FINAL

Preliminary Geotechnical Investigation – Proposed Industrial Development

45 Blowers Crescent, Ajax, Ontario

Prepared for:

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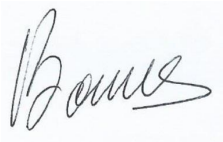

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1.0 INTRODUCTION AND SCOPE

Pinchin Ltd. (Pinchin) was retained by Star Night Import & Export Inc. (Client) to conduct a Preliminary Geotechnical Investigation and provide subsequent preliminary geotechnical design recommendations for the proposed industrial development to be located at 45 Blowers Crescent, Ajax, Ontario (Site). The Site location is shown on Figure 1.

Drawing titled "*Site Plan*, Industrial Condo Development, 45 Blowers Cres., Ajax, Ontario, Canada, Drawing No. A-100, Project No. S20-19, prepared by Saplys Architects Incorporated, and dated May 16, 2022" was provided by the Client and reviewed in preparation of this report.

It is Pinchin's understanding that the proposed development is to consist of a one-storey slab-on-grade (i.e. no basement level) warehouse / office building, complete with at-grade parking/loadings areas and access driveways.

Pinchin's geotechnical comments and recommendations are based on the results of the Preliminary Geotechnical Investigation and our current understanding of the project scope. This report is preliminary in nature and may need to be supplemented and updated with a future, more extensive, geotechnical investigation once detailed design of the proposed development has been completed.

The purpose of the Preliminary Geotechnical Investigation was to delineate the subsurface conditions and soil engineering characteristics by advancing a total of four (4) sampled boreholes (Boreholes BH1 to BH4), at the Site.

Based on the results of the Preliminary Geotechnical Investigation, the following preliminary geotechnical data and engineering design recommendations are provided herein:

- A review of relevant area geology and Site background information;
- A detailed description of the soil and groundwater conditions;
- Site preparation recommendations;
- Open cut excavations;
- Anticipated groundwater management;
- Preliminary foundation design recommendations including soil bearing resistances at Ultimate Limit States (ULS) and Serviceability Limit States (SLS) design;
- Potential total and differential settlements;
- Preliminary Seismic Site Classification for Seismic Site Response;
- Foundation frost protection and engineered fill specifications and installation;
- Seismic Site classification for seismic Site response;
- Concrete floor slab-on-grade support recommendations;

- Pavement structure design for parking/loading areas and access roadways; and,
- Potential construction concerns.

Abbreviations terminology and principle symbols commonly used throughout the report, borehole logs and appendices are enclosed in Appendix I.

2.0 SITE DESCRIPTION AND GEOLOGICAL SETTING

The Site is located on the west side of Blowers Crescent, just south of the road's north bend, and consists of an undeveloped vacant parcel of land with an area of approximately 0.35 ha. The Site is bounded by Blowers Crescent to the east, undeveloped vacant lots to the north and south, and woodlot areas to the west.

It is understood that the proposed development is to consist of a single-storey slab-on-grade warehouse building, complete with at-grade parking/loading areas and access driveways.

Data obtained from the Ontario Geological Survey Maps, as published by the Ontario Ministry of Natural Resources, indicates that the Site is located on stone-poor, sandy silt to silty sand-textured till deposits (Ontario Geological Survey 2010, Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV). The underlying bedrock at this Site is of the Georgian Bay formation; Blue Mountain formation and Billings formation consisting of shale, limestone, dolostone and siltstone (Armstrong, D.K. and Dodge, J.E.P. 2007, Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219). Based on Ontario Department of Mines Preliminary Map 196 (Bedrock Topography of the Markham Area, Southern Ontario, issued 1992), the bedrock within the vicinity of the Site is expected to be approximately 20 to 30 metres below ground surface (mbgs).

3.0 PRELIMINARY GEOTECHNICAL FIELD INVESTIGATION AND METHODOLOGY

Pinchin completed the field investigations at the Site on June 6, 2022 by advancing a total of four (4) sampled boreholes (Boreholes BH1 to BH4) throughout the Site. The boreholes were advanced to depths ranging from approximately 5.3 to 6.6 mbgs. The approximate spatial locations of the boreholes advanced at the Site are shown on Figure 2.

The boreholes were advanced with the use of a track-mounted drill rig which was equipped with standard soil sampling equipment. Soil samples were collected at regular intervals using a 51 mm outside diameter (OD) split spoon barrel in conjunction with Standard Penetration Tests (SPT) "N" values (ASTM D1586). The SPT "N" values were used to assess the compactness condition of the non-cohesive soil and to estimate the consistency of the cohesive soil. Groundwater observations and measurements were obtained from the open boreholes during and upon completion of drilling. The in-situ testing, groundwater observations and measurements recorded are included on the appended borehole logs.

The borehole locations and ground surface elevations were surveyed by Pinchin using a Trimble R10 Global Navigation Satellite System (GNSS) rover and the Can-Net reference system to determine target location and elevation. The ground surface elevations are geodetic, based on GNSS and local base station telemetry with a precision static of up to 10 mm horizontally and up to 30 mm vertically.

The field investigation was monitored by experienced Pinchin personnel. Pinchin logged the drilling operations and identified the soil samples as they were retrieved. The recovered soil samples were sealed into plastic bags and carefully transported to Pinchin's laboratory in Waterloo, Ontario for detailed analysis. All soil samples were classified according to visual and index properties by the project engineer.

The field logging of the soil and groundwater conditions was performed to collect preliminary geotechnical engineering design information. The borehole logs include textural descriptions of the subsoil in accordance with a modified Unified Soil Classification System (USCS) and indicate the soil boundaries inferred from non-continuous sampling and observations made during the borehole advancement. These boundaries reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The modified USCS classification is explained in further detail in Appendix I. Details of the soil and groundwater conditions encountered within the boreholes are included on the Borehole Logs within Appendix II.

4.0 SUBSURFACE CONDITIONS

4.1 Borehole Soil Stratigraphy

The following stratigraphy is based on the borehole findings. The summary provided below is for general guidance only. Detailed depths and elevations are given in the following subsections and appended borehole logs. In general, the three (3) main stratigraphic units were encountered below the surficial topsoil, as follows:

- Compact to very dense (typically dense to very dense) undisturbed sandy silt to silty sand till deposits were encountered below the surficial topsoil, extending to approximately 4.6 mbgs (Boreholes BH1 and BH4) and the full depth of the investigation (Boreholes BH2 and BH3); overlying
- Hard clayey silt till deposit, extending to approximately 6.1 mbgs (Borehole BH2) and the full depth of the investigation (Borehole BH4); and
- Very dense sand deposit, extending to the full depth of the investigation in Borehole BH1.

4.1.1 Topsoil

A topsoil layer with thickness ranging from approximately 180 to 300 mm was encountered at the ground surface in each borehole.

4.1.2 Glacial Till

Sandy silt to silty sand till deposits, with trace to some amounts of gravel and clay, trace stone fragments and containing layers of silty sand were encountered beneath the topsoil in each borehole and extended to approximately 4.6 mbgs (Boreholes BH1 and BH4) and the full depth of the investigation (Boreholes BH2 and BH3).

Clayey silt till deposit, with varying amounts of sand (trace sand to sandy), trace gravel and stone fragments was encountered within and beneath the cohesionless glacial till deposits in Boreholes BH2 and BH4, and extended to approximately 6.1 mbgs (Borehole BH2) and the full depth of the investigation (Borehole BH4).

The cohesionless glacial till deposits have a compact to very dense (typically dense to very dense) relative density based on SPT ‘N’ values of 22 to greater than 50 blows per 300 mm penetration of a split spoon sampler. The cohesionless glacial till samples were generally described as moist at the time of sampling.

The clayey silt till deposit has a hard consistency based on SPT ‘N’ values of greater then 50 blows per 300 mm penetration of a split spoon sampler. The clayey silt till samples were generally described as drier than plastic limit (DTPL) to about plastic limit (APL) at the time of sampling.

4.1.3 Sand

A sand deposit, with trace to some silt, trace amounts of gravel and stone fragments was encountered beneath the silty sand till deposit at 4.6 mbgs in Borehole BH1 and extended to the full depth of the investigation.

The sand deposit has a very dense relative density based on SPT ‘N’ values of greater than 50 blows per 300 mm penetration of a split spoon sampler. The native sand samples were described as wet at the time of sampling.

4.2 Groundwater Conditions

Groundwater observations and measurements were obtained in the open boreholes at the completion of drilling and are summarized on the appended borehole logs. Unstabilized water level and depth to cave as measured at the borehole locations upon completion of drilling are summarized below:

Borehole No.	Borehole Depth (mbgs)	Unstabilized Water Level (mbgs / masl)	Depth to Cave (mbgs)
BH1	6.4	2.7 / 105.4	4.6
BH2	6.6	dry	2.1

Borehole No.	Borehole Depth (mbgs)	Unstabilized Water Level (mbgs / masl)	Depth to Cave (mbgs)
BH3	5.3	2.7 / 105.6	open
BH4	6.6	dry	5.8

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions.

It is noted that the grey colouration of the soils starting at 0.8 to 3.0 mbgs can be an indication of the stabilized groundwater table.

5.0 PRELIMINARY GEOTECHNICAL DESIGN RECOMMENDATIONS

5.1 General Information

The recommendations presented in the following sections of this report are preliminary and based on the information available regarding the proposed construction, the limited results obtained from the geotechnical investigation, and Pinchin's experience with similar projects.

Since the investigation only represents a portion of the subsurface conditions, it is possible that conditions may be encountered during construction that are substantially different than those encountered during the investigation. If these situations are encountered, adjustments to the design may be necessary.

As the design progresses, these preliminary results should be reviewed by Pinchin and potentially supplemented with a more detailed geotechnical field investigation and the design recommendations below should be revised based on the updated information. In addition, a qualified geotechnical engineer should be on-Site during the foundation preparation to ensure the subsurface conditions are the same/similar to what was observed during the investigation.

It is understood that the proposed development is to consist of a single-storey slab-on-grade warehouse building, complete with at-grade parking/loading areas and access driveways. The Site is relatively flat with elevations as inferred from the borehole locations ranging from Elevation 107.7 to 108.3 masl, thus implying an average Site elevation of approximately 108 ± masl.

A total of four (4) boreholes were advanced throughout the Site. In general, the three (3) main stratigraphic units were encountered below the surficial topsoil, as follows:

- Compact to very dense (typically dense to very dense) undisturbed sandy silt to silty sand till deposits were encountered below the surficial topsoil, extending to approximately 4.6 mbgs (Boreholes BH1 and BH4) and the full depth of the investigation (Boreholes BH2 and BH3); overlying

- Hard clayey silt till deposit, extending to approximately 6.1 mbgs (Borehole BH2) and the full depth of the investigation (Borehole BH4); and
- Very dense sand deposit, extending to the full depth of the investigation in Borehole BH1.

The highest unstabilized groundwater level as measured in the open boreholes was approximately 2.7 mbgs (i.e. Elevation of 105.4 masl). It is noted that the grey colouration of the soils starting at 0.8 to 3.0 mbgs can be an indication of the stabilized groundwater table.

5.2 Site Preparation

The topsoil is not considered suitable to remain below the proposed building and pavement structures for parking areas and access driveways, and will need to be removed. The inorganic native soils beneath the topsoil may remain below the proposed pavement and building slab subject to inspection by a geotechnical engineer. Any organics encountered at the subgrade are to be removed.

In calculating the approximate quantity of soil to be stripped, we recommend that the topsoil thickness provided on the individual borehole logs be increased by 50 mm to account for variations and some stripping of the mineral soil below.

Pinchin recommends that any engineered fill required at the Site be compacted in accordance with the criteria stated in the following table:

Type of Engineered Fill	Maximum Loose Lift Thickness (mm)	Compaction Requirements	Moisture Content (Percent of Optimum)
Structural fill to support foundations and floor slabs	200	100% SPMDD	Plus 2 to minus 4
Subgrade fill beneath parking lots and access roadways	300	98% SPMDD	Plus 2 to minus 4

The existing native soils at the Site are suitable for reuse as subgrade fill below the parking/loading areas and access driveways. Any surficial organics should be removed prior to placing road subgrade fill. Further assessment of the on-site soils would be needed in order to allow the native soils to be used as engineered fill below proposed buildings.

It is recommended that any fill required to raise grades below the proposed building and pavement alignment comprises of imported Ontario Provincial Standard Specification (OPSS.MUNI) 1010 Granular ‘B’ Type I or II material. If the work is carried out during very dry weather, water may have to be added to the material to improve compaction.

The engineered fill should extend for a distance of at least 1 m beyond the edge of foundation, and should extend outwards and downwards from this point at a 1 horizontal to 1 vertical slope, to the approved subgrade. In addition, the engineered fill should extend at least 0.3 m above the proposed foundation elevation. This is to ensure that the foundations are placed on the engineered fill both in plan and elevation.

A qualified geotechnical engineering technician from Pinchin should be on site to observe fill placement operations and perform field density tests at random locations throughout each lift, to indicate the specified compaction is being achieved. Full time testing should be conducted for engineered fill to support buildings.

The above noted recommendations are from a geotechnical perspective and additional analytical requirements may need to be reviewed in order to ensure compliance with Ontario Regulation 406/19, *On-Site and Excess Soil Management,* depending on when any imported material is received at the Site.

5.3 Open Cut Excavations and Anticipated Groundwater Management

The proposed development consists of a slab-on-grade warehouse / office building. The finished floor elevation (FFE) of the building was not provided at the time of preparation of this report. It is anticipated that the FFE of the proposed building will be constructed close the existing grade (i.e. Elevation 108 ± masl, as inferred from the surveyed borehole locations).

Based on the subsurface information obtained from within the boreholes, the excavated material will consist of topsoil and glacial till deposits.

Where workers must enter trench excavations deeper than 1.2 m, the trench excavations should be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act (OHSA), Ontario Regulation 213/91, Construction Projects, July 1, 2011, Part III - Excavations, Section 226.

Based on the OHSA, the glacial till deposits would be classified as Type 2 soil above and Type 3 soil below the prevailing groundwater level. Temporary excavations in Type 2 soils may be cut near vertical in the bottom 1.2 m of the excavation and must be trimmed back at an inclination of 1 horizontal to 1 vertical (H to V) above this level. Temporary excavations in Type 3 soils must be trimmed back at an inclination of 1 horizontal to 1 vertical (H to V) from the base of excavation. Excavations through more than one soil type must be sloped as per the requirements of the higher numbered soil type.

In addition to compliance with the OHSA, the excavation procedures must also be in compliance to any potential other regulatory authorities, such as federal and municipal safety standards.

Alternatively, the excavation walls may be supported by either closed shoring, bracing, or trench boxes complying with sections 235 to 239 and 241 under O. Reg. 231/91, s. 234(1). The use of trench boxes can most likely be used for temporary support of vertical side walls.

It should be noted that the glacial till deposit may contain larger particles (cobbles and boulders) that are not specifically identified in the Borehole Logs. The size and distribution of such obstructions cannot be predicted with borings, because the borehole sampler size is insufficient to secure representative samples of the particles of this size. Provision should be made in excavation contracts to allocate risks associated with time spent and equipment utilized to remove or penetrate such obstructions when encountered.

The highest unstabilized groundwater level as measured in the open boreholes advanced on June 6, 2022 was approximately 2.7 mbgs (i.e. Elevation of 105.4 masl). It is noted, however, that the grey colouration of the soils starting at 0.8 to 3.0 mbgs can be an indication of the stabilized groundwater table.

Based on the above information, groundwater table may or may not be encountered during the excavations. However, perched seepage may be encountered at some locations during the excavation. The groundwater seepage emanating from above the static groundwater table should diminish slowly and can be controlled by continuous pumping from filtered sumps at the base of the excavation.

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions. If construction commences during wet periods (typically spring or fall), there is a greater potential that the groundwater elevation could be higher and/or perched water seepage emanating from the sand/silt seams of the glacial till deposits may be present. Any potential precipitation or perched groundwater should be able to be controlled from pumping from filtered sumps and should be pumped away immediately (not allowed to pond).

Prior to commencing excavations, it is critical that all existing surface water and potential surface water is controlled and diverted away from the Site to prevent infiltration and subgrade softening. At no time should excavations be left open for a period of time that will expose them to precipitation and cause subgrade softening.

All collected water is to discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures, such as a silt fence should be installed at the discharge point of the dewatering system. The utmost care should be taken to avoid any potential impacts on the environment.

It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. The method used should not adversely impact any nearby structures.

5.4 Foundation Design

It is understood that the proposed development is to consist of a one-storey, slab-on-grade building. The average elevation of the Site may be taken as 108 ± masl, and the finished floor level of the proposed slab-on-grade building is expected to be constructed close to existing grade.

5.4.1 Shallow Foundations Bearing on Native Soils

The compact to very dense (typically dense to very dense) glacial till deposits at the Site are considered suitable to support the proposed building.

Conventional shallow strip footings established in the undisturbed glacial till deposits may be designed using a bearing resistance for 25 mm of settlement at Serviceability Limit States of 200 kPa, and a factored geotechnical bearing resistance of 300 kPa at Ultimate Limit States (ULS).

The minimum width of the continuous strip footings must be 500 mm and the minimum size of isolated footings must be 900 mm x 900 mm regardless of loading considerations, in conjunction with the above recommended geotechnical resistance.

5.4.2 Foundation Installation

It is noted that there is a potential for weaker subgrade soil to be encountered between the investigation locations. Pinchin presumes that any areas of weaker subgrade soil will consist of small pockets of soft/loose natural soil. Any soft/loose areas are to be removed and replaced with a low strength concrete.

The foundation installations must be reviewed in the field by Pinchin. The on-site review of the condition of the foundation subgrade, as the foundations are constructed, is an integral part of the geotechnical engineering design function, and is not to be considered as third-party inspection services.

The natural subgrade soil is sensitive to changes in moisture content and can become loose/soft if subjected to additional water or precipitation. As well, it could be easily disturbed if travelled on during construction. Once it becomes disturbed it is no longer considered adequate to support the recommended design bearing pressures. It is recommended that a working slab of lean concrete (mud slab) be placed in the footing areas immediately after excavation and inspection to protect the founding soils during placement of formwork and reinforcing steel.

In addition, to ensure and protect the integrity of the subgrade soil during construction operations, the following is recommended:

- Prior to commencing excavations, it is critical that all existing surface water, potential surface water and perched groundwater are controlled and diverted away from the work Site to prevent infiltration and subgrade softening. At no time should excavations be left open for a period of time that will expose them to inclement weather conditions and cause subgrade softening;
- The subgrade should be sloped to a sump outside the excavation to promote surface drainage and the collected water pumped out of the excavation. Any precipitation or seepage entering the excavations should be pumped away immediately (not allowed to pond);

- The footing areas should be cleaned of all deleterious materials such as topsoil, organics, fill, disturbed, caved materials, or construction debris;
- Any potential large cobbles or boulders (i.e. greater than 200 mm in diameter) within the subgrade material are to be removed and replaced with a similar soil type not containing particles greater than 200 mm in diameter. It is critical that particles greater than 200 mm in diameter are not in contact with the foundation to prevent point loading and overstressing; and,
- If the excavated subgrade soil remains open to weather conditions and groundwater seepage, sidewall stability and suitability of the subgrade soil will need to be verified prior to construction.

If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided and maintained above freezing at all times.

5.4.3 Site Classification for Seismic Site Response & Soil Behaviour

The following information has been provided to assist the building designer from a geotechnical perspective only. These geotechnical seismic design parameters should be reviewed in detail by the structural engineer and be incorporated into the design as required.

The seismic site classification has been based on the 2012 Ontario Building Code (OBC). The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the OBC. The site classification is based on the average shear wave velocity in the top 30 m of the site stratigraphy. If the average shear wave velocity is not known, the site class can be estimated from energy corrected Standard Penetration Resistance (N60) and/or the average undrained shear strength of the soil in the top 30 m.

The boreholes advanced at this Site extended to depths ranging from approximately 5.3 to 6.6 mbgs and were terminated on native deposits. SPT “N” values within the native soil deposits ranged between 22 and more than 50 blows per 300 mm. As such, based on Table 4.1.8.4.A of the OBC, this Site has been classified as Class C. A Site Class C has an average shear wave velocity (Vs) of between 360 and 760 m/s.

5.4.4 Foundation Transition Zones

Excessive differential settlements can occur where the subgrade support material types differ below the underside of continuous strip footings, (i.e., different types of native soils). As such, where strip footings transition from one material to another the transition between the materials should be suitably sloped or benched to mitigate differential settlements.

Pinchin also recommends the following transition precautions to mitigate/accommodate potential differential settlements:

- For strip footings, the transition zones should be adequately reinforced with additional reinforced steel lap lengths or widened footings;
- Steel reinforced poured concrete foundation walls; and
- Control joints throughout the transition zone(s).

The above recommendations should be reviewed by the structural engineer and incorporated into the design as necessary.

Where strip footings are founded at different elevations, the subgrade soil is to have a maximum slope of 2 H to 1 V, with the concrete footing having a maximum rise of 600 mm and a minimum run of 600 mm between each step, as detailed in the 2012 Ontario Building Code (OBC). The lower footing should be installed first to mitigate the risk of undermining the upper footing.

Individual spread footings are to be spaced a minimum distance of one and a half times the largest footing width apart from each other to avoid stress bulb interaction between footings. This assumes the footings are at the same elevation.

5.4.5 Estimated Settlement

Foundations installed in accordance with the recommendations outlined in the preceding sections are not expected to exceed total settlements of 25 mm and differential settlements of 19 mm.

All foundations are to be designed and constructed to the minimum widths as detailed in the 2012 OBC.

5.4.6 Building Drainage

To assist in maintaining the building dry from surface water seepage, it is recommended that exterior grades around the buildings be sloped away at a 2% gradient or more, for a distance of at least 2.0 m. Roof drains should discharge a minimum of 1.5 m away from the structure to a drainage swale or appropriate storm drainage system.

Exterior perimeter foundation drains are not required, where the finished floor elevation is established a minimum of 150 mm above the exterior final grades or that the exterior gradient is properly sloped to divert surface water away from the buildings.

5.4.7 Shallow Foundations Frost Protection & Foundation Backfill

In the Ajax, Ontario area, exterior perimeter foundations for heated buildings require a minimum of 1.2 m of soil cover above the underside of the footing to provide soil cover for frost protection.

Where the foundations for heated buildings do not have the minimum 1.2 m of soil cover frost protection, they should be protected from frost with a combination of soil cover and rigid polystyrene insulation, such as Dow Styrofoam or equivalent product. If required, Pinchin can provide appropriate foundation frost protection recommendations as part of the design review.

To minimize potential frost movements from soil frost adhesion, the perimeter foundation backfill should consist of a free draining granular material, such as a Granular ‘B’ Type I or Type II (OPSS 1010) or an approved sand fill, extending a minimum lateral distance of 600 mm beyond the foundation. The existing glacial till deposit is not considered suitable for reuse as foundation wall backfill.

The backfill material must be brought up evenly on both sides of walls not designed to resist lateral pressure..

All granular material is to be placed in maximum 300 mm thick lifts compacted to a minimum of 100% SPMDD below the building floor slab and below exterior hard landscaping areas; and, 95% SPMDD below exterior soft landscaping areas. It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure compaction requirements are achieved.

5.5 Slab-on-Grade Floors

It is anticipated that the finished floor level of the proposed slab-on-grade buildings will be constructed close to existing grade. The topsoil encountered at the Site is not considered suitable to support the floor slabs and the subgrade should be prepared as discussed in Section 5.2 Site Preparation, above.

The in-situ inorganic native soils encountered within the boreholes is considered adequate for the support of the concrete floor slabs provided it is proof roll compacted as outlined above. Any soft area(s) encountered during proof rolling should be excavated and replaced with a similar soil type.

Once the subgrade soil is exposed, it is to be inspected and approved by a qualified geotechnical engineering consultant to ensure that the material conforms to the soil type and consistency observed during the subsurface investigation work.

The finished floor elevation of the proposed slab-on-grade building is not available at the time of preparation of this report. Pinchin should review the following recommendations once detailed details are available.

Based on the in-situ soil conditions, it is recommended to establish the concrete floor slab on a minimum 200 mm thick layer of 19 mm clear stone Type I or Type II (OPSS 1004) or Granular “A” (OPSS 1010). Any required up-fill should consist of a Granular “B” Type I or Type II (OPSS 1010). It should be noted that 19 mm clear stone is vulnerable to fines migration from adjacent soils, if clear stone is to be used it should be protected by an appropriate filter cloth based on the gradation of the adjacent soils. Granular ‘A’ must be compacted to 100% SPMDD.

Subgrade support for concrete floors on ground is measured by Westergaard's modulus of subgrade reaction, k. Provided that the floor slab is constructed directly on 200 mm of 19 mm clear stone Type I or Type II or Granular "A" material an approximate value of k for the soil at the Site is 35,000 kN/m^3. The modulus of subgrade reaction would be lower for the Site if the floor slab is not constructed as noted above. The value provided above is for loaded areas of 0.3 m by 0.3 m.

5.6 Asphaltic Concrete Pavement Structure Design for Parking Lot and Driveways

5.6.1 Discussion

Parking areas and driveway access will be constructed around the proposed building. The in-situ glacial till deposits are considered a sufficient bearing material for an asphaltic concrete pavement structure provided all organics are removed prior to installing the engineered fill material as discussed in Section 5.2, Site Preparation, above.

5.6.2 Pavement Structure

The following table presents the minimum specifications for a flexible asphaltic concrete pavement structure:

Pavement Layer	Compaction Requirements	Parking Areas	Driveways
Surface Course Asphaltic Concrete HL-3 (OPSS 1150)	92% MRD as per OPSS 310	40 mm	40 mm
Binder Course Asphaltic Concrete HL-8 (OPSS 1150)	92 % MRD as per OPSS 310	55 mm	80 mm
Base Course: Granular "A" (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Subbase Course: Granular "B" Type I or Type II (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM D698)	300 mm – Type I or 250 mm – Type II	450 mm – Type I or 400 mm – Type II

Notes:

I. Prior to placing the pavement structure, the subgrade soil is to be proof rolled with a smooth drum roller without vibration to observe weak spots and the deflection of the soil; and

II. The recommended pavement structure may have to be adjusted according to the Town of Ajax standards. Also, if construction takes place during times of substantial precipitation and the subgrade soil becomes wet and disturbed, the granular thickness may have to be increased to compensate for the weaker subgrade soil. In addition, the granular fill material thickness may have to be temporarily increased to allow heavy construction equipment access the Site, in order to avoid the subgrade from "pumping" up into the granular material.

5.6.3 Pavement Structure Subgrade Preparation and Granular up Fill

The proper placement of base and subbase fill materials becomes very important in addressing the proper load distribution to provide a durable pavement structure.

The pavement subgrade materials should be prepared as discussed in Section 5.2, Site Preparation and thoroughly proof-rolled prior to placement of the Granular ‘B’ subbase course. If any unstable areas are noted, then the Granular ‘B’ thickness may need to be increased to support pavement construction traffic. This should be left as a field decision by a qualified geotechnical engineer at the time of construction, but it is recommended that additional Granular ‘B’ be carried as a provisional item under the construction contract.

Where fill material is required to increase the grade to the underside of the pavement structure it should consist of Granular ‘B’ Type I or Type II (OPSS 1010). The up fill material is to be placed in maximum 300 mm thick lifts compacted to 98% SPMDD within 4% of the optimum moisture content.

Samples of both the Granular ‘A’ and Granular ‘B’ Type I or Type II aggregates should be tested for conformance to OPSS 1010 prior to utilization on Site and during construction. All stockpiled material should be protected from deleterious materials, additional moisture and be kept from freezing.

Post compaction settlement of fine-grained soil can be expected, even when placed to compaction specifications. As such, fill material should be installed as far in advance as possible before finishing the parking lot and access roadways for best grade integrity.

Where the subgrade material types differ below the underside of the pavement structure, the transition between the materials should be sloped as per frost heave taper OPSD 205.60.

Performance grade PG 58-28 asphaltic concrete should be specified for all Marshall mixes. The PGAC grade should be increased to 64-28 for any areas of heavy truck usage.

5.6.4 Drainage

Control of surface water is a critical factor in achieving good pavement structure life. The pavement thickness designs are based on a drained pavement subgrade via sub-drains or ditches.

The native soils at the Site have poor natural drainage and therefore it is recommended that pavement subdrains be installed in the lower areas and be connected to the catch basins. Subdrains should comprise perforated 150 mm diameter pipe in filter sock, bedded in concrete sand. The upper limit of the concrete sand bedding must be at the lower limit of the pavement subbase, with the subgrade below the subbase sloped towards the subdrain.

The surface of the roadways should be free of depressions and be sloped at a minimum grade of 1% in order to drain to appropriate drainage areas. Subgrade soil should slope a minimum of 3% toward stormwater collection points. Positive slopes are very important for the proper performance of the drainage system. The granular base and subbase materials should extend horizontally to any potential ditches or swales.

In addition, routine maintenance of the drainage systems will assist with the longevity of the pavement structure. Ditches, culverts, sewers and catch basins should be regularly cleared of debris and vegetation.

6.0 SITE SUPERVISION & QUALITY CONTROL

It is recommended that all geotechnical aspects of the project be reviewed and confirmed under the appropriate geotechnical supervision, to routinely check such items. This includes but is not limited to inspection and confirmation of the undisturbed natural subgrade material prior to subgrade preparation, pouring any foundations or footings, backfilling, or engineered fill installation to ensure that the actual conditions are not markedly different than what was observed at the borehole locations and geotechnical components are constructed as per Pinchin's recommendations.

Compaction quality control of engineered fill material (full-time monitoring) is recommended as standard practice, as well as regular sampling and testing of aggregates, asphalt, and concrete, to ensure that physical characteristics of materials for compliance during installation and satisfies all specifications presented within this report.

7.0 CONCLUSIONS

The purpose of the Preliminary Geotechnical Investigation was to delineate the subsurface conditions and engineering characteristics of the soils at the Site. It is understood that the proposed development at the Site is to consist of one-storey slab-on-grade (i.e. no basement level) warehouse / office building, complete with at-grade parking/loadings areas and access driveways.

Based on our preliminary analysis and the subsurface information obtained at the borehole locations, the undisturbed glacial till deposits at the Site are generally favourable and should provide sufficient bearing resistance for the slab-on-grade development with shallow foundations.

Therefore, Pinchin considers the Site generally suitable for the proposed development from a geotechnical engineering perspective.

8.0 TERMS AND LIMITATIONS

This Preliminary Geotechnical Investigation was performed for the exclusive use of Star Night Import & Export Inc. (Client) in order to evaluate the subsurface conditions at 45 Blowers Crescent, Ajax, Ontario. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practises in the field of geotechnical engineering for the Site. Classification and identification of soil, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. No warranty or other conditions, expressed or implied, should be understood. Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations.

Performance of this Preliminary Geotechnical Investigation to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the subgrade soil at the Site, and recognizes reasonable limits on time and cost.

Regardless how exhaustive a Preliminary Geotechnical Investigation is performed, the investigation cannot identify all the subsurface conditions. In addition, this report in preliminary and is intended to be supplemented and updated with a future, more extensive, geotechnical investigation. Therefore, no warranty is expressed or implied that the entire Site is representative of the subsurface information obtained at the specific locations of our investigation. If during construction, subsurface conditions differ from then what was encountered within our test location and the additional subsurface information provided to us, Pinchin should be contacted to review our recommendations. This report does not alleviate the contractor, owner, or any other parties of their respective responsibilities.

This report has been prepared for the exclusive use of the Client and their authorized agents. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time. Please refer to Appendix III, Report Limitations and Guidelines for Use, which pertains to this report.

Specific limitations related to the legal and financial and limitations to the scope of the current work are outlined in our proposal, the attached Methodology and the Authorization to Proceed, Limitation of Liability and Terms of Engagement which accompanied the proposal.

Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

310414 FINAL Preliminary Geotechnical Investigation 45 Blowers Crescent Ajax ON June 17 2022.docx

Template: Master Geotechnical Investigation Report – Ontario, GEO, April 1, 2020

FIGURES

PINCHIN

PROJECT NAME:	PRELIMINARY GEOTECHNICAL INVESTIGATION				
CLIENT NAME:	STAR NIGHT IMPORT & EXPORT INC.				
PROJECT LOCATION:	45 BLOWERS CRESCENT, AJAX, ONTARIO				
FIGURE NAME:	KEY MAP				FIGURE NUMBER: 1
PROJECT NUMBER: 0310414.000	SCALE: 1:20,000	DRAWN BY: MYB	REVIEWED BY: MYB	DATE: JUNE 2022	

N

LEGEND

SITE BOUNDARY

BOREHOLE LOCATION

0m 50m

APPROXIMATE SCALE

LEGEND IS COLOUR DEPENDENT.
NON-COLOUR COPIES MAY ALTER
INTERPRETATION.

PINCHIN

PROJECT NAME:
PRELIMINARY GEOTECHNICAL INVESTIGATION

CLIENT NAME:
STAR NIGHT
IMPORT AND EXPORT INC.

PROJECT LOCATION:
45 BLOWERS CRESCENT
AJAX, ONTARIO

FIGURE NAME:
BOREHOLE LOCATION PLAN

PROJECT NUMBER:	SCALE:
310414.000	AS SHOWN
DRAWN BY:	REVIEWED BY:
MYB	MYB
DATE:	FIGURE NUMBER:
JUNE 2022	2

APPENDIX I

Abbreviations, Terminology and Principle Symbols used in Report and Borehole Logs

ABBREVIATIONS, TERMINOLOGY & PRINCIPAL SYMBOLS USED

Sampling Method

AS	Auger Sample	**w**	Washed Sample
SS	Split Spoon Sample	**HQ**	Rock Core (63.5 mm diam.)
ST	Thin Walled Shelby Tube	**NQ**	Rock Core (47.5 mm diam.)
BS	Block Sample	**BQ**	Rock Core (36.5 mm diam.)

In-Situ Soil Testing

Standard Penetration Test (SPT), "N" value is the number of blows required to drive a 51 mm outside diameter spilt barrel sampler into the soil a distance of 300 mm with a 63.5 kg weight free falling a distance of 760 mm after an initial penetration of 150 mm has been achieved. The SPT, "N" value is a qualitative term used to interpret the compactness condition of cohesionless soils and is used only as a very approximation to estimate the consistency and undrained shear strength of cohesive soils.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to "A" size drill rods continuously into the soil for each 300 mm penetration with a 63.5 kg weight free falling a distance of 760 mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm2 base area with a 60 degree apex pushed through the soil at a penetration rate of 2 cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

Soil Descriptions

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained, fine grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75 mm. To aid in quantifying material amounts by weight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification		Terminology	Proportion
Clay	< 0.002 mm		
Silt	0.002 to 0.06 mm	“trace”, trace sand, etc.	1 to 10%
Sand	0.075 to 4.75 mm	“some”, some sand, etc.	10 to 20%
Gravel	4.75 to 75 mm	Adjective, sandy, gravelly, etc.	20 to 35%
Cobbles	75 to 200 mm	And, and gravel, and silt, etc.	>35%
Boulders	>200 mm	Noun, Sand, Gravel, Silt, etc.	>35% and main fraction

Notes:

- Soil properties, such as strength, gradation, plasticity, structure, etcetera, dictate the soils engineering behaviour over grain size fractions; and
- With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations. The accuracy of visual and tactile observation is not sufficient to differentiate between changes in soil classification or precise grain size and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the compactness condition of cohesionless soil:

Cohesionless Soil	
Compactness Condition	**SPT N-Index (blows per 300 mm)**
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soil		
Consistency	**Undrained Shear Strength (kPa)**	**SPT N-Index (blows per 300 mm)**
Very Soft	<12	<2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

Note: Utilizing the SPT, N-Index value to correlate the consistency and undrained shear strength of cohesive soils is only very approximate and needs to be used with caution.

Soil & Rock Physical Properties

General

W Natural water content or moisture content within soil sample

γ Unit weight

γ' Effective unit weight

γ_d Dry unit weight

γ_{sat} Saturated unit weight

ρ Density

ρ_s Density of solid particles

ρ_w Density of Water

ρ_d Dry density

ρ_{sat} Saturated density e Void ratio

n Porosity

S_r Degree of saturation

E_{50} Strain at 50% maximum stress (cohesive soil)

Consistency

W_L	Liquid limit
W_P	Plastic Limit
I_P	Plasticity Index
W_S	Shrinkage Limit
I_L	Liquidity Index
I_C	Consistency Index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density Index (formerly relative density)

Shear Strength

C_u, S_u	Undrained shear strength parameter (total stress)
C'_d	Drained shear strength parameter (effective stress)
r	Remolded shear strength
τ_p	Peak residual shear strength
τ_r	Residual shear strength
ø’	Angle of interface friction, coefficient of friction = tan ø’

Consolidation (One Dimensional)

C_C	Compression index (normally consolidated range)
C_r	Recompression index (over consolidated range)
C_S	Swelling index
m_V	Coefficient of volume change
c_V	Coefficient of consolidation
T_V	Time factor (vertical direction)
U	Degree of consolidation
σ'_O	Overburden pressure
σ'_p	Preconsolidation pressure (most probable)
OCR	Overconsolidation ratio

Permeability

The following table outlines the terms used to describe the degree of permeability of soil and common soil types associated with the permeability rates**:**

Permeability (k cm/s)	Degree of Permeability	Common Associated Soil Type
$> 10^{-1}$	Very High	Clean gravel
10^{-1} to 10^{-3}	High	Clean sand, Clean sand and gravel
10^{-3} to 10^{-5}	Medium	Fine sand to silty sand
10^{-5} to 10^{-7}	Low	Silt and clayey silt (low plasticity)
$>10^{-7}$	Practically Impermeable	Silty clay (medium to high plasticity)

Rock Coring

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum**.**

RQD is calculated as follows:

$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of core pieces} > 100 \text{ mm} \times 100}{\text{Total length of core run}}$$

The following is the Classification of Rock with Respect to RQD Value:

RQD Classification	RQD Value (%)
Very poor quality	**<25**
Poor quality	25 to 50
Fair quality	50 to 75
Good quality	75 to 90
Excellent quality	90 to 100

APPENDIX II

Pinchin’s Borehole Logs

Log of Borehole: BH1

Project #: 310414.000 **Logged By:** MYB

Project: Preliminary Geotechnical Investigation

Client: Star Night Import and Export Inc.

Location: 45 Blowers Crescent, Ajax, Ontario

Drill Date: June 6, 2022 **Project Manager:** MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Water Content (%)	Laboratory Analysis and Comments
0		Ground Surface	108.1								
		Topsoil Approximately 200 mm	0.0		SS	1	60	22			
		Sand Till Brown silty sand till, trace to some gravel, trace clay, trace stone fragments, compact, moist	107.3 0.8		SS	2	80	82			
1		dense to very dense below	106.6 1.5		SS	3	100	38			
2		grey below			SS	4	100	37			
3					SS	5	100	39			
4			103.5								
		Sand Grey sand, trace to some silt, trace gravel, trace stone fragments, very dense, wet	4.6		SS	6	100	>50			
5											
6			101.7		SS	7	100	>50			
		End of Borehole Borehole terminated at approximately 6.4 mbgs. Borehole caved at approximately 4.6 mbgs; Unstabilized water level was measured at approximately 2.7 mbgs upon completion of drilling.	6.4								
7											
8											
9											

No Monitoring Well Installed

Rig Type: Track-mount

Drilling Method: Split Spoon / Solid Stem Auger

Well Diameter: N/A

Grade Elevation: 108.1 masl.

Top of Casing Elevation: N/A

Sheet: 1 of 1

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level

Log of Borehole: BH2

Project #: 310414.000 **Logged By:** MYB

Project: Preliminary Geotechnical Investigation

Client: Star Night Import and Export Inc.

Location: 45 Blowers Crescent, Ajax, Ontario

Drill Date: June 6, 2022 **Project Manager:** MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Water Content (%)	Laboratory Analysis and Comments
0		Ground Surface	107.7	No Monitoring Well Installed							
		Topsoil Approximately 250 mm	0.0		SS	1	100	37			
1		**Sand Till** Brown sandy silt to silty sand till, trace to some gravel, trace to some clay, trace stone fragments, dense to very dense, moist			SS	2	80	>50			
			106.2								
		grey below	1.5		SS	3	70	47			
2											
3					SS	4	50	>50			
4			103.1								
		Silt Till Grey clayey silt till, sandy, trace gravel, trace stone fragments, hard, APL	4.6		SS	5	70	>50			
5											
6			101.6								
		Sand Till Grey silty sand till, trace clay, trace gravel, very dense, moist	6.1		SS	6	10	>50			
			101.1								
			6.6								
7		End of Borehole Borehole terminated at approximately 6.6 mbgs. Borehole caved at approximately 2.1 mbgs; Borehole was dry upon completion of drilling.									
8											
9											

Rig Type: Track-mount

Grade Elevation: 107.7 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 1 of 1

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level

Log of Borehole: BH3

Project #: 310414.000 **Logged By:** MYB

Project: Preliminary Geotechnical Investigation

Client: Star Night Import and Export Inc.

Location: 45 Blowers Crescent, Ajax, Ontario

Drill Date: June 6, 2022 **Project Manager:** MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Water Content (%)	Laboratory Analysis and Comments
0		Ground Surface	108.3	No Monitoring Well Installed							
		Topsoil Approximately 180 mm	0.0		SS	1	100	44			
1		**Sand Till** Brown silty sand till, trace clay, trace gravel, trace stone fragments, dense to very dense, moist			SS	2	NR	>50			
2					SS	3	20	>50			
3			105.3								
		grey below	3.0		SS	4	100	>50			
4			103.7								
		some clay	4.6		SS	5	50	>50			
5			103.0		AS	6					
		End of Borehole	5.3								
6		Borehole terminated at approximately 5.3 mbgs due to auger refusal. Unstabilized water level was measured at approximately 2.7 mbgs' Borehole was open upon completion of drilling.									
7											
8											
9											

Rig Type: Track-mount

Grade Elevation: 108.3 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 1 of 1

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level

Log of Borehole: BH4

Project #: 310414.000 **Logged By:** MYB

Project: Preliminary Geotechnical Investigation

Client: Star Night Import and Export Inc.

Location: 45 Blowers Crescent, Ajax, Ontario

Drill Date: June 6, 2022 **Project Manager:** MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Water Content (%)	Laboratory Analysis and Comments
0		Ground Surface	107.9	No Monitoring Well Installed							
		Topsoil Approximately 300 mm	0.0		SS	1	100	24			
		Sand Till Brown silty sand till, trace to some clay, trace gravel, trace stone fragments, compact to very dense, moist	107.1 0.8		SS	2	50	>50			
1			106.4								
		grey below	1.5		SS	3	100	42			
2		layers of silty sand									
					SS	4	100	43			
3					SS	5	100	70			
4			103.3								
		Silt Till Grey clayey silt till, trace to some sand, trace gravel, hard, DTPL	4.6		SS	6	30	>50			
5											
6			101.3		SS	7	20	>50			
		End of Borehole Borehole terminated at approximately 6.6 mbgs. Borehole caved at approximately 5.8 mbgs; Borehole was dry upon completion of driling.	6.6								
7											
8											
9											

Rig Type: Track-mount

Grade Elevation: 107.9 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 1 of 1

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level

APPENDIX III

Report Limitations and Guidelines for Use

REPORT LIMITATIONS & GUIDELINES FOR USE

This information has been provided to help manage risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report was prepared for the exclusive use of the Client and their authorized agents, subject to the conditions and limitations contained within the duly authorized work plan. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical report is based on the existing conditions at the time the study was performed, and Pinchin's opinion of soil conditions are strictly based on soil samples collected at specific test hole locations. The findings and conclusions of Pinchin's reports may be affected by the passage of time, by manmade events such as construction on or adjacent to the Site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations.

LIMITATIONS TO PROFESSIONAL OPINIONS

Interpretations of subsurface conditions are based on field observations from test holes that were spaced to capture a 'representative' snap shot of subsurface conditions. Site exploration identifies subsurface conditions only at points of sampling. Pinchin reviews field and laboratory data and then applies professional judgment to formulate an opinion of subsurface conditions throughout the Site. Actual subsurface conditions may differ, between sampling locations, from those indicated in this report.

LIMITATIONS OF RECOMMENDATIONS

Subsurface soil conditions should be verified by a qualified geotechnical engineer during construction. Pinchin should be notified if any discrepancies to this report or unusual conditions are found during construction.

Sufficient monitoring, testing and consultation should be provided by Pinchin during construction and/or excavation activities, to confirm that the conditions encountered are consistent with those indicated by the test hole investigation, and to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated. In addition, monitoring, testing and consultation by Pinchin should be completed to evaluate whether or not earthwork activities are completed in

accordance with our recommendations. Retaining Pinchin for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions. However, please be advised that any construction/excavation observations by Pinchin is over and above the mandate of this geotechnical evaluation and therefore, additional fees would apply.

MISINTERPRETATION OF GEOTECHNICAL ENGINEERING REPORT

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having Pinchin confer with appropriate members of the design team after submitting the report. Also retain Pinchin to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having Pinchin participate in pre-bid and preconstruction conferences, and by providing construction observation. Please be advised that retaining Pinchin to participation in any 'other' activities associated with this project is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

CONTRACTORS RESPONSIBILITY FOR SITE SAFETY

This geotechnical report is not intended to direct the contractor's procedures, methods, schedule or management of the work Site. The contractor is solely responsible for job Site safety and for managing construction operations to minimize risks to on-Site personnel and to adjacent properties. It is ultimately the contractor's responsibility that the Ontario Occupational Health and Safety Act is adhered to, and Site conditions satisfy all 'other' acts, regulations and/or legislation that may be mandated by federal, provincial and/or municipal authorities.

SUBSURFACE SOIL AND/OR GROUNDWATER CONTAMINATION

This report is geotechnical in nature and was not performed in accordance with any environmental guidelines. As such, any environmental comments are very preliminary in nature and based solely on field observations. Accordingly, the scope of services do not include any interpretations, recommendations, findings, or conclusions regarding the, assessment, prevention or abatement of contaminants, and no conclusions or inferences should be drawn regarding contamination, as they may relate to this project. The term "contamination" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, PCBs, petroleum hydrocarbons, inorganics, pesticides/insecticides, volatile organic compounds, polycyclic aromatic hydrocarbons and/or any of their by-products.

Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be held liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered within the meaning of the Limitations Act, 2002 (Ontario), to commence legal proceedings against Pinchin to recover such losses or damage.