ug/g dry	-	<1.0	-	-
Nickel	5.0 ug/g dry	-	30.6	-	-
Selenium	1.0 ug/g dry	-	<1.0	-	-
Silver	0.3 ug/g dry	-	<0.3	-	-
Thallium	1.0 ug/g dry	-	<1.0	-	-
Uranium	1.0 ug/g dry	-	<1.0	-	-
Vanadium	10.0 ug/g dry	-	59.8	-	-
Zinc	20.0 ug/g dry	-	88.4	-	-
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	62.7%	-	-
Hydrocarbons					

Certificate of Analysis

Report Date: 13-Apr-2022

Client: **Malroz Engineering Incorporated**

Order Date: 1-Apr-2022

Client PO:

Project Description: 1591

	Client ID:	BH16-SS2	BH17-SS1	-	-
	Sample Date:	01-Apr-22 09:00	01-Apr-22 09:00	-	-
	Sample ID:	2214529-05	2214529-06	-	-
	MDL/Units	Soil	Soil	-	-
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	-	<0.02	-	-
Anthracene	0.02 ug/g dry	-	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	-	0.07	-	-
Benzo [a] pyrene	0.02 ug/g dry	-	0.07	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	0.07	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	0.05	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	0.04	-	-
Chrysene	0.02 ug/g dry	-	0.08	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	<0.02	-	-
Fluoranthene	0.02 ug/g dry	-	0.17	-	-
Fluorene	0.02 ug/g dry	-	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	0.04	-	-
1-Methylnaphthalene	0.02 ug/g dry	-	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	-	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	<0.04	-	-
Naphthalene	0.01 ug/g dry	-	<0.01	-	-
Phenanthrene	0.02 ug/g dry	-	<0.02	-	-
Pyrene	0.02 ug/g dry	-	0.15	-	-
2-Fluorobiphenyl	Surrogate	-	106%	-	-
Terphenyl-d14	Surrogate	-	97.8%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.01*		*ug/g*		*75.4*	*50-140*			
Surrogate: Terphenyl-d14	*1.18*		*ug/g*		*88.7*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*2.58*		*ug/g*		*80.6*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.32	0.01	N/A	0.31			3.2	30	
Conductivity	156	5	uS/cm	150			3.3	5	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g	ND			NC	30	
Metals									
Antimony	2.2	1.0	ug/g	ND			NC	30	
Arsenic	3.6	1.0	ug/g	3.4			5.9	30	
Barium	279	1.0	ug/g	266			4.7	30	
Beryllium	0.9	0.5	ug/g	0.9			0.4	30	
Boron, available	ND	0.5	ug/g	ND			NC	35	
Boron	7.2	5.0	ug/g	6.3			12.4	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	136	5.0	ug/g	125			8.6	30	
Cobalt	24.1	1.0	ug/g	22.3			8.0	30	
Copper	51.9	5.0	ug/g	47.4			9.1	30	
Lead	8.0	1.0	ug/g	7.5			6.1	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	ND	1.0	ug/g	ND			NC	30	
Nickel	74.2	5.0	ug/g	67.6			9.2	30	
Selenium	ND	1.0	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1.0	ug/g	ND			NC	30	
Uranium	ND	1.0	ug/g	ND			NC	30	
Vanadium	102	10.0	ug/g	93.5			8.7	30	
Zinc	119	20.0	ug/g	110			7.8	30	
Physical Characteristics									
% Solids	91.8	0.1	% by Wt.	87.9			4.4	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g	ND			NC	40	
Anthracene	ND	0.02	ug/g	ND			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g	ND			NC	40	
Chrysene	ND	0.02	ug/g	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g	ND			NC	40	
Fluoranthene	ND	0.02	ug/g	ND			NC	40	
Fluorene	ND	0.02	ug/g	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g	ND			NC	40	
Naphthalene	ND	0.01	ug/g	ND			NC	40	
Phenanthrene	ND	0.02	ug/g	ND			NC	40	
Pyrene	ND	0.02	ug/g	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.38*		*ug/g*		*92.8*	*50-140*			
Surrogate: Terphenyl-d14	*1.49*		*ug/g*		*99.8*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g	ND			NC	50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	ND	0.05	ug/g	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g	ND			NC	50	
o-Xylene	ND	0.05	ug/g	ND			NC	50	
Surrogate: Toluene-d8	*3.03*		*ug/g*		*67.9*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	172	7	ug/g	ND	86.2	80-120			
F2 PHCs (C10-C16)	81	4	ug/g	ND	83.7	60-140			
F3 PHCs (C16-C34)	247	8	ug/g	ND	105	60-140			
F4 PHCs (C34-C50)	178	6	ug/g	ND	119	60-140			
Metals									
Antimony	36.2	1.0	ug/g	ND	72.5	70-130			
Arsenic	48.2	1.0	ug/g	1.4	93.6	70-130			
Barium	148	1.0	ug/g	106	82.5	70-130			
Beryllium	45.9	0.5	ug/g	ND	91.1	70-130			
Boron, available	4.01	0.5	ug/g	ND	80.1	70-122			
Boron	45.2	5.0	ug/g	ND	85.4	70-130			
Cadmium	44.6	0.5	ug/g	ND	89.2	70-130			
Chromium (VI)	0.2	0.2	ug/g	ND	92.5	70-130			
Chromium	98.0	5.0	ug/g	50.0	96.0	70-130			
Cobalt	54.6	1.0	ug/g	8.9	91.4	70-130			
Copper	64.0	5.0	ug/g	19.0	90.0	70-130			
Lead	45.2	1.0	ug/g	3.0	84.4	70-130			
Mercury	1.56	0.1	ug/g	ND	104	70-130			
Molybdenum	47.1	1.0	ug/g	ND	93.6	70-130			
Nickel	72.6	5.0	ug/g	27.1	91.0	70-130			
Selenium	43.7	1.0	ug/g	ND	87.3	70-130			
Silver	39.8	0.3	ug/g	ND	79.6	70-130			
Thallium	45.3	1.0	ug/g	ND	90.2	70-130			
Uranium	45.2	1.0	ug/g	ND	89.8	70-130			
Vanadium	85.1	10.0	ug/g	37.4	95.4	70-130			
Zinc	86.8	20.0	ug/g	44.0	85.5	70-130			
Semi-Volatiles									
Acenaphthene	0.133	0.02	ug/g	ND	71.6	50-140			
Acenaphthylene	0.103	0.02	ug/g	ND	55.3	50-140			
Anthracene	0.130	0.02	ug/g	ND	69.9	50-140			
Benzo [a] anthracene	0.113	0.02	ug/g	ND	60.6	50-140			
Benzo [a] pyrene	0.159	0.02	ug/g	ND	85.3	50-140			
Benzo [b] fluoranthene	0.118	0.02	ug/g	ND	63.4	50-140			
Benzo [g,h,i] perylene	0.139	0.02	ug/g	ND	74.7	50-140			
Benzo [k] fluoranthene	0.127	0.02	ug/g	ND	68.5	50-140			
Chrysene	0.124	0.02	ug/g	ND	66.5	50-140			
Dibenzo [a,h] anthracene	0.137	0.02	ug/g	ND	73.6	50-140			
Fluoranthene	0.125	0.02	ug/g	ND	66.9	50-140			
Fluorene	0.112	0.02	ug/g	ND	60.1	50-140			
Indeno [1,2,3-cd] pyrene	0.126	0.02	ug/g	ND	67.9	50-140			
1-Methylnaphthalene	0.149	0.02	ug/g	ND	79.9	50-140			
2-Methylnaphthalene	0.158	0.02	ug/g	ND	84.9	50-140			
Naphthalene	0.161	0.01	ug/g	ND	86.3	50-140			
Phenanthrene	0.132	0.02	ug/g	ND	71.1	50-140			
Pyrene	0.136	0.02	ug/g	ND	73.0	50-140			
Surrogate: 2-Fluorobiphenyl	*1.02*		*ug/g*		*68.2*	*50-140*			
Surrogate: Terphenyl-d14	*1.27*		*ug/g*		*85.6*	*50-140*			
Volatiles									

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	4.76	0.02	ug/g	ND	119	60-130			
Ethylbenzene	2.51	0.05	ug/g	ND	62.8	60-130			
Toluene	2.93	0.05	ug/g	ND	73.3	60-130			
m,p-Xylenes	6.91	0.05	ug/g	ND	86.4	60-130			
o-Xylene	2.74	0.05	ug/g	ND	68.6	60-130			
Surrogate: Toluene-d8	*2.11*		*ug/g*		*65.8*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 2214529

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2214529	№ 135847

Client Name: Malroz	Project Ref: 1591	Page 1 of 1
Contact Name: Tristan Brandridge	Quote #: 22-327	Turnaround Time
Address: 308 Wellington St. Kingston ON	PO #:	☐ 1 day ☐ 3 day
	E-mail: brandr.tyler@malroz.com, hodgsin@malroz.com, brown@malroz.com	☐ 2 day ☒ Regular
Telephone: 613 401 661		Date Required:

☐ REG 153/04 ☒ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☒ Table 2.1 RPI
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Full Metals ~~by ICP~~	Hg	CrVI	B (HWS)	EC	SAR	Mercury		
1	BH14-SS1	S		2	Apr 1/22		X		+	X				X	X			
2	BH14-SS2	↓		↓												X		
3	BH15-SS1						X		X	X				X	X			
4	BH16-SS1						X		X	X				X	X			
5	BH16-SS2															X		
6	BH17-SS1						X		X	X				X	X			
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: WALK IN

Relinquished By (Sign): [signature]	Received By Driver/Depot: [signature]	Received at Lab: Jungeun Bhmai	Verified By: [signature]
Relinquished By (Print): Tristan Brandridge	Date/Time: 01 APR 22 16:11	Date/Time: APR 05, 2022 10:47	Date/Time: Apr 5 2022 1147
Date/Time: Apr 1/22 4:05	Temperature: 16.3 °C	Temperature: 9.6 °C	pH Verified: ☐ By:

Appendix J
Sample Tracking Documents

<Insert your company logo here>

Hauling Record

P.O/Job/Ticket # _____

GENERATOR (PROJECT AREA)			
Contact Name:		***Tel:***	
		Email:	
Generating Company	***Address***	***City, Province***	***Postal Code***

GENERATING SITE (PROJECT AREA)			
Address		***City, Province***	***Postal Code***
Pick-up Location:			
Date Loaded:	***Time Loaded:***	Lat.:	
		Long.:	

Soil Information			
Profile/ID #:	***Materials Type***	☐ Compost ☐ Clean fill ☐ Other: ☐ Contaminated soil ☐ IC&I _____	
Quantity Loaded	Yards: Tons: Meters: Tonnes:	***Material Description:***	
Contact Name: *(For soil quality info)*	***Tel:***	***Email:***	
I hereby certify that the above material has been properly described, classified and packaged, and is in proper condition for transportation to applicable regulation.			
Authorized Signature:			

TRANSPORTER			
Transport Company	***Address***	***City, Province***	***Postal Code***
Driver Name:		***Tel:***	
License Plate #:		***Email:***	
Driver Signature:			

RECEIVER			
Receiving Company	***Address***	***City, Province***	***Postal Code***
Date Unloaded:	***Time Unloaded:***	Lat.:	
		Long.:	
I hereby certify that the above listed material has been accepted and that the materials are representative of the materials outlined in the above.			
Authorizer Name:		***Tel:***	
Signature:		***Email:***	

Highlighted sections denote required information under Ontario Regulation 406/19: On-Site and Excess Soil Management
Template produced by the Ontario Environment Industry Association, 2020

Appendix C

Owner supplied laboratory equipment

KONECRANES CANADA INC.
5300 Mainway
Burlington, ON L7L 6A4
TEL: (905)-332-5409
FAX: (905)-332-8928

KONECRANES®
Lifting Businesses™

Handled by / Version	Offer date	Revision date	Offer number
Paul Vandermeulen	12/13/2019	03/29/2021	T26682-0907

Customer	Customer's ref / Inquiry date	
Queen's University 58 University Ave Kingston, Ontario K7L 3N6 Canada	Reference Inquiry date	10 tonne Crane & Runway 12/10/2019
	Subject	Overhead Travelling Cranes
Contact person	Customer's Tel.	Customer's Fax.
Graeme Boyd	(613) 533-2123	

Dear Sirs,

Konecranes Canada Inc. thanks you for your valued inquiry and takes pleasure in submitting our formal proposal for the Overhead Travelling Cranes.

The CXT– wire rope hoists are Konecranes latest innovation. The revolutionary compact design of the CXT wire rope hoist is designed to offer more efficient use of floor space under the crane and increased lifting heights as well as accurate load positioning by minimised horizontal hook drift. The CXT wire rope hoist is designed to improve safety by using 4 step rotating limit switch for standard applications. The lifetime of the rope is increased and adjustment free hoisting brake is measured to last over 1 million operations.

Konecranes is one of the leading companies in the crane business. Worldwide sales and maintenance organizations as well as extensive production resources provide professional customer service and the most advanced crane techniques. Over the past decades we have delivered material handling solutions to virtually any application to all industries. This experience combined with wide range of components enable us to produce optimized customer-engineered solutions with computer aided component selection and design.

Konecranes design, material and final products are CSA certified and inspected by most worldwide standards. All the strategic components of our crane such as motors, gears and drums are specially designed for crane applications and produced in Konecranes owned component factories providing the highest quality, compatibility and availability.

We trust that this offer meets with your present requirement, however, should you require further information, please do not hesitate to contact the undersigned, we will be pleased to be of further assistance.

Yours truly,
KONECRANES CANADA INC.

_____
Paul Vandermeulen
Sales Representative

1 TECHNICAL SPECIFICATION

2.1 Item 1 ● 10t CXTS Single girder crane with 15.000 m span

2.1.1 References

Client's / Seller's reference: ..... 10 Tonne Crane and Runway / 21-2340
Description: ..... 10 Tonne CXTS

2.1.2 Technical data of the crane

Quantity..... 1
Type ..... CXTS Single girder crane / Profile girder
Capacity crane ..... 10 000 kg
Span ..... 15.000 m
Duty group steel structure ..... CMAA C
Crane weight with hoist..... 5 190 kg
Structure finishing ..... ENA 127 µm, RAL1028
Static wheel load..... 60.2 kN
Runway rail type ..... 2"x2"
Crane voltage..... 3Ph / 575 V / 60 Hz, 115 V Control
Starting / Nominal current ..... 70.9 A / 22.9 A
Ambient temperature ..... 5 - 40 °C

Hoist 1

- Wire rope hoist type ..... 1 x CXT50410100P5
- Max. capacity hoist 1..... 10 000 kg
- Duty group hoist ..... ISO M5
- Lifting height ..... 8.0 m [Max. 8.92 m]
- Trolley type ..... Low headroom
- Reeving type ..... True lift

Speeds

- Hoist 1: Hoisting speed	6/1 m/min	2 - speed
- Hoist 1: Trolley traversing speed.....	20 m/min	Stepless VFD
- Bridge travelling speed.....	32 m/min	Stepless VFD

Motors

- Hoist 1: Hoist motor power	11/1.6 kW	60% ED
- Hoist 1: Trolley motor power.....	2 x 0.43 kW	40% ED
- Bridge travelling motor power	2 x 0.46 kW	40% ED

Crane is controlled with Radio remote control and Pendant control

Standard features (Included in supply)

- CSA approved products
- Overload protection device
- Carburized & ground gearing (AGMA 11)
- 40:1 rope to drum ratio
- Ergonomic hook design c/w safety latch
- Thermal protection on hoisting motor
- Mainline contactor
- CSA fabrication and assembly facilities
- Rope guides to prevent wire rope overlap
- Squirrel cage motors with DC disk brakes
- 4 step geared upper limit switch
- Lifetime adjustment on hoist brake
- Under voltage and over current protection

Special features (Included in supply)

-DynA60 stepless speed control for trolley traversing motion
- DynA60 stepless speed control for bridge traveling motion
- Radio remote control
- 2-step limit switch, bridge traveling (slow+stop)
- Bridge travelling motor thermal protection
- Storage for radio control transmitter
- Horn type (operator controlled)
- Hook operated control limit switch
- Travelling motor thermal protection
- Warning indication for travelling movement
- TruConnect Remote Services
- 2-step limit switch, trolley traveling (slow+stop)
- Condition monitoring type

1.1.3 Crane installation and transportation

Scope of supply (included in the Price)
-Crane design
-Crane factory test and in-house quality control
-Packing and loading on truck in crane factory
-Transportation of crane to site
-Crane installation
-Crane commissioning and testing

Not included in the Price
-Approval of crane layout drawing
-Organizing free space in building
-Measuring the building dimensions
-Providing test load
-Test load transportation

1.1.4 Runway and/or runway rails

Type.....Free Standing Type (columns based on 7m centres)
Length.....2 x 35.00 m

Scope of supply (included in the Price)
-Runway design
-Supply of materials
-Runways to be cleaned to SSPC-SP3 c/w 1 coat of grey primer
-Transportation with same terms as crane
-Runway installation

Not included in the Price
-Approval of runway layout drawing
-Organizing free space in building

1.1.5 Power supply along runway

Type.....EnclosedFig-8Type
Length.....35.00 m
Type of fixing.....Hangers suspended from runway

Scope of supply (included in the Price)
-Supply of conductor system material
-Transportation with same terms as crane
-Runway power supply installation

Not included in the Price
-Hard wiring to disconnect switch
-Hard wiring from the disconnect switch to the runway elevation
-Organizing free space in building.

2.1.6 Delivery address

The equipment will be delivered to following address:

58 University Ave
Kingston, Ontario K7L 3N6
Contact person at site: Graeme Boyd

2 COMMERCIAL TERMS

2.1 Pricing summary

Item No	Qty	Description	Customer's reference Seller's reference	Price	
1	1	CXTS Single girder crane 10t, spans 15.000 m Free standing runway system Runway power conductor system Transportation to site Complete installation Commissioning and testing	10 Tonne Crane and Runway 21-2340	CAD	140 940
TOTAL PRICE:				**CAD**	**140 940**
				[Excluding Taxes]	

Notes:

- The crane runway is based on SSPC-SP3 shop clean and 1 coat of Grey Primer.
- The above crane and runway costs do not include the cost to design the runway footing or to supply. Konecranes will supply reactions and loading generated by the crane and runway to help in the design of the footing. The preliminary footing size is 8'-3" x 6'-6"x 18" dp
- Installation and commissioning is based on clear and unobstructed access to the crane installation area during regular business hours of 8 am to 5 pm Monday to Friday.
- The above crane pricing is based on a continuous installation with 1 mobilization.

2.2 Payment terms

25% of the price as down payment
25% of the price on issuance of drawings for approval
40% of the price when the crane is ready for delivery
10% of the price after commissioning and testing

In the event that installation, start-up or commissioning is delayed due to any site conditions, Konecranes, Inc. may at its discretion, elect to close and invoice the portion of the order that is already delivered, not including the 10% holdback for commissioning and testing listed above.

2.3 Delivery time

12 weeks from receipt of signed approval clearance drawings.

2.4 Delivery terms

Ready erected with commissioning

2.5 Warranty

The Equipment is warranted for a period of 12 months from acceptance (not to exceed 12 months from shipment) against all defects in workmanship. The warranty does not apply to parts that must be replaced due to wear or due to abuse of the Equipment.

2.6 Validity of the offer

This offer is valid until 05/28/2021.

2.7 Terms and conditions

This quotation, proposal or offer is subject to and incorporates as if fully rewritten herein the Seller's Standard Terms and Conditions of Sale (Equipment) (Revision 08.01.2016), a copy of which is attached hereto or is available at www.konecranes.ca or upon request of Buyer.

2.8 Data Collection and Reporting Services

The Equipment purchased by the Customer may have functionality, through an included data connection, that monitors and records data related to certain aspects of equipment usage. If the Equipment has such functionality, it will be activated upon installation and commissioning of the Equipment, and, unless and until the Customer directs Konecranes otherwise in writing, the data collected will be transmitted to and collected by Konecranes through the data connection. If separately agreed or the Customer otherwise receives such reporting services, Konecranes shall deliver reporting services by collecting data on the Equipment and its operation through the data connection. The Customer has the right to prohibit such collection and transmission of data at any time. Despite of such prohibition the Customer is obliged to pay any agreed charges until the end of the contract period. Reporting services provided to the Customer shall be provided subject to the Konecranes Remote Services Terms and Conditions in effect from time to time which shall be provided to the Customer upon request and/or upon the Customer's use of Konecranes' internet portal through which the reporting services may be provided.

2.9 Acceptance

Any of the following actions will constitute the Customer's unqualified acceptance of this offer; (a) placing the Customer's signature at the end of this document; (b) Konecranes' receipt of a verbal or written purchase order, work order, or other similar order for the goods and/or services contemplated herein; (c) the Customer's silence followed by Konecranes' performance of the work under this offer and the Customer's knowledge of such performance by Konecranes, (d) Konecranes' receipt of full or partial payment for the equipment contemplated herein; or (e) any other conduct that recognizes the existence of a contract with respect to the subject matter of this offer.

2.10 Permitting

Buyer shall be responsible for obtaining all local permits as well as any costs associated with any such permits.

3 MAINTENANCE AND TRAINING

Our maintenance services will be pleased to offer a preventive maintenance program, on call services, training and spare parts for your Konecranes Overhead Traveling Crane. Please contact our local service branch.
(Burlington)
5300 Mainway
Burlington, ON L7L 6A4
Tel. (905)-332-5409

Please review this proposal, literature and drawings carefully and advise of any questions or comments you may have. We appreciate this opportunity to be of service on your materials handling requirements and are confident that we have offered equipment that meet and exceed your expectations. We look forward to receiving your valued order.

Thank you for your consideration!

Yours truly,
KONECRANES CANADA INC.

_____
Paul Vandermeulen
Sales Representative

CUSTOMER ACCEPTANCE FOR KONECRANE OFFER# T26682-201912130907

In addition to the other manners in which you can accept this offer set forth above, you may acknowledge your agreement by endorsing this proposal with your signature and returning the signature page to our office via fax or scan and email. This will allow us to process your order in a timely manner securing the price and a calendar date in our production schedule. This quotation, proposal or offer is subject to and incorporates as if fully rewritten herein the Seller's Standard Terms and Conditions of Sale (Equipment) (Revision 08.01.2016), a copy of which is attached hereto or is available at www.konecranes.ca or upon request of Buyer.

Date: _____ Purchase Order Number: _____

Signature: _____ Confirm Purchase Price: _____

Name (Printed): _____

PLEASE PROVIDE REQUIRED INFORMATION BELOW:

Please Confirm Crane Voltage is correct on the offer drawing: _____

KONECRANES CANADA, INC.
STANDARD TERMS AND CONDITIONS OF SALE (Rev. 08.01.2016 CANADA)

1. APPLICABILITY. The sale of any and all Seller goods shall be conditioned upon, and subject to the following terms and conditions ("Terms and Conditions") which shall form an integral part of any agreement between Buyer and Seller. Buyer's acceptance of any quotation, proposal or offer made by Seller for the sale of its goods (collectively, "Quotation") is expressly made subject to these Terms and Conditions and none of the Terms and Conditions may be added to, modified, superseded or otherwise altered except as revised in writing by Seller. All orders for goods received by Seller shall be governed only by these Terms and Conditions, notwithstanding any terms and conditions in any purchase order, release order, or any other form issued by Buyer. Seller hereby objects to any terms and conditions which may be found in any purchase order, release order, or any other form issued by Buyer and hereby notifies Buyer that they are rejected. Any services of Seller that are included in and/or provided in connection with the sale of any goods ("Services") are conditioned upon and subject to Seller's Standard Terms and Conditions of Sale (Service) that are in effect from time to time and are incorporated by reference as if fully rewritten in these Terms and Conditions and are attached to these Terms and Conditions or are available at www.konecranes.ca or upon request of Buyer.

2. PRICE. Prices quoted by Seller shall remain firm for a period of thirty (30) days from the date of a Quotation; provided, however, Seller reserves the right, at any time prior to the acceptance of a Quotation by Buyer to adjust said prices by providing written notice to Buyer regarding any such adjustment. Quotations provided are priced based on Buyer's purchase of the entire scope of goods identified in a Quotation. If less than the entire scope of goods identified in a Quotation is ordered by Buyer, prices may vary. Unless otherwise stated in a Quotation, installation, commissioning, supervision and/or start-up services are not included in the price of goods to be provided by Seller. Buyer shall pay Seller to the extent of Services provided, or for the quantity of goods shipped should Seller be unable for any reason to provide and/or ship the entire scope of goods identified in a Quotation. Prices quoted by Seller are exclusive of all local permits and taxes (except taxes levied on Seller's income and payroll) including federal, state, provincial and local use, sales, property or similar taxes, and Buyer shall pay all such amounts or taxes in full or shall reimburse Seller for any such amounts or taxes paid by Seller.

3. SCOPE OF GOODS AND SERVICES. The goods and Services provided by Seller pursuant to a Quotation are limited exclusively, at the express request of Buyer, to the goods expressly identified in such Quotation. As a result, Seller does not assume responsibility and/or liability for the failure to provide any other goods or Services. Modifications, additions or deletions to or from the scope referenced in a Quotation shall only be effective if evidenced in writing signed by Seller and the sale of any and all goods affected by such modification, addition or deletion shall be subject to these Terms and Conditions whether or not referenced therein. All sales of goods and Services are final.

4. PAYMENT TERMS. Unless otherwise provided in the Quotation, all Seller invoices shall be paid by Buyer within fifteen (15) days of the date of invoice. If Buyer fails to timely pay invoices, Seller shall be entitled to suspend all work and deliveries and issue a late charge equivalent to the lesser of one and one half percent (1 1/2%) per month (eighteen percent (18%) per annum) or the maximum rate allowed by law on all unpaid invoices or invoices not paid in accordance with these Terms and Conditions. Buyer shall reimburse Seller for all expenses, regardless of their nature or type (including attorney's fees), related in any way to Seller's collection of invoices not paid in accordance with these Terms and Conditions or otherwise incurred by Seller in the enforcement of these Terms and Conditions. Unless otherwise provided in a Quotation, for all goods and Services with a Quotation or purchase order price in excess of thirty thousand dollars (USD $30,000.00) (or the local currency equivalent), Buyer shall pay a deposit in the amount of forty percent (40%) of the price (due upon Seller's receipt of Buyer's purchase order). Buyer shall make progress payments as stated in the applicable Quotation or otherwise agreed to in a writing signed by Buyer and Seller. Buyer shall have no right to offset any amounts due Seller by any payment or other obligation which Seller or any of its affiliates may owe to Buyer.

***5. CANCELLATION**. A purchase order may be cancelled by Seller (in whole or in part) at any time if (a) Buyer fails to strictly comply with the terms governing the order, (b) Buyer becomes insolvent, appoints or has appointed a receiver, or makes an assignment for the benefit of creditors, (c) a petition in bankruptcy or insolvency is filed by or against Buyer, (d) Seller requests and is unable to secure acceptable payment assurances from Buyer for the Services and/or goods identified in a Quotation or purchase order, or (e) amounts due Seller by Buyer are unpaid. Upon cancellation of a purchase order, Buyer shall be obligated to pay to Seller the price for all goods that can be completed and shipped within thirty (30) days of the date of cancellation, all Services performed to date, all special tooling for which commitments have been made by Seller, and all of Seller's costs, expenses and reasonable profit for work in process as of the date of cancellation.*

6. CREDIT APPROVAL. All orders are subject to Buyer credit approval by Seller. Seller reserves the right to refuse shipment of any and all goods or provision of any and all Services identified in any Quotation or purchase order and/or modify the payment terms identified therein or in Section 4 hereof.

7. DELIVERY TERMS AND DELAYS. Unless otherwise identified in a Quotation, all shipments of goods are F.C.A. Seller's plant, warehouse or dock, as defined by Incoterms 2010, and all risk of loss with respect to any goods shipped shall pass to Buyer when such goods are delivered to the carrier at such plant, warehouse or dock. Title to goods shall transfer to Buyer upon Seller's receipt of payment in full for all goods and Services provided pursuant to a Quotation and/or purchase order.

a. Delivery. All dates for the shipment and/or delivery of goods and/or for the provision of Services are approximate. Seller shall not be liable for delay in or failure to make shipment and/or delivery of goods or commencement, performance or completion of Services by any identified date for any reason whatsoever. In the event of any delay, regardless of the cause, the parties shall agree upon a new date for the shipment and/or delivery of goods and/or commencement, performance or completion of Services. In the event of any delay caused by Buyer, Buyer shall pay Seller for all costs and expenses incurred by Seller related to such delay.

***b. Freight Charges.** Any reference to freight charges contained in a Quotation is an estimate. Seller is not responsible for any differences that may occur between freight estimates contained in a Quotation and actual freight charges applicable at the time of shipment, and Buyer shall incur and be responsible for all costs associated therewith.*

c. Packaging. Unless otherwise identified in a Quotation, quoted prices do not include the cost for export or special packaging of Goods and Buyer shall assume and be responsible for those extra costs associated with such export and packaging.

d. Cost of Goods. Unless otherwise stated in a Quotation, Buyer shall pay all cost increases Seller is assessed for materials incorporated into goods and/or Services, including but not limited to steel, copper, and fuel surcharges, to the extent such increases exceed any estimated costs used by Seller to develop a Quotation by ten percent (10%) and which occurs subsequent to the issuance of a Quotation, but prior to the delivery of the goods and/or provision of the Services.

e. Site Condition. Buyer warrants that the site where goods are to be delivered and/or installed and/or where Services are to be performed shall be ready and adequate for Seller's delivery and/or installation of the goods and/or performance of Services. Buyer's obligations in this regard include but are not limited to the removal of all obstructions and institution of adequate safety measures to protect Seller's property, employees, agents and contractors. Buyer shall be responsible for all costs and expenses associated with Seller's delay and/or inability to deliver and/or install any goods and/or perform any Services related to Buyer's failure to comply with this provision. Seller in no way warrants the sufficiency of the site for the goods referenced in a Quotation.

8. SECURITY INTEREST. Buyer hereby grants Seller a security interest in the goods to secure the unpaid balance of the price and all other obligations of Buyer to Seller however arising. Buyer authorizes Seller to file all necessary financing statements and other similar documents required to perfect the security interest granted herein and irrevocably grants Seller a power of attorney to execute any documents on behalf of Buyer relating thereto.

9. WARRANTIES. The sale of any and all goods manufactured by Seller ("Seller Products") are conditioned upon, and subject to Seller's Standard Warranty for such Seller Product in effect on the date of sale (incorporated by reference as if fully rewritten herein and a copy of which is attached to the Quotation or is available at www.konecranes.ca or upon request of Buyer). Any verbal and/or written purchase order, release order or other form issued by Buyer to confirm any order issued pursuant to a Quotation or receipt of any of the goods identified in a Quotation shall serve as conclusive proof that Buyer has reviewed and agrees to be bound by the terms of Seller's Standard Warranty.

SELLER'S STANDARD WARRANTY REPRESENTS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY SELLER TO BUYER WITH RESPECT TO THE GOODS PROVIDED UNDER A QUOTATION AND IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BUYER HEREBY WAIVES ANY CLAIM THAT ANY EXCLUSIONS OR LIMITATIONS OF ANY WARRANTY PROVIDED BY SELLER DEPRIVE IT OF AN ADEQUATE REMEDY OR CAUSE ITS AGREEMENT WITH SELLER TO FAIL OF ITS ESSENTIAL PURPOSE. BUYER SHALL BE ENTITLED TO NO OTHER REMEDY REGARDLESS OF THE FORM OF CLAIM OR CAUSE OF ACTION, WHETHER BASED IN AGREEMENT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE.

10. LIMITATION OF DAMAGES. SELLER SHALL HAVE NO LIABILITY TO BUYER OR ANY END USER OF GOODS OR SERVICES WITH RESPECT TO THE SALE OF GOODS OR PROVISION OF SERVICES UNDER A QUOTATION FOR LOST PROFITS OR FOR SPECIAL, CONSEQUENTIAL, EXEMPLARY OR INCIDENTAL DAMAGES OF ANY KIND WHETHER ARISING IN CONTRACT, TORT, PRODUCT LIABILITY OR OTHERWISE, EVEN IF SELLER WAS ADVISED OF THE POSSIBILITY OF SUCH LOST PROFITS OR DAMAGES. SELLER'S DIRECT DAMAGES ARE LIMITED TO THE CONTRACT PRICE AND IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY DAMAGES WHATSOEVER IN EXCESS OF THE TOTAL PRICE PAID BY BUYER FOR GOODS AND/OR SERVICES REFERENCED IN A QUOTATION.

11. CONFIDENTIALITY; LICENSE. Without limitation, Buyer shall not, at any time disclose to any other person or entity any information provided to Buyer by, and relating to the business of Seller including without limitation, plans and specifications and any other inventions, devices, formulas, processes, programs, software, listings, print-outs, documentation, notes, charts, manuals, programming aids, source codes, object codes, compilations, technology, know-how, price lists, costs, policies, techniques, trade practices, accounting methods, methods of operation or other data that Seller considers confidential, and trade secrets of every kind relating to Seller's business, whether or not patentable or copyrightable. Such information shall remain the exclusive property of Seller and shall be returned to Seller upon request at any time. Further, these Terms and Conditions do not constitute a license or authorization of any kind for Buyer to use any of the trademarks or trade names owned or licensed by Seller. Buyer hereby grants to Seller a worldwide, irrevocable, royalty-free, non-exclusive license to collect, store and use any data collected by Seller through a Data Connection (as defined below) for any internal purposes of Seller, including but not limited to research and development.

12. INDEMNIFICATION. SELLER SHALL NOT BE LIABLE FOR AND BUYER SHALL RELEASE, INDEMNIFY AND HOLD SELLER, OR ANY ENTITY AFFILIATED IN ANY WAY THEREWITH, HARMLESS FROM ANY CLAIMS, DEMANDS, DAMAGES (REGARDLESS OF THEIR TYPE, INCLUDING, BUT NOT LIMITED TO DIRECT, CONSEQUENTIAL, INCIDENTAL, PUNITIVE OR SPECIAL), ACCOUNTS, GRIEVANCES, LOSSES AND EXPENSES, WHETHER KNOWN OR UNKNOWN, PRESENT OR FUTURE, ANY AND ALL LIABILITY, OF AND FROM ANY AND ALL MANNER OF ACTIONS, CAUSE(S) OF ACTION, INCLUDING BUT NOT LIMITED TO SUITS FOR CONTRIBUTION AND/OR INDEMNITY AND ALL SUITS IN LAW, IN EQUITY, OR UNDER STATUTE, OF WHATEVER KIND OR NATURE, ON ACCOUNT OF OR IN ANY WAY ARISING OUT OF ACTS OR OMISSIONS OF BUYER, ITS AGENTS, CONTRACTORS, EMPLOYEES OR ANY PERSON UNDER THEIR CONTROL AND RELATING IN ANY WAY TO THE GOODS AND/OR SERVICES PROVIDED UNDER A QUOTATION OR THE EQUIPMENT RELATED THERETO, INCLUDING, BUT NOT LIMITED TO BUYER'S USE, INSTALLATION, INCORPORATION OR SELECTION THEREOF.

13. MANUALS. To the extent an equipment manual is delivered to Buyer with goods (applicable exclusively to those goods where such a manual is produced), Seller reserves the right to assess a charge, per manual, for each additional manual requested by Buyer. Each manual produced by Seller is a confidential, proprietary and copyrighted document and may not be copied, published or reproduced in any manner or form without prior written agreement of Seller. Such agreement is at the sole discretion of Seller and Seller may revoke same at its discretion at any time.

14. APPROVAL DRAWINGS. *Approval drawings, if provided to Buyer by Seller and either signed by a representative of Buyer with apparent authority to do so or not objected to by Buyer in writing within the time required by Seller, shall constitute exclusive proof regarding Buyer's verification and acceptance of the dimensions and other information described therein and Buyer shall be entitled to rely on such approval drawings to develop a Quotation and provide the goods and/or Services referenced therein. Buyer hereby assumes any and all responsibility for any inaccurate or incomplete information contained therein.* ***TO THE EXTENT THAT BUYER PROVIDES THE DESIGN FOR ANY GOODS OR SERVICES TO BE PERFORMED BY SELLER, BUYER SHALL INDEMNIFY, DEFEND, AND HOLD HARMLESS SELLER AGAINST ALL CLAIMS, SUITS, AND CAUSES OF ACTION AND FROM ALL COSTS, EXPENSES, DAMAGES AND LIABILITIES (INCLUDING BUT NOT LIMITED TO ATTORNEYS AND CONSULTANTS FEES) FOR ACTUAL OR ALLEGED INFRINGEMENT OF ANY UNITED STATES OR FOREIGN PATENT, COPYRIGHT, TRADEMARK, INTELLECTUAL PROPERTY RIGHTS, OR PROPRIETARY RIGHTS OF THIRD PARTIES BY REASON OF THE USE, SALE, MANUFACTURE, OR DESIGN OF GOODS AND/OR SERVICES COVERED BY THESE TERMS AND CONDITIONS.***

15. DATA COLLECTION. *The goods purchased by Buyer may have functionality through an included data connection ("Data Connection") that monitors, transmits and records data related to certain aspects of equipment usage. Buyer acknowledges and agrees that Seller may activate the Data Connection immediately upon or at any time following installation of goods or equipment and the data collected will be transmitted to and collected by Seller or its affiliates through the Data Connection. Buyer, on behalf of itself, any end user of equipment ("End User") and any individual identified or identifiable by equipment usage data, hereby consents to the collection, storage and use by Seller of such information and agrees that Seller's collection of such information may continue until such time that Buyer or End User terminate its agreement to receive and/or purchase remote monitoring services from Seller or its affiliates (if applicable) or otherwise directs Seller in writing to deactivate the Data Connection (provided, however, Buyer hereby acknowledges and agrees that deactivation of the Data Connection may not be immediate and Seller will use its commercially reasonable best efforts to deactivate the Data Connection as promptly as possible). Buyer further accepts and agrees that Seller shall not actively monitor or inspect any equipment or equipment usage data or other information that is generated by using a condition monitoring unit incorporated into any equipment and/or transmitted and collected through the Data Connection. Regardless of the nature of information collected by Seller, Buyer acknowledges and agrees that Seller shall have no obligation to alert or notify Buyer of any information collected by Seller except as specifically set forth in a separate agreement between Seller and Buyer and, unless and until Buyer has agreed to purchase or receive remote monitoring services offered by Seller, Seller shall be under no obligation to provide any equipment usage data to Buyer.*

16. COMPLIANCE WITH LAWS; EMBARGOES AND ECONOMIC SANCTIONS COMPLIANCE. *Buyer shall at all times comply with all federal, state, local and provincial laws, ordinances, regulations, and orders that are applicable to the goods and/or Services provided by Seller and its performance hereunder, except to the extent that failure to comply therewith could/would not, in the aggregate, reasonably be expected to have a material adverse effect on its business or on its ability to comply with its obligations under these Terms and Conditions.*

Buyer represents and warrants that Buyer: (i) is and shall remain in compliance with all laws administered by the United States Office of Foreign Assets Control or any other applicable governmental entity imposing economic sanctions and trade embargoes ("Economic Sanctions Laws") against designated countries, entities and persons (collectively, "Embargoed Targets"); (ii) is not an Embargoed Target or otherwise subject to any Economic Sanctions Law; and (iii) shall comply with all Economic Sanctions Laws. Without limiting the generality of the foregoing, Buyer shall not (a) directly or indirectly export, re-export, transship or otherwise deliver any goods and/or Services provided by Seller or any portion of such goods and/or Services to an Embargoed Target, or (b) broker, finance or otherwise facilitate any transaction in violation of any Economic Sanctions Law.

BUYER SHALL RELEASE, INDEMNIFY, DEFEND AND HOLD HARMLESS SELLER OR ANY ENTITY AFFILIATED IN ANY WAY THEREWITH FROM ANY CLAIMS, DEMANDS, DAMAGES LIABILITIES, FINES, PENALTIES, LOSSES AND EXPENSES OF AND FROM ANY AND ALL MANNER OF SUITS, ACTIONS OR CAUSE(S) OF ACTION (INCLUDING BUT NOT LIMITED TO SUITS FOR CONTRIBUTION AND/OR INDEMNITY AND ALL GOVERNMENTAL ACTIONS AND/OR SUITS IN LAW, IN EQUITY, OR UNDER STATUTE, OF WHATEVER KIND OR NATURE) ON ACCOUNT OF OR IN ANY WAY ARISING OUT OF BUYER'S BREACH OF THIS SECTION 16.

17. SURVIVAL. Each section hereof intended for the benefit of Seller shall survive the delivery of the goods or expiration or termination of the Services outlined in a Quotation.

18. ENTIRE AGREEMENT. These Terms and Conditions and the applicable Quotation, together with Seller's Standard Warranty incorporated herein by reference, represent the entire agreement between Seller and Buyer. **THESE TERMS AND CONDITIONS AND THE PRICES SET OUT IN A QUOTATION SPECIFICALLY RECOGNIZE THE ALLOCATION OF THE RISKS OF PERFORMANCE OF THE PARTIES AS WELL AS THE LIMITATION OF LIABILITY AND DAMAGES AND THE RECOVERY OF COLLECTION COSTS, AND THE PARTIES EXPRESSLY AGREE THAT THESE LIMITATIONS ON REMEDIES, RESPONSIBILITY FOR COLLECTION COSTS, AND OBLIGATIONS TO INDEMNIFY ARE ESSENTIAL PARTS OF THE AGREEMENT BETWEEN THEM AND ARE SPECIFICALLY BARGAINED FOR.** Any purchase order or other document issued by Buyer shall be deemed to (i) be solely for the record keeping convenience of Buyer, and (ii) confirm these Terms and Conditions and not add to, delete from, or otherwise change or modify these Terms and Conditions or those contained in a Quotation.

19. SEVERABILITY. The partial or complete invalidity of any one or more provisions of these Terms and Conditions shall not affect the validity or continuing force and effect of any other provision. If any portion of this these Terms and Conditions shall be determined to be invalid or unenforceable, that portion shall automatically be modified to the extent necessary to make it valid. Notwithstanding the foregoing, such determination of invalidity or unenforceability shall not affect any other portion of these Terms and Conditions and such other portions shall remain in full force and effect.

20. GOVERNING LAW; JURISDICTION. Any controversy arising out of or related to these Terms and Conditions, a Quotation, the provision of goods and/or Services thereunder, or any contract between Seller and the Buyer shall be construed and governed by the laws of the Province of Ontario and the federal laws of Canada, notwithstanding conflicts of law principles. Any action arising from or related to these Terms and Conditions, a Quotation, the provision of goods and/or Services thereunder, or any contract between Seller and the Buyer shall be instituted and litigated in any provincial court located in Ontario, or in any federal court with jurisdiction over Ontario. Seller and Buyer hereby irrevocably consent to the jurisdiction of the courts of Ontario. The rights and obligations of Seller and Buyer will not be governed by the provisions of the 1980 United Nations Convention on Contracts for the International Sale of Goods; rather these rights and obligations will be governed by the laws of the Province of Ontario and the federal laws of Canada.

21. WAIVER. *No waiver by Seller of any breach of any term or condition of these Terms and Conditions shall be deemed a waiver of any other breach. No delay in enforcement of rights by Seller will be deemed a waiver, and Seller's failure to object to any provision contained in any communication from Buyer shall not be deemed an acceptance thereof or a waiver of any of these terms and conditions.*

22. NUCLEAR LIABILITY. In the event that the goods and/or Services provided by Seller and/or otherwise identified in these Terms and Conditions or in a Quotation are provided, used, or otherwise employed in, on or around a facility generating and/or otherwise employing in any manner nuclear, radioactive or ionizing radiation whether as a fuel, product or any other substance, the terms and conditions of the Seller Nuclear Liability Addendum (Revision 12.31.2012) incorporated by reference as if fully rewritten herein and a copy of which is attached to the Quotation or is available at www.konecranes.ca or upon request of Buyer.

23. ENGLISH LANGUAGE. Buyer and Seller confirm that it is their wish that these Terms and Conditions and each Quotation as well as all other documents relating to these Terms and Conditions and each Quotation, including notices, be drawn up in English only. L'acheteur et le vendeur confirment qu'ils désirent que les présentes modalités et conditions, chaque devis ainsi que tous les autres documents connexes, y compris les avis, soient rédigés uniquement en anglais.

KONECRANES CANADA, INC.
STANDARD WARRANTY (REV. 08.01.2016)

1. WARRANTY POLICY. Subject to those terms and conditions contained herein, Seller warrants that all Seller products conform in all material respects to the description identified in the quotation, proposal or offer made by Seller to Buyer for the sale of its products (collectively, "Quotation") and will be free from defects in material and workmanship for two (2) years from the date of shipment to Buyer (except for spare parts which Seller warrants for one (1) year from the date of shipment to Buyer). Products manufactured by parties other than Seller and/or its affiliates ("Third Party Products") supplied by Seller to Buyer are not warranted by Seller. Third Party Products may be warranted separately by their respective manufacturers or such other parties from whom Seller purchases such Third Party Products and Seller shall, to the extent possible, assign to Buyer whatever rights Seller may obtain under any such warranties.

THE FOREGOING REPRESENTS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY SELLER TO BUYER AND IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

2. WARRANTY REMEDIES. Buyer's sole and exclusive remedy for Seller's breach of the foregoing warranties during the warranty period shall be, at Seller's sole discretion, the repair and/or replacement of any defective products (or component parts thereof) pursuant to the terms of and conditioned upon Buyer's compliance with the procedure identified in Section 5 hereof.

3. LIMITATION OF DAMAGES. SELLER SHALL HAVE NO LIABILITY TO BUYER OR ANY END USER OF PRODUCTS OR SERVICES WITH RESPECT TO THE SALE OF PRODUCTS OR PROVISION OF SERVICES UNDER THE QUOTATION FOR LOST PROFITS OR FOR INDIRECT, SPECIAL, CONSEQUENTIAL, EXEMPLARY OR INCIDENTAL DAMAGES OF ANY KIND WHETHER ARISING IN, CONTRACT, TORT, PRODUCT LIABILITY, STRICT LIABILITY OR OTHERWISE, EVEN IF SELLER WAS ADVISED OF THE POSSIBILITY OF SUCH LOST PROFITS OR DAMAGES. SELLER'S LIABILITY IS LIMITED TO THE AMOUNT OF BUYER'S DIRECT DAMAGES UP TO THE AMOUNT OF THE CONTRACT PRICE AND IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY DAMAGES WHATSOEVER IN EXCESS OF THE TOTAL PRICE PAID BY BUYER FOR PRODUCTS AND/OR SERVICES REFERENCED IN THE QUOTATION.

4. INAPPLICABILITY OF, AND VOIDING OF THE WARRANTY. This Standard Warranty does not cover defects in Seller products which, in the sole discretion of Seller, are not defects in material and workmanship and may be attributed to other causes including but not limited to failure to operate and/or maintain Seller products in accordance with the applicable Seller installation and/or operator's manuals, owner's manuals, maintenance manuals, manufacturer's recommendations, and any other manuals, guidelines or recommendations of Seller concerning the maintenance and operation of Seller products that may be communicated to Buyer from time to time, side-pulling of load, shock loading, excessive jogging, eccentric loading, overloading, accidental occurrence, improper repair, improper handling or storage of products, chemical exposure and/or abnormal operating conditions not identified to Seller in writing prior to Seller's issuance of a Quotation, or any other cause that in Seller's sole discretion is not attributable to defects in material and workmanship. Failure of products to meet published performance specifications due to abnormal operating conditions beyond Seller's knowledge or control shall not be considered defects in either workmanship and/or material.
Modification of Seller products and/or incorporation of Other Manufacturer's Products into Seller products by individuals and/or organizations other than Seller shall void this Standard Warranty.
Buyer's failure to pay in full for the products and services provided for in a Quotation shall void this Standard Warranty.

5. WARRANTY PROCEDURE. To obtain warranty remedies pursuant to this Standard Warranty, Buyer must strictly adhere to the following procedure. Buyer's failure to comply with the terms of this procedure shall void this Standard Warranty.
a. Buyer shall, within seventy-two (72) hours of any claimed nonconformance or defect in Seller products, notify Seller's Warranty Administrator in writing of the alleged nonconformance or defect.
b. Seller shall, within a reasonable time, advise Buyer of its intention to initially accept or deny the warranty claim pursuant to the terms of this Standard Warranty. If Seller elects to initially accept the warranty claim, it shall advise Buyer of its intention to replace, repair or otherwise further inspect the allegedly nonconforming or defective products (or component parts thereof) ("Initial Acceptance").
(1) Replacement of allegedly nonconforming or defective products. Should Seller provide Initial Acceptance of Buyer's warranty claim and elect to replace the allegedly nonconforming or defective products (or component parts thereof), or should Seller elect to provide Initial Acceptance of Buyer's warranty claim through notification to Buyer that Seller elects to inspect the allegedly nonconforming or defective products (or component parts thereof) and then subsequently elect to replace the allegedly nonconforming or defective products (or component parts thereof), Seller shall within a reasonable time, ship new, comparable, replacement products to Buyer F.C.A. Seller's plant, warehouse or dock, as defined by Incoterms 2010, via the lowest cost method available.
(2) Repair of allegedly nonconforming or defective products. Should Seller provide Initial Acceptance of Buyer's warranty claim and elect to repair and/or permit the repair of the allegedly nonconforming or defective products (or component parts thereof) by approved third parties, or should Seller elect to provide Initial Acceptance of Buyer's warranty claim through notification to Buyer that Seller elects to inspect the allegedly nonconforming or defective products (or component parts thereof) and then subsequently elects to repair the allegedly nonconforming or defective products, Seller shall, unless otherwise agreed in writing by the Warranty Administrator, pay only those direct labor costs incurred to effectuate the repair and the cost of Seller replacement products consumed during said repair provided that the costs for all products and/or services are approved in advance in writing by Seller's Warranty Administrator.
(3) Inspection of allegedly nonconforming or defective products. Should Seller provide Initial Acceptance of Buyer's warranty claim through notification to Buyer that Seller elects to inspect the allegedly nonconforming or defective products (or component parts thereof) and then subsequently determine that the alleged nonconformity or defect is not covered under this Standard Warranty, Seller shall bill Buyer, and Buyer shall pay Seller any and all costs associated with the performance of inspection of allegedly nonconforming or defective products.

6. WAIVER. BUYER HEREBY WAIVES ANY CLAIM THAT THE EXCLUSIONS OR LIMITATIONS IDENTIFIED HEREIN DEPRIVE IT OF AN ADEQUATE REMEDY OR CAUSES THIS OR ANY OTHER AGREEMENT WITH SELLER TO FAIL OF ITS ESSENTIAL PURPOSE. BUYER SHALL BE ENTITLED TO NO OTHER REMEDY OTHER THAN THOSE IDENTIFIED IN SECTION 2 HEROF WITH RESPECT TO THE PROVISION OF PRODUCTS AND/OR SERVICES BY SELLER REGARDLESS OF THE FORM OF CLAIM OR CAUSE OF ACTION, WHETHER BASED IN AGREEMENT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE.

Code Blue®

CB 1-s

Order Information

SEND COMPLETED FORM TO **CUSTOMERSERVICE@CODEBLUE.COM** TO PLACE ORDER.

Order Form

Reseller:	City:	State:	PO #: *(required)*	Date:
End User or Project Name: *(required)*	City:	State:	Quote #:	

Unit Configuration

	PART #	PRICE	ADD
■ Code Blue 1-standard (CB 1-s), pedestal mount enclosure		5895	5895

Color and Graphics Options

	PART#	PRICE	ADD
FINISH COLOR (choose one)			
Standard Color: ◉ Safety Blue		0	0
Optional Colors: ○ Safety Yellow ○ Safety Red ○ Gloss White ○ Bright Silver ○ Tiger Orange ○ Midnight Blue ○ Gloss Black ○ Dark Bronze ○ Cardinal Red ○ Medium Bronze ○ British Racing Green ○ Architectural Gray ○ Oak Buff		100	0
Custom Color* ○		150	0
*A physical color sample must be sent to Code Blue for matching. It must be painted or professionally printed and be at least 2x2" in size.			
☐ Clear Coat enclosure *(required for high iron and saltwater regions to prevent corrosion)*		250	0
GRAPHICS TEXT (choose one)			
◉ Emergency ○ Assistance ○ Help Point ○ Police ○ Courtesy ○ Security ○ Information ○ [None]		0	0
☐ 4-Sided Graphics (2-sided graphics are standard)	40600	100	0
GRAPHICS COLOR (choose one)			
◉ Reflective White ○ Reflective Black ○ Reflective Blue ○ Reflective Red ○ Reflective Green ○ Reflective Yellow ○ Reflective Orange ○ Reflective Purple ○ Reflective Brown ○ [None]		0	0

Faceplate Opening Options

	PART #	PRICE	ADD
IA4100 Analog Speakerphone ◉ 1 Button ○ 2 Button ○ 2 Button, Keypad		1195	1195
IP5000 IP Speakerphone ○ 1 Button ○ 2 Button ○ 2 Button, Keypad		0	0
LS1000 IP Speakerphone ○ 1 Button ○ 2 Button ○ 2 Button, Keypad ○ 1 Button, Camera ○ 2 Button, Camera ○ 2 Button, Keypad, Camera		0	0
SPEAKERPHONE MAIN BEZEL TEXT *(Raised letters with Braille)* ◉ "PUSH FOR HELP" ○ "EMERGENCY"		0	0
LS2000 IP Handset Phone ○ Handset Only ○ Handset, Volume Button ○ Handset, Keypad ○ Handset, Volume Button, Keypad		0	0
No Phone ○ Blank Lexan plate *(units ordered without phone will not contain surge suppression)*			0

PHONE/FACEPLATE ADDITIONS

☐ IP5000 Battery Back-Up	40006	95	0
☐ Clear Coat faceplate *(required for high iron and saltwater regions to prevent corrosion)*		120	0
☐ Custom Silkscreen		250	0
☐ Silkscreen Tool Fee		150	0

Second Opening (Top Opening)

			0
○ Blank Stainless Steel Plate ○ Directory ○ Custom Cut-Out*		0	0
☐ Engineering Fee *(may apply)		895	0
☐ Clear Coat 2nd faceplate *(required for high iron and saltwater regions to prevent corrosion)*		120	0

Power

	PART #	PRICE	ADD
◉ Line Power (standard)		0	0
○ Power over Ethernet (PoE) Extractor (powers auxillary Code Blue equipment)		0	0
○ NightCharge (requires 120V AC external power supplied to CB unit)		1495	0

Voltage (Select the voltage that will be available at the installation site)

	PART #	PRICE	ADD
○ 24V AC (standard) ◉ 120V AC 250VA ○ 240V AC 250VA ○ 277V AC 250VA ○ 347V AC 250VA		300	300

NOTE: A POE+ switch must be utilized when powering this unit with a POE+ Extractor.

RESET FORM

Code Blue®

CB 1-s

Unit Order Form

Communication Connection Options

		PART #	PRICE	ADD
None	○			
Wired	◉ Line (standard)			
Cellular	○ 4G/LTE Cellular		0	0
☐ **Managed Cloud**				
☐ VoIP Extension Activation Fee		SLNH0028	$25	0
☐ VoIP Call Routing Annual Renewal		SLNH0033	$288	0
☐ VoIP SIM Card for VPN Router		SLNH0040	$3	0
☐ VoIP Annual Renewal for SLNH0040		SLNH0040-AR	$264	0

Note: For Private Cloud, email solutions@codeblue.com. For more information, see SLN-122.

Accessories

	PART #	PRICE	ADD
◉ Overhead Camera Mount (safety blue) (camera not included)	40141	$1195	1195
○ Overhead Camera Mount (other paint) (camera not included)		$1295	0
☐ Clear Coat Overhead Camera Mount *(required for high iron and saltwater regions to prevent corrosion)*		$100	0
☐ Active Venting Option		$280	0
○ Public Address (safety blue)		$4065	0
○ Public Address (other paint)		$4165	0
☐ Clear Coat Public Address *(required for high iron and saltwater regions to prevent corrosion)*		$75	0
☐ AED Housing (defibrillator not provided)		$2725	0
○ 1 Series 5.25" Blank Mounting Ring (safety blue)	41150	$745	0
○ 1 Series 5.25" Blank Mounting Ring (other paint)	41150	$795	0
☐ Clear Coat 5.25" Mounting Ring *(required for high iron and saltwater regions to prevent corrosion)*		$50	0
○ 1 Series 5.25" Blank Mounting Ring with Antenna Post (safety blue)	41030	$875	0
○ 1 Series 5.25" Blank Mounting Ring with Antenna Post (other paint)	41030	$925	0
☐ Clear Coat 5.25" Mounting Ring with Post *(required for high iron and saltwater regions to prevent corrosion)*		$50	0
○ 1 Series 16.5" Blank Mounting Ring (safety blue)	41250	$1000	0
○ 1 Series 16.5" Blank Mounting Ring (other paint)	41250	$1050	0
☐ Clear Coat 16.5" Mounting Ring *(required for high iron and saltwater regions to prevent corrosion)*		$75	0

Product details: **www.codeblue.com/1-series**

Rush Order Options

Expedited production options - maximum quantities apply. Excludes shipping time and cost. See **codeblue.com/rush-order** for details.

◉ **None**: Production completed by the Estimated Ship Date listed on your invoice

○ **Rush Order - 6 Day**: 11% fee, production complete within 6 ***business*** days of order receipt.

○ **Rush Order - 16 Day**: 6% fee, production complete within 16 ***business*** days of order receipt 0

Prices and specifications subject to change without notice. ***Please confirm final pricing at customerservice@codeblue.com.***

RESET FORM

Quantity & Total

Unit Price		Quantity		Subtotal		Customization Fees		Rush Fee		Total: (U.S. Dollars - excludes S&H)
8585	X	22	=	188870	+	0	+	0	=	188870

General Project Report (I)
Ultra Large Triaxial Test System
Sep 2019

To:

Royal Military College of Canada
Department of Civil Engineering
Geo-Engineering Centre at Queens`s-RMC
Dr.P.Eng. Greg Siemens

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Ultra Large Scale Triaxial Apparatus

1. Introduction on Testing Methods

The vast application of rock fill materials in geotechnical engineering, as in rock fill dams, makes the precise knowledge of the behavior of this materials indispensable. To conduct a feasible and accurate test, the size of these materials must not be scaled down. However, due to the correspondingly large scale of triaxial specimens necessary for rock fill , the numbers of facilities that are capable of testing these materials are few because manufacturing devices for testing large sizes of prototype rock fill materials is difficult and need extra ordinary experiences for designing, assembling and taking the accurate data to analysis them.

Laboratory tests have shown that the behavior of rockfill materials depends on a variety of factors such as stress level, void ratio, gradation, number of fine particles, maximum grain size, moisture content, mineral composition, and particle shape. As the stress level increases, dilation and compressibility decrease, whereas initial settlement and creep rate increase. Failure envelopes of rockfill materials are usually non-linear, for which particle breakage is responsible. The breakage, depending on the individual particles' specifications, can occur even at relatively low stresses. Several factors responsible for the amount of particle breakage are proposed: stress level, stress path, particle size, relative density, particle angularity, mineral hardness, and water presence. Saturation degrades the strength parameters and deformation moduli of rockfill materials. This degradation is due to weakening of particles leading to their breakage, and lubrication effects of water which acts on the grain-to-grain contacts.

Ultra Large Scale Triaxial testing system for the determination of meaningful shear strength parameters is the best way compare with other methods for the determination of strength properties exists to evaluate landfill stability and also to Achieve above summarized mentioned parameters.

Compared to direct shear tests the Triaxial compression test offers several advantages due to the testing procedure. The variable lateral stress can be adjusted according to in-situ conditions and to control of drainage, drained or un-drained tests can be conducted to determine effective stress parameters. Also, the shear plane can develop based on the material properties without restriction or restraint of the testing device.

The most common practice to determine shear strength parameters is laboratory testing. The determination of strength properties with laboratory devices is always a matter of scale.

For this purpose, two major points should be considered: 1) determination of the maximum particle size, and 2) selection of a proper gradation modeling technique. In a laboratory specimen, the maximum particle size (d) is determined according to the minimum dimension of the specimen (D). The specimen gradation can be selected by one of the four modeling techniques: scaling, parallel gradation, quadratic grain-size distribution, and replacement technique.

Large Triaxial test system(500mm) Photo No.1

2. About us

APS Antriebs- Prüf- und Steuertechnik GmbH (drive test and control technology company) is a highly regarded German enterprise due to its soil- rockasphalt and material testing machines, which are marketed under the brand name “Wille Geotechnik”. The initial activities of the company began in the 1990s in cooperation with universities and the implementation of research activities and development of scientific equipment. The contact and collaboration with such institutes remains strong to this day, and has developed over the past years with the APS GmbH having now over 40 employees.

All parts of designing, construction, manufacturing, quality-control and delivery tests are conducted by our own qualified experts in our factory in Germany. With high-quality special testing machines, the company has received international acknowledgement, in particular by research institutes and universities from all over the world. With such capabilities, the company manufactures standard testing systems as well as customized material testing systems for a wide range of applications. In the meantime, the company has grown into a globally expanding enterprise. With our expertise we help a range of users in standard, routine challenges to highly complex investigations.

With this noticeable background the company not only manufactures standard test systems (i.e. conventional triaxial apparatus, etc.) but also develops, customized, and modifies equipment for various proposes. The talent to innovate, which is based on our highly skilled coworkers and reliable devices, is more pronounced in large-scale apparatuses.

Enlarging an experimental system is not only to change the dimension of the components, but also to change in segments' materials, supplementary utilities, stiffness, methodology, test procedure, accuracy control, data analyzing, and most importantly the know-how. Few companies could dare to claim that they are able to develop large scale apparatuses properly, unless on a practically proved background.

ASP Wille Geotechnik based on its distinguished and successful experiences in manufacturing geotechnical and geological testing systems is competent to develop apparatuses with different sizes depend on the required application, as have done previously.

3. Description

It is scientifically accepted that dimension of sample in a Triaxial device limits the largest grain size of material examined. In order to have enough accuracy and repeatability in the results the ratio of largest grain size to diameter of sample has been suggested to be about 1/6. Thus, in order to determine the shear strength parameters of a rock fill (i.e. our target material) with ~150 mm coarse grains sample with diameter of minimum 900 mm is required. According to ASTM D5311-92 to have reliable results slenderness ratio of sample should be 2, which means for diameter of 900 mm, height of sample must be 1800 mm. The device must be able to apply sufficient cell and pore-water pressures, which should be calculated from the in-situ condition. For example, if we assume the density of 20 kN/m^3 for the rock fill, the vertical pressure at depths of 10, 20, 50, and 100 m will be 200, 400, 1000, and 2000 kPa respectively which is represented by cell pressure in the triaxial device. Pore-water pressure is the hydrostatic pressure of existing water in or above the soil. For depths mentioned above required pore-water pressure are 100, 200, 500, and 1000 kPa.

In order to measure all required data of the tests several types of transducers should be implemented. For measuring deformations axial and radial LVDTs are required to be installed above and around the sample. Minimum one load cell must be installed in the central axis of the sample above or below the pistons to measure the axial load. Pressure transducer with enough capacities must be implemented for reading pore-water and cell pressures.

All experimental data obtained from various sensors mentioned above should be logged to computer through data convertors using a data acquisition system. Using a powerful software data can be categorized, analyzed, and reported. This software must be user-friendly enough to be easily handled by technical staffs of laboratory.

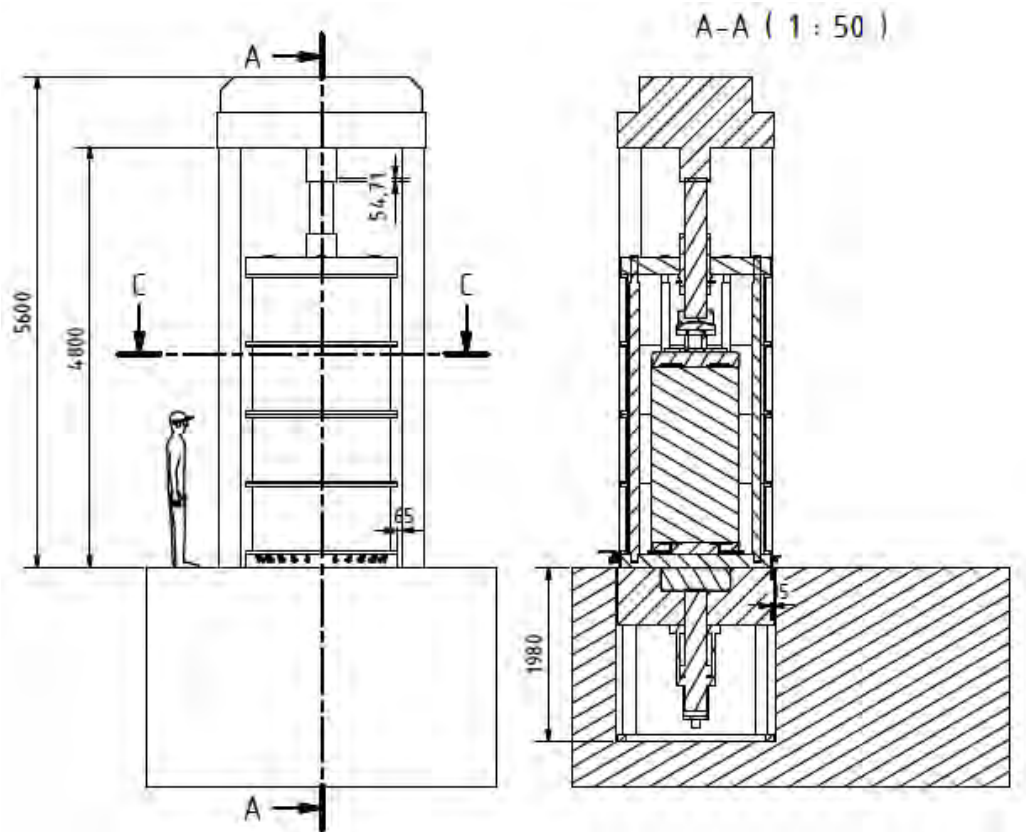


Figure 1. Cross section of the large scale triaxial device

Several sets of accessories must be provided to enable the assemblage of device, transport of heavy parts, storage of materials, sample preparation kit, initial and basic tests which must be done prior to a triaxial experiment, etc. The sample preparation kits must contain a crane to transport material to the height of more than 2 *m*, latex / Flexible membrane with thickness of minimum 8 *mm*, equipment for pouring material inside the membrane (manual shooting and funnel), compactors, rail to transport mounted sample and cell under the loading frame, etc.

Summary of System:

Regarding what mentioned above the general configuration of a large scale triaxial test system would be as or including following items:

1. Load frame with capacity of 3000 kN, ability to accept triaxial cell with diameter up to 1800 mm and 4500mm height
2. Cylindrical Triaxial cell with diameter of 900 and height 1800 *mm*. Should be able to carry pressure of 3 Mpa.
3. Confining / pore pressure of 3 Mpa.
4. High quality transducers (External Load cells, Axial LVDTs, Radial deformation transducers, Pore water pressure, back pressure and etc.)
5. Data acquisition and controlling unit to control and reading data from load frame, power pack and all Transducers.
6. Powerful and user-friendly software to log, analyze, and present online graphs and data and would be able to run all kinds of Triaxial tests (such as Test stages with Consolidation stage (isotropic or anisotropic); Saturation stage (saturated/unsaturated);B-value check control; All shear stages (compression and extension tests for simulating all kinds of stress-paths); K0-tests (if hardware is available);Unsaturated test conditions with air pressure control; Multi stage test procedures; Standard triaxial testing (UU, CU, and CD) with pore pressure measurement.; Advanced loading module; Stress path module; Monitoring with simultaneous data calculation during the tests; Data conversion to ASCII format) and other functions.
7. Sample preparation kit including all required hardware
8. Sample handling device like crane with 25,000 KG capacity to lift the Triaxial cell and pouring device, manual shooting and funnel and conducting Triaxial cell inside the testing areas.
9. Emergency hardware and software, which should be set up on the equipment with knowledge of manufacturer.

4) Our System's Configuration, Components and specialties

In comparison to other shear strength experiments large-scale triaxial test is flexible and gives realistic results, however its apparatus has its own specialties and difficulties to be manufactured. Here some of traits and differences of designed large triaxial apparatus by Wille Geotechnik with other equipment are mentioned:

An 8-*m* load frame with weight of around 35000 *kg* (without cell and other lateral parts) is required for applying deviator stress, which is almost 60 times heavier than standard concrete testing machine. Regarding the size effect, large elements should be designed and manufactured in an especial way based on our instructions. Few companies in the world can manufacture elements with such this dimension. The implemented cylindrical cell with huge diameter of 1800 *mm* has to resist 3 *MPa* cell pressure. Such a large cell must be produced with special material to guarantee the safe application of the device. The triaxial cell will have the weight of 18 *t* approximately.

The surface area of the cell is about 2500 cm^2 on which the cell pressure will be applied. Cell pressure of 3 MPa causes a Pressure load of 750 t on the upper lid of the cell that must be kept by tie rods. Other components (e.g. Seals, membrane, valves, piston bearings, connections, etc.) are considerably greater than standard triaxial device and should be designed and produced on special regulation.

A number of emergencies stops and safety protections against unexpected operating errors has to be incorporated. Volume of standard cells used for 100 mm samples is 900 cm^3, but in the designed triaxial device the volume of cell is around 600,000 cm3 that means normal volume change indicators cannot be implemented here but regarding the volume change range which is between 40,000 to 70,000 cm^3 appropriate volume/pressure controllers must be used.

Actuators are about 3500 mm long with a real time controller, differential pressure measurement, and other different security levels.

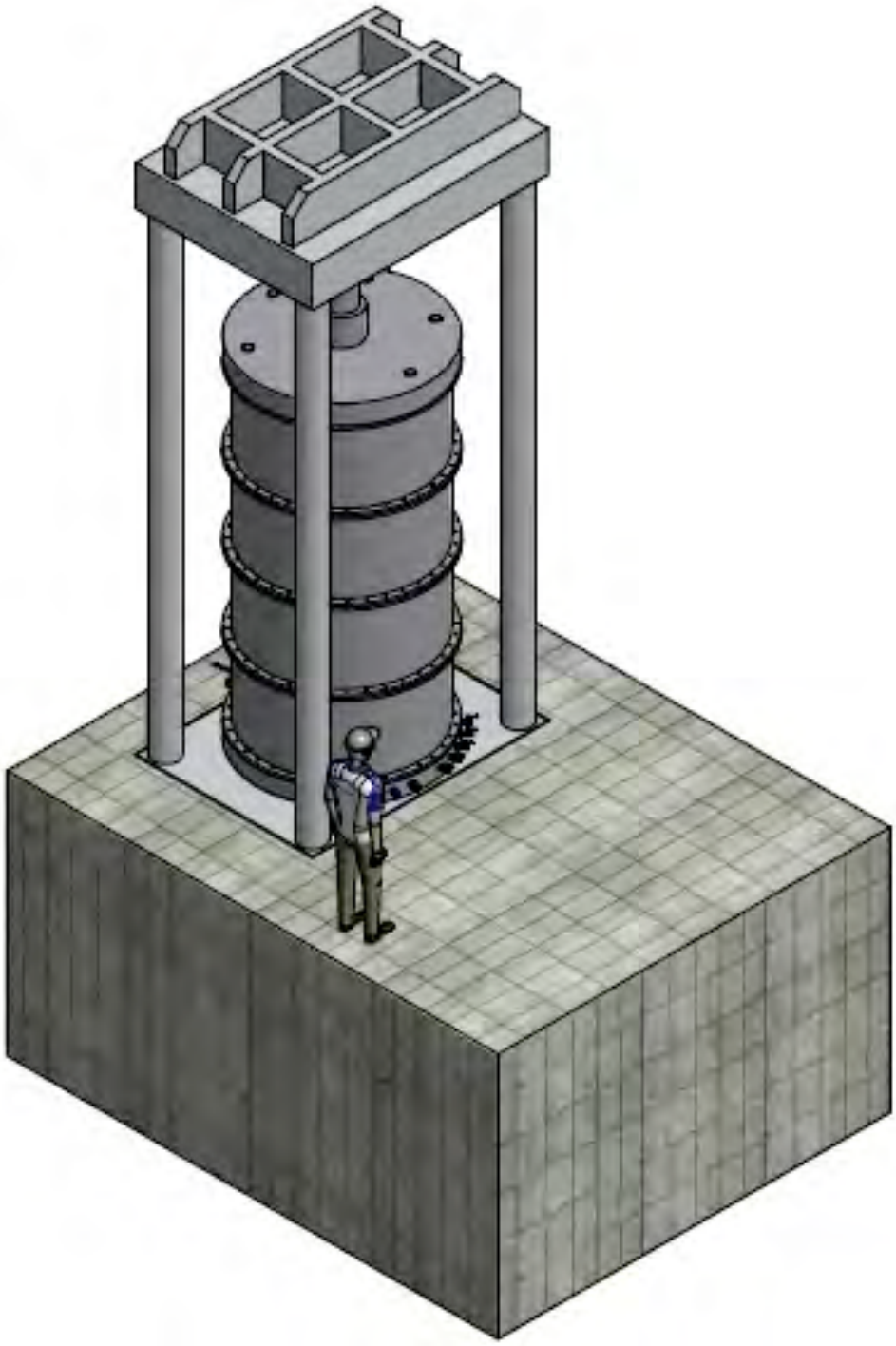


Figure 2. Schematic view

Based on designs and calculations by APS Wille Geotechnik's technical engineers,we would suggest you our Large Triaxial system with below technical specifications:

4.1 Load frame (Item No.: UL3000-SP/X) (1 Piece)

In order to apply deviator stress over the triaxial sample a large servo-hydraulic double acting compression frame load with capacity of 3000*kN* is designed for closed loop load or displacement-controlled tests. Wille Geotechnik suggests the following utilities and characteristics for the loading frame:

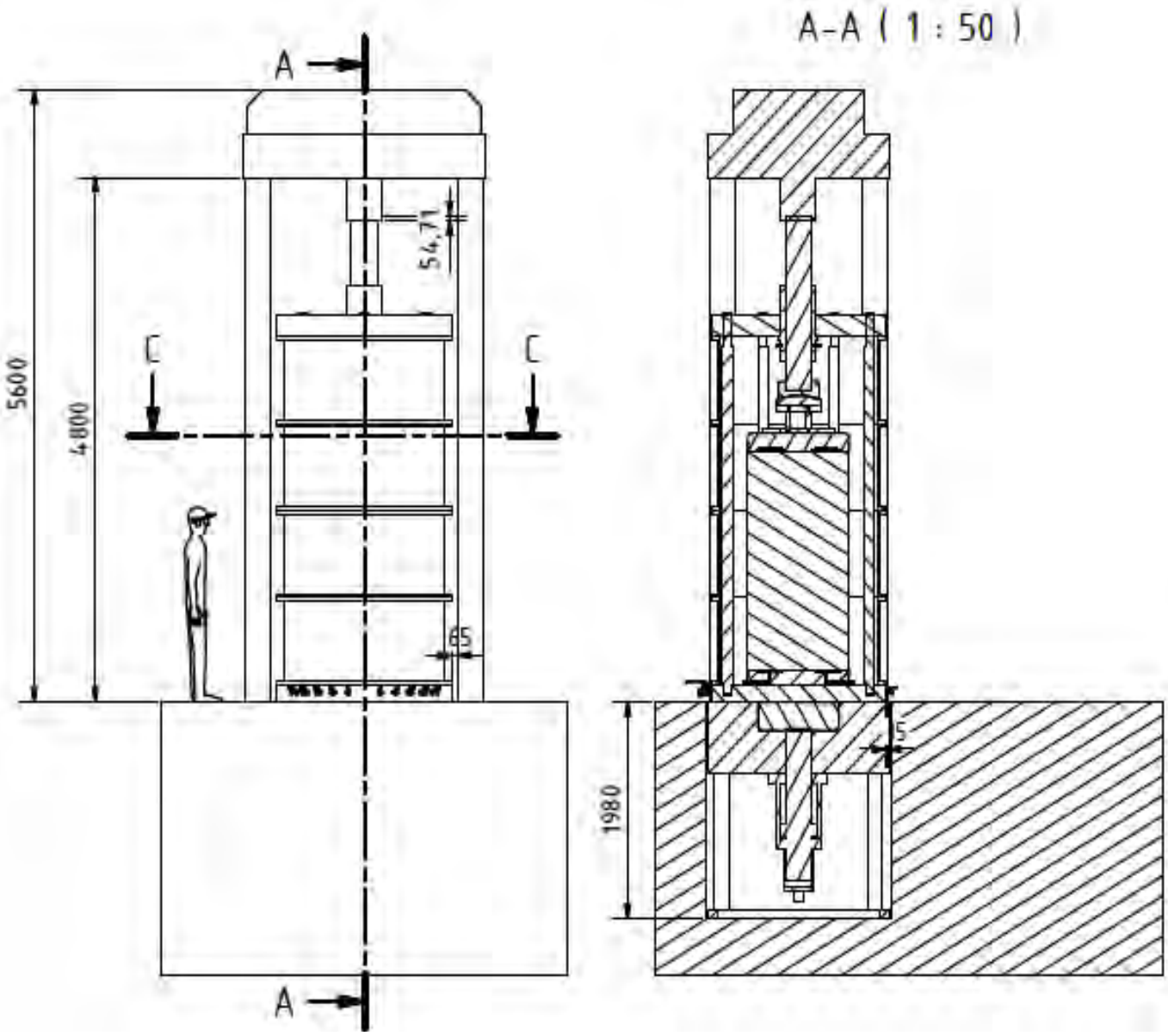
- Large double acting actuator integrated into the basement construction
- Lower compression platen fixed onto piston road
- 4 stiff columns construction
- Rigid crosshead onto columns with spherical head compression plate connected to the triaxial cell
- Test space depending from the demands of the system (triaxial cells)
- Including high quality MOOG servo valve for best feedback control of the low-pressure servo hydraulic
- Integrated Stroke transducer: with high precision displacement stroke transducer, integrated directly at the hydraulic cylinder for strain and position-controlled test down to 0.01 *mm/min* strain rate
- Integrated high accuracy and stability pressure transducer with accuracy of ±0.2 % for constant stress or stress ramps-controlled tests

Technical specifications:

- Compression rating 3000 kN
- Stroke: approx. 400 mm
- Speed range: 0.01 - 140 mm/min

Optional accommodates to TX-cell

- Loading plate accommodates to TX-cell
- Compression platen
- Clearance between columns: approx. 2000 mm
- Distance between pressure platen: approx. 5000 mm
- Dimensions (WxDxH): approx. 2500x2500x8500 mm
- Weight: approx. 40000 kg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4.2 Force measuring system (1 Piece)

Integrated force measuring system 3000 *kN*, linearity 0.05 % including data acquisition electronic with amplifier and calibration should have the characteristics as below:

- with high precision load cell between crosshead and upper compression platen for measuring accuracy from nearly beginning of of machine capacity
  - According to EN ISO 7500-1
  - Incl. Upgrade of free space between four columns for the load cell and adapter
- High accuracy 20-bit high speed, high resolution amplifier

4.3 Hydraulic power pack (Item No.: WBHxx) (1 Piece)

Advanced hydraulic power pack with, tubing, hose connection and re-cooling system is suggested to have these features:

- Air or Water cooling depends on Water source
- Low noise internal gear pump with constant oil delivery
- Oil filter with clogged filter indication
- Max. oil temperature protection (shut down of the system)
- Motor power indication with electrical safety mode
- Electrical switchboard with integral starter and relays with remote control unit
- Including hydraulic oil filling
- Dust protection casing
- Noise protection with noise level of 59 *dB*
- Delivery includes: External re-cooling system by air ventilation

4.4 Triaxial cell (1 Piece)

- Advanced large triaxial cell for sample sizes up to diameter of 900 *mm* and height of 1800 *mm*.
- Equiped with optimized low friction guide bush
- Stiff patical cell wall construction with flanch connection
- Includes wire outlet connector/ports for internal transducer
- Bottom and pressure plate with drainage and porewater connection
- Valve system with couplings for connecting cell pressure, back pressure, flushing, pore pressure

Technical specifications:

- Height: approx. 4500 *mm*
- Diameter: approx. 1800 *mm*
- Max. working pressure: 3000 *kPa*

4.5 Adapter Set (1 Piece)

Sample adapter Set for diameter of 900 *mm* for large triaxial cell consisting of stiff loading plate, exchangeable bottom plate, hose connections, membrane clamping system.

Note: *Picture is a sample pictured of 1000mm Large triaxial Cell manufactured by our company before.*

4.6 Split-former (1 Piece)

A split-former for sample preparation for non-cohesive material for sample diameter 900 and height 1800 *mm*.

4.7 Volume/Pressure-Controller (2 pieces)

Automatic servo hydraulic stainless steel Volume/Pressure-Controller VPC 3 with volume measurement, 3 MPa, approx. Volume of approximately 40.000 cm3 with high quality real time high resolution Controller up to 20 bit and 0.2 ms closed-loop control for stand alone use or integrated into triaxial system with high quality pressure transducer < accuracy class 0.05 %.

- With integrated limit switches and pressure overload limits (safety stop)
- Microprocessor servo hydraulic closed loop control of hydrostatic cell pressure or pore-water pressure
- Fully automatic closed loop control of pressure and water volume through an internal high-resolution pressure transducer and displacement transducer
- Different modes of pressure control
  - Constant pressure
  - Continuous and step less increasing or decreasing pressure Ramps
  - Constant flow rates
  - Constant volume conditions
- Automatic volume measurement and automatic volume calibration using various pressure increments
- Corrosions less chamber to avoid Corrosion
- Compact and space saving design
- Menu driven calibration storage of built-in transducer
- Different control interfaces are available depending from customers requirements
- Includes Ethernet port

Specifications:

- Max. pressure: 3 MPa
- Resolution: 0.001 MPa
- Volume (standard): approx. 40.000 cm^3
- Voltage: (110 V) 330 V
- Dimensions (LxWxH): 3600x600x800 mm
- Ethernet port included
- Hose or tube connection: Customized

4.8 Pore water pressure transducer (1 Piece)

Special cell- or pore water pressure transducer 3.0 *MPa*

- Electronical transducer for automatically acquisition of the cell or pore water pressure
- Special version made of stainless steel and with a membrane flush
- Calibrated precision pressure sensor with integrated measuring amplifier and standard signal output

Technical data:

- Measuring range: 0 - 3 *MPa*
- Accuracy: < 0.2 % of range

4.9 Displacement transducer (1 Piece)

Submersible axial-deformation system with 3 submersible displacement transducer with 200 *mm* range

- 3 displacement transducers for internal use in the large triaxial cell at the top cap of the sample
- 3 attachments for the transducer based at the bottom of the triaxial cell as reference point
- High accuracy amplifier and A/D converter with 20 bit resolution
- Intelligent EEPROM plugs with calibration values
- Electrical connectors plug through the triaxial cell base

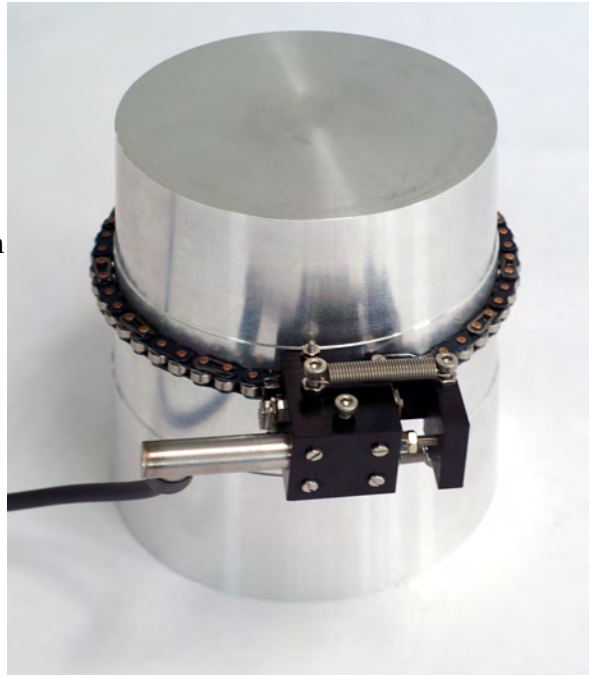
Technical specification:

- Displacement range: +/- 100 mm (200 mm)
- Max. Pressure: 3 MPa

4.10 Strain measuring devices (3 Pieces)

Submersible Local Circumferential Strain measuring devices for static and dynamic tests for specimen-diameter 900 mm includes 2 high accuracy LVDT transducers for max. radial deformation of 150 mm (470 mm circumference deformation).

- Measurement of the average radial strain
- High accuracy LVDT displacement transducer



Technical specification:

- Displacement range: +/- 75 mm
- Resolution: < +/- 0.1 mm

4.11 Real time control system (1 Piece)

Digital High-Speed High Resolution expandable Real Time Control System WDCdyn 5000

Including 20-bit high resolution data acquisition system with expandable up to 16 high speed, low noise channels for data acquisition or closed-loop control (feedback) for each actuator.

High performance technology permits the execution of static and dynamic asphalt or material tests as uniaxial or multi axial tests (stress-path triaxial tests) in real time modus.

Features:

- High performance controller-system, expandable up to 8 static or dynamic controller with master/slave function in real time for phase shift control between all controlled axis/actuator
- It offers a bump less transfer between load-, position- and strain control.
- Almost all kinds of analog or incremental transducers can be connected via plug-in cards.
- Using our modular plug-in cards with high speed 5 *kHz* / 20 bit amplifier and A/D converter best performance is guaranteed for dynamic applications with testing frequencies of up to approx. 100 *Hz* and higher.
- Calibration of all sensors are stored in the EEPROM of a sensor plug, so sensors are exchangeable without new calibration. Automatical read-in of sensor- and calibration data with switch-on or on demand.
- Closed-loop control with up to 5 *kHz* = 0.2 millisecond controlling rate (5000 values per second)
- Communication port using USB or Ethernet

Digital Controller:

The Controller is a real digital controller. That means, all adjustments like PID parameters will be done by software.

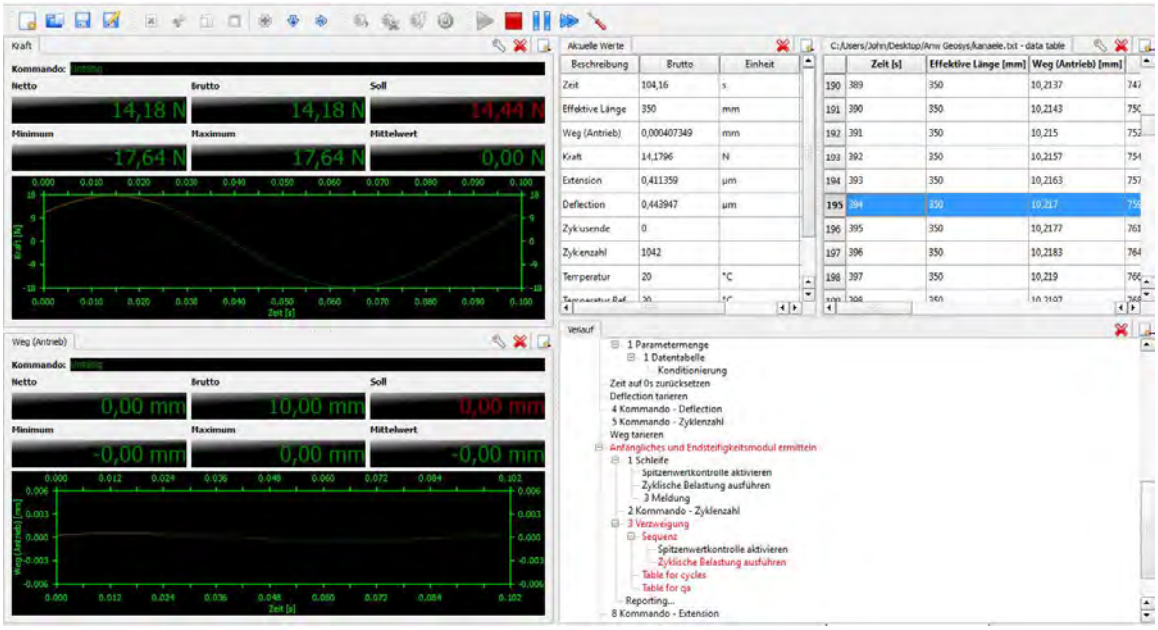
- Parallel processing: Optimum distribution of computing capacity through parallel processing. Short response time to external events.
- High system-reliability: Clearly structured system with few highly integrated and easily comprehensible hardware components.
- Multiple command-value generators
- Multiple control and measurement actuator circuit
- Synchronization mechanisms for multi actuator applications
- High rate of data acquisition
- Incremental manual control for manual setup and operation
- I/0 handling of peripheral units
- Soft- and Hardware surveillance
- Interfaces: USB or Ethernet

4.12 Data acquisition and Testing software,GEOsys (1 Piece)

Fully automatic multi channel Triaxial control and data acquisition software GEOSYS-Professional.

This free programmable software solution gives the possible to the user to realize every stress or strain-controlled test (standard triaxial tests, stress-path tests) and any other tests procedures with complex sequences (test editor) with any amount and free definable stop and calculated criteria (formula editor).

The user friendly and menu guided software controls (closed loop control) and monitors all operations of the set components (e.g. axial load, cell pressure, pore water- or air pressure, all transducers).



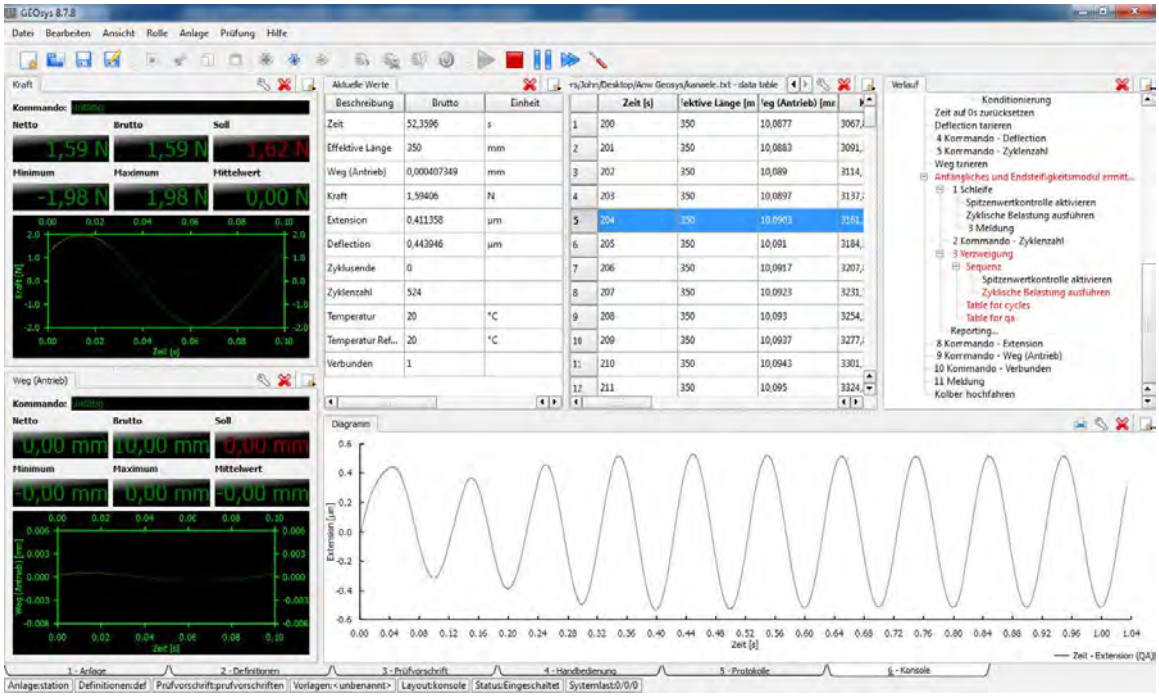
For example the structure can be as followed:

- Test type and conditions / Specimen parameters
- Test stages with
  - Consolidation stage (isotropic or anisotropic)
  - Saturation stage (saturated/unsaturated)
  - B-value check control
  - All shear stages (compression and extension tests for simulating all kinds of stress-paths)
  - K0-tests (if hardware is available)
  - Unsaturated test conditions with air pressure control

- Multi stage test procedures
- Standard triaxial testing (UU, CU, and CD) with pore pressure measurement.
- Advanced loading module
- Stress path module

- Monitoring with simultaneous data calculation during the tests
- Data conversion to ASCII format

The data recording (transfer rates) can be executed in relation to time or strain rate. The achieved measuring values can be monitored on screen whether as graph or as chart.



The advantage of this kind of control is the combined acquisition of all measurand, the correlative data evaluation and a direct process feedback. That means, that the achieved data are used to control the test procedure directly according to default termination criteria (selfcontrol) with up to 5000 cycles per second.

Beside to the automatic test procedure it is possible to intervene at any time in order to modify manually the test parameters.

Further features are available:

- Automatic area correction by volume change or vertical strain
- Automatic load piston correction for the axial stress
- Synchronised pressure decrease or increase
- Multi stage triaxial tests

4.13 Auxiliary tools for sample preparation and testing (1 Set)

Auxiliary tools to move the triaxial cell, cell wall and sample preparation equipment. This set up is including of a **Vibrating compactor (**Vibrating compactor, adapted to the sample preparation system, for compacting of the sample) and **Crane (**Gantry crane for lifting the triaxial cell, cell wall and sample preparation tools, 5000 *kg* capacity including a guide rail system into the frame.) and a **guide rail** to transport the assembled Ttiaxial cell with sample to the load frame Without any noticeable changes in sample.

A number of **emergency stops** and safety protections against unexpected operating errors have to be incorporated.

4.14 Latex membrane

Typical latex membranes used in triaxial testing are made by dipping a wire hoop oriented horizontally into a pan of molten latex. The hoop is then removed from the molten creating a cylinder of latex. For thicker membranes a slower rate of extraction from the pan of molten latex is used.

APS Wille Geotechnik Company is willing to custom build membranes for samples of 900 mm in diameter and 1800mm in length. Therefore, we customized for you will construct latex membranes for this testing. We deliver numbers of latex membrane with different thickness in offered range for different type of samples, which would be tested. This is primarily due to large particles edge effects of different type of samples.

5. Method of Sample preparation

After installation of bottom platen and tightening the membrane to it the sample can be mounted. The split-former explained in section 3.6 covers and supports the latex membrane. Using some clampers at the top of split-former and a vacuum the membrane is hold to the split-former. Now we can pour and compact material inside the membrane. A funnel of material must be lifted by crane to top of the split-former and poured inside in layers using manual shooting. The compactor used in this procedure should be equipped with a round plate to distribute energy over the sample's surface. Compacting duration and number of layers are selected in a way that the uniform required void ratio is achieved. Considering the depth of sample, which is 1800 *mm*, the compaction must be performed using a customized plate compactor designed for this large-scale triaxial device. Beside the method suggested there are also other alternative methods like using manual vibratory hammer. Special care must be taken to avoid the membrane cut during compaction.

The mold for the specimen preparation consists of three independent parts that make up the cylinder. Natural rubber membranes, 8 to 10 mm thick, were used for containing the specimen. These were vacuum fitted inside the cylinder. A non-woven geotextile will be placed as an interface between the material and both caps, at the top and bottom of the specimen.
A second natural rubber membrane would cover the specimens with lower thickness to avoid water infiltration in case the inner membrane was punctured. The second membrane was placed on the specimen after the mold was withdrawn. Special membranes are necessary for the higher confining pressure tests as well.

For an additional stabilization of sample after installation the upper cap and before replacing the split-former a partial vacuum must be set on the sample.

After all connections and sensors are installed, by using the crane, cell must be placed on its position, sealed, and fixed. The heavy system of triaxial cell now is transported over rails under the load frame and aligned accurately to the correct position. The pore and cell waters can be filled based on the instruction.

After the sample was placed on the loading place, a confining vacuum was maintained at all times to prevent sample collapse.

Vacuum was maintained during sample preparation using the laboratory vacuum system. If there was a membrane leak suspected before removing the sample mold, a second vacuum system
Would be connected to the sample. This second portable vacuum pump had a large volume capacity. This large volume capacity allowed the patching of the membrane in all but one occasion. Once a stable vacuum would be attained, the sample mold was removed and the sensors would be placed.

6. Installation, Commissioning and Training:

Installation, commissioning and run the system would be done by engineers of Wille company and all required utilities for the test e.g electricity, water line ,air pressure and etc should be provided by the end user. After successful installation, the training starts with a dummy test and all the procedure of the test will be reached by our engineers to numbers of engineers of the end user. There would be special course for training of software and special features of the software after or during training course. The Installation and commissioning time is depends on the speed of the job at site but the company would finish it by itself.

Training course would be 4 working days, and if needed can be extended after a breath period.

7. After sales services and Supports

The Wille Geotechik provides variety reliable of ways for technical support for its products, such as printed instruction manuals, remote support over internet, email and by phone. The technical support includes all Wille Geotechik products either new devices or older devices.

Our networks of overseas representatives help you for any enquiries in your native and local language during office hours. The local representatives are supported directly by our engineering department who can advise and solve are your problems. You are also able to have a direct contact with the designers and manufacturer now and receive all technical advices direct from experienced engineers in our company.

We offer a full range of services for our products and systems, including installation, training, support, software updates, calibration, planned maintenance and repair.

7.1 Printed instruction manuals

All our products have a wealthy operational manual, which described in detail the methods of installation and also troubleshooting. Using these documents help the operators to find more details about the equipment and run them in a safe mode and find the reasons of the errors that will be faced in future. It’s included of the some solutions for these errors.

7.2 Remote access and support over the internet

We are able to do remote desktop support with the help of Team Viewer Software. With Team Viewer, we are able to connect to your PC or server around the world within a few

seconds and take control of the PC and then the equipment by GEOsys software.do the troubleshooting of the software or our equipment.

All you have to do is start a small application, which does not even require installation or administrative rights and connect your PC to Internet. Now we can chat with your equipment!

This connection of us to your system is limited and we do not have acces to any data onm your PC,also it would be done just by your permission and special password that you will creat and give to our engineers just for one time connection. For each time connection ,we need new password from your side. This is because of privacy for your testing information.

7.3 Email support

Technical support is available at the following email-address: support@wille-geotechnik.com. We aim to reply any support enquiry at the same day, at least within 24 hours. For a quick and significant treatment of your enquiry, we need the following information:

1. Type of equipment.
2. Serial number of the device.
3. Year of manufacture.
4. A detailed description of the concern.

7.4 Telephone / Fax support

Although a detailed technical treatment of your enquiry is more effective by email contact, you can call our service department to talk with our technical support specialists for an immediate answer via the central phone connection (+49 (0) 551 307520) from 8:00 a.m. to 5:00 p.m. (Local Time of Germany) or send it by Fax to our company (+49 (0) 551 30752 20). Our competent service stuff is ready to give you detailed technical advices and information.

7.5 Onsite support

We are always in contact with our customers by our network of agents overseas or directly. Beside all abovementioned contact ways, If you need further supports, our service engineers are ready to meet you at your site immediately and do the equipment service and maintenance.

We are always pleased to stay beside of our customers and keep their trust to us by using years practical and theoretical experiences across design and manufacturing variety range of high quality products and solutions for the research aims.

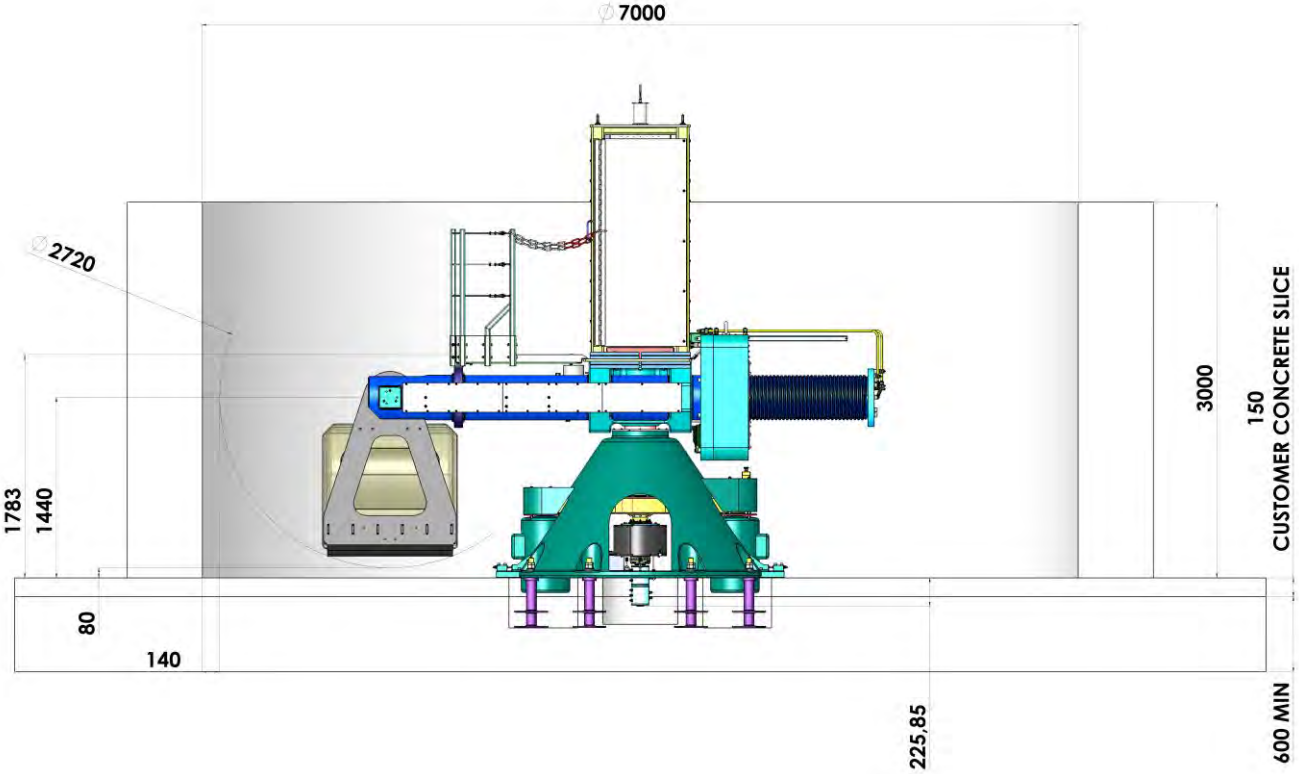
8. Conclusion

We believe that it has the right products and the right people to attract a loyal customer base. But most importantly, it is our business philosophy that will ensure success in long term.

Enlarging an experimental system is not only to change the dimension of the components, but also to change in segments' materials, supplementary utilities, stiffness, methodology, test procedure, accuracy control, data analyzing, and most importantly the know-how.

Few companies could dare to claim that they are able to develop large-scale apparatuses properly, unless on a practically proved background. APS Wille Geotechnik based on its distinguished and successful experiences in manufacturing geotechnical and geological testing systems is competent to develop apparatuses with different sizes depend on the required application, as have done previously. By manufacturing large scale testing system e.g. Large-scale Triaxial test system, Large scale ring shear device, Large scale shear test device, we obtained the experiences of this market. Regarding to the specialties of large scale triaxial apparatuses mention there are only few companies that can develop such devices.

MODEL C67- 4 CIVIL ENGINEERING CENTRIFUGE



INSTALLATION MANUAL

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1 INTRODUCTION

The C67-4 centrifuge is to be installed in a circular chamber, built underground.

The centrifuge chamber walls are made of reinforced concrete, precisely cast in order to present good geometrical tolerance and smooth finish.

For centrifuges installed in underground chamber, a removable ceiling will be provided for centrifuge installation which is hoisted down with a crane or a special gantry.

Figure 1.1 represents a typical layout of the underground chamber arrangement.

It is also of great importance that users and maintenance personnel are given short and easy access to the various parts of the centrifuge system.

Pit doors or access latches which are at the chamber's periphery must warrant reasonable air tightness.

The necessary forced air circulation required for the proper operation of the centrifuge is made from an access port located at the center of the ceiling to an exit port near the base of the centrifuge.

An underground air duct is used for air exhaust.

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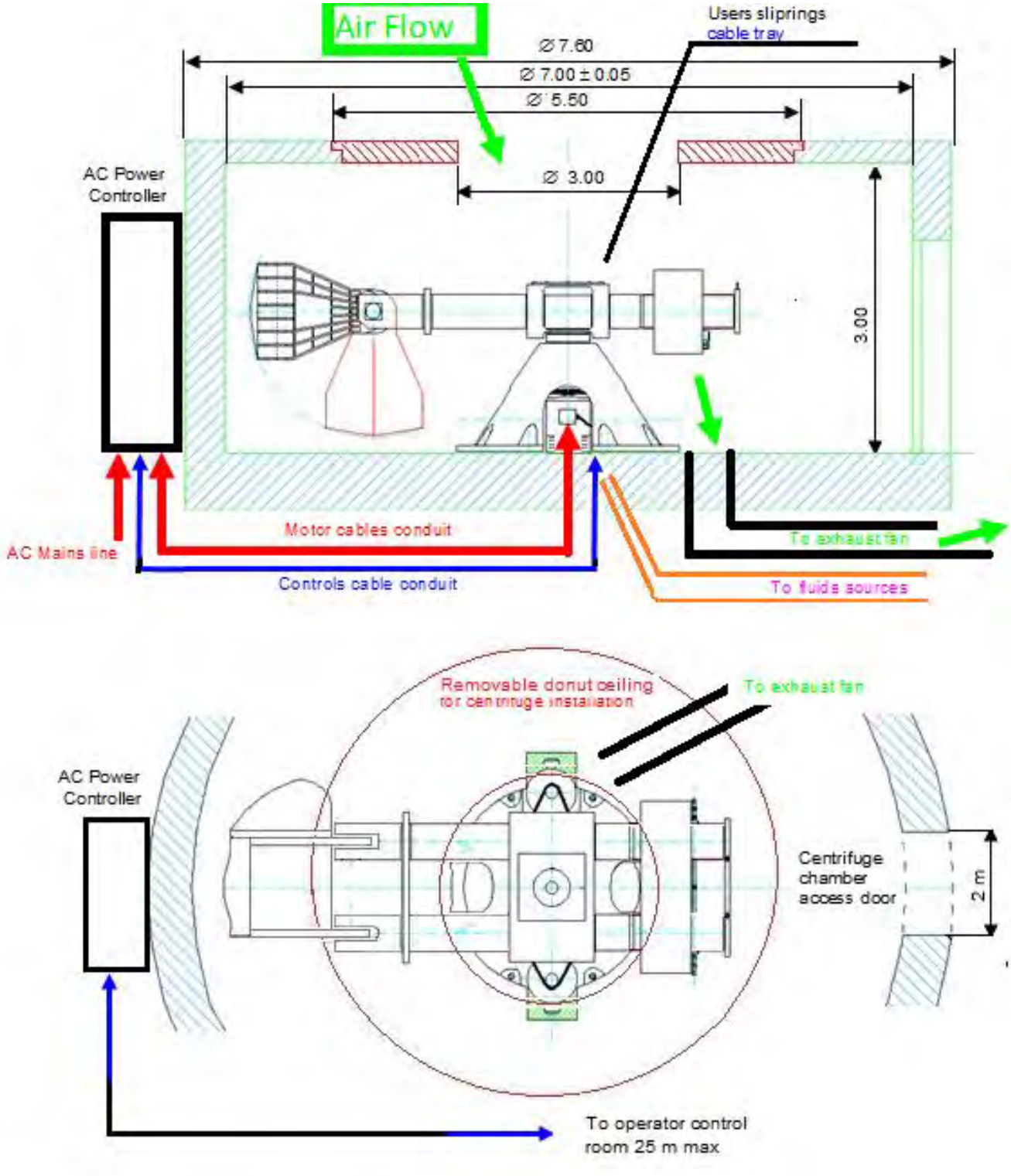
FIGURE 1.1 Centrifuge underground Chamber Elevation & Top View



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2 CENTRIFUGE CHAMBER DESIGN CRITERIA

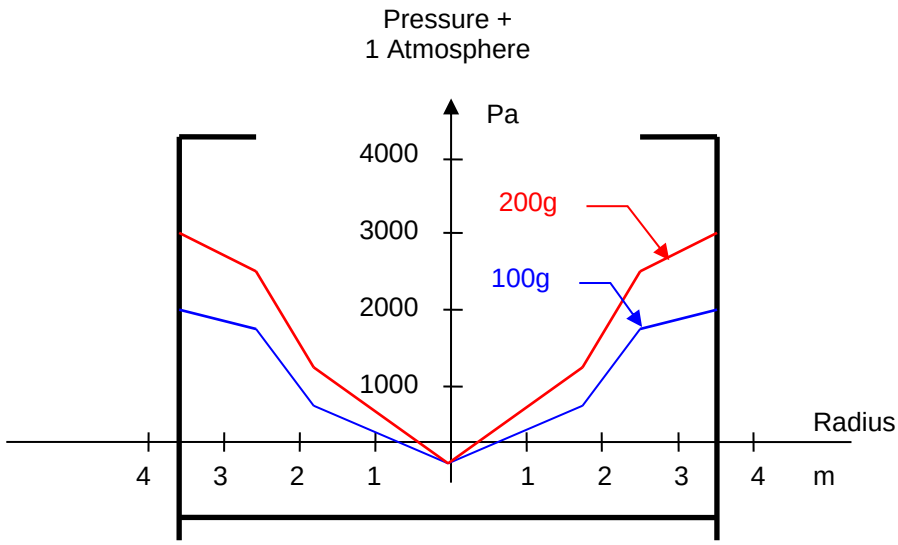
2.1 Aerodynamic Pressure in Centrifuge Chamber

The centrifuge arm in rotation sets the centrifuge chamber's air into motion and thus creates an aerodynamic pressure which develops onto the peripheral wall and the adjacent portion of the ceiling and the floor.

This aerodynamic pressure is for a part continuous (static) and grows as a function of the centrifuge arm rotating speed and is for another part periodic where both frequency and amplitude are a function of the centrifuge rotating speed.

The mean (static) pressure distribution along the wall, the ceiling and the floor of the centrifuge chamber is represented in figure 2.1,1.

FIGURE 2.1.1 **PRESSURE IN THE CENTRIFUGE CHAMBER**



At 130 g, the centrifuge maximum acceleration, the continuous (static) mean pressure along the peripheral wall is 2000 Pa the periodic peak pressure is 4000 Pa.

The periodic pressure wave travels with the centrifuge arm.

The frequency of this periodic "pressure wave" is therefore equal to the centrifuge rotating speed or 3.5 Hz at 130 g's.

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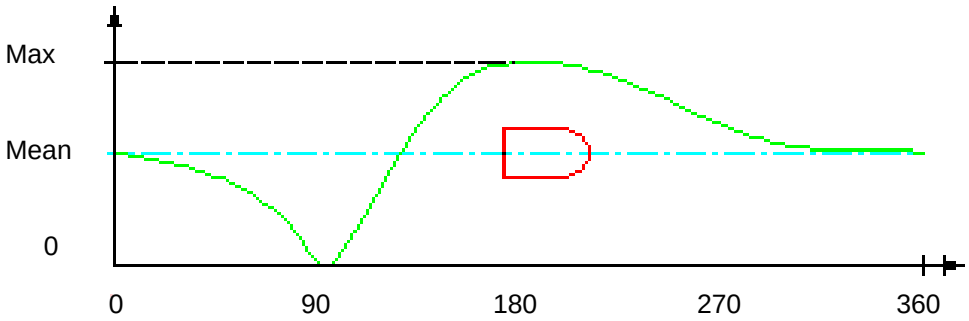
The periodic pressure wave consists of a high-pressure zone traveling in front of the centrifuge arm and a depression trailing behind the boom.

As mentioned before, the peak value of the high pressure is equal to twice the value of the mean pressure while the value of the low pressure is about equal to the atmospheric pressure.

Typical pressure wave is represented in figure 2.1,2

FIGURE 2.1.2 **PRESSURE WAVE IN CENTRIFUGE CHAMBER**

Pressure above 1 atmosphere



Arm angular position in Centrifuge Chamber

The forces developed by this aerodynamic behavior must be contained by the wall and the ceiling of the centrifuge chamber and its access door.

The periodic excitation resulting from the rotating pressure wave makes it mandatory that the centrifuge chamber lowest mechanical resonance frequency is equal or larger than 15 Hz.

Another important consideration is the aerodynamic disturbances which are caused by the geometrical imperfections of the building.

Experimental data and mathematical analysis have been used to precisely dimension the centrifuge chamber in order to optimize the system power consumption.

This has resulted in a relatively small air gap between the chamber wall and the bottom of the platform which must be maintained as constant as practically possible in order to prevent from excessive torque disturbance and aerodynamic buffeting.

The general dimension tolerances are +/- 0.05 m, but for the centrifuge chamber circularity which must be equal or better than +/- 0.02 m.

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2.2 Centrifuge chamber air temperature control

2.2.1 Centrifuge Out Of Operation

The centrifuge chamber must be maintained in every condition at temperature above 0°C in a non-condensing atmosphere.

The AC power cabinet must be maintained at a temperature ranging from 10 to 40°C in strictly non condensing atmosphere.

The operator controller, computer and peripheral equipment will be installed in the laboratory room with good air conditioning.

2.2.2 Centrifuge In Operation

The power dissipated by the air friction along the walls causes the air temperature increase in the centrifuge chamber.

A forced air circulation capable of $6m^3$ per second is required to ensure the air temperature in the centrifuge chamber is maintained to within + 10°C of the outside ambient. The air circulation is to be established as soon as the centrifuge chamber air temperature exceeds 20°C.

Depending on the section, the shape and the length of the air way inside the building, one or two fans might be required as defined by the building designer.

In areas with extreme climatic conditions, it is desirable to have these fans equipped with electrically actuated shutters and proportional rate control as a function of the centrifuge chamber temperature.

Temperature and humidity safety alarms which are part of the optional safety management system will warn operator when excessive temperature is reached.

On the contrary, when this option is not required, the building contractor must provide such alarms and actuates the customer safety line (relay closure = 0K = run).

The room temperature setting should be 20°C.

The room temperature for maximum fan speed should be 25 to 30°C. The maximum room temperature permitted is 50°C.

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2.3 Centrifuge Foundation

The forces developed in foundations can greatly vary depending upon the quality of balancing which can be merely perfect to accidental catastrophic unbalance.

2.3.1 Forces in Foundation

Balanced centrifuge
The foundation must support the mass of the centrifuge equally distributed on each of the anchoring points generating a compression of 170000/8 = 21,25 KN

Acceptable permanent unbalance 50 KN
During such normal operation the forces as described here after can be applied to each of the 4 anchoring points continuously for 24 H period and over.

The dynamic forces developed in the foundation are cyclic sinusoidal by essence.

The frequency of the excitation is equal to the rotating frequency of the centrifuge.

The table below gives the forces developed in one anchor for every 45° boom position.

	1	2	3	4	5	6	7	8
Tension kN					2.1			
Compression kN	44.6	36.3	21.2	3.3		6.2	21.2	39.2
Shear kN	30	23.8	11.8	0.06	3.8	2.1	13	26

Catastrophic unbalance 1500 kN
The dynamic forces developed in the foundation are cyclic pseudo sinusoidal by essence.

The frequency of the excitation is constantly varying until the full stop of the centrifuge.
The table below gives the forces developed in one anchor for every 45° boom position.

	1	2	3	4	5	6	7	8
Tension kN				213	481	481	213	
Compression kN	523.7	523.7	255.5					255.5
Shear kN	357	357	173.5	147.5	331	331	147.5	173.5

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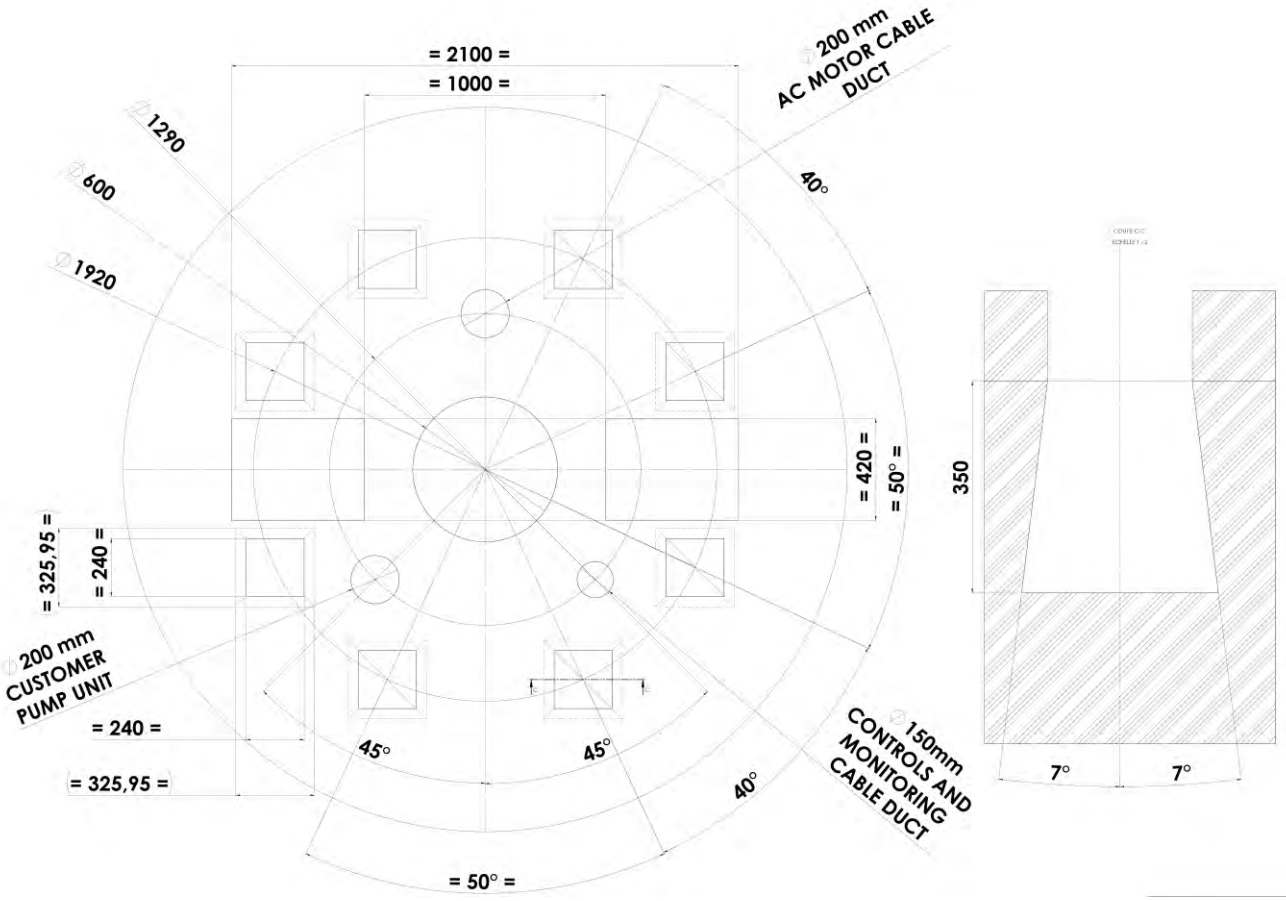
2.3.2 Anchoring Pattern

The anchoring patterns, the location of the electrical conduit and of the air duct are represented in figure 2.3.2.

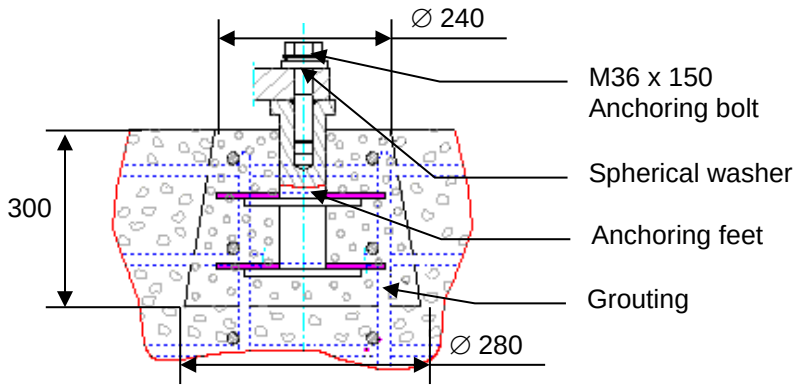
FIGURE 2.3.2 **ANCHORING AND CONDUITS LAYOUT PATTERN**



Note: It is the building designer sole responsibility to warrant the performance of the anchoring system.

FIGURE 2.3.2 **ANCHORING ASSEMBLY**

Dimensions are in mm



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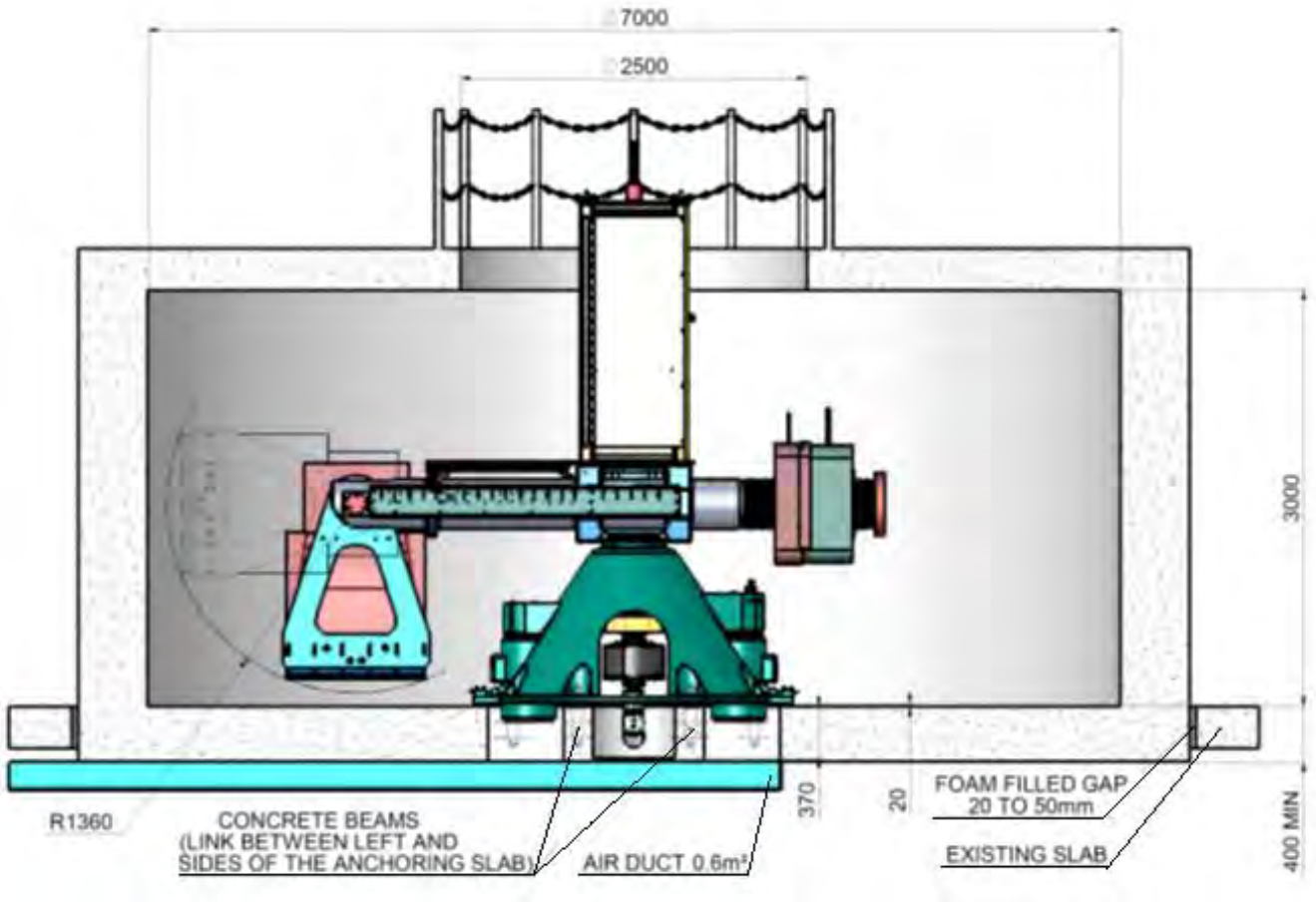
Note: We recommend use of CLAVEX LANCO 701 from Lafarge, or equivalent grouting.
Use approximately of 50kg per anchoring point.

FIGURE 2.3.3 **CENTRIFUGE GENERAL LAYOUT**



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3 INSTALLATION

3.1 Introduction

The C67-4 centrifuge is delivered partially assembled, ready for installation.

The mechanical assembly and the electrical controller are packed separately.

The packing is sealed for sea transportation (if necessary) and must therefore be opened just prior to installation.

3.2 Tools Required

The tools required for the physical installation of the centrifuge are :

- crane or fork lift capable of 20,000 kg,
- strut and nylon straps,
- steel tubes or steel bars,
- heavy duty roller castors,
- 4 hydraulic jacks 5,000 kg each,
- set of metric mechanical tools and wrenches.

3.3 Mechanical Assembly Installation

The pit of the centrifuge has been prepared in accordance with the recommendations in paragraph 1.

When available, a crane is used to hoist the mechanical assembly of the box, but use of steel tubes and heavy duty castors is possible if the box is already set at floor level.

Transportation to the installation point is possible by using a fork lift, rollers and steel bars or a crane.

Use of crane is mandatory for pit installation when leveled access to the centrifuge room is impossible.

Once in place, anchoring parts assembled, the machine is leveled using leveling jacks and then, anchoring holes are grouted using cement refill as shown in figure 2.3.1.

The boom transportation locking screws are then removed.

The centrifuge is ready for operation after the interconnecting cables are plugged and the mains supply connected.

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3.4 Dimensions and weights

The system overall dimensions, the major component mass and dimensions
are described in table 3.4 and figure 3.4.

Conduits and channels are to be build by customer in accordance with system layout and dimensions indicated hereafter or in figure 3.4,2.

TABLE 3.4,1 **DIMENSIONS AND WEIGHTS (Shipping)**

PARTS	Dimensions m			Weight per unit
	Length	Width	Height	kg
Centrifuge Assembly	4.3	2.1	2.0	20,000
Power Cabinet	1.8	0.6	2.6	1,500

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3.5 Electrical Mains Supply

The centrifuge power plant consists of two AC induction motors driven by an AC to AC converter operating from a three phase AC mains network in either 50 or 60 Hz option to defined at time of procurement.

3.5.1 Centrifuge AC drive

The centrifuge AC motor which drives the centrifuge arm is powered through a solid-state thyristor controller which controls both the motor current and the rotating speed.

This system eliminates virtually all and every power transient during the start or the stop of the centrifuge.

Normal precaution as required for the installation of thyristor controlled system are described hereafter and must be applied during the construction of the electrical power line.

It is essential that particular attention is given to the questionnaire in 3.6.1.3 for which answers must be transmitted to ACTIDYN SYSTEMES not later than 3 months after the initial contract date.

3.5.1.1 Harmonics

It is a physical fact, that converters generate current harmonics and absorb a variable amount of reactive power.

When connecting converters to the public low voltage supply network, voltage harmonics may cause disturbances e.g. in centralized tele-control systems or other electrical consumers, or may overload cos. φ capacitor banks not equipped with series filter reactors.

The degree of disturbances, caused by harmonics, depends not only on the supply network, but also on the relative converter power.

If high power converters are connected to low voltage distribution networks with low fault levels, the resulting voltage harmonic content could be claimed by the power supply authority to exceed the permitted values, stated in the international standards.

According to regulations as SEV 36001 and EN 50 006, the following portions per consumer of harmonic voltage distortion are permitted at the point of common coupling.

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Odd Harmonics	Max permitted harmonics	Recommended maximum harmonic distortion in the low voltage supply
3	0.85 %	4.50 %
5	0.65 %	5.0 %
7	0.60 %	4.5 %
11	0.40 %	3.0 %
13	0.30 %	2.50 %
17 / 19	0.25 %	1.25 / 1.15 %
21 / 39	0.25 %	< 1.0 %

Regarding connection to the mains, we distinguish two cases:

The point of common coupling to the public supply network is at the low voltage side (transformer owned by electricity board).

Normally, in this case, the limits of the individual harmonics are not exceeded, if the effective power of the 6-pulses converters do not exceed 10 % of the transformer power and the line short-circuit power at the transformer primary side is at least 80 MVA.

The point of common coupling to the public supply network is at the medium/high voltage side (transformer owned by the user).

Normally in this case, the limits of the individual harmonics are not exceeded, if the effective power of the 6-pulses converters do not exceed 0.4 % of the line short circuit power at the connection point.

In other conditions, the harmonic currents must be reduced in the supply network by means of tuned harmonic filters.

General statements about filters cannot be given, because of the different network impedances, which could form a parallel resonance circuit with the filter impedance.

The individual units must be exactly matched to the harmonic frequency and rated for the maximum harmonic currents.

The difficulty with fine tuning and long-term stability of the components, which influence the filter effect cannot be explained in detail here.

For reducing the resonance with the supply line impedance to a minimum, series reactors are required for existing or future capacitors banks.

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In general, these reactors are matched with the capacitors for 214 to 225 Hz harmonics.

Detailed information about the network characteristics are important for an analysis of the complete installation.

The connection of capacitor banks without series reactors to supply networks with converter loads is only permitted, if the capacitor bank power and the converter power do not exceed 6 % of the transformer power, or 0.4 % of the short-circuit power at the connection point.

As already mentioned, information of the supply line data is important for analyzing the complete distribution network (see attached questionnaire).

Summarizing:

For proper connection of 6-pulse converters to public supply networks the following rules apply:

▪ Harmonics to avoid resonance with the supply line impedance, series reactors must be provided for all capacitor banks (de-tuned filter circuits 214... 225 Hz).

▪ Capacitor banks improve the cos. φ of the supply system, and when fitted with series reactors they reduce the total harmonic distortion (distortion factor) created when converters with controlled input rectifier are used.
They have a significant effect on the 5th harmonic.

▪ if the permitted harmonic voltage levels are exceeded, then for converters with uncontrolled input rectifiers a tuned filter circuit for the 5th and possibly the 7th harmonics will be required and for converters with controlled input rectifier tuned filters for the 5th, 7th, 11th and 13th harmonics are required.
Reduction of the permitted relative converter power is necessary to fulfill the recommendations if the following conditions prevail :

▪ long feeder cables between generator and point of common coupling,

▪ high current ripple (e.g. on DC-drives with extremely low armature inductance)

▪ low load at the supply network.
An increase of the permitted relative converter power is possible if the following conditions prevail:

▪ several converters with controlled input rectifier (factor 2 at more than 10),

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▪ capacitive load at the supply network.

3.5.1.2 Voltage Dips

According to VDE 160, part 2, voltage dips during commutation of a converter must be limited to permitted values, to avoid disturbances on other equipment.

This is generally reached by incorporating line reactors with a 2 to 4 % voltage drop.

The drive manufacturer has specified a series of line reactors matched to the standard converter line.

The inductivity of these reactors for 2 % voltage drop has been proved in practice.

If higher impedance should be required, 2 to 4 reactors in series will be provided.

3.5.2 Questionnaire

Loads at distribution point (AC bus)

Operating power of all connected loads including converter driver :	_____	kW
Inductive loads (AC Motors)	_____	kW
Capacitive loads (lighting)	_____	kW
Ohmic loads (heating)	_____	kW

Are further converters/inverters connected ?

Indicate connection point		
Type	_____	
Manufacturer	_____	
Power	_____	kW
With harmonic filter	no_____ yes_____	
f resonance	_____	Hz

Capacitor bank for power-factor compensation

Indicate connection point		
Total power	_____	kVA
Recommended cos. φ	_____	
Power per stage	_____	kVA
Series reactors	no_____ yes_____	
Resonance frequency	_____	Hz
Automatic stage control	no_____ yes_____	
Remarks :	_____	

Centralized telecontrol system

Indicate connection points of the receivers		
Has to be considered	no_____ yes_____	
Control frequency	_____	Hz
Min. response level	_____	

Recommendations

▪ Which national or international standards regarding harmonic voltage levels must be fulfilled? _____

▪ Maximum individual harmonic voltage levels complying

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with SEV, IEC _____
odd harm. 1 % _____
others _____
at low voltage side (380 - 660 V) _____
at medium voltage supply (2-16 kV) _____
at high voltage side (> 20 kV) _____

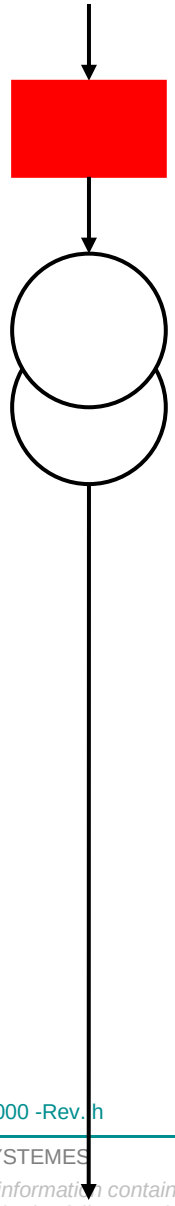
▪ Matching the maximum values according to Table
others _____
at low voltage supply side _____
at medium voltage supply side _____

▪ Matching the maximum harmonic voltage content (distortion factor)

at low voltage side	< 5 %	_____
	< 10 %	_____
	others	_____
at medium voltage supply	1.6 %	_____
	< 5 %	_____
	others	_____

3.5.2.1 Supply data for harmonic filter specification

▪. Medium or high voltage supply



Line data

Line inductance	L	_____	µH
Line impedance	Z	_____	mΩ
Line reactance	X	_____	mΩ
Line resistance	R	_____	mΩ

or Transformer data

Secondary Power		_____	MVA
Output Voltage		_____	kV
Short circuit voltage	U_{cc} _	_____	%

and feeder data

Operating frequency		50_____ 60_____	Hz

▪ Point of common coupling medium voltage line
(Transformer primary)

medium voltage	Vm	_____	kV
fault level	S"k	_____	MVA
or short circuit current	I"cc	_____	kA
Line transformer			
Nominal power	P	_____	kVA
No load voltage	U	_____	V
Short circuit voltage	U_{cc}	_____	%
or short circuit current	I'cc	_____	kA
or short circuit power	S'cc	_____	MVA

▪ Point of common coupling low voltage supply
(transformer secondary)

Low voltage	V_s	_____660_____	V

▪ Cable between line transformer - drive branching point

Cable cross section	S	_____	mm^2
Length	L	_____	m
Number of parallel conductors per phase		_____	
Type :		bus bar ____cable ____	

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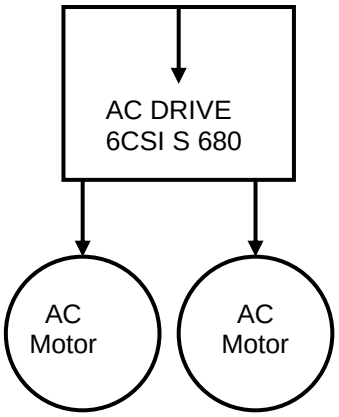
air conductors _____
copper _____ alu _____



▪ Drive branching point Limit of ACTIDYN SYSTEMES supply

Frequency converter drive		
Drive reference	UMV 3301 120T	
Rated power (motor)	2 × 45	kW
Rated voltage	380	V
Rated current	2 × 90	A
Frequency	50 or 60	Hz
Pole No	4	
Speed	1300	Rpm
Cos. φ	0.8	
Continuous duty	60	kW
Overload duty	90	kW

3.5.3 Auxiliary System

Depending on the options selected by the customer, the following auxiliary power supplies might be added to the AC drive :

- Safety Management System,
- Hydraulic Power Supply for automatic balancing,
- Fan and fan controller,
- Refrigerating unit.

Each of these optional accessories is fed through the AC motor cabinet.

In general, their individual power consumption does not exceed 10 kilowatts and is a secondary consideration in terms of installed power

4 CUSTOMER DUTIES AND RESPONSIBILITIES

In general, unless otherwise specifically agreed, the customer or the building contractor is responsible for the building design and construction, the building foundation performances and commissioning.

The customer or the building contractor is also responsible for providing electrical mains supply and its connection to ACTIDYN SYSTEMES power cabinet at the voltage frequency and power specified during the centrifuge procurement negotiation phase.

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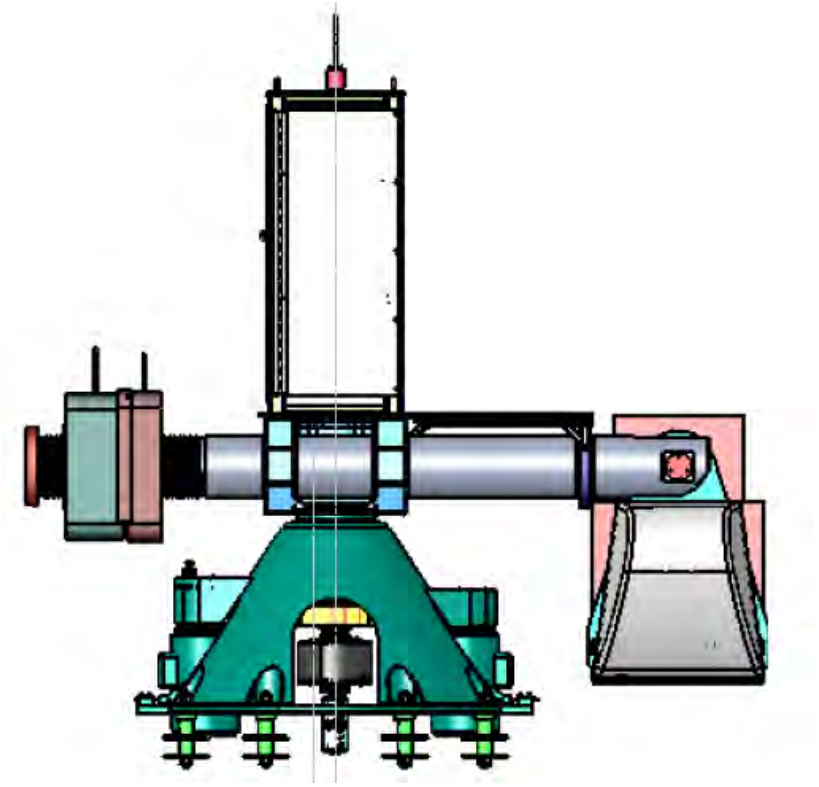
CIVIL ENGINEERING CENTRIFUGE

MODEL C67- 4
List of Equipment Required for Installation and Maintenance



ATTACHMENT 1

ACTIDYN SYSTEMES | Site Web: www.actidyn.com | E-Mail : contact@actidyn.com
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MECHANICS TOOLS

The following tools are specifically required for installation and later on for maintenance.

(1) Mechanic's usual tool box
(1) Set of fork wrenches for screws H M3 to M36
(1) Set of tubular wrenches for screws H M3 to M36
(1) Set of Allen wrenches for screws CHc M3 to M36
(1) Set of torque wrenches capacity 10 Nm to 1000 Nm
(1) Set of tips for screws CHC M3 to M36 and screws H M3 to M36
(1) Magnetic base and indicator capacity ± 3 mm
(1) Grease gun, Grease cleaner (trichloroethylene) Dusters
(4) Hydraulic jacks toe type, 5000 kg capacity
(1) Hand drill capacity up to 13 mm diameter
(1) Set of drills 1 to 13 mm diameter
(1) Spirit level
(1) Load of 550 kg capacity
(1) Load of 1 200 kg capacity
(10) Loads of 10 kg capacity
(1) Crane jib
(4) Chain lift 5000 kg capacity

MECHANICS TOOL BOX

Minimum list of equipment
Screwdrivers
Jewellers, 3 slots and Philips 0.001
Slot 64 x 3.2 mm blade
Slot 102 x 3.2 mm blade
Slot 102 x 4.8 mm blade
Slot 152 x 4.8 mm blade
Slot 152 x 6.4 mm blade
Slot, main tester 150/250 V_{ac}
Philips, 75 mm blade x No 1 point
Philips, 102 mm blade x n° 2 point
Pozidriv, 75 mm blade x N° 1 point
Pozidriv, 102 mm blade x N° 2 point

Cutting/Drilling
Light duty Lindstrom cutters
Medium duty Lindstrom cutters
Wire stripper/cutters
Junior hacksaw
Spare junior hacksaw blades, pack of 10
Cone cut 6 to 20 mm
'T' handle reamer

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MECHANICS TOOL BOX (Continued)

Grippers/Spanners/Wrenches
Snipe nose pliers 5'' long
Snipe nose combination pliers
Combination pliers 6'' long
Adjustable spanner 6'' long 20 mm opening
Allen keys set of 7. 1.5mm to 6 mm
Spanners set of 6. 4mm to 11mm

Threads
Hand tap and die plate - M3 thread
Hand tap and die plate - M4 thread
Hand tap and die plate - M5 thread
Hand tap and die plate - M6 thread

Measuring/Marking
6'' steel metric/imperial divisions
Scriber double ended
Automatic centre punch
Feeler gauge dual metric/imperial

Soldering/Wiring
Portasol professional, portable gas soldering iron kit
Tip tinier/cleaner
Solder dispenser
De-soldering gun

ELECTRICIAN TOOLS

The following tools are specifically required for installation and later on for maintenance.

(1) Electrician tool case
(1) Electronic engineer tool case
(1) Dual channel FFT spectrum analyser, frequency range 0 to 20 kHz
(1) Laboratory adjustable power supply 0 to 1 A, 0 to 24 V
(1) Portable oscilloscope 2 channels 50 MHz or more.
(1) Multimeter

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Appendix D

Owner ITS Communications Infrastructure Guidelines

27 00 00 Communications

1. **Introduction**

1.1. The purpose of this document is to provide a guideline for the standardization of the telecommunications cabling (copper and fibre) and wireless network installations within the Queen's University campus.

The intention of this document is to provide the comprehensive source of information and guidance for those involved with cabling installations within the Queen's University campus.

These guidelines will be adhered to by Queen's staff and external contractors for telecommunications related work at Queen's University. This applies to all new and renovated space as well as moves, adds and changes in the campus cable plant.

The original guidelines were instituted December 1, 2009 and updated from time to time.

1.2. Applied Codes and Standards

This document embraces the following Telecommunication codes and standards:

- TIA/EIA-568-B.1, B.2, B.3 Cabling Standards
- TIA/EIA-569 (CSA-T530) Pathways and Spaces
- TIA/EIA-606 (CSA-T528) Infrastructure
- TIA/EIA-607 (CSA-T527) Performance Standard
- Ontario Hydro – Electrical Safety Code

1.3. Approved Designers

Division 27 does not have a defined code which must be met and inspected. Communications infrastructure and system designers must take into account many issues that are not mandated by electrical code.

Queen's requires that system designers have BICSI RCDD designation and that design for communications infrastructure & pathways follow BICSI standards and best practices. Where this document diverges from those standards and practices, the provisions of this document will take precedence. Where this document is silent, BICSI standards will be adhered to.

1.4. Approved Installers

The installation of communications cabling is a specialized function which shall only be performed by companies and workgroups who have established credentials.

The minimum training requirement for communication cable installers:

Belden IBDN 726	Copper Installation
Belden IBDN 727	IBDN System Installation & Testing - Copper
One of the following for fibre installation	
Belden IBDN 746	Fibre installation
Corning CFI	Corning Fibre Installation

Some projects will require system certification and manufacturer warranty. To meet this requirement, installation companies must be Certified System Vendors (CSV) for the Belden Category 6 solution.

Some projects will require the cable contractor to be a member in good standing with an applicable trade union.

1.5. Scope

These guidelines are intended to provide the cabling specification for:

- Newly constructed buildings
- Buildings undergoing major renovations
- New long-term leased occupancy facilities
- MAC's (moves adds and changes) to existing facilities

1.6. Installation Policy

1.6.1. Queen's ITS is the authority for communications cable plant at Queen's University

1.6.2. Design of communications infrastructure shall be performed by approved designers (1.3)

1.6.3. Designs of communications infrastructure will be approved by Queen's ITS

1.6.4. Installation of communications cable plant will be performed by approved installers (1.4)

1.6.5. Installers will provide the required documentation as a contract deliverable (3.3)

1.6.6. Installers will test cable plant to the required performance level and rectify any failures as a contract deliverable (6)

2. **Spaces**

2.1. Telecommunication Rooms (TR)

TR is an enclosed space for housing telecommunications equipment, cable terminations, and cross-connects. The room is the cross-connect between the backbone cable and horizontal cabling. There will be one TR per floor but may be more

depending on the size and layout of a floor. The TRs should be centrally located to accommodate cable routing to each location served by that TR. Cabling from the TR is distributed to each work space served by that TR using a variety of approved pathways and infrastructure. The cable distance between the TR and any workspace must be no more than 90 meters. The equipment in the TR may include cabling cross connects and patch panels, punch down blocks, fiber patching equipment, network devices etc.

- TR's must be dedicated to the exclusive use of telecommunications. TR's will not be shared space with electrical, mechanical, security and access control or janitorial storage of any kind.
- TR's will have a unique key lock system under the control of ITS.
- TR's size will be a minimum of 3.5 X 2.5 m unless otherwise approved.
- Floors in TR's shall be treated concrete or tile. Carpeted floors are unacceptable.
- The TR will have an open ceiling i.e. no suspended or false ceilings
- Each TR will have a minimum of four 100mm sleeved core holes between floors. Core holes will be properly fire-stopped.
- At least one wall of a TR will be covered in ¾" fire rated plywood from floor to ceiling. If fire rated plywood is not available then the plywood will be painted with at least two coats of fire resistant paint.
- TR's shall be equipped with a grounding bus bar that is tied back to the building's grounding system.
- TR's will be equipped with a rack for network, fibre patch panels and UPS. The rack will be secured to the wall or floor and shall have 80 cm of open space on all sides for access.
- The TR door should open out where permitted by code.
- TR's must have adequate ventilation or conditioned air to maintain a room temperature from 21 to 24 C and relative humidity of 45%.
- TR's must have a minimum light level of 50 foot candles
- TR's shall have two separate 15 amp 110 volt electrical outlets and one 20 amp 110 volt emergency power electrical outlet (where available) to provide power to the equipment rack.
- TR's in any new construction shall adhere to specifications in CSA-T530, Standards for Telecommunications Pathways and Spaces.

2.2. Equipment Room (ER)

A centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a TR because of its nature or complexity. The physical and environmental requirements are the same as specified in section 2.1.1 for TR.

2.3. Entrance Facilities (EF)

The Entrance Facility (EF) is the main telecommunications building service entrance. It is the area where the demarcation between the inter-building and intra-building

cabling systems is effected. This securable room is to be dedicated to this purpose with no other building services sharing the space.

The EF will be connected to the campus communications network with a minimum of 4 100mm PVC ducts to the nearest communications manhole (MH) as specified by ITS. If the EF is not serving as the Main Telecommunications Room (MTR) for the building then an equal number of 4" conduits must be installed to connect the EF and the MTR.

One wall of the EF will be covered in ¾" fire rated plywood (good one side) from floor to ceiling. If fire rated plywood is not available then the plywood will be painted with at least two coats of fire resistant paint as specified by ITS.

3. **Pathways**

3.1. Horizontal

Horizontal pathways are the routes taken for the installation of cable from the TR's to the WA (work area). The pathways may include cable tray, conduit, under floor duct, and J hooks in ceiling spaces.

3.2. Vertical

Vertical pathways consist of conduit runs or risers going between floors, and are used to connect TR's and ER's. There will be a minimum of 4 x 100mm conduits or sleeves between TR's or ER's.

3.3. J-Hooks

J-hooks are used to support telecommunications cabling within ceiling spaces. They should be spaced a maximum of 1 meter apart. Cable pathways should follow a prescribed route going over the top of heating ducts and other conduit if possible. Lines shall not be lain across ceiling tiles. Mechanical ducts and pipes shall not be used as support. J-hooks may be stacked to handle up to 100 lines; trays must be used for over 100 lines.

3.4. Cable Tray

Cable tray used to support cable in ceiling spaces and under access floors will be ventilated or basket type tray. Cable tray hung from a ceiling will have a minimum 4 inches of clearance above from obstructions for installation of cable.

3.5. Conduit

TOs will have a minimum 19mm conduit installed directly to the Telecommunications room (TR) or to cable tray in the ceiling space. Where J hooks will be used to run cable in suspended ceiling the conduit will stub above the ceiling and be finished with a bushing. Where there is a bulkhead, conduit will stub into the ceiling space outside the bulkhead.

When conduit is used, there will be no more than two 90 degree bends between pull boxes. For runs more than 30m, pull boxes must be installed so that no segment between pull boxes exceeds 30m. Pull boxes will not be used as a 90 degree bend. The use of "LB" type conduit fittings is not allowed. Empty conduit must have a pull string with 90.7kg (200 lbs) minimum test rating installed. The conduit fill will not exceed CSA standards for all sizes (see 6.2 Conduit Fill Guidelines).

3.6. Floor Boxes

If a floor box is required to service a space, the type and size used must be approved by Queens ITS.

3.7. Outlet Boxes

The outlet box will be mounted at the same height as the convenience electrical outlet, 45mm AFF unless otherwise specified.

There will be no more than 4 cables installed per single gang box. For 5 or more cables, a double gang box must be used. A 4x4 box may be used with the appropriate single- or double-gang plaster ring.

4. **Cable System Design Intent**

The campus communications cable plant is designed as a "structured cabling system" (SCS). An SCS attempts to wire a building for information needs without knowing specifically what equipment will be utilized. An SCS is geared for long term stability and flexibility and is based on the idea of wiring the building once. The structured cabling system approach allows the wire and outlets to remain unchanged while the connections and services vary.

Queen's current building communications system is built on Belden IBDN Category 6 Copper using 2400 series horizontal cable and GigaBIX & GigaFlex termination hardware. This system has guaranteed bandwidth of 250 MHz and meets or exceeds performance measures for category 6 channel specifications**.**

4.1. Planning Process

ITS is the control entity for campus telecommunication facilities. ITS will review drawings and specifications on construction and renovation projects for compliance with University telecommunications/network infrastructure standards and user specifications.

Queens ITS will review and approve all additions or alterations to the outside plant distribution system.

5. **Horizontal Cabling**

Horizontal cabling is the portion of the telecommunications cabling system that extends from the work area telecommunications outlet (TO) to the horizontal cross-connect in TR.

The horizontal cabling includes the horizontal cable, the TO, and the horizontal cross-connect.

5.1. Copper Cable

Copper horizontal cable shall be plenum-rated FT6 category 6 4-pair UTP as set out in Section 6.1.1. The cables will be terminated in RJ45 jacks with the T568A pinout configuration.

The maximum horizontal cable distance from the TR to the TO shall be 90 metres.

Any special service-specific requirement (e.g. pair crossover) shall be done outside of the telecommunication outlet in the cross-connect or the station patch cord.

5.2. Telecommunications Outlet

The standard TO will consist of two copper cables terminated in RJ45 jacks. The jacks will be mounted in a 4-port faceplate. See 10.3 for specific part numbers.

5.3. Cross-Connect

Connections between copper horizontal and backbone cables and between network equipment and horizontal cables will be done with suitable cross-connect wire.

Voice grade services will be connected with category 3 rated cross-connect cable.

Data services will be connected with category 6 rated cross-connect cable.

5.4. Data Pigtails

For network equipment installed in a TO, data pigtails will be installed to extend the ports to the MDF to allow connection to horizontal cables.

A data pigtail is a category 6 patch cord with factory-terminated RJ45 on one end to plug into equipment and the other end terminated on GigaBIX hardware mounted in the MDF.

Data pigtails are installed in bundles of 24 unless otherwise specified and are of a length suitable for dressing within the rack.

6. Backbone Cabling

Backbone cable, regardless of media type, is defined as the cable that connects telecommunications rooms (TR's), entrance facilities (EF), and/or equipment rooms (ER's) within or between buildings. This definition includes cable formally known as riser and outside plant cable. The Backbone cable type and size will be specified by ITS.

Typical backbone cable will consist of:

- Appropriately sized category 3 multipair copper for PBX telephone & other analogue circuits. Minimum size: for in-building distribution, 50 pair; for inter-building distribution, 100 pair
- Appropriately sized singlemode OS2 fibre for data network distribution. Minimum size: for in-building, 12 strand; for inter-building, 24 strand
- Six category 6 cables for in-building distribution

7. Testing

7.1. Copper Cables

Testing of all cables is to be completed in accordance with the manufacturer's certification requirements and the applicable standards.

Testing of the horizontal 4 pair cables will involve a complete "Channel Test" using a certified Category 6 tester. If any of the cables fail the "Channel Test", then the failure will be assessed and the appropriate action taken to ensure a pass. This may include re-terminating and/or replacing termination hardware or the entire cable run.

Data pigtails must also be tested using the primary "Wire Mapping" to ensure correct end-to-end continuity, opens, shorts, and pair polarity. Any deficiencies found during testing must be corrected immediately and re-tested.

Multipair copper riser and backbone cables must be tested using the primary "Wire Mapping" to ensure correct end-to-end continuity, opens, shorts, and pair polarity. Any deficiencies found during testing must be corrected immediately and re-tested.

A report of test results will be provided by the installer.

7.2. Fibre Cables

Design will include a loss budget calculation which will be included in the tender specification.

Primary test of power loss with a light source and power meter will be performed to be sure the maximum loss margin is not exceeded.

Test each strand of fibre with a Power Meter / Light Source combination operating at wavelengths of 850 nm and 1300 nm for multimode fibres and 1310 nm and 1550 nm for single mode fibres. Perform these tests in both directions. The tests are to be completed after cable installation, splicing and connectors are installed.

The total Link loss including fibre, connectors and splices for will not exceed 4dB for SM fibre and 8dB for MM fibre.

Secondary test with OTDR will be performed to document the fibre run including any connector loss and losses due to other issues (macrobend, reflectance). This test will be performed at wavelengths of 850 nm and 1300 nm for multimode fibres and 1310 nm and 1550 nm for single mode fibres. Perform these tests in both directions.

Device	Maximum
OS2 LC UPC connector	-55 dB reflectance
OM3/4 LC UPC connector	-30 dB reflectance

A report of test results will be provided by the installer.

7.3. Labelling Requirements

The labeling scheme will be based on the CAN/CSA-T529-95, T528-93, EIA/TIA-606 and EIA/TIA-568-A standards with modifications to fit Queen's requirement. Queen's ITS will specify the labeling to be used on jacks, Bix connectors and pigtails as well as fibre terminated in patch panels.

If an outlet has multiple jacks, the labeling must be affixed to represent the exact jack without confusion to which jack corresponds to the labels. In the TR the labeling will be reflected as it is at the outlet.

7.4. Records

The communications installer will provide As-Built drawings for the horizontal cabling upon completion of the installation in AutoCAD Version (current version) or equivalent format, and hard copy. The drawings will include the following:

- outlet location with appropriate outlet labeling
- primary cable tray and conduit infrastructure
- wireless access points with MAC address of the device clearly labelled

The communications installer will submit documentation of cross-connects in a spreadsheet showing the following for each connection:

- jack label & room number
- label of data pigtail or backbone cable name and pair

The communications installer will submit a test report in soft copy to document the results of all tests performed. The report should indicate for each cable the values of all measured parameters, when it was tested successfully, the location, cable type, cable number and tester make and model. The test report must be submitted at the conclusion of the project.

8. **Communications Ducts**

All new building construction planning must include a cable path into the existing telecommunications outside plant distribution system. The Queens standard is four (4) 100mm communication ducts installed from the building EF to the nearest manhole MH. There may be a requirement for additional ducts or there may be more than one EF in a building complex, in which case, there will be a minimum of four 100mm ducts installed from each EF to the nearest MH. The telecommunications outside plant distribution system will be used exclusively for data, voice, low voltage control/alarms, and video cables.

9. **Wireless Access Point (WAP)**

Queen's ITS provides a centrally managed wireless network using technology by Aruba Networks.

Design & device layout will take into account client device transmit power levels and programmed occupancy of the space. Designers will refer to Aruba Validated Reference Design documents especially for dense deployment areas like classrooms, and voice services.

The standard WAP is the AP300/310 series with internal dual band antennas supporting IEEE 802.11b/g, a, n, & ac wave 2. Service is to be available in both 2.4 gig and 5 gig bands to a minimum level of -65 dBm throughout useable space. This includes mechanical/electrical, elevator, stairwell, storage, kitchen & washroom facilities. Minimum SNR is to be 25.

Power for the WAP is to be provided by POE+ 802.3at.

Each WAP location will have a single cable terminated in a box. For t-bar ceiling, a doublegang box or 4x4 box with double or single gang ring will be installed flush with the ceiling and supported by box hanger or similar device. In the case of drywall ceiling, the box will be flush mounted and fed by conduit to an access hatch or other accessible ceiling. Installation and termination of the cable is to follow the horizontal cable standards.

9.1. Current Queen's University wireless policy

The wireless airspace at Queens will be solely administered by ITS to ensure the quality, integrity, reliability, and security of the Queens University wireless network. Queens ITS is the authority for approval and installation of all devices using wireless connectivity. The unmanaged use of devices could potentially interfere with Queens

University wireless network and in extreme cases render wireless inoperable. In order to assure the highest level of service to the users of the wireless network, the university requests cooperation from all members of the campus community in minimizing the potential for interference. The university requests that use of all other devices in the 2.54 and 5 GHz bands be discontinued in university-owned buildings. In cases where the device is being used for a specific teaching or research application, support staff will work with faculty to determine whether there are circumstances under which use of the device may still be accommodated without causing interference to wireless network users. ITS will work with departments to accommodate special needs, where technically feasible.

10. **Copper Cable and Termination Hardware**

Queen's current standard for horizontal cable is based on Belden IBDN Category 6 system

10.1. Horizontal Cable

All horizontal cable runs will consist of Category 6 PVC 4 pair UTP, Belden IBDN GigaFlex 2400 series cable

Belden 2413 - Plenum White CMP

Horizontal cable runs are not to exceed 90 metres

10.2. Riser Cable

Riser cables will be 24 gauge, Category 3, twisted solid annealed copper conductors, individually insulated and color-coded in accordance with telephone industry standards.

Belden ARMM/ATMM Category 3 Armored Cable, or equivalent

10.3. Termination Hardware

The termination hardware used at Queens is Belden IBDN products which are category 6 GigaBix and GigaFlex devices. These include but are not limited to:

- Workstation Outlet (jack) PS6+Module (Almond) AX101064
- Modular furniture Outlet (jack) PS6+Module (Black) AX101066
- Wall Plate – 4 Port (Almond) AX101436
- Modular Furniture Adapter 3 Port (Black) A0407074
- Mount AX101472
- Connector AX101447
- Wire Guard AX101486
- Designation Strip AX101483
- Management Ring AX101478
- WAP t-bar support Caddy Bar 512A T-bar box hanger 24"

11. **Conduit Fill Guidelines**

Queen's expects communications infrastructure designers to follow BICSI best practices and the Ontario Electrical Code.

For horizontal cable conduit fill, see also Belden conduit fill guidelines.

The following chart provides guidelines used by ANSI/EIA/TIA 569 on conduit capacities for cat. 6 cable servicing voice and data systems (OD 0.230 in). The minimum size conduit used will be 19mm.

- 19 mm (3/4 inch) 5 cables
- 25 mm (1 inch) 8 cables
- 32 mm 1 ¼ inch) 14 cables
- 38 mm (1 ½ inch) 18 cables
- 51 mm (2 inch) 26 cables

12. **Fibre Cable and Termination Hardware**

12.1. Inside Riser Fibre

OM3 (current) multimode 50/125 um breakout riser cable - Corning xxxT88-31180-29 or equivalent.

OS2 single mode enhanced, breakout riser - Corning xxxE81-33131-24 or equivalent

OM1 (legacy) multimode 62.5/125 um breakout riser cable

12.2. Outside Distribution Fibre

Cable	Fibre Count	Corning Part #	Description
OM3	12	012TUF-T4180DA1	12 multimode OM3 50/125 loose tube, gel-free, interlocked armor distribution, indoor/outdoor
OM3	24	024TUF-T4180DA1	12 multimode OM3 50/125 loose tube, gel-free, interlocked armor distribution, indoor/outdoor
OS2	24	024EUF-T4101DA1	24 single mode OS2 loose tube, gel-free, interlocked armor distribution, indoor/outdoor

Cable	Fibre Count	Corning Part #	Description
OS2	48	048EUF-T4101DA1	48 single mode OS2 loose tube, gel-free, interlocked armor distribution, indoor/outdoor
OM1 (legacy)			multimode 62.5/125 loose tube outdoor series, armored

12.3. Fibre Termination

Patch panels: The fibre cable will terminate in a multiport Corning patch panel in the MTR and at the individual floor TR's.

Connectors: the standard connector is LC duplex UPC, factory terminated, for both OS2 and OM3/4

12.4. Fibre Termination Hardware

The fibre termination hardware used at Queens is Corning devices. Queen's standard is fusion-spliced pigtails with factory terminated LC UPC connectors in a slack management cassette. Mounting bulkhead is LC duplex. Cable polarity for inter- and intra-building cable runs is Type A both ends.

- Standard fibre patch panel CCH-04U
- Fibre patch panel (smaller installations) CCH-01U
- LC termination (**current standard as of summer 2017**)
- 50 micron OM3 12 strand (6 port LC duplex)
  PC pigtail cassette CCH-CS12-E4-P00TE
- OS2 12 strand (6 port LC duplex) UPC pigtail cassette CCH-CS12-A9-P00RE
- OS2 24 strand (12 port LC duplex) UPC pigtail cassette CCH-CS24-A9-P00RE

13. Other Hardware

- Rack - R.F.Mote 83 inch relay rack RFM-1944-RM
- Floor box - Wiremold have a variety of floor boxes
- Cable tray - Thomas&Betts have a selection of ventilated tray available
- J-Hooks - Erico have Caddy J-Hooks of various sizes

14. Glossary

ANSI - American National Standards Institute.

Backbone Cabling- The inter-building and intra-building cable connections in a SCS (Structured Cabling System) between EF, ER and TR. Backbone cabling consists of copper and fibre media, main and intermediate cross-connects and terminations at these locations.

CSA – Canadian Standards Association

Cross Connect- Cabling systems which include index strips (GigaBix connectors) mounted on terminal blockpanels (GigaBix Mounts) which seat individual pairs of wires from cables that connect with BIX style punch-down wire connecting blocks that are subsequently interconnected with either horizontal cables, riser cables or patch cord connectors.

EIA - Electronics Industries Alliance.

EF (Entrance Facility) - Room where outside circuits/wiring enter a building through communications ducts and are terminated or distributed to TR's throughout the building.

ER (Equipment Room)- An area within a building where major components of voice and data systems (PBX's, data switches and communications processors) are housed. ER's are often distinct from TR due to the size and quantity of the equipment they contain.

Horizontal Cabling- Category 6, 4 pair cabling system that runs from each WA outlet to the TR's. The maximum horizontal distance from the TR to the communication outlets is 90 meters.

MDF (Main Distribution Frame**)** – Old term removed from standards language but left in this document for reference. The MDF is a termination point in either the EF or TR where equipment and terminations of circuits are connected by crossconnect wires or patch cords. All cables including copper pairs and fibre cables supplying services are terminated at the MDF.

M.H. (Man Hole)- is an underground vault used to house communications ducts for installing Cables between other M.H. or to a building(s) EF.

Network Infrastructure - The components (TR's, EF, cable pathways, grounding, wiring and termination hardware) that together provide the basic support for the distribution of all voice and data information.

Outside Plant- all cables, conduits, ducts and other equipment located between a buildings EF and other building(s) EF.

ITS - Queens University Information Technology Services, responsible for wired and wireless data and telephone systems.

PATCH CORD - A length of wire, or fiber cable, with connectors on each end used to join network circuits.

PATHWAY - A raceway, sleeve, or exposed location for the placing of telecommunications cable.

SCS (Structured Cabling System)- TIA/EIA-568-B defines a hierarchical cable system architecture, in which a main cross-connect (MCC) is connected via a star topology across backbone cabling to intermediate cross-connects (ICC) and horizontal cross-connects (HCC).

TR (Telecommunications Room) - The space in a building designed to provide a secure, suitable environment for the installation of cable, telecommunications equipment, and termination and administration systems. Telecommunications rooms are the points where the backbone and horizontal distribution facilities intersect. They are floor-serving rooms whose function is to terminate and connect the backbone cable system to the horizontal cable system and to house electronics that assist in the distribution of information to that floor.

TIA – Telecommunications Industries Association.

UTP (Unshielded Twisted Pair) - wiring consisting of two insulated wires twisted around each other to reduce induction, thus interference, from one wire to the other. Twisted pair wire comes in bundles with varying numbers of pairs of wires, from two pair (four wires) to many thousands of pairs. UTP wiring is used to wire voice and data networks within buildings because it is relatively easy to install.

WA (Work Area Outlet) - Work area wiring subsystem consists of communication outlets (wallboxes and faceplates), wiring, and connectors needed to connect the work area equipment (computers, printers, and so on) via the horizontal wiring subsystem to the TR. The standard requires that two outlets be provided at each wall plate-one for voice and one for data.

WAP (Wireless Access Point)- a device that allows wireless communication devices to connect to a wireless network using Wi-Fi 802.11 standards. The WAP usually connects to a wired network, and can relay data between the wireless devices (such as computers) and wired devices on the network.