1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2
Tel: (343) 266-0002
Fax: (343) 266-0028

Defence Construction Canada
CFB Kingston, Kingston, Ontario

Final Geotechnical Investigation Report

CFHA Apartments

Project No. KN20701

Contract No. 70550KN

November 2019
AG File No: 19525-1

Submitted To:
Gabriel Hokayem
Defence Construction Canada
Canadian Forces Base Kingston
Bldg A-26 Dunlop Building
5 d'Artisan Road, Kingston
Ontario, K7K 7B4

TABLE OF CONTENTS

PAGE NO.

1.0 INTRODUCTION

Ainley Group was retained by Mr. Chris Iverson, Contract Services, Coordinator for Defence Construction Canada (DCC), to carry out geotechnical consulting services in support of the detail design for proposed CFHA Apartments at CFB Kingston, Ontario.

The objectives of the geotechnical assignment were:

- To secure soils and groundwater information/data about the proposed development site that could affect the design, including the effects that the soil and groundwater may have on construction procedures.
- To determine the physical and chemical properties of the soil within the proposed development site.
- To prepare a geotechnical report addressing the requirements set out in the Statement of Work, based on the information obtained during the geotechnical site investigation and laboratory analysis completed.

2.0 SITE DESCRIPTION

The proposed apartment buildings are to be located on vacant lots within an existing residential subdivision owned and operated by CFB Kingston. The subdivision is located on the west side of Niagara Park Drive between Highway 2 and Hermes Drive and is split into Phase 1 and Phase 2. Phase 1 is located within the area of a pre-existing school with a few mature trees along the east side and appears to sheet drain to the southeast. Phase 2 is located just west of an existing park area with few mature trees and appears to sheet drain to the northwest.

It was noted to Ainley Group in the background info received, Phase 1 contains an area of buried demolition material from the pre-existing school.

A Site Plan is attached to this report as **Figure No.** 1 showing the location of both Phase 1 and Phase 2.

3.0 FIELDWORK / METHODOLOGY

The fieldwork for the investigation was conducted in accordance with the Statement of Work provided to our office by DCC, on behalf of the Department of National Defence (DND). The field program consisted of the advancement of ten (10) boreholes (BH1 – BH10) to investigate sub-surface conditions, five (5) per proposed apartment site, and the advancement of four (4) penetration cones (PH1 – PH4) to investigate bedrock depths, two (2) per proposed apartment site.

Prior to commencing the geotechnical investigation program, Ainley Group contacted the local utility companies in order to obtain clearances for all base and non-base controlled underground services in the immediate area of the proposed field program.

The borehole program was completed during the week of August 20th, 2019, under the constant supervision of a qualified member of Ainley Group's geotechnical/environmental staff.

A Borehole Location Plan is attached to this report as **Figure No. 2**.

The boreholes were advanced throughout the proposed development areas as per the approved investigation plan. Boreholes were advanced to depths ranging from 0.9 m to 8.1 m below the existing ground surface. The boreholes were advanced by means of a track-mounted CME-55 drill rig equipped for soil sampling. Split spoon sampling procedures were performed within the boreholes to determine the penetration resistance (in terms of N values, Standard Penetration Index) of the existing subsoils. The values obtained may be correlated to the relative density of non-cohesive materials and consistency of cohesive soils. A total of four (4) 1.5 m rock cores were extracted, one (1) from BH Nos. 3, 4, 6 and 8 for the purpose of verifying the bedrock surface and establishing the Rock Quality Designation (RQD).

The penetration cones were advanced throughout the proposed development areas as per the approved investigation plan. Penetration cones were advanced to depths ranging from 3.71 m to 6.90 m below existing ground surface. The penetration cones were advanced by means of track-mounted CME-55 drill rig.

Additional field objectives for the assignment included the visual/olfactory inspection of soil samples for environmental contaminants. Representative samples were secured within each borehole for further review and laboratory analysis. All sampling and investigation works were completed by a qualified member of the Ainley Group team meeting the requirements of O.Reg. 153/04. There were no visual or olfactory environmental impacts noted at the time of investigation with exception to BH7 which had a strong cement smell.

The location and ground surface elevations at each respective borehole location were surveyed using a Sokkia SRX3 Robotic Total Station with real time sub-centimeter accuracy, and referenced to the MTM Geodetic Coordinate system.

4.0 RESULTS OF THE INVESTIGATION

4.1 Sub-Surface Conditions and Laboratory Analysis

Full details of the subsurface conditions encountered at the borehole locations are presented on the individual borehole logs included in **Appendix A**. It is emphasized however, that the soil types, their sequence, thickness and physical properties may vary between test locations and samples both vertically and horizontally.

Representative samples of the subsoil materials encountered within the boreholes were collected and returned to our office for further visual review by an engineer having experience with soil classification and identification. A total of six (6) samples were selected and submitted

to SNC Lavalin in Kingston, Ontario for gradation analysis and moisture content determination. Copies of the Grain Size Distribution results are included in **Appendix B**.

The subsoil conditions encountered throughout the site generally consisted of the following:

4.1.1 Topsoil

A surficial layer of topsoil consisting predominately of brown, silty sand or silty sand with clay trace of rootlets was encountered within all boreholes. The topsoil was found to be approximately 25 mm to 75 mm thick.

4.1.2 Fill; Sand and Gravel

Fill material consisting of sand with varying amounts of gravel and silt was encountered in all boreholes except BH Nos. 1, 3 and 6. The fill was found to be in a compact state. This fill layer was encountered below the topsoil layer and extended to depths ranging from 0.45 m to 2.7 m below existing site grades.

Grain size distribution analysis was completed on one (1) sample of the sand fill material. The fill was found to have 72.8% of the material passing the 4.75 mm sieve and 26.9% of the material passing the 75 µm sieve with a Moisture Content of 5.4%. The fill material encountered generally meets OPSS 1010 specifications for Select Subgrade.

4.1.3 Fill; Construction Debris (BH7)

A layer of construction debris consisting of concrete, rebar, bricks and gravel was encountered in BH Nos. 7. The fill was found to be in a loose state becoming compact with depth. This fill layer was encountered below the sand and gravel fill layer and extended to a depth of 5.1 m below existing site grades. This layer was found to be wet at the time of the field investigation.

4.1.4 Fill; Silty Clay

Fill material consisting of silty clay with varying amounts of sand, gravel, and fibrous organics was encountered in all boreholes with exception to BH Nos. 4, 6 and 7 at depths ranging from 0.10 m to 1.20 m below existing grade and extended to depths of 0.75 m to 2.25 m below grades. This layer was found to be in a medium to hard state.

Grain size distribution analysis completed on one (1) sample classified the material as silty clay some sand, trace of gravel. The material is considered to have a Low Susceptibility to Frost Heave (LSFH). The Moisture Content was found to be 22.0% at the time of the field investigation.

4.1.5 Clay

Clay was encountered in all boreholes with exception to BH No. 1 at depths ranging from 0.075 m to 5.10 m below existing site grades. The clay layer was found to be in a very stiff to hard state and extended to depths ranging from 1.55 m to 6.60 m below grade.

Grain size distribution analysis completed on two (2) samples classified the material as clay with silt some sand. Atterberg Limit testing indicated a Plasticity Index of 30.0 and 34.4 resulting in a classification of CH, an inorganic clay of high plasticity. The material is considered to have a LSFH. The Moisture Content was found to be 25.5% and 26.6% at the time of the field investigation.

4.1.6 Glacial Till

The glacial till can be separated into two (2) types based on Phase 1 and Phase 2 sites.

A layer of glacial till was encountered in all boreholes within Phase 1 at depths ranging from 1.95 m to 6.60 m below existing site grades. The till was found to be in a compact to dense state and extended to depths ranging between 4.75 m and 6.90 m below existing site grades.

Grain size distribution analysis completed on one (1) sample obtained from Phase 1 classified the till as sand with silt and gravel, some clay. This till was found to have 80.0% of the material passing the 4.75 mm sieve, 42.0% of material passing the 75 µm sieve, 25.0% of material passing the 5 µm sieve and 18.0% of the material passing the 2 µm sieve with a Moisture Content of 7.2%. The material is considered to have a Low Susceptibility to Frost Heave (LSFH).

A layer of glacial till was only encountered in BH No.5 within Phase 2 at a depth of 5.25 m below existing site grades. The till was found to be in a compact state and extended to a depth of 6.00 m below grade.

Grain size distribution analysis completed on one (1) sample obtained from Phase 2 and was classified the till as silty clay, trace of sand and gravel. This till was found to have 99.9% of the material passing the 4.75 mm sieve, 91.0% of material passing the 75 µm sieve, 78.0% of material passing the 5 µm sieve and 60.0% of the material passing the 2 µm sieve with a Moisture Content of 24.7%. The material is considered to have a Low Susceptibility to Frost Heave (LSFH).

4.1.7 Bedrock

Inferred bedrock was encountered in all boreholes and probe holes with exception to BH Nos. 5, 9 and 10 at depths ranging from 0.90 m to 6.90 m (95.28 m to 101.10 m) below existing site grades. The limestone bedrock was cored at four (4) borehole locations with one 1.5 m rock core extracted from BH Nos. 3, 4, 6 and 8. The bedrock cores were found to be good to excellent quality limestone bedrock with few horizontal fractures and mud seams. Rock Quality Designations (RQD)s were found to range between 76% and 94%.

4.1.8 Groundwater

Groundwater infiltration was observed only within BH Nos. 2 and 7 during the field investigation. Groundwater infiltration was encountered at depths ranging from 2.25 m to 4.55 m below existing site grades (100.91 m to 102.23 m).

It should be noted that groundwater levels at the site may fluctuate seasonally and in response to precipitation events.

4.2 Environmental Laboratory Analysis

Representative environmental samples of the subsoil materials encountered within the boreholes were collected and secured in sealable plastic bags. Non-combustible and combustible soil vapours were screened using a RKI Eagle II Hydrocarbon/PID Detector and the results were used to select soil samples to be submitted for environmental analysis. The samples with the highest results were submitted to meet the requirements of the scope of work for toxicity characteristics to determine the presence of petroleum hydrocarbons and glycols in the site soils.

A total of six (6) samples were submitted for analysis. All samples were appropriately packaged and transported to an accredited laboratory for analysis. The following samples were submitted:

- S01 – BH2 – 3.75-4.35 m
- S02 – BH3 – 0.75-1.35 m
- S03 – BH4 – 1.50-2.10 m
- S04 – BH7 – 0.75-1.35 m
- S05 – BH8 – 2.25-2.85 m
- S06 – BH10 – 4.50-5.10 m

Based on the results of the laboratory testing, all samples, except for S04, submitted were determined to be less than the Method Detection Limit (MDL) or less than the selected Soil criteria. Soil Criteria was compared to Table 3 for Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Conditions from MOE Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*, April 2011 for criteria limits defined for Industrial/Commercial/Community Property Use and Soil Quality Guidelines for the Protection of Environmental and Human Health, Industrial Property Use (CCME, 1999 and subsequent updates).

S04 was collected from BH7 which was completed within the area of buried demolition material and showed exceedances in Polycyclic Aromatic Hydrocarbons (PAH). It is recommended this material and any surrounding impacted soil be removed and sent to a disposal site licensed to accept this material.

With respect to offsite disposal of the subsoil material outside of the buried demolished area, it is recommended that the material be utilized on a site used for Industrial/Commercial/Community Property Use and/or a waste disposal site in acceptance of material meeting the environmental criteria noted. A summary table of the laboratory results and copy of the Certificates of Analysis completed for the above noted samples are attached to the report as **Appendix C**.

5.0 DISCUSSION AND RECOMMENDATIONS

It is our understanding that the purpose of the geotechnical investigation and report is to provide soils information concerning the existing conditions and site information for the construction of two (2), three (3) story, two (2) bedroom, six (6) unit apartment buildings. The buildings have the potential to contain basements.

Based on the subsoil and groundwater conditions encountered at the test locations and considering them to be generally representative of the subsoil and groundwater conditions across the proposed development site, the following recommendations and comments are offered to advance the design of the housing development.

5.1 Foundations

Phase 1

Based on the results of the field investigation, the placement of shallow strip and spread footings will be adequate to support the proposed structure. The geotechnical resistance values provided below shall be used for the design of strip or spread footings bearing on the native clay encountered across the site.

- The factored bearing resistance at USL (Ultimate Limit States) of 200 kPa with a resistance factor of 0.5.
- The geotechnical resistance at SLS (Serviceability Limit States) can be taken as 150 kPa.

The bearing capacity noted is valid provided the footings are placed on undisturbed soils, free of frost, topsoil and organic materials. Total and differential settlements for foundations placed on the approved native clay soil under SLS pressure conditions should not exceed 25 mm and 19 mm respectively.

Alternatively, foundations may be placed on properly constructed engineered fill built up from the native clay. Engineered fill should consist of granular material approved by the engineer and compacted to 100% Standard Proctor Maximum Dry Density (SPMDD). The engineered fill material should be placed in lifts compatible with the compaction equipment used. A quality control technician should monitor the placement of the engineered fill material and the compaction densities for each lift to ensure that proper compaction efforts have been achieved. Foundations placed on properly constructed engineered fill built up from the approved clay may be designed using an SLS pressure of 150 kPa and ULS pressure of 200 kPa. Total and differential settlements for foundations placed on properly constructed engineered fill should not exceed 25 mm and 19 mm respectively.

In consideration of the nature of fill material (construction debris, organics) encountered in BH Nos. 7 to 10, all fill material should be removed from within the building footprint to expose the underlying native subsoil. To achieve the required footing elevation, build up with engineered fill as detailed previously.

Phase 2

Based on the results of the field investigation, the placement of shallow strip and spread footings will be adequate to support the proposed structure. The geotechnical resistance values provided below shall be used for the design of strip or spread footings bearing on the native clay encountered across the site.

- The factored bearing resistance at USL (Ultimate Limit States) of 200 kPa with a resistance factor of 0.5.
- The geotechnical resistance at SLS (Serviceability Limit States) can be taken as 150 kPa.

The bearing capacity noted is valid provided the footings are placed on undisturbed soils, free of frost, topsoil and organic materials. Total and differential settlements for foundations placed on the approved native clay soil under SLS pressure conditions should not exceed 25 mm and 19 mm respectively.

Alternatively, foundations may be placed on properly constructed engineered fill built up from the native clay. Engineered fill should consist of granular material approved by the engineer and compacted to 100% Standard Proctor Maximum Dry Density (SPMDD). The engineered fill material should be placed in lifts compatible with the compaction equipment used. A quality control technician should monitor the placement of the engineered fill material and the compaction densities for each lift to ensure that proper compaction efforts have been achieved. Foundations placed on properly constructed engineered fill built up from the approved clay may be designed using an SLS pressure of 150 kPa and ULS pressure of 200 kPa. Total and differential settlements for foundations placed on properly constructed engineered fill should not exceed 25 mm and 19 mm respectively.

In order to prevent differential performance of the footings it is recommended that in areas where shallow bedrock is encountered, a minimum 300 mm OPSS 1010 Granular A layer compacted to 100% SPMDD be placed between the underside of the footing and underlying bedrock. Bedrock removal will be necessary to achieve this separation and the placement of insulation around the footing should be considered should adequate frost cover depth not be achievable. Alternatively, the footings could be stepped to be placed on the bedrock however, additional reinforcement will be necessary at the bedrock to soil transition to allow for the expected differential settlement between the footings on bedrock and native soil.

All exterior footings for unheated structures must be protected by a minimum of 1.5 m of earth cover or equivalent, and 1.2 m for heated structures in order to provide protection against detrimental frost action. Alternatively, using insulation material placed over the concrete foundation wall and below the slab base course may also be considered.

5.2 Slabs-on-Grade

For the Phase 1 site, it is recommended that all surficial topsoil and fill materials be removed to throughout the proposed building site. For the Phase 2 site, the existing fill material is considered suitable to support slab-on-grade construction.

Normal slab-on-grade construction can be carried out as follows:

a) Proof roll the exposed surface to reveal any loose or unsuitable material and replace with approved Granular 'B' Type II material compacted to 95% Standard Proctor Maximum Dry Density (SPMDD).

b) Build up granular fill materials from the approved soil placing Granular 'B' Type II material in lifts suitable with the compaction equipment used to achieve a minimum of 100% SPMDD. A capillary moisture barrier consisting of either 19 mm clear crushed stone or Granular 'A' is recommended at least 200 mm thick immediately underlying the slab. The 200 mm thick Granular 'A' is also recommended for fine grading purposes and to provide a uniform bearing surface for the concrete slab.

Basement areas and slabs set below 0.3 m of the finished grade are recommended to provide permanent perimeter drainage. Under floor drains are not considered necessary.

5.3 Groundwater Control/Subsurface Drainage

Based on the observations made during the field investigation, groundwater was encountered in BH2 near the overburden and bedrock contact area and in BH7 within the construction debris. All remaining boreholes remained dry during the field investigation, however, it should be noted that groundwater levels will fluctuate seasonally and also during periods of drought and precipitation.

Development areas within the site should be graded in the early stages of construction to provide for positive runoff of all surface water. The silty nature of the subsoil material encountered makes it problematic therefore, groundwater and moisture control during construction and post development is key to the workability and movement of this soil. In addition, the high plasticity of the clay makes it subject to swelling and shrinking when exposed to excessive moisture.

The pumping of groundwater may be required during excavation of the shallow overburden. Normal pumps should suffice but some sand filters may be required to prevent clogging of the pumps. The groundwater level should be controlled at all times and be kept below the excavation level during the construction period.

5.4 Excavations

All excavations should be carried out in accordance with the provisions in the Occupational Health and Safety Act. At the time of the field investigations the sub-soil materials encountered across the site may be classified as follows:

- The fill and clay materials may be classified as Type 3 soil.
- The glacial till may be classified as Type 2 soil.

5.5 Lateral Earth Pressure Coefficients

Free draining material such as Granular A or Granular B , Type 2 (75 mm minus) should be used as backfill for the foundation walls. If proper drainage is provided the “at rest” condition maybe used for calculation of earth pressure on foundation walls. The existing native or fill material is not considered suitable for reuse as backfill to the foundation walls.

The following parameters may be used to determine lateral earth pressures:

Soil Type	Unit Weight – dry (kN/m^3)	Angle of Internal Friction (Φ)	Coefficient of Earth Pressure at Rest (K_o)
Granular ‘A’	22.8	35	0.42
Granular ‘B’	21.2	30	0.50

5.6 Suitability of Material

The sand and silty clay fill material encountered across the site may be reused for grading operation outside the building envelope. It is recommended that moisture contents in the soils be closely monitored when they are to be used as subgrade fill or as a founding soil during construction.

A surficial layer of topsoil was encountered across the site, however the quality of the material for reuse as landscaping has not been evaluated and is considered outside the scope of this assignment. For general consideration a thickness of 75 mm may be considered for planning purposes.

5.7 Utility Trenches

The construction of proposed utility trenches to service the proposed site should consist of removal of the existing overburden soils to achieve the required grades. Based on the soils information obtained from the site, utility pipes will be installed in fine-grained subsoil trenches. Bedding for the pipes should consist of 150 mm Granular ‘A’ material. The bedding should be placed in lifts compatible with the compaction equipment used to achieve 100% SPMDD.

Backfill around the pipes should consist of Granular 'A' material with a minimum cover thickness of 300 mm over the obvert of the pipe. The backfill should be compacted to 100% SPMDD.

Utility pipes (watermain, storm, sanitary) must be protected by a minimum of 1.5 m of earth cover or equivalent in order to provide against frost action.

5.8 Pavement Design

Construction of the roadways and parking areas should consist of removing all existing organic and topsoil materials to expose the underlying fill material. Any deleterious materials should be removed and the area proof-rolled, compacted and brought to grade in accordance with design drawings. Any areas exhibiting rutting or appreciable deflection should be excavated and replaced with suitable fill material compacted to a minimum of 95% SPMDD.

All compaction operations should be carried out in layers suitable to the compaction equipment used to achieve 100% SPMDD. It is recommended the following pavement structures be provided:

Light Duty Pavement Structure		**Heavy Duty Pavement Structure**	
50 mm	HL3 Surface Course	40 mm	HL3 Surface Course
150 mm	OPSS 1010 Granular 'A'	50 mm	HL8 Binder Course
300 mm	OPSS 1010 Granular 'B', Type II	150 mm	OPSS 1010 Granular 'A'
		400 mm	OPSS 1010 Granular 'B', Type II

For any sidewalk construction, a 150 mm base consisting of OPSS 1010 Granular A compacted to 100% SPMDD should be provided. Prior to placing the granular base material, all topsoil should be removed to expose the underlying subsoil, any loose or soft areas should be replaced with Granular A or Granular B compacted to 95% SPMDD.

Inspection by qualified geotechnical personnel should be carried out during the construction process to verify the competence of the subgrade material and to verify the compaction densities of both the subbase and base course materials.

5.9 Site Inspections

It is recommended that all foundation and subgrade materials be inspected by qualified geotechnical personnel prior to the placement of concrete for footings, in order to ensure that the materials and founding elevations are consistent with the recommendations of this report. It is also recommended that the placement and compaction of all fill soils be monitored and tested by qualified geotechnical personnel to ensure that the appropriate materials and compaction densities are achieved.

6.0 CLOSURE

The Limitations of Report attached, form an integral part of this report. We trust this report provides sufficient information for your present requirements in accordance with our Statement of Work. We trust this report is to your satisfaction. Should you have any questions concerning the above, please feel free to contact our office.

Sincerely,

AINLEY GRAHAM & ASSOCIATES LIMITED

Lois-Ann L. Hayes

Lois-Ann L. Hayes P.Eng.
Senior Geotechnical Engineer

Limitations of Report

The conclusions and recommendations given in this report are based on information determined at the borehole locations. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the boreholes.

The comments made in this report are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all factors that may affect construction methods and costs. The contractors bidding on this project or undertaking the construction should therefore make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

This report has been prepared for design purposes, for the sole use of Defence Construction Canada. Any uses, which a Third Party makes of this report, or any reliance or decisions to be made based on it, are the responsibilities of said Third Parties. Ainley Group accepts no responsibility for damages if any, suffered by any Third Party as a result of decisions made or actions based on this report.

Figure Nos. 1
Site Location Plan

National Defence | Défense nationale
Canadian Forces Housing Agency | Agence de logement des Forces canadiennes

CFB / BFC Kingston

Proposed New 6-Plex Location and Preliminary Siting (Map 1 of 2 - General)

COUNTY RD 2

Topographical Extent

Geotechnical Extent

PHASE 1

PHASE 2

PHASE 2

PHASE 2

6-Plex

6-Plex

6-Plex

ASSORO

YPRES

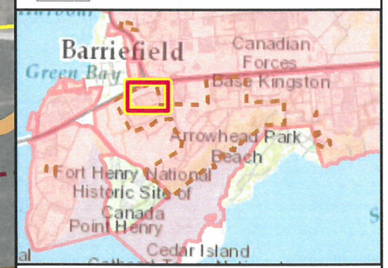
Legend

- New Appartment Building (6-Plex)
- Sidewalk
- Parking Area & Accessway
- Recolated Pathway
- Project Location
- Gas Line
- Water
- Sewer
- Phase 1
- Phase 2

Specifications (use as indication only)

- Access roadway - 7 m wide
- Building setback from curb - 12 m
- Sidewalk around building - 1.2 m wide
- Building footprint: ± 198 m²
- Conventional parking space dimensions: 2.5 m x 5.5 m
- Handicap parking spaces dimensions: 4. m x 5.5 m
- Total parking spaces required:
  2 parking spaces/unit = 12 spaces/building
  1 handicap parking space/building = 1
  2 visitors parking spaces/building = 2
  Total parking spaces: 12 + 1 + 2 = 15 spaces/build
- Snow storage areas to be determined
- Shed, bikerack and BBQ areas to be determined

- DND Property Boundary
- Residential Housing Site (RHS)
- Residential Housing Unit (RHU)



Housing Site Location

This map is not a legal survey document and should only be used for presentation purposes. /

Created by: André Da Silva
Approved by: Pierre Beauchamp

Produced by the Canadian Forces Housing Agency
Infrastructure and Technical Sevices
April 2019

0 10 20 40 60 80 100 m

Projection : NAD 1983, Universal Transverse Mercator, zone 18

N

Data sources
- DND - RP Ops - Kingston
- CFHA Unit information as of February 1, 2019
- ESRI
- Imagery: DND / RPSDW (Date unknown)

Canada

Figure Nos. 2
Historical Site Plan

Government of Canada | Gouvernement du Canada

UNCLASSIFIED | NON CLASSIFIE

Legend

- Buried Demolition Material
- Niagara School_Demolished in 2017
- Building - DND
- PMQ
- Building - Non DND

NOTE:
1) BURIED DEMOLITION MATERIAL IS COMPOSED OF CONCRETE AND CORK MATERIAL.

FOR PRINTED VERSION OR UPDATED DIGITAL VERSION PLEASE CONTACT:
drafting.eng.sup@forces.gc.ca

SCALE | ÉCHELLE: 1:1,250

LOCATION | EMPLACEMENT:
ASSORO CRES
KINGSTON
ONTARIO

N W E S

PROJECT | PROJECT:
NEW APARTMENT BLDG
PROPOSED SITE

TRADE | METIER: SITING

DATE: 11/07/2019

SUBJECT | SUJET:
EXISTING SITE CONDITION

DRAWN | DESSINE: JDP

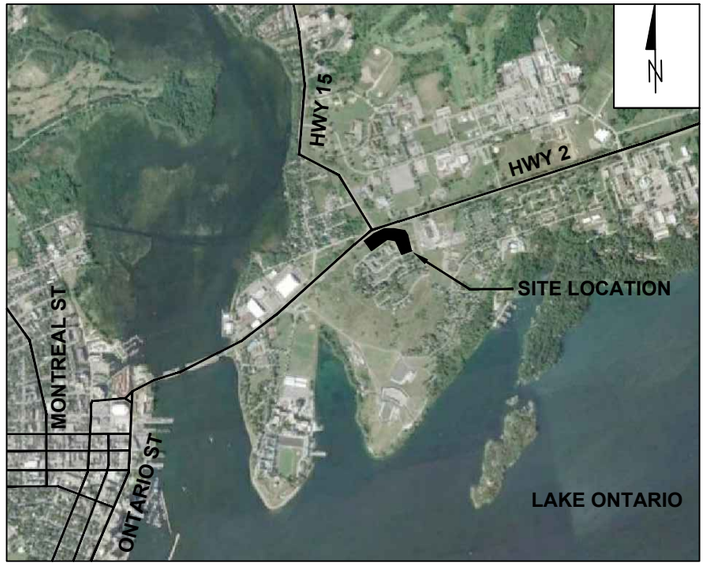
PF NUMBER | No DP:

DWG. NO. | DESSIN NO.:

Canada

Path: K:\Base Geomatics\Geomatics Projects\Base Updating\001 - ARCHIVED JOBS\FHH\GISU_Demolition Projects\HR23_Feb2017\FHH_Proposed PMQ site_July2019.mxd

Figure Nos. 3
Borehole Location Plan



KEY MAP

N.T.S.

BOREHOLE DATA			
ID	TOP OF GRADE ELEVATION (masl)	BEDROCK ELEVATION (masl)	GROUNDWATER ELEVATION (masl)
PHASE II			
BH1	101.85	101.10	NE
BH2	102.53	97.68	102.23
BH3	102.26	100.71	NE
BH4	102.68	97.48	NE
BH5	101.70	NE	NE
PH1	102.53	98.82	NE
PH2	102.15	96.45	NE
PHASE I			
BH6	101.81	97.06	NE
BH7	103.46	97.71	100.91
BH8	103.03	96.43	NE
BH9	103.06	NE	NE
BH10	102.18	95.28	NE
PH3	102.78	96.93	NE
PH4	102.93	96.03	NE

LEGEND

⊕ = BOREHOLE/PROBEHOLE LOCATION

NE = FEATURE NOT ENCOUNTERED

Ainley CONSULTING ENGINEERS PLANNERS

FIGURE NO. 3

BOREHOLE LOCATION PLAN

Appendix A
Borehole Logs

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH1

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 101.85

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
	0.10	***Topsoil*** Silty sand with rootlets, trace of gravel, brown.	JC059	25	21		135	0		
2		***Fill*** Silty clay, trace of sand, stiff, brown.								
	0.75									
	0.90	***Weathered Bedrock***								
4		***End of Borehole at 0.90 m below existing site grades upon inferred bedrock.*** Note: Groundwater infiltration was not encountered during the borehole investigation.								
6 / 2										
8										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH2

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.53

Project: CFHA New Apartments ***Water Elevation (masl):*** 102.23

Client: Defence Construction Canada ***Depth to Water (m):*** 4.55

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Topsoil Silty sand with rootlets, trace of gravel, brown. (75 mm)	JC053	42	19		160	0		
	0.45	***Fill*** Sandy gravel with cobbles, compact, brown.								
2	1.05	***Fill*** Silty clay, trace of sand, hard, brown.	JC054	75	13		150	0		
4		***Clay*** Clay with silt, trace of sand, hard, brown.	-	8	13		-	-		
6 / 2			JC055	100	20		155	0		
8										
10			JC056	100	16		160	0		
12										
14 / 4			JC057	100	20		230	0		
									▼	
16	4.85		JC058	50	22		120	0		
		End of Borehole at 4.85 m below existing site grades upon inferred bedrock. Note: Groundwater infiltration was encountered at 4.55 m below existing site grades during the borehole investigation.								
18										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH3

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.26

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Topsoil Silty sand with rootlets, trace of gravel, brown. (75 mm)	JC050	50	9		160	0		
2		***Fill*** Silty clay, trace of sand, hard, brown.								
	1.20		JC051	100	23		170	0		
4		***Clay*** Clay with silt, trace of sand, hard, brown.								
	1.55									
6 / 2		***Bedrock*** Good quality limestone bedrock with few horizontal fractures and mud seams. Rec = 100% RQD = 82%								
8										
10	3.11									
		End of Borehole at 3.11 m below existing site grades within bedrock. Note: Groundwater infiltration was not encountered during the borehole investigation.								
12 / 4										
14										
16										
18										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH4

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.68

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Topsoil Silty sand with rootlets, trace of gravel, brown. (75 mm)	JC043	50	18		185	0		
2	1.05	***Fill*** Sandy gravel with cobbles, compact, brown.	JC044	75	10		180	0		
4		***Clay*** Clay with silt, trace of sand, stiff becoming very stiff at 4.8 m and moist, brown. % Passing JC046 4.75 mm = 100.0 75 um = 92.0 5 um = 84.0 LSFH 2 um = 70.0 Moisture Content = 25.5% Plasticity Index = 34.4 Classification = CH	JC045	100	17		240	0		
6 / 2			JC046	100	26		0	0		
8			JC047	100	16		210	0		
10			JC048	100	26		165	0		
12 / 4			JC049	100	13		195	0		
14	5.20									
16		***Bedrock*** Good quality limestone bedrock with few horizontal fractures and mud seams. Rec = 99% RQD = 76%								
18 / 6	6.60									
20		***End of Borehole at 6.60 m below existing site grades within bedrock.*** Note: Groundwater infiltration was not encountered during the borehole investigation.								
22										
24										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH5

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 101.70

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Topsoil Silty sand with rootlets, trace of gravel, brown. (75 mm)	JC035	29	32		115	0		
2										
	1.20	***Fill*** Sandy gravel with cobbles, compact, brown.	JC036	50	18		195	0		
4	1.50									
		Fill Silty clay, trace of sand and fibrous organics, medium, black.	JC037	100	8		155	0		
6 / 2										
		Clay Clay with silt, trace of sand, hard, brown.	JC038	100	30		230	0		
8										
10			JC039	100	21		75	0		
12										
4			JC040	100	15		185	0		
14										
16			JC041	100	10		190	0		
	5.25									
18		***Till*** Silty clay, trace of sand and gravel, compact, moist, grey.	JC042	100	19		195	0		
	6.00	% Passing JC042 4.75 mm = 99.9 75 um = 91.0 5 um = 78.0 LSFH 2 um = 60.0 Moisture Content = 24.7%								
6 / 20										
22										
24		***End of Borehole at 6.00 m below existing site grades.*** Note: Groundwater infiltration was not encountered during the borehole investigation.								
26 / 8										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: PH1

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.53

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Overburden								
	3.71									
12 / 4		***End of Probehole at 3.71 m below existing site grades upon inferred bedrock***								

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: PH2

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.15

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Overburden								
2 / 4 / 6 / 2 / 8 / 10 / 12 / 4 / 14 / 16										
18	5.70									
20 / 6 / 22 / 24		***End of Probehole at 5.70 m below existing site grades upon inferred bedrock***								

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH6

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 101.81

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Topsoil Silty sand with rootlets, trace of gravel, brown. (75 mm)	JC001	88	11		55	0		
2		***Clay*** Clay with silt, some sand, hard, brown.	JC002	100	15		125	0		
4										
6 / 2	1.95		JC003	100	13		210	0		
		Till Silty sand with gravel, some clay, compact becoming dense, moist, grey.	JC004	100	50		90	0		
8										
10			JC005	63	R		80	0		
12 / 4										
14	4.75									
		Bedrock Good quality limestone bedrock with few horizontal fractures and mud seams. Rec = 99% RQD = 77%								
16										
18										
20 / 6	6.23									
		End of Borehole at 6.23 m below existing site grades within bedrock. Note: Groundwater infiltration was not encountered during the borehole investigation.								
22										
24										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH7

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 103.46

Project: CFHA New Apartments ***Water Elevation (masl):*** 100.91

Client: Defence Construction Canada ***Depth to Water (m):*** 2.55

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Topsoil Silty sand with rootlets, trace of gravel, brown. (25 mm)	JC029	92	46		200	0		
		Fill Sand and gravel with concrete and rebar, compact, brown.	JC030	100	37		220	0		
6 / 2			JC031	100	29		150	0		
8	2.70		JC032	100	19		195	0	▼	
10		***Fill*** Construction debris, concrete, rebar, brick, gravel, wet, grey. Strong cement smell.	JC033	100	19		75	0		
12 / 4			JC034	33	R		165	0		
16	5.10									
18	5.50	***Clay*** Clay with silt, some sand, hard, becoming moist, brown.								
	5.75									
20 / 6		***Till*** Silty sand with gravel, some clay, dense, moist, grey.								
22		***End of Borehole at 5.75 m below existing site grades upon inferred bedrock.*** Note: Groundwater infiltration was encountered at 2.55 m below existing site grades during the borehole investigation.								
26 / 8										
32										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH8

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 103.03

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Topsoil Silty sand with rootlets, trace of gravel, brown. (50 mm)	JC014	17	20		195	0		
	0.55	***Fill*** Sand with silt and gravel, compact, brown. % Passing JC014 4.75 mm = 72.8 75 um = 26.9 Moisture Content = 5.4%	JC015	54	5		175	0		
		Fill Silty clay some sand, trace of gravel and bricks, medium, dark brown. % Passing JC015 4.75 mm = 96.0 75 um = 83.0 5 um = 60.0 LSFH 2 um = 47.0 Moisture Content = 22.0%	JC016	50	10		165	0		
	1.80	***Clay*** Clay with silt, some clay, hard, brown.	JC017	100	21		210	0		
10			JC018	100	18		130	0		
	3.60	***Till*** Sand with silt and gravel, some clay, dense, moist, grey. % Passing JC019 4.75 mm = 80.0 75 um = 42.0 5 um = 25.0 LSFH 2 um = 18.0 Moisture Content = 7.2%	JC019	100	49		175	0		
14			JC020	50	R		185	0		
16										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 2

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH8

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 103.03

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth	Elevation	Description	Number	Recovery	SPT	SPT Graph 10 20 30 40	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
18										
20										
	6.60									
22		***Bedrock*** Excellent quality limestone bedrock with few horizontal fractures. Rec = 99% RQD = 94%								
	7									
24										
26										
	8.10									
28		***End of Borehole at 8.10 m below existing site grades within bedrock.*** Note: Groundwater infiltration was not encountered during the borehole investigation.								
	9									
30										
32										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 2 of 2

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH9

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 103.06

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
	0.50	***Topsoil*** Silty sand with rootlets, trace of gravel, brown. (25 mm)	JC021	75	25		195	0		
		Fill Sand with silt and gravel, compact, brown.	JC022	42	11		230	0		
	1.80	***Fill*** Silty clay some sand, trace of gravel and fibrous organics, medium, dark brown.	JC023	100	11		240	0		
8 / 2			JC024	100	17		155	0		
10		***Clay*** Clay with silt some sand, hard, brown.	JC025	100	19		220	0		
12 / 4			JC026	100	11		185	0		
14										
16	4.95		JC027	100	15		185	0		
		Till Silty sand with gravel, some clay, compact becoming dense, moist, grey.	JC028	29	R		115	0		
20 / 6	6.00	***End of Borehole at 6.00 m below existing site grades.*** Note: Groundwater infiltration was not encountered during the borehole investigation.								
26 / 8										
32										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: BH10

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.18

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
	0.60	***Topsoil*** Silty sand with rootlets, trace of gravel, brown. (75 mm)	JC006	100	20		90	0		
		Fill Sand with silt and gravel, compact, brown.	JC007	100	18		145	0		
6 / 2	2.25	***Fill*** Silty clay some sand, trace of gravel and fibrous organics, medium, dark brown.	JC008	17	8		240	0		
		Clay Clay with silt, some sand, hard, becoming moist, brown. % Passing JC010 4.75 mm = 100.0 75 um = 89.0 5 um = 76. LSGH 2 um = 63.0 Moisture Content = 26.6% Plasticity Index = 30.0 Classification = CH	JC009	100	10		180	0		
10 / 4			JC010	100	22		185	0		
			JC011	100	19		160	0		
16 / 6			JC012	100	12		250	0		
			JC013	100	16		195	0		
20 / 6	6.60									
22 / 6	6.90	***Till*** Silty sand with gravel, some clay, compact becoming dense, moist, grey.								
26 / 8		***End of Borehole at 6.90 m below existing site grades.*** Note: Groundwater infiltration was not encountered during the borehole investigation.								
32										

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: PH3

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.78

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 / 0	0.00	Ground Surface								
		Overburden								
2 / 4 / 6 / 2 / 8 / 10 / 12 / 4 / 14 / 16 / 18										
	5.85									
20 / 6 / 22 / 24		***End of Probehole at 5.85 m below existing site grades upon inferred bedrock***								

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Ainley Group
1-50 Grant Timmins Drive
Kingston, Ontario
K7M 8N2

Log of Borehole: PH4

Project No.: KN20701 70550 KN ***Ground Elevation (masl):*** 102.93

Project: CFHA New Apartments ***Water Elevation (masl):*** NE

Client: Defence Construction Canada ***Depth to Water (m):*** NE

Location: Assoro Drive, CFB Kingston, Ontario

SUBSURFACE PROFILE			SAMPLE							
Depth (ft / m)	Elevation	Description	Number	Recovery	SPT	SPT Graph (10 20 30 40)	Hexane (ppm)	PID - VOCs (ppm)	Groundwater	Symbol Log
0 ft / 0 m	0.00	Ground Surface								
		Overburden								
2 ft / 2 m										
4 ft / 4 m										
6 ft / 2 m										
8 ft / 4 m										
10 ft / 6 m										
12 ft / 4 m										
14 ft / 6 m										
16 ft / 6 m										
18 ft / 6 m										
20 ft / 6 m										
22 ft / 6 m	6.90									
24 ft / 6 m		***End of Probehole at 6.90 m below existing site grades upon inferred bedrock***								

Drilled By: G.E.T Drilling ***Project Engineer: L.A. Hayes, P.Eng***

Drill Method: Truck Mounted CME 55 ***Project Technician: Joshua Charlton, C.Tech***

Drill Date: August 20 & 21, 2019 ***Sheet:*** 1 of 1

Appendix B
Grain Size Distribution Results

SNC·LAVALIN

Lab # 19318

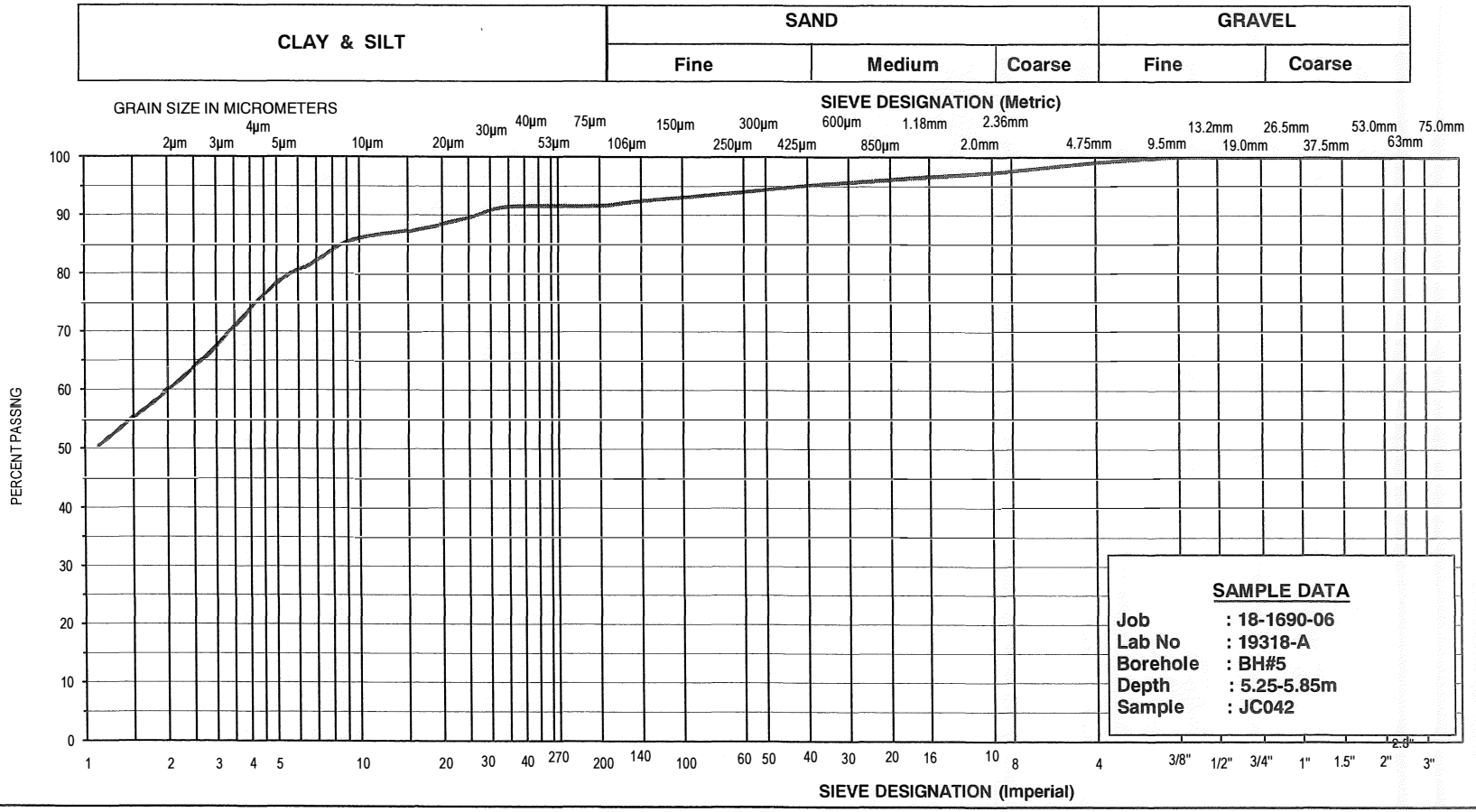
Project #18-1690-06 Client: Ainley

Project Name: 19525-1 New Apartment CFB Kingston Date: August 17, 2018

SAMPLE INFORMATION	SAMPLE	MASS OF SAMPLE WET & TARE (g)	MASS OF SAMPLE DRY & TARE (g)	MASS OF WATER (g)	MASS OF DRY SOIL (g)	MASS OF TARE (g)	MOISTURE CONTENT (%)
JC042	A	450.7	382.4	68.3	276.5	105.9	24.7
JC046	B	750.6	619	131.6	516	103	25.5
JC035	C	592	565.6	26.4	437.3	128.3	6.0
JC019	D	674.5	638.5	36	502	136.5	7.2
JC010	E	636.7	530.8	105.9	397.5	133.3	26.6
JC015	F	442.6	374.6	68	308.4	66.2	22.0
JC014	G	575	552.9	22.1	412.7	140.2	5.4

SNC-LAVALIN

UNIFIED SOIL CLASSIFICATION SYSTEM



% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	0	1	2	2	4	32	60

SNC-LAVALIN
1164 Clyde Court
Kingston, Ontario K7P 2E4

GRAIN SIZE DISTRIBUTION

SILTY CLAY

Trace Sand,Trace Gravel

Client: Ainley

Project: 18-1690-06

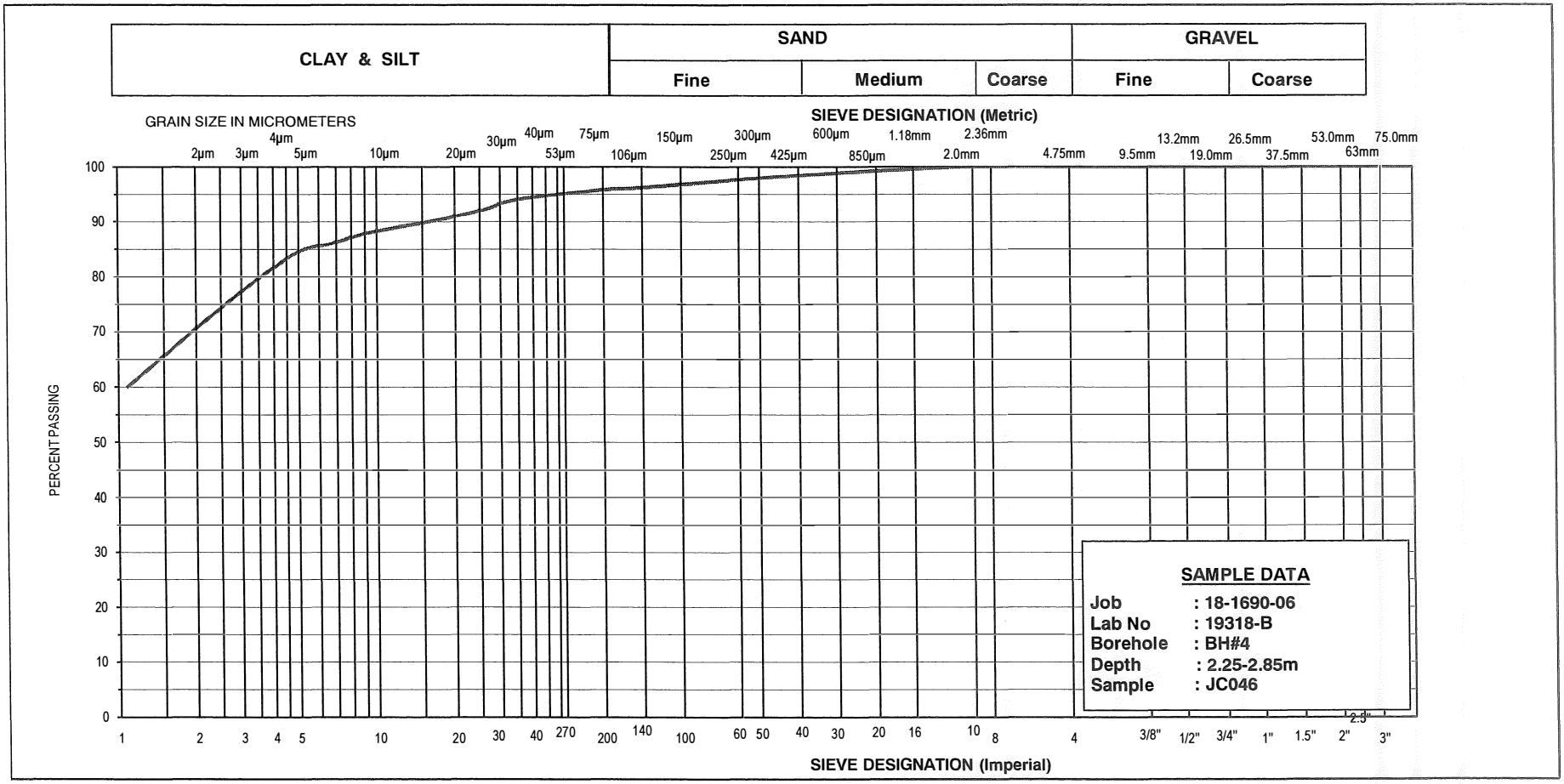
Location: 19525-1 New Apartment CFB Kingston

Date: August 21,2019

Moisture Content is 24.7

SNC-LAVALIN

UNIFIED SOIL CLASSIFICATION SYSTEM

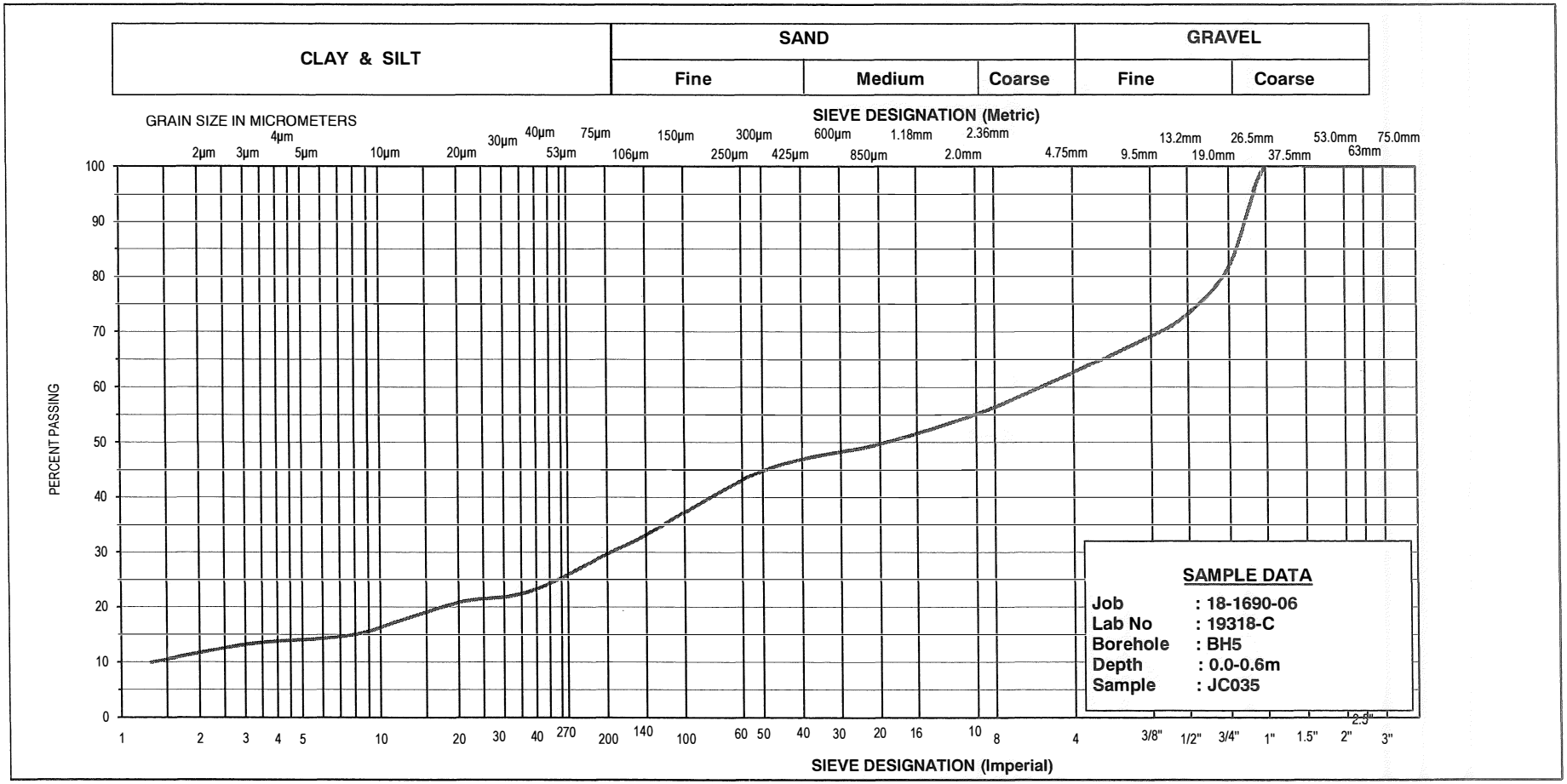


% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	0	0	0	2	3	26	70

SNC-LAVALIN 1164 Clyde Court Kingston, Ontario K7P 2E4	**GRAIN SIZE DISTRIBUTION**	**Client: Ainley**
		Project: 18-1690-06
	CLAY	**Location: 19525-1 New Apartment CFB Kingston**
	With Silt, Trace Sand	**Date: August 21,2019** — **Moisture Content is 25.5%**

SNC-LAVALIN

UNIFIED SOIL CLASSIFICATION SYSTEM

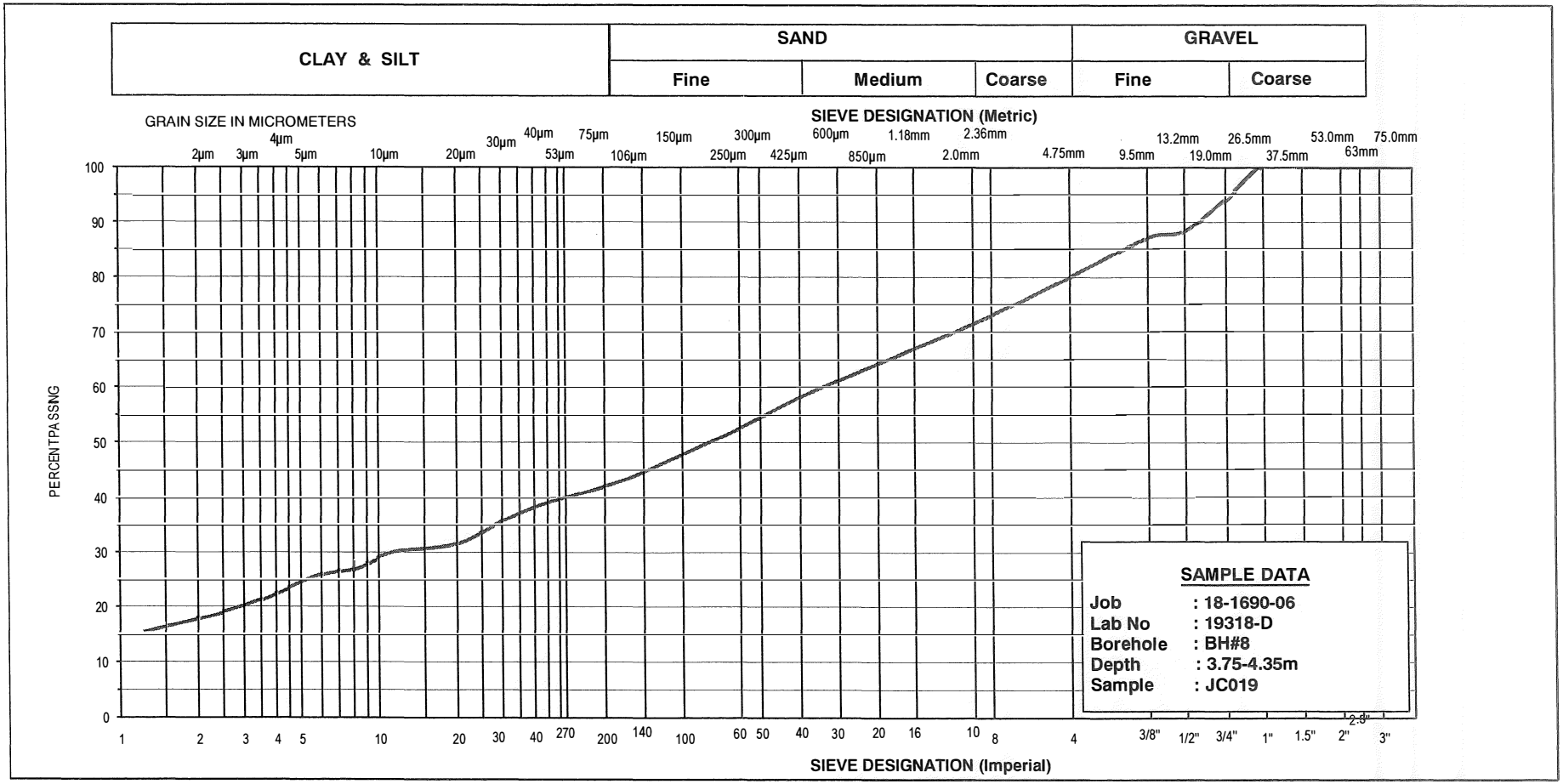


% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	18	19	8	8	17	19	11

SNC-LAVALIN 1164 Clyde Court Kingston, Ontario K7P 2E4	**GRAIN SIZE DISTRIBUTION**	**Client: Ainley**
		Project: 18-1690-06
	SAND GRAVEL	**Location: 19525-1 New Apartment CFB Kingston**
	Some Silt,Some Clay	**Date: August 21,2019** — **Moisture Content is 6.0%**

SNC-LAVALIN

UNIFIED SOIL CLASSIFICATION SYSTEM



% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	6	14	8	13	16	24	18

SNC-LAVALIN
1164 Clyde Court
Kingston, Ontario K7P 2E4

GRAIN SIZE DISTRIBUTION

GRAVELLY SILTY SAND

Some Clay

Client: Ainley

Project: 18-1690-06

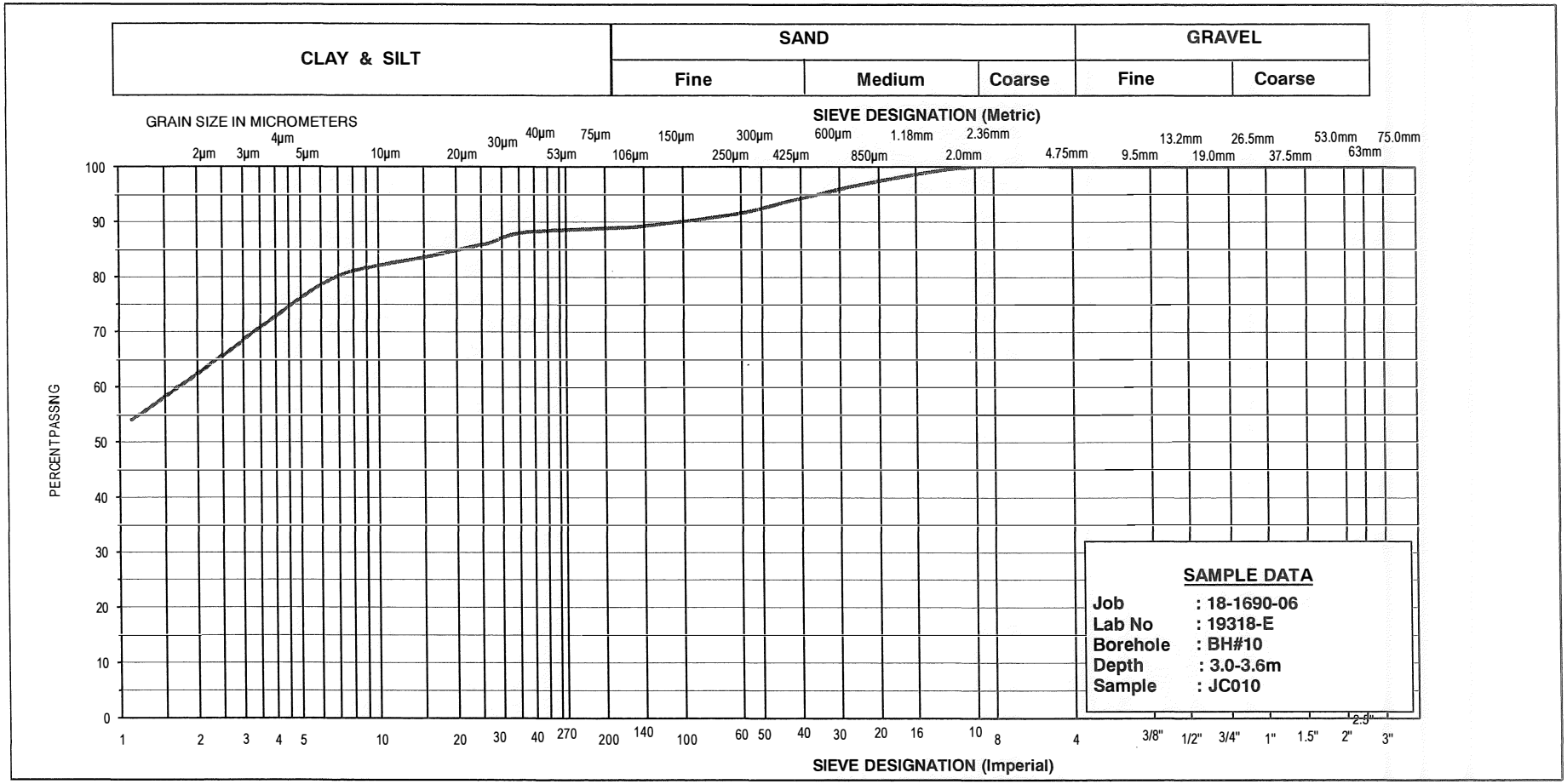
Location: 19525-1 New Apartment CFB Kingston

Date: August 21,2019

Moisture Content is 7.2%

SNC-LAVALIN

UNIFIED SOIL CLASSIFICATION SYSTEM

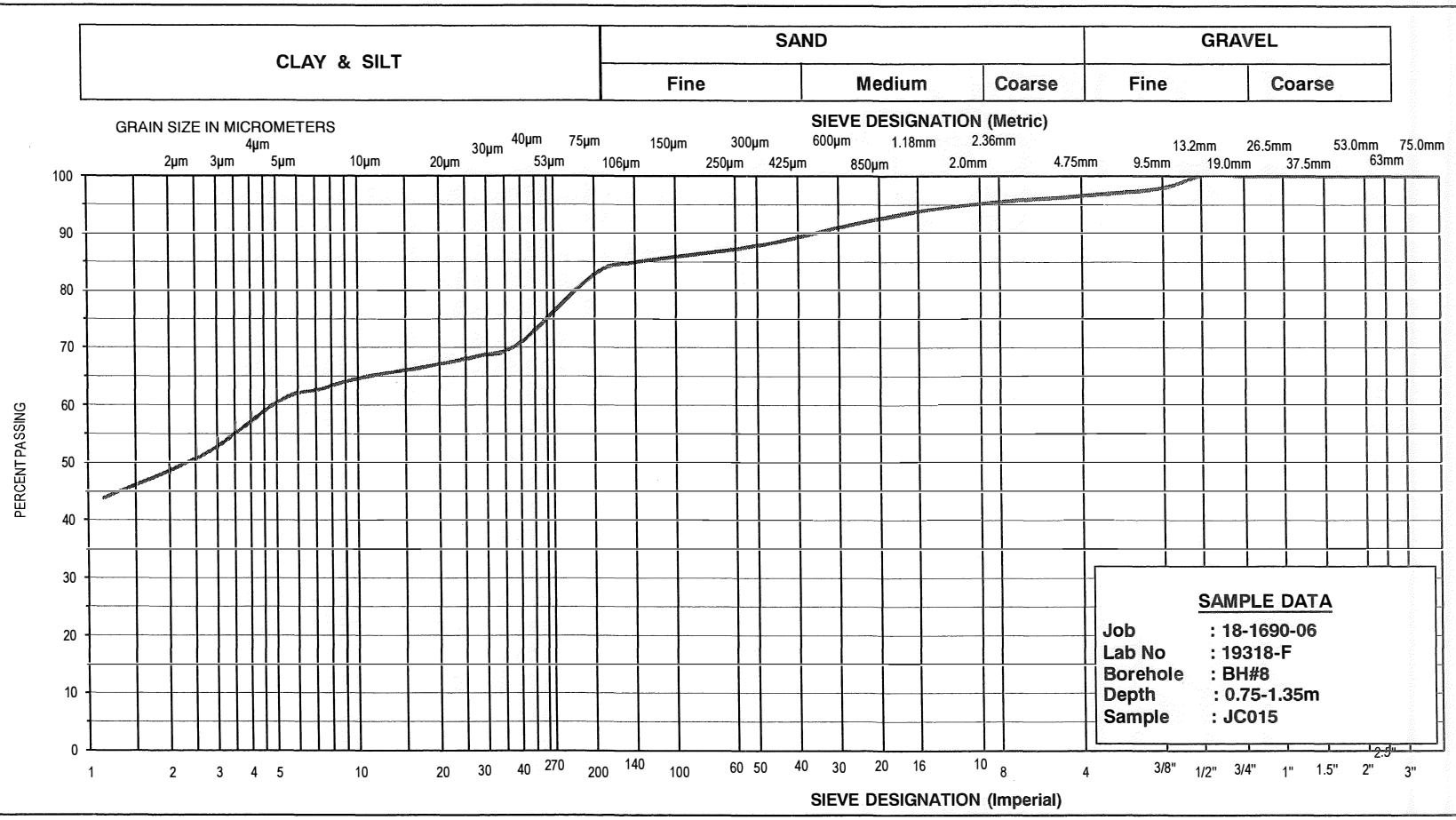


% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	0	0	0	6	5	26	63

SNC-LAVALIN 1164 Clyde Court Kingston, Ontario K7P 2E4	**GRAIN SIZE DISTRIBUTION**	**Client: Ainley**
		Project: 18-1690-06
	CLAY **With Silt, Some Sand**	**Location: 19525-1 New Apartment CFB Kingston**
		Date: August 21,2019 — **Moisture Content is 26.6%**

SNC-LAVALIN

UNIFIED SOIL CLASSIFICATION SYSTEM



% +3"	% Gravel		% Sand			% Fines	
	Course	Fine	Course	Medium	Fine	Silt	Clay
	0	4	1	6	6	36	47

SNC-LAVALIN 1164 Clyde Court Kingston, Ontario K7P 2E4	**GRAIN SIZE DISTRIBUTION**	**Client: Ainley**
		Project: 18-1690-06
	SILTY CLAY	**Location: 19525-1 New Apartment CFB Kingston**
	Some Sand,Trace Gravel	**Date: August 21,2019** — **Moisture Content is 22.0%**

SNC·LAVALIN

SNC-Lavalin GEM Ontario Inc.
1164 Clyde Court
Kingston, Ontario K7P 2E4
(613) 389-178 (613) 389-4204

Grain Size Analysis Test Report

Project No.: 18-1690-06 **Project Description:** Lab Testing **Date:** Sep 04, 2019

Project Location: **Contract No.:**

SAMPLE DATA

Material: Soil
Date Sampled: Aug 21, 2019
Time Sampled:
Sample Type: Borehole
Sample Location: CFB Kingston Apartments 19525-1 BH#8 0-0.6M jc014
Lot: **Sublot:**
Source: Ainley
Sampled By: Client

LAB DATA

Lab No.: 19318-G **Date Tested:** Aug 21, 2019
Specification: ,

PARTICLE ANALYSIS

TEST	Sample	Specification
Percent Crushed:		
% Asphalt Coated:		
% Flat and Elongated		

WASH PASS 0.075mm

TEST	Sample	Specs
Wash Pass 0.075 mm:		

FINENESS MODULUS	2.63

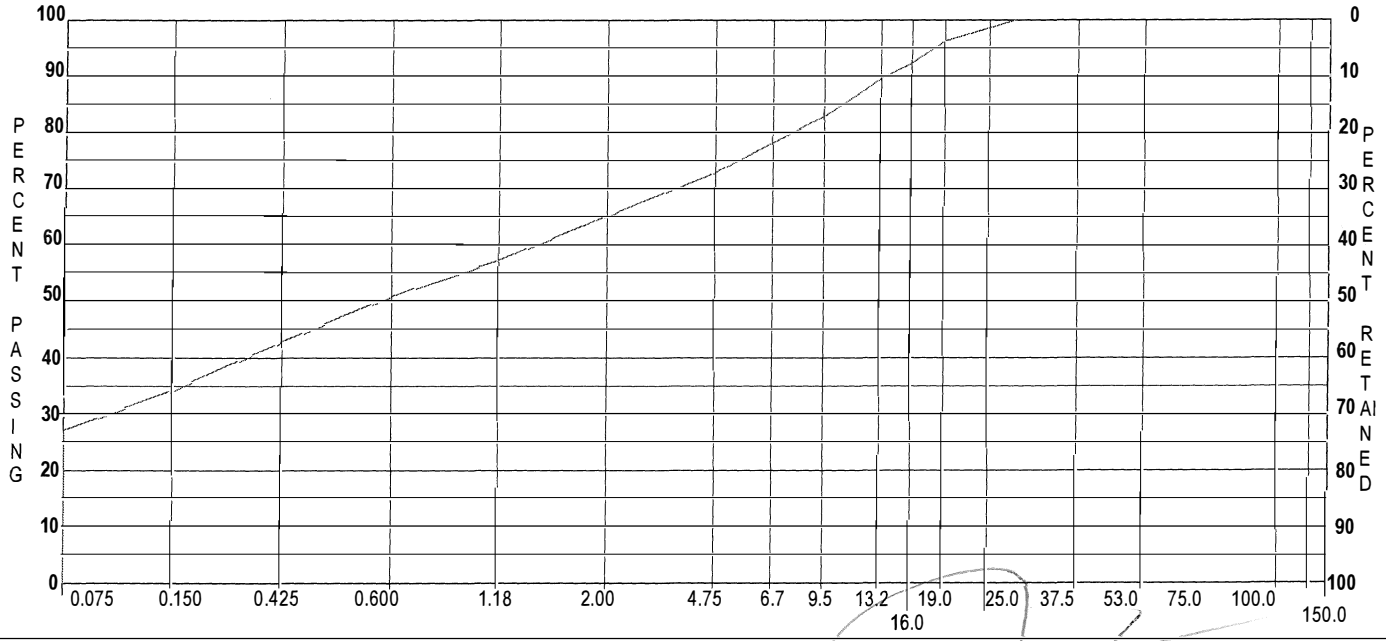
Comments: Moisture Content is 5.4%

Grain Size Analysis

Sieve Sizes (mm)	Percent Passing	
	Sample	Specification
150.0		
100.0		
75.0		
53.0		
50.0		
37.5		
26.5	100	
25.0		
19.0	96.3	
16.0	92.4	
13.2	89.6	
9.5	83.2	
6.7		
4.75	72.8	
2.36	64.2	
2.00		
1.18	57.1	
0.600	50.7	
0.425	42.6	
0.300	42.6	
0.150	34	
0.075	26.9	

* Indicates Out of Specification

Sample: ..... **Specs:** .....



Project Manager: Mark McClelland, C.E.T

SNC-LAVALIN

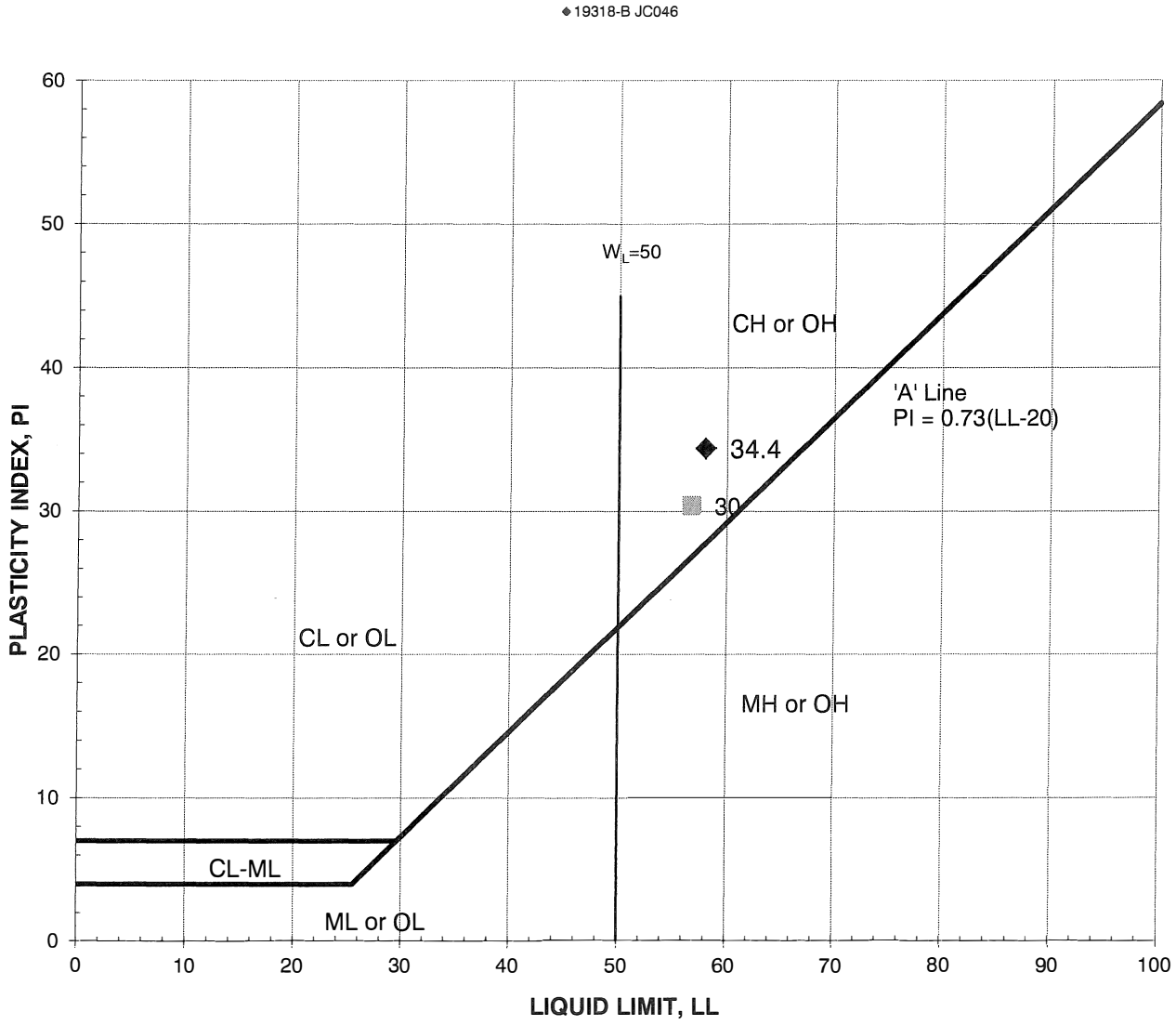
SNC·LAVALIN

PLASTICITY CHART

Job # :	18-1690-06	**Lab #** :	19318
Project Client:	Ainley	**Technician** :	COS
Project :	19525-1 New Apartment CFB Kingston	**Manager**	JU
Location :	Boreholes	**Date** :	08/29/19

TEST RESULTS

Specimen #	Sample #	Depth	LL%	PL%	PI	Fines	W%	Classification	Remarks
19318-B	JC046	2.25-2.85M	58.0	23.6	34.4			CH	Moisture 25.5 %
19318-E	JC010	3.0-3.6M	57	26	30			CH	Moisture 26.6%



Appendix C
Environmental Conditions – Analytical Table and Laboratory Results

Environmental Conditions – Analytical Table and Laboratory Results

Parameter	Units	MDL[3]	Soil - Table 3 Criteria[1,2] (2011)	BH2 3.75 - 4.35 m S01 JC057	BH3 0.75 - 1.35 m S02 JC051	BH4 1.50 - 2.10 m S03 JC045	BH7 0.75 - 1.35 m S04 JC030	BH8 2.25 - 2.85 m S05 JC017	BH10 4.50 - 5.10 m S06 JC012
Metals									
Antimony	µg/g	0.8	(50) 40	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	1	18	4	4	4	4	3	4
Barium	µg/g	2	670	300	300	388	129	358	392
Beryllium	µg/g	0.5	(10) 8	0.7	0.7	0.8	<0.5	0.7	0.7
Boron	µg/g	5	120	7	7	5	17	6	6
Cadmium	µg/g	0.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	2	160	52	48	61	18	55	51
Cobalt	µg/g	0.5	(100) 80	17.6	17	21.1	5.7	17	17.4
Copper	µg/g	1	(300) 230	35	32	42	16	33	35
Lead	µg/g	1	120	10	9	13	8	9	10
Molybdenum	µg/g	0.5	40	<0.5	<0.5	<0.5	0.7	0.7	0.9
Nickel	µg/g	1	(340) 270	39	36	45	14	38	39
Selenium	µg/g	0.4	5.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g	0.2	(50) 40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	0.4	3	<0.4	<0.4	0.4	<0.4	<0.4	<0.4
Uranium	µg/g	0.5	33	0.6	0.5	0.6	0.9	1	1.5
Vanadium	µg/g	1	86	72	68	82	26	70	67
Zinc	µg/g	5	340	99	91	114	60	97	99
Chromium VI	µg/g	0.2	(10) 8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury	µg/g	0.1	(20) 3.9	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	µg/g	0.05	40	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	µg/g	0.05	(0.17) 0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	µg/g	0.05	96	<0.05	<0.05	<0.05	0.2	<0.05	<0.05
Fluorene	µg/g	0.05	(69) 62	<0.05	<0.05	<0.05	0.18	<0.05	<0.05
Phenanthrene	µg/g	0.05	(16) 12	<0.05	<0.05	<0.05	5.4	<0.05	<0.05
Anthracene	µg/g	0.05	(0.74) 0.67	<0.05	<0.05	<0.05	**1**	<0.05	<0.05
Fluoranthene	µg/g	0.05	9.6	<0.05	<0.05	<0.05	5.9	<0.05	<0.05
Pyrene	µg/g	0.05	96	<0.05	<0.05	<0.05	4.7	<0.05	<0.05
Benz(a)anthracene	µg/g	0.05	0.3	<0.05	<0.05	<0.05	2.9	<0.05	<0.05
Chrysene	µg/g	0.05	(100) 80	<0.05	<0.05	<0.05	1.8	<0.05	<0.05
Benzo(b)fluoranthene	µg/g	0.05	0.96	<0.05	<0.05	<0.05	**1.7**	<0.05	<0.05
Benzo(k)fluoranthene	µg/g	0.05	0.96	<0.05	<0.05	<0.05	**0.98**	<0.05	<0.05
Benzo(a)pyrene	µg/g	0.05	0.3	<0.05	<0.05	<0.05	**1.4**	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	µg/g	0.05	(0.95) 0.76	<0.05	<0.05	<0.05	0.66	<0.05	<0.05
Dibenz(a,h)anthracene	µg/g	0.05	0.1	<0.05	<0.05	<0.05	**0.14**	<0.05	<0.05
Benzo(g,h,i)perylene	µg/g	0.05	9.6	<0.05	<0.05	<0.05	0.7	<0.05	<0.05
2-and 1-methyl Naphthalene	µg/g	0.05	(85) 76	<0.05	<0.05	<0.05	0.07	<0.05	<0.05
Petroleum Hydrocarbons (PHCs)									
F1 (C6 to C10)	µg/g	5	(65) 55	<5	<5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	5	(65) 55	<5	<5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	10	(250) 230	<10	<10	<10	<10	<10	<10
F2 (C10 to C16) minus Naphthalene	µg/g	10	(250) 230	<10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	50	(2500) 1700	<50	<50	<50	200	<50	<50
F3 (C16 to C34) minus PAHs	µg/g	50	(2500) 1700	<50	<50	<50	180	<50	<50
F4 (C34 to C50)	µg/g	50	(6600) 3300	<50	<50	<50	220	<50	<50

Environmental Conditions – Analytical Table and Laboratory Results

Parameter	Units	MDL[3]	Soil - Table 3 Criteria[1,2] (2011)	BH2 3.75 - 4.35 m S01 JC057	BH3 0.75 - 1.35 m S02 JC051	BH4 1.50 - 2.10 m S03 JC045	BH7 0.75 - 1.35 m S04 JC030	BH8 2.25 - 2.85 m S05 JC017	BH10 4.50 - 5.10 m S06 JC012
Volatile organic compounds (VOCs)									
Dichlorodifluoromethane	µg/g	0.05	(25) 16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vinyl Chloride	ug/g	0.02	(0.25) 0.032	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromomethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	ug/g	0.05	(0.61) 0.91	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acetone	ug/g	0.50	(28) 16	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/g	0.05	(0.48) 0.064	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	ug/g	0.05	(2) 1.6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g	0.05	(9.3) 1.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl tert-butyl Ether	ug/g	0.05	(3.2) 11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	ug/g	0.02	(21) 17	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Methyl Ethyl Ketone	ug/g	0.50	(88) 70	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g	0.02	(9.3) 1.3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chloroform	ug/g	0.04	(0.18) 0.47	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	ug/g	0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
1,1,1-Trichloroethane	ug/g	0.05	(12) 6.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	ug/g	0.05	(1.5) 0.21	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzene	ug/g	0.02	(0.4) 0.32	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
1,2-Dichloropropane	ug/g	0.03	(0.68) 0.16	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Trichloroethylene	ug/g	0.03	(0.61) 0.91	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Bromodichloromethane	ug/g	0.05	18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl Isobutyl Ketone	ug/g	0.50	(210) 31	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/g	0.04	(0.11) 0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Toluene	ug/g	0.05	(78) 68	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibromochloromethane	ug/g	0.05	13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylene Dibromide	ug/g	0.04	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Tetrachloroethylene	ug/g	0.05	(0.61) 0.91	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.04	(0.11) 0.087	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Chlorobenzene	ug/g	0.05	(2.7) 2.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	ug/g	0.05	(19) 9.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
m & p-Xylene	ug/g	0.05	(30) 26	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bromoform	ug/g	0.05	(1.7) 0.61	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Styrene	ug/g	0.05	(43) 34	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g	0.05	(0.094) 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	ug/g	0.05	(30) 26	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	ug/g	0.05	(12) 9.6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	ug/g	0.05	(0.84) 0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	ug/g	0.05	(8.5) 6.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	ug/g	0.05	(30) 26	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichloropropene	µg/g	0.04	(0.21) 0.18	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
n-Hexane	µg/g	0.05	(88) 46	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Polychlorinated Biphenyl (PCBs)									
PCBs	µg/g	0.1	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:

1. Table 3 criteria for Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition from MOE *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act* , April 2011.
2. Criteria limits defined for Industrial/Commercial/Community Property Use.
3. Method Detection Limit.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: AINLEY GROUP
45 SOUTH FRONT STREET
BELLEVILLE, ON K8N2Y5
(613) 966-4243

ATTENTION TO: Joshua Charlton

PROJECT: CFB Kingston New Apartments

AGAT WORK ORDER: 19P509014

SOIL ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

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

DATE REPORTED: Sep 03, 2019

PAGES (INCLUDING COVER): 14

VERSION*: 1

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

*NOTES

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

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

CLIENT NAME: AINLEY GROUP

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

O. Reg. 153(511) - All Metals (Soil)

DATE RECEIVED: 2019-08-23

DATE REPORTED: 2019-09-03

SAMPLE DESCRIPTION:				S01	S02	S03	S04	S05	S06
SAMPLE TYPE:				Soil	Soil	Soil	Soil	Soil	Soil
DATE SAMPLED:				2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21
Parameter	Unit	G / S	RDL	466628	466662	466663	466664	466665	466666
Antimony	µg/g		0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g		1	4	4	4	4	3	4
Barium	µg/g		2	300	300	388	129	358	392
Beryllium	µg/g		0.5	0.7	0.7	0.8	<0.5	0.7	0.7
Boron	µg/g		5	7	7	5	17	6	6
Boron (Hot Water Soluble)	µg/g		0.10	0.11	<0.10	<0.10	0.38	0.12	0.14
Cadmium	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g		2	52	48	61	18	55	51
Cobalt	µg/g		0.5	17.6	17.0	21.1	5.7	17.0	17.4
Copper	µg/g		1	35	32	42	16	33	35
Lead	µg/g		1	10	9	13	8	9	10
Molybdenum	µg/g		0.5	<0.5	<0.5	<0.5	0.7	0.7	0.9
Nickel	µg/g		1	39	36	45	14	38	39
Selenium	µg/g		0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g		0.4	<0.4	<0.4	0.4	<0.4	<0.4	<0.4
Uranium	µg/g		0.5	0.6	0.5	0.6	0.9	1.0	1.5
Vanadium	µg/g		1	72	68	82	26	70	67
Zinc	µg/g		5	99	91	114	60	97	99
Chromium VI	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury	µg/g		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

CLIENT NAME: AINLEY GROUP

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

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

DATE RECEIVED: 2019-08-23

DATE REPORTED: 2019-09-03

		SAMPLE DESCRIPTION:		S01	S02	S03	S04	S05	S06
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21
Parameter	Unit	G / S	RDL	466628	466662	466663	466664	466665	466666
Naphthalene	µg/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	µg/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	µg/g		0.05	<0.05	<0.05	<0.05	0.20	<0.05	<0.05
Fluorene	µg/g		0.05	<0.05	<0.05	<0.05	0.18	<0.05	<0.05
Phenanthrene	µg/g		0.05	<0.05	<0.05	<0.05	5.4	<0.05	<0.05
Anthracene	µg/g		0.05	<0.05	<0.05	<0.05	1.0	<0.05	<0.05
Fluoranthene	µg/g		0.05	<0.05	<0.05	<0.05	5.9	<0.05	<0.05
Pyrene	µg/g		0.05	<0.05	<0.05	<0.05	4.7	<0.05	<0.05
Benz(a)anthracene	µg/g		0.05	<0.05	<0.05	<0.05	2.9	<0.05	<0.05
Chrysene	µg/g		0.05	<0.05	<0.05	<0.05	1.8	<0.05	<0.05
Benzo(b)fluoranthene	µg/g		0.05	<0.05	<0.05	<0.05	1.7	<0.05	<0.05
Benzo(k)fluoranthene	µg/g		0.05	<0.05	<0.05	<0.05	0.98	<0.05	<0.05
Benzo(a)pyrene	µg/g		0.05	<0.05	<0.05	<0.05	1.4	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	µg/g		0.05	<0.05	<0.05	<0.05	0.66	<0.05	<0.05
Dibenz(a,h)anthracene	µg/g		0.05	<0.05	<0.05	<0.05	0.14	<0.05	<0.05
Benzo(g,h,i)perylene	µg/g		0.05	<0.05	<0.05	<0.05	0.70	<0.05	<0.05
2-and 1-methyl Naphthalene	µg/g		0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05
Moisture Content	%		0.1	25.4	20.4	22.3	8.4	21.2	25.1
Surrogate	Unit	Acceptable Limits							
Chrysene-d12	%	50-140		97	118	91	119	117	111

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

466628-466666 Results are based on the dry weight of the soil.
Note: The result for Benzo(b)Fluoranthene is the total of the Benzo(b)&j)Fluoranthene isomers because the isomers co-elute on the GC column.
2- and 1-Methyl Naphthalene is a calculated parameter. The calculated value is the sum of 2-Methyl Naphthalene and 1-Methyl Naphthalene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

CLIENT NAME: AINLEY GROUP

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

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

DATE RECEIVED: 2019-08-23

DATE REPORTED: 2019-09-03

		SAMPLE DESCRIPTION:		S01	S02	S03	S04	S05	S06
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21
Parameter	Unit	G / S	RDL	466628	466662	466663	466664	466665	466666
F1 (C6 to C10)	µg/g		5	<5	<5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g		5	<5	<5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g		10	<10	<10	<10	<10	<10	<10
F2 (C10 to C16) minus Naphthalene	µg/g		10	<10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g		50	<50	<50	<50	200	<50	<50
F3 (C16 to C34) minus PAHs	µg/g		50	<50	<50	<50	180	<50	<50
F4 (C34 to C50)	µg/g		50	<50	<50	<50	220	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g		50	NA	NA	NA	NA	NA	NA
Moisture Content	%		0.1	25.4	20.4	22.3	8.4	21.2	25.1
Surrogate	Unit	Acceptable Limits							
Terphenyl	%	60-140		87	73	119	120	86	99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

466628-466666 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX and PAH contributions.
C>10 – C16 (F2- Naphthalene) is a calculated parameter. The calculated value is F2 - Naphthalene.
C>16 - C34 (F3-PAH) is a calculated parameter. The calculated value is F3-PAH (PAH: sum of Phenanthrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-c,d)pyrene and Pyrene).
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories
5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

CLIENT NAME: AINLEY GROUP

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

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

DATE RECEIVED: 2019-08-23

DATE REPORTED: 2019-09-03

		SAMPLE DESCRIPTION:		S01	S02	S03	S04	S05	S06
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21
Parameter	Unit	G / S	RDL	466628	466662	466663	466664	466665	466666
Dichlorodifluoromethane	µg/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vinyl Chloride	ug/g		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromomethane	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acetone	ug/g		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl tert-butyl Ether	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	ug/g		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Methyl Ethyl Ketone	ug/g		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chloroform	ug/g		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	ug/g		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
1,1,1-Trichloroethane	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzene	ug/g		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
1,2-Dichloropropane	ug/g		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Trichloroethylene	ug/g		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Bromodichloromethane	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl Isobutyl Ketone	ug/g		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/g		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Toluene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibromochloromethane	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylene Dibromide	ug/g		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Tetrachloroethylene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Chlorobenzene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
m & p-Xylene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

CLIENT NAME: AINLEY GROUP

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

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

DATE RECEIVED: 2019-08-23

DATE REPORTED: 2019-09-03

				SAMPLE DESCRIPTION:	S01	S02	S03	S04	S05	S06
				SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil
				DATE SAMPLED:	2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21
Parameter	Unit	G / S	RDL		466628	466662	466663	466664	466665	466666
Bromoform	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Styrene	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	ug/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichloropropene	µg/g		0.04		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
n-Hexane	µg/g		0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	Unit	Acceptable Limits								
Toluene-d8	% Recovery	50-140			100	92	93	92	92	91
4-Bromofluorobenzene	% Recovery	50-140			85	79	83	86	78	80

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

466628-466666 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

CLIENT NAME: AINLEY GROUP

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

Total PCBs (soil)

DATE RECEIVED: 2019-08-23

DATE REPORTED: 2019-09-03

SAMPLE DESCRIPTION:				S01	S02	S03	S04	S05	S06
SAMPLE TYPE:				Soil	Soil	Soil	Soil	Soil	Soil
DATE SAMPLED:				2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21	2019-08-21
Parameter	Unit	G / S	RDL	466628	466662	466663	466664	466665	466666
PCBs	µg/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate	Unit	Acceptable Limits							
Decachlorobiphenyl	%	60-130		92	92	100	116	68	112

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

466628-466666 Results are based on the dry weight of soil extracted.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: AINLEY GROUP
PROJECT: CFB Kingston New Apartments
SAMPLING SITE:CFB Kingston

AGAT WORK ORDER: 19P509014
ATTENTION TO: Joshua Charlton
SAMPLED BY:Joshua Charlton

Soil Analysis

RPT Date: Sep 03, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - All Metals (Soil)															
Antimony	468538		<0.8	<0.8	NA	< 0.8	100%	70%	130%	96%	80%	120%	90%	70%	130%
Arsenic	468538		3	3	NA	< 1	104%	70%	130%	100%	80%	120%	103%	70%	130%
Barium	468538		34	35	2.9%	< 2	97%	70%	130%	97%	80%	120%	94%	70%	130%
Beryllium	468538		<0.5	<0.5	NA	< 0.5	73%	70%	130%	119%	80%	120%	112%	70%	130%
Boron	468538		<5	<5	NA	< 5	73%	70%	130%	115%	80%	120%	108%	70%	130%
Boron (Hot Water Soluble)	467439		0.83	0.85	2.4%	< 0.10	107%	60%	140%	102%	70%	130%	103%	60%	140%
Cadmium	468538		<0.5	<0.5	NA	< 0.5	108%	70%	130%	99%	80%	120%	103%	70%	130%
Chromium	468538		6	6	NA	< 2	94%	70%	130%	112%	80%	120%	109%	70%	130%
Cobalt	468538		2.8	2.7	3.6%	< 0.5	94%	70%	130%	107%	80%	120%	104%	70%	130%
Copper	468538		13	13	0.0%	< 1	91%	70%	130%	107%	80%	120%	99%	70%	130%
Lead	468538		40	40	0.0%	< 1	102%	70%	130%	100%	80%	120%	97%	70%	130%
Molybdenum	468538		<0.5	<0.5	NA	< 0.5	109%	70%	130%	105%	80%	120%	106%	70%	130%
Nickel	468538		6	6	0.0%	< 1	93%	70%	130%	106%	80%	120%	103%	70%	130%
Selenium	468538		<0.4	<0.4	NA	< 0.4	121%	70%	130%	97%	80%	120%	101%	70%	130%
Silver	468538		<0.2	<0.2	NA	< 0.2	128%	70%	130%	101%	80%	120%	96%	70%	130%
Thallium	468538		<0.4	<0.4	NA	< 0.4	89%	70%	130%	102%	80%	120%	101%	70%	130%
Uranium	468538		<0.5	<0.5	NA	< 0.5	98%	70%	130%	96%	80%	120%	102%	70%	130%
Vanadium	468538		11	12	8.7%	< 1	92%	70%	130%	110%	80%	120%	107%	70%	130%
Zinc	468538		38	37	2.7%	< 5	97%	70%	130%	106%	80%	120%	108%	70%	130%
Chromium VI	468551		<0.2	<0.2	NA	< 0.2	85%	70%	130%	104%	80%	120%	101%	70%	130%
Mercury	468538		<0.10	<0.10	NA	< 0.10	99%	70%	130%	96%	80%	120%	100%	70%	130%

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

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: AINLEY GROUP
PROJECT: CFB Kingston New Apartments
SAMPLING SITE:CFB Kingston

AGAT WORK ORDER: 19P509014
ATTENTION TO: Joshua Charlton
SAMPLED BY:Joshua Charlton

Trace Organics Analysis

RPT Date: Sep 03, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	458680		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	80%	50%	140%	79%	50%	140%
Vinyl Chloride	458680		< 0.02	< 0.02	NA	< 0.02	88%	50%	140%	84%	50%	140%	81%	50%	140%
Bromomethane	458680		< 0.05	< 0.05	NA	< 0.05	79%	50%	140%	89%	50%	140%	96%	50%	140%
Trichlorofluoromethane	458680		< 0.05	< 0.05	NA	< 0.05	79%	50%	140%	80%	50%	140%	99%	50%	140%
Acetone	458680		< 0.50	< 0.50	NA	< 0.50	77%	50%	140%	108%	50%	140%	111%	50%	140%
1,1-Dichloroethylene	458680		< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	98%	60%	130%	84%	50%	140%
Methylene Chloride	458680		< 0.05	< 0.05	NA	< 0.05	116%	50%	140%	112%	60%	130%	104%	50%	140%
Trans- 1,2-Dichloroethylene	458680		< 0.05	< 0.05	NA	< 0.05	77%	50%	140%	107%	60%	130%	96%	50%	140%
Methyl tert-butyl Ether	458680		< 0.05	< 0.05	NA	< 0.05	90%	50%	140%	71%	60%	130%	113%	50%	140%
1,1-Dichloroethane	458680		< 0.02	< 0.02	NA	< 0.02	75%	50%	140%	98%	60%	130%	95%	50%	140%
Methyl Ethyl Ketone	458680		< 0.50	< 0.50	NA	< 0.50	80%	50%	140%	116%	50%	140%	117%	50%	140%
Cis- 1,2-Dichloroethylene	458680		< 0.02	< 0.02	NA	< 0.02	99%	50%	140%	108%	60%	130%	108%	50%	140%
Chloroform	458680		< 0.04	< 0.04	NA	< 0.04	100%	50%	140%	115%	60%	130%	112%	50%	140%
1,2-Dichloroethane	458680		< 0.03	< 0.03	NA	< 0.03	111%	50%	140%	124%	60%	130%	117%	50%	140%
1,1,1-Trichloroethane	458680		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	93%	60%	130%	94%	50%	140%
Carbon Tetrachloride	458680		< 0.05	< 0.05	NA	< 0.05	84%	50%	140%	84%	60%	130%	82%	50%	140%
Benzene	458680		< 0.02	< 0.02	NA	< 0.02	84%	50%	140%	86%	60%	130%	90%	50%	140%
1,2-Dichloropropane	458680		< 0.03	< 0.03	NA	< 0.03	72%	50%	140%	79%	60%	130%	83%	50%	140%
Trichloroethylene	458680		< 0.03	< 0.03	NA	< 0.03	82%	50%	140%	80%	60%	130%	86%	50%	140%
Bromodichloromethane	458680		< 0.05	< 0.05	NA	< 0.05	89%	50%	140%	102%	60%	130%	98%	50%	140%
Methyl Isobutyl Ketone	458680		< 0.50	< 0.50	NA	< 0.50	78%	50%	140%	86%	50%	140%	96%	50%	140%
1,1,2-Trichloroethane	458680		< 0.04	< 0.04	NA	< 0.04	108%	50%	140%	121%	60%	130%	105%	50%	140%
Toluene	458680		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	74%	60%	130%	88%	50%	140%
Dibromochloromethane	458680		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	109%	60%	130%	112%	50%	140%
Ethylene Dibromide	458680		< 0.04	< 0.04	NA	< 0.04	118%	50%	140%	109%	60%	130%	111%	50%	140%
Tetrachloroethylene	458680		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	86%	60%	130%	91%	50%	140%
1,1,1,2-Tetrachloroethane	458680		< 0.04	< 0.04	NA	< 0.04	93%	50%	140%	87%	60%	130%	94%	50%	140%
Chlorobenzene	458680		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	95%	60%	130%	104%	50%	140%
Ethylbenzene	458680		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	99%	60%	130%	71%	50%	140%
m & p-Xylene	458680		< 0.05	< 0.05	NA	< 0.05	70%	50%	140%	77%	60%	130%	91%	50%	140%
Bromoform	458680		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	113%	60%	130%	116%	50%	140%
Styrene	458680		< 0.05	< 0.05	NA	< 0.05	87%	50%	140%	85%	60%	130%	88%	50%	140%
1,1,2,2-Tetrachloroethane	458680		< 0.05	< 0.05	NA	< 0.05	104%	50%	140%	118%	60%	130%	86%	50%	140%
o-Xylene	458680		< 0.05	< 0.05	NA	< 0.05	92%	50%	140%	94%	60%	130%	108%	50%	140%
1,3-Dichlorobenzene	458680		< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	106%	60%	130%	109%	50%	140%
1,4-Dichlorobenzene	458680		< 0.05	< 0.05	NA	< 0.05	120%	50%	140%	107%	60%	130%	107%	50%	140%
1,2-Dichlorobenzene	458680		< 0.05	< 0.05	NA	< 0.05	123%	50%	140%	106%	60%	130%	120%	50%	140%
1,3-Dichloropropene	458680		< 0.04	< 0.04	NA	< 0.04	90%	50%	140%	93%	60%	130%	87%	50%	140%
n-Hexane	458680		< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	103%	60%	130%	113%	50%	140%

AGAT Laboratories
5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: AINLEY GROUP
PROJECT: CFB Kingston New Apartments
SAMPLING SITE:CFB Kingston

AGAT WORK ORDER: 19P509014
ATTENTION TO: Joshua Charlton
SAMPLED BY:Joshua Charlton

Trace Organics Analysis (Continued)

RPT Date: Sep 03, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (with PAHs and VOC) (Soil)															
F1 (C6 to C10)	470828		< 5	< 5	NA	< 5	87%	60%	130%	96%	85%	115%	87%	70%	130%
F2 (C10 to C16)	472271		< 10	< 10	NA	< 10	84%	60%	130%	92%	80%	120%	85%	70%	130%
F3 (C16 to C34)	472271		< 50	< 50	NA	< 50	82%	60%	130%	89%	80%	120%	78%	70%	130%
F4 (C34 to C50)	472271		< 50	< 50	NA	< 50	92%	60%	130%	110%	80%	120%	109%	70%	130%
O. Reg. 153(511) - PAHs (Soil)															
Naphthalene	466666	466666	< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	99%	50%	140%	70%	50%	140%
Acenaphthylene	466666	466666	< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	110%	50%	140%	81%	50%	140%
Acenaphthene	466666	466666	< 0.05	< 0.05	NA	< 0.05	111%	50%	140%	114%	50%	140%	82%	50%	140%
Fluorene	466666	466666	< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	120%	50%	140%	83%	50%	140%
Phenanthrene	466666	466666	< 0.05	< 0.05	NA	< 0.05	116%	50%	140%	120%	50%	140%	79%	50%	140%
Anthracene	466666	466666	< 0.05	< 0.05	NA	< 0.05	111%	50%	140%	115%	50%	140%	81%	50%	140%
Fluoranthene	466666	466666	< 0.05	< 0.05	NA	< 0.05	111%	50%	140%	103%	50%	140%	80%	50%	140%
Pyrene	466666	466666	< 0.05	< 0.05	NA	< 0.05	108%	50%	140%	106%	50%	140%	79%	50%	140%
Benz(a)anthracene	466666	466666	< 0.05	< 0.05	NA	< 0.05	80%	50%	140%	109%	50%	140%	75%	50%	140%
Chrysene	466666	466666	< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	106%	50%	140%	82%	50%	140%
Benzo(b)fluoranthene	466666	466666	< 0.05	< 0.05	NA	< 0.05	103%	50%	140%	95%	50%	140%	63%	50%	140%
Benzo(k)fluoranthene	466666	466666	< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	110%	50%	140%	79%	50%	140%
Benzo(a)pyrene	466666	466666	< 0.05	< 0.05	NA	< 0.05	86%	50%	140%	102%	50%	140%	79%	50%	140%
Indeno(1,2,3-cd)pyrene	466666	466666	< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	82%	50%	140%	66%	50%	140%
Dibenz(a,h)anthracene	466666	466666	< 0.05	< 0.05	NA	< 0.05	73%	50%	140%	89%	50%	140%	71%	50%	140%
Benzo(g,h,i)perylene	466666	466666	< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	95%	50%	140%	85%	50%	140%
Total PCBs (soil)															
PCBs	471755		< 0.1	< 0.1	NA	< 0.1	96%	60%	140%	93%	60%	140%	93%	60%	140%

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

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: AINLEY GROUP

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: AINLEY GROUP

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

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

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: AINLEY GROUP

AGAT WORK ORDER: 19P509014

PROJECT: CFB Kingston New Apartments

ATTENTION TO: Joshua Charlton

SAMPLING SITE:CFB Kingston

SAMPLED BY:Joshua Charlton

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
PCBs	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD

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

Chain of Custody Record

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

Laboratory Use Only
Work Order #: 19P509014
Cooler Quantity: 1
Arrival Temperatures: 9.8 | 9.6 | 9.9 / 8.0 | 8.2 | 8.4
Custody Seal Intact: ☐ Yes ☐ No ☑ N/A
Notes: Onice.

Report Information:
Company: Ainley Group
Contact: Joshua Charlton
Address: 1-50 Grant Timmins Drive, Kingston, Ontario
Phone: 343-266-0002 Fax:
Reports to be sent to:
1. Email: charlton@ainleygroup.com
2. Email:

Regulatory Requirements:
☐ No Regulatory Requirement
(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture *(Check One)* ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region *Indicate One*
☐ MISA

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

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

Report Guideline on *Certificate of Analysis* ☐ Yes ☑ No

Turnaround Time (TAT) Required:
Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*
For 'Same Day' analysis, please contact your AGAT CPM

Project Information:
Project: CFB Kingston New Apartments
Site Location: CFB Kingston
Sampled By: Joshua Charlton
AGAT Quote #: 243724HM PO: 19525-1
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:
Bill To Same: Yes ☑ No ☐
Company: Ainley Group
Contact: Joshua Charlton
Address: 1-50 Grant Timmins Drive, Kingston, Ontario
Email:

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y/N	Field Filtered - Metals, Hg, CrVI	O. Reg 153: Metals and Inorganics	All Metals ☐ 153 Metals (excl. Hydrides)	Hydride Metals ☐ 153 Metals (Incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cr ☐ CN ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☑ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use						Potentially Hazardous or High Concentration (Y/N)
S01	08/21/19	-	3	Soil								☑			☑	☑		☑	☑									
S02	08/21/19	-		Soil								☑			☑	☑		☑	☑									
S03	08/21/19	-		Soil								☑			☑	☑		☑	☑									
S04	08/21/19	-		Soil								☑			☑	☑		☑	☑									
S05	08/21/19	-		Soil								☑			☑	☑		☑	☑									
S06	08/21/19	-		Soil								☑			☑	☑		☑	☑									

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Josh Charlton	Aug 23 2019	12:50	Karey Jones	Aug 23/19	1330
	Aug 23/19	1600		Aug 24/19	8:50AM

Page 1 of 1
N°:

Document ID: DIV-78-1511-016
Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT
Date Issued: March 22, 2019