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INFINITY DEVELOPMENT GROUP

Project No. FE-P 22-11966Geo

March 11, 2022

Issued to:	Infinity Development Group
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Project Name:	Geotechnical Investigation for Proposed Development
Project Address:	1396 Guelph Line, Burlington, ON
Project Number:	FE-P 22-11966Geo
Issued on:	March 11, 2022
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1. INTRODUCTION

Fisher Engineering Limited (Fisher) was commissioned by Infinity Development Group to conduct a Geotechnical Investigation for the proposed redevelopment of the property located at 1396 Guelph Line, Burlington, ON hereinafter referred to as the 'Site'.

The purpose of this investigation was to assess subsurface soil and groundwater conditions at the Site, and to outline geotechnical parameters and make recommendations for the design of the proposed redevelopment.

Discussion of the findings and results of the geotechnical investigation is in accordance with the general terms of reference. This report was prepared specifically and solely for the purpose of assessing geotechnical conditions as they relate to the development of the site with respect to the proposed structures as detailed to Fisher at the time of the investigation.

2. SITE and PROJECT DESCRIPTIONS

Site Settings

Guelph line is taken as running in a north-south direction for the purpose of this report. The site is located on the west side of Guelph Line, in a mixed commercial-residential neighbourhood, approximately 1.5km north of the onramp with Queen Elizabeth Way and is bounded by Guelph Line to the east, residential properties to the south, a hydro corridor to the west and north, beyond which are houses.

At the time of the investigation, the site was occupied by a single-storey commercial building with loading area located at the rear. The remaining areas of the site were mainly covered with asphalt pavement and utilized for parking.

Topography

The site is mostly flat and graded for drainage towards catch basins.

Proposed Development

It was understood that the existing building will be demolished to permit the construction of a new eleven-storey residential building, with three levels of underground parking. Finished Floor Elevation (FFE) is expected at 131.45m asl with TOS for P3 at 9.75m below (121.70m asl) according to the Site Plans prepared by Zedd Architecture dated March 8, 2022.

3. SCOPE OF GEOTECHNICAL WORK

The geotechnical scope of work included the following:

- Investigation of subsurface conditions at the site by advancing boreholes, soil sampling and visual evaluation.
- Prepare a geotechnical report with general comments and recommendations regarding:
  - Appropriate foundation depths, type and bearing pressures (SLS & ULS)
  - Seismic site classification
  - Slab-on-grade construction
  - Pavement construction
  - Excavation etc.

4. FIELD AND LABORATORY WORK

Public utilities clearances were carried out by Ontario One-Call while private utilities clearances were done by Utility Marks on behalf of Fisher Engineering.

Subsurface Investigation

Field exploration for the geotechnical investigation was carried out concurrent with drilling for the hydrogeological investigation on March 2 and 3, 2022 and consisted of (6) borehole advanced to depths of 9.12m to 15.32m below prevailing grade. All boreholes were instrumented as monitoring wells with 3.05m (10') long, 51mm diameter PVC slotted screen pipes. A clean silica sand pack was placed around each well screen which was isolated with bentonite extending to slightly below existing grade as shown on the Log of Boreholes in Appendix B.

A CME-55 Truck mounted drill rig equipped with solid stem augurs, supplied by Terra Firma Services, was used for all drilling work under direct supervision of Fisher Engineering personnel. Soil samples, in the overburden soils, were taken at regular intervals using a split–spoon sampler advanced by means of the Standard Penetration Test (SPT) which was conducted in general accordance with ASTM Specification D1586. Field tests to determine engineering parameters of the soils were carried out during drilling, which included Standard Penetration Tests (SPT). Approximate locations of the boreholes are shown on the Borehole Location Plan in Appendix A.

Laboratory Analyses

The soil samples were taken to the Fisher Environmental laboratory for further visual assessment and classification. Three (3) representative soil samples from BH1, BH3 and BH6 were submitted for grain size analyses and nine (9) samples for moisture content tests. Two (2) samples were submitted for pH, Chloride and Sulphate analyses to determine impact on concrete. The laboratory samples were tested and classified in general accordance with the Unified Soil Classification System, ASTM D 2487, and Standard Practice for Classification of Soil for Engineering Purposes. The laboratory results, which are presented in Appendix C, confirm the field description for subsurface soils discussed in Section 5.0.

The soil samples recovered during the investigation will be stored in the Fisher Environmental laboratory for a period of 30 days after submitting this report and will be discarded thereafter unless instructed otherwise by the client.

Site Survey

Elevations at borehole/monitoring well locations were interpolated from a topographic survey plan, prepared by Ashenhurst Nouwens & Associates Inc, dated December 20, 2021.

5. SUBSOIL AND BEDROCK CONDITIONS

Surface and subsurface conditions encountered at borehole locations are shown in Appendix B - Log of Boreholes and are summarized in the following sections. The logs include soil stratification at borehole locations along with detailed soil descriptions. Variations in soil stratification may occur and should be expected between borehole locations and elsewhere on the site.

Asphalt/Fill - Approximately 1.5" to 3" of asphalt pavement was encountered at the surface of all boreholes and was underlain by granular material consisting generally of moist, dense gravelly sand to sand and gravel. Fill soils consisting of dark grey to black clayey silt to brown sandy silt with trace gravel, pieces of concrete and asphalt and some organic materials were encountered below the granular material in BH1, BH3, BH5 and BH6. A layer of dark brown, moist, firm clayey silt at 0.91m to 2.29m in BH4 could not be positively identified and was described as 'possibly fill'. Fill depths and elevations are presented in Table 1.

Grey to Brown Sandy Silt Till – A layer of grey/grey to brown, generally moist, compact, sandy silt till, with trace gravel and trace clay was encountered below the fill of BH1, BH2, BH4 (possibly fill), BH5 and BH6 and below clayey silt till in BH3. The sandy silt layer extended to depths of 1.98m (BH1) to 3.35m (BH6).

Reddish Brown Silt to Clayey Silt Till - Reddish brown, moist to dry, hard to very stiff, clayey silt till with trace sand and pieces of shale/cobbles was encountered generally below the sandy silt till extending to depths of 5.18m (BH5) to 6.10m (BH2 & BH4).

Light Brown Silty Sand - A layer of light brown, wet, silty sand was encountered at depths of 2.44m to 3.05m bgs in BH3.

Red Weathered Shale – Red, moist to dry, hard, weathered shale was encountered beneath the overburden soils in all boreholes at depths of 5.18m (BH5) to 6.10m (BH2, BH3 & BH4). Power auguring was undertaken to refusal in the weathered shale to borehole termination depths of 9.25m (BH6) to 15.37m (BH3).

Table 1: Summary of Depth and Elevation of Fill

Borehole No.	Surface Elevation (m asl)	Depth of Borehole (m bgs)	Ele at Bottom of Borehole (m asl)	Depth of Fill (m bgs)	Ele at Bottom of Fill (m asl)
BH1	131.11	10.75	120.36	0.91	130.20
BH2	131.27	10.36	120.91	0.46	130.81
BH3	130.96	15.37	115.59	1.68	129.28
BH4	130.64	15.24	115.40	1.52	129.12
BH5	129.92	13.80	116.12	0.61	129.31
BH6	130.12	9.25	120.87	1.37	128.75

6. GROUNDWATER CONDITIONS

Boreholes were advanced using dry auguring and subsoils and groundwater conditions observed and recorded during the field investigation. Standing water was measured at 5.18m in BH2 and BH4 and at 4.57m bgs in BH6 on completion of drilling. The other open boreholes were observed to be dry. A layer of wet silty sand was observed in BH6 between 2.44m and 3.05m bgs while wet seams were observed at 4.57m bgs.

The monitoring wells were purged/developed and groundwater levels measured. Measured groundwater depths and elevations are summarized in Table 2.

Based on the preceding and visual examination of the soil samples, it was concluded that groundwater exists in layers/seams of silty sand in some areas of the site. Perched water may also be encountered in the wet seams/pockets/layers trapped inside the fill or trapped/interbedded inside the native soils. Groundwater levels are also expected to fluctuate with seasonal weather conditions.

Table 2 – Measured Groundwater Depths and Elevations

Well No.		MW1	MW2	MW3	MW4	MW5	BH6
Elev. at Ground (m asl)		131.11	131.27	130.96	130.64	129.92	130.12
Depth of MW	m bgs	10.67	10.36	14.63	15.24	13.41	9.15
Elev. at bottom of well	m asl	120.44	120.91	116.33	115.40	116.51	120.97
On Completion	GW level, m bgs	Dry	5.18	Dry	5.18	Dry	4.57
	GW Ele, m asl	-	126.09	-	125.46	-	125.55
2-Mar-22	GW level, m bgs	n/a	n/a	12.64	11.17	n/a	2.84
	GW Ele, m asl	-	-	118.32	119.47	-	127.28
9-Mar-22	GW level, m bgs	10.15	3.57	4.00	3.95	6.05	2.70
	GW Ele, m asl	120.96	127.70	126.96	126.69	123.87	127.42

7. FOUNDATION CONSIDERATIONS

It is understood that the proposed development will comprise the construction of an eleven-storey residential building with three underground parking levels. FFE is 131.45m with TOS for P3 at 121.70m asl. The investigation showed that the predominant native stratum below the overburden soils, is fair to good quality rock.

7.1 Spread/Strip Footing Founded on Native Shale

The proposed building, with three underground levels, may be supported on conventional spread/strip footings in the native undisturbed shale bedrock at approximate elevations of 120.5m or below.

Spread/strip footings may be proportioned using bearing resistances given below. Differential settlement is not expected to be significant as the rock conditions were consistent across the site. For foundations embedded in bedrock, or socketed at least 0.5m into sound shale, bearing resistances can be taken as follows:

Bearing Resistance at SLS = 1000 kPa
Factored Bearing Resistance at ULS = 1200 kPa

7.2 General Comments about Footing Construction

- The as-built vertical / horizontal alignment and conditions of existing underground services should be established prior to the design / construction stage.
- In the area of existing structure footings / service trenches, the proposed footings should be established below existing footings and inverts of services in native undisturbed soils or alternatively could potentially be bridged over the trench backfill (subject to review by a structural engineer).
- Adjacent footings founded at different elevations should be stepped at 10 horizontal to 7 vertical.
- Footings subjected to seasonal winter weather, such as exterior wall and column footings, should be founded at least 1.2m below the adjacent finished grades to prevent any damage due to frost penetration.
- During construction, should areas of less competent material be encountered at the design grade, over excavations may be advanced until suitable conditions are achieved. The resulting over excavation may be returned to the proposed design grade through the placement of a low strength concrete (~2 MPa). This should be conducted under direct supervision of geotechnical personnel from Fisher.

7.3 Seismic Design Considerations

The 2012 OBC Subsection 4.1.8.7 stipulates that earthquake design for building should be based on the average properties of the top 30m soil profile.

The parameters for determining Site Classification for Seismic Site Response are given in Table 4.1.8.4A of the 2012 OBC. Site Classification for Seismic Site Response (Table 4.1.8.4.A) is based on the average shear wave velocity or Standard Penetration Resistance (N60), or the undrained shear strength of the soils (Su).

Based on the results of the current geotechnical investigation, the site designation for seismic analysis applicable for the proposed buildings with three levels of underground parking and footings placed over sound bedrock is expected to be **"Class B".** Shear wave velocity tests are recommended to confirm seismic classification and to determine if Site Class 'A' may be available for footings placed over the solid shale material.

7.4 Basement Walls

Basement walls should be designed to resist a minimum pressure "p", in the overburden soils, at any depth "h" below the surface, as given by the expression:

$$\boldsymbol{p = K[\Upsilon h + q]}$$

Where: K = coefficient of earth pressure

Υ = 21.0 kN/m^3 is the unit weight of backfill and

q = an allowance for surcharge in kPa.

The preceding equation assumes that a perimeter drainage system, as shown in Appendix D, will be provided and that the backfill against subsurface walls, where applicable, would be a free-draining granular material. If perimeter/underfloor drainage systems are not feasible or permitted, and a watertight structure (bath tub) design (full or partial) is adopted, then impacted lowest parking garage floor slab must be designed to resist hydrostatic/uplift pressures and be waterproofed. Potential/anticipated highest groundwater level during the life of the structure should be used to determine the water pressures. Parking garage walls should be waterproofed to at least 1m above the highest water level.

For a waterproofed basement, the lateral earth pressures acting on basement walls may be calculated from the following expression:

$$p = K (\gamma h_1 + \gamma' h_2 + q) + \gamma_w h_2$$

where p = lateral earth pressure in kPa acting at depth h

K = earth pressure coefficient, assumed to be 0.4 for vertical walls and horizontal backfill

γ' = submerged unit weight of backfill of 12 kN/m^3 may be assumed

γ_w = Unit weight of water, a value of 10 kN/m^3 can be used

h_1 = depth to the highest groundwater table in metre

h_2 = depth below water table in metres

q = Equivalent value of surcharge on the ground surface in kPa

7.5 Excavation and Backfill

Excavation on the site is expected to encounter layers of sandy silt and clayey silt fill with some debris. The fill may be classified as Type 3 soil (previously excavated or disturbed). The fill is generally underlain sandy silt till with silt to clayey silt till at further depths. The till below the fill may be classified as Type 2 soils. The red shale is part of a sedimentary formation with moisture content and strength properties of a Type 1 soil as set out in the Occupational Health and Safety Act Classification Part III.

For the proposed construction it should be possible to excavate the weathered shale and most of the hard shale with either a backhoe equipped with a rock bucket for service trenches, or a dozer mounted with rock rippers for large excavation areas.

Excavation for footings or underground services must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA).

Slopes in the sandy silt till and clayey silt fill may be constructed at a gradient of 1H:1V. For excavation into native silt and sand layers, where encountered, a vertical face can be supported up to 1.2m. For excavations deeper than 1.2m, the sides must be sloped at a gradient of 1:1 in accordance with requirements of the OHSA. If this condition cannot be met, a temporary shoring system should be introduced.

Excavation into the solid shale should be stable at near vertical side slopes during the construction period provided adequate measures are taken to ensure the face of the rock remains in good condition. Where weathered shale is encountered, this should be cut back to approximately 2V:1H. In order to prevent loose material spilling into the excavated areas, grouting of fractures may be required to stabilize the face of the excavation.

Groundwater level in the excavation area is expected to vary depending on the time of year, and precipitation in the period of construction. Vertical seepage through the shale should be negligible, however horizontal seepage can be significant where fissures, fractures and local weathering of the rock layers exist. Water in the excavation, due to seepage from the more permeable seams/lenses or surface run-off, can be controlled by pumping from sump pits at the base of the excavation.

It is anticipated that significant amount of excavated material on the site will be red shale. Weathered shale will appear to be, and closely resemble, very stiff to hard clayey soil. The more solid shale will be in the form of large slabs. The excavated shale can be reused as backfill material after inspection by a

geotechnical engineer. Prior to reuse as backfill, the shale material will need to be conditioned as engineering fill by breaking down the material into maximum 150mm sizes and moisture conditioning the dry shale with water. Compaction should then be carried out with heavy steel vibratory pad or similar equipment in controlled lift thicknesses.

The material to be used for backfill in service trenches should be suitable for compaction, i.e., free of organics and with moisture content within 2 percent of the optimum moisture value. The backfill material should be compacted, in lifts of no more than 200mm in thickness, to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

For backfill against the subsurface walls and footings it is recommended that backfill materials consist of Granular Class 'B' aggregates.

7.6 Stability of Excavation Wall

It is expected that the excavation walls into the red shale will be stable at near vertical slopes during the construction period. The sandy silt till and clayey silt till layers are expected to be stable at 1V:1H in the absence of seepage while the silt is expected to be stable at 2V:1H for the duration of the construction. Loose rock pieces should be removed, and the rock face of the excavation cut back to approximately 10V:1H. Onsite inspection by qualified geotechnical engineer will determine if the slope needs to be flatter, particularly where weathered shale is encountered. A geogrid may be required to cover the full face of the exposed shale to minimize rock fall.

Other factors which could adversely impact the stability of the excavated rock face is the installation of utilities. The need for shoring should be evaluated and anticipated where excavation for utilities is in close proximity to the building excavation.

7.7 Impact on Construction and Durability of Shale

Shale comprises over-consolidated clay and silt or, in some instances, mudstone. Shale is usually susceptible to slaking which can be defined as the disintegration of the clay material when exposed to water and or wetting/drying and freezing/thawing cycles. Consequently, the following measures are recommended to minimize degradation of the shale during construction:

- Minimize the amount of time that the excavated shale is exposed to the elements to a maximum of 7 days,

- Protect exposed shale base by placing ±75mm of 15MPa concrete to form a working surface; alternatively, a ±250mm thick layer of free draining granular material (OPSS 1004 19mm Type 2 clear stone) could be applied,
- Regular inspection of the exposed rock face by a geotechnical engineer.

8. SHORING REQUIREMENTS

8.1 General Considerations

A shoring system should be designed to protect adjacent structures/infrastructure and to facilitate the excavation of underground levels and utilities in the proposed development. The shoring system should be designed in accordance with the requirements set out in the Canadian Foundation Engineering Manual, 4th Edition.

Examples of temporary shoring systems include:

- A soldier pile and timber lagging system where some deflection of the wall is permitted, and groundwater is not a concern or can be handled with conventional dewatering system and
- A caisson wall, formed from secant piles, where only minor deflections of the wall are permitted, and groundwater is a concern or where dewatering is prohibited.

Factors to be considered for the subject Site:

1. The highest groundwater elevation in the overburden soil was 127.70m asl. Groundwater elevations in the bedrock varied between 118.32m and 120.96m asl.
2. The anticipated depth of excavation for footings is approximately 120.5m asl.

8.2 Design Approach and Parameters

Geotechnical parameters, which are considered applicable for the design, are shown in Table 3. Any surcharge loads must be included in the lateral earth pressure calculations.

It should be noted that groundwater, shale fragments and boulders may be encountered during soldier pile/caisson construction, and contractors must be prepared to deal with boulders and water seepage into the caisson shafts without undue delays.

The tiebacks should be designed for 35 kPa in the overburden soils and 200 kPa in the shale bedrock. The design values must be confirmed by at least two load tests, carried out to 2 x the design loads.

The shoring system and surrounding structure must be monitored for horizontal and vertical movement, prior to shoring/or dewatering and during excavation to ensure satisfactory performance of the shoring system.

A pre-construction inspection/survey of the surrounding structures and roads is recommended prior to commencement of shoring construction and / or dewatering activities.

Table 3: Geotechnical Soil Data

Parameter	Granular Fill (Very loose to dense)	Native Granular Strata (compact to dense)	Native cohesive Strata (very stiff to hard)	Shale bedrock
Depth bgs	0.5 - 1.7m	1.7m to 3.05m	3.05m to 5.5m	5.5m to 15.39m
Range of SPT 'N' values	4 - 38	15 - 40	23 – 100+	100^{+}
Bulk Unit Weight (kN/m^3)	19	20	21	25
Effective friction angle, φ^o	26	34	38	48
Effective Cohesion C' (KPa)	0	0	25	-
K_o (at rest)	0.56	0.44	0.41	-
K_a (active)	0.39	0..28	0.26	-
K_p (passive)	2.56	3.53	3.85	-

9. SLAB ON GRADE AND PERMANENT DRAINAGE

For the subject Site, the floor slab for the lowest underground parking level should rest on a compacted bed of size 19mm clear stone at least 200mm thick which will act as a vapour barrier. The vapour barrier stone should meet the requirements of OPSS 1004 for 19mm Type II clear stone. If required, the thickness of

the stone layer can be increased to 500mm to accommodate mechanical components of the parking drainage.

Perimeter drainage pipes, with a positive gravity outlet, should be solid PVC with a minimum of 0.5% slope. In addition, silt traps must be provided at convenient / accessible locations. To further minimize siltation, all drainage pipe connection should be solid PVC elbows and T's. No 'butt' end should be permitted. The perforated pipes should slope to a sump at a minimum 1% slope.

A permanent perimeter and sub-floor drainage system for shoring system/foundation walls must be provided as shown in Appendix D.

It should be noted that if a watertight subsurface structure is used on the site, then a permanent drainage system for the footings may not be required. This is however contingent on a properly designed watertight structure with adequate built-in maintenance.

10. UNDERGROUND UTILITIES

Pipe bedding and backfill materials specifications and compaction criteria for water and sewer services should be in accordance with the pipe designer's recommendations and/or local municipal requirements.

If the excavation is deeper than 1.2m, the excavation sides should be sloped in accordance with requirements of OHSA. If this condition cannot be met, a temporary shoring system or trench box should be introduced.

Trench backfill should be uniformly compacted to a density that minimizes the risk of long-term settlement. Selected on-site excavated native soils may be considered suitable for re-use in trench backfilling, provided that organics / construction debris are sorted out and material are not allowed to be wet. Moisture content should be within 2% of the optimum moisture content.

In normal sewer construction practice, the problem of road settlement largely occurs adjacent to manholes, catch basins and service crossings. In these areas, granular materials are generally required for backfill and compaction.

Backfill in the upper 1.0m from road subgrade or in settlement sensitive areas should be placed in maximum 200mm thick lifts and compacted to 98% SPMDD. Beyond these zones, a 95% SPMDD compaction criterion is considered acceptable.

Water lines installed outside of heated areas should be provided with a minimum of 1.8m soil cover or equivalent for frost protection.

11. Pavement Design

The functional life of a pavement depends directly on the subgrade conditions and the load carrying capacity of the pavement structure. Typical flexible pavement designs are presented in Table 4.

Table 4: Minimum Flexible Pavement Structure Thicknesses

PAVEMENT LAYER	COMPACTED THICKNESSES	
	LIGHT DUTY PARKING	DRIVEWAYS & HEAVY DUTY PARKING
Asphalt top course, HL-3	40mm	40mm
Asphalt base course, HL-8	40mm	60mm
Granular 'A' or 20mm crusher run limestone base	150mm	150mm
Granular 'B' or 50mm crusher run limestone sub-base	200mm	300mm

The pavement structure should also meet the minimum municipal design requirements, if any, for the proposed development.

The above thicknesses are applicable for dry and stable subgrade conditions during summer season construction only. If construction is carried out during winter, and for unstable subgrade conditions, the thicknesses of granular materials may have to be increased.

The granular base materials should conform to O.P.S.S. Form 1010 specifications and be compacted to at least 98% of their SPMDD's. Similarly, asphaltic concretes should meet O.P.S.S. Form 1150 requirements for specified grades and be compacted to at least 97% of their Marshall Densities.

The subgrade should be prepared as described previously in subsection 7.3. Prior to placement of granular bases, the finished sub-grade should be contoured to eliminate depressions and sloped at a minimum of 2% towards the catch basins or perimeter ditches to facilitate drainage of subgrade and base materials.

Water should not be allowed to accumulate at/near the pavement edges. The importance of sub-grade drainage and regular maintenance and repairs cannot be over-emphasized.

12. EXCAVATION / VIBRATION MONITORING

It is understood that two stage tie backs will likely be required for the proposed soldier pile/lagging support purposes. It should be noted that encroachment agreements will be required with adjacent property owners. If the above agreements are not feasible/achievable then raker pads may be used for the soldier pile support purposes.

Zone of influence for excavation wall movements/displacements can be estimated as 12m or depth of excavation, whichever is greater beyond the property lines. All control network points should be located outside the above zone of influence. Reflective targets should be installed at the top of each soldier pile and for each tie-back to monitor the movement of shored walls during and after excavation. Precision targets should be installed on the neighbouring structures, if any within the zone of influence to ensure they are not being impacted by the construction activities on the subject site.

Construction activities for the proposed development such as drilled caissons, soil compaction etc. may generate vibrations which could be perceptible to nearby residents or sensitive to the adjacent structures or infrastructure. Construction induced vibrations must be limited to the maximum peak particle velocity (PPV) as outlined/regulated by the local/regional/provincial authorities or an expert/qualified person in vibration monitoring and control. Frequency & duration of monitoring and zone of influence due to vibration should also be established by or in accordance with the recommendations by the qualified person.

Pre and post construction surveys should be undertaken to document existing conditions of properties/infrastructure/structures prior to the start of construction and at the end of project for determining/establishing any substantial changes resulting from construction within the zones of influence.

13. CHEMICAL ANALYSES

Two soil samples from BH1 and BH3 at depths of 1.52-1.98m were submitted to Fisher Environmental laboratories for chemical analyses related to potential sulphate attack on buried concrete. The results of tests are presented in Appendix C.

The chemical analyses show that the sulphate concentration in the soil samples varies from 25.5mg/kg to 122.4mg/kg or 0.00255% to 0.01224%. According to CSA-A23 1-09 Table 3, the results indicate that sulphate concentrations are well below the S-3 exposure values of 0.10-0.20%.

The results from the chloride tests show that the subsurface strata generally have a mild chloride environment and are not aggressive to concrete. Water-cement ratio in concrete should not exceed 0.5. Additionally, subsurface concrete for footings and exterior walls should have minimum 28-day and 56-day compressive strengths of 25 and 30 MPa respectively. The pH analyses show that the pH levels are within acceptable range for groundwater in soils.

14. LIMITATIONS

This report is limited in scope to those items specifically referenced in the text. The discussions and recommendations presented in this report are intended only as guidance for the named client and their design engineers.

The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction.

Localized variations in the subsoil conditions, and particularly the fill material, may be present between and beyond the boreholes on which the recommendations are made and will have to be verified during construction. As more specific subsurface information becomes available during excavations on the subject Site, this report should be updated.

Contractors bidding on or undertaking the work should decide on their own investigations, as well as their own interpretations of the factual borehole results. This concern specifically applies to the classification of the subsurface soils and the potential reuse of these soils on / off Site.

Contractors must draw their own conclusions as to how the near surface and subsurface conditions may affect them.

APPENDIX A: SITE LOCATION MAP, BOREHOLE LOCATIONS & SITE PLANS



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NORTH

N

LEGEND

SITE BOUNDARY

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1396 Guelph Line,
BURLINGTON,ONTARIO

FIGURE A1:

SITE LOCATION PLAN

SHEET NO.

PROJECT NO.

FE-P22-11967

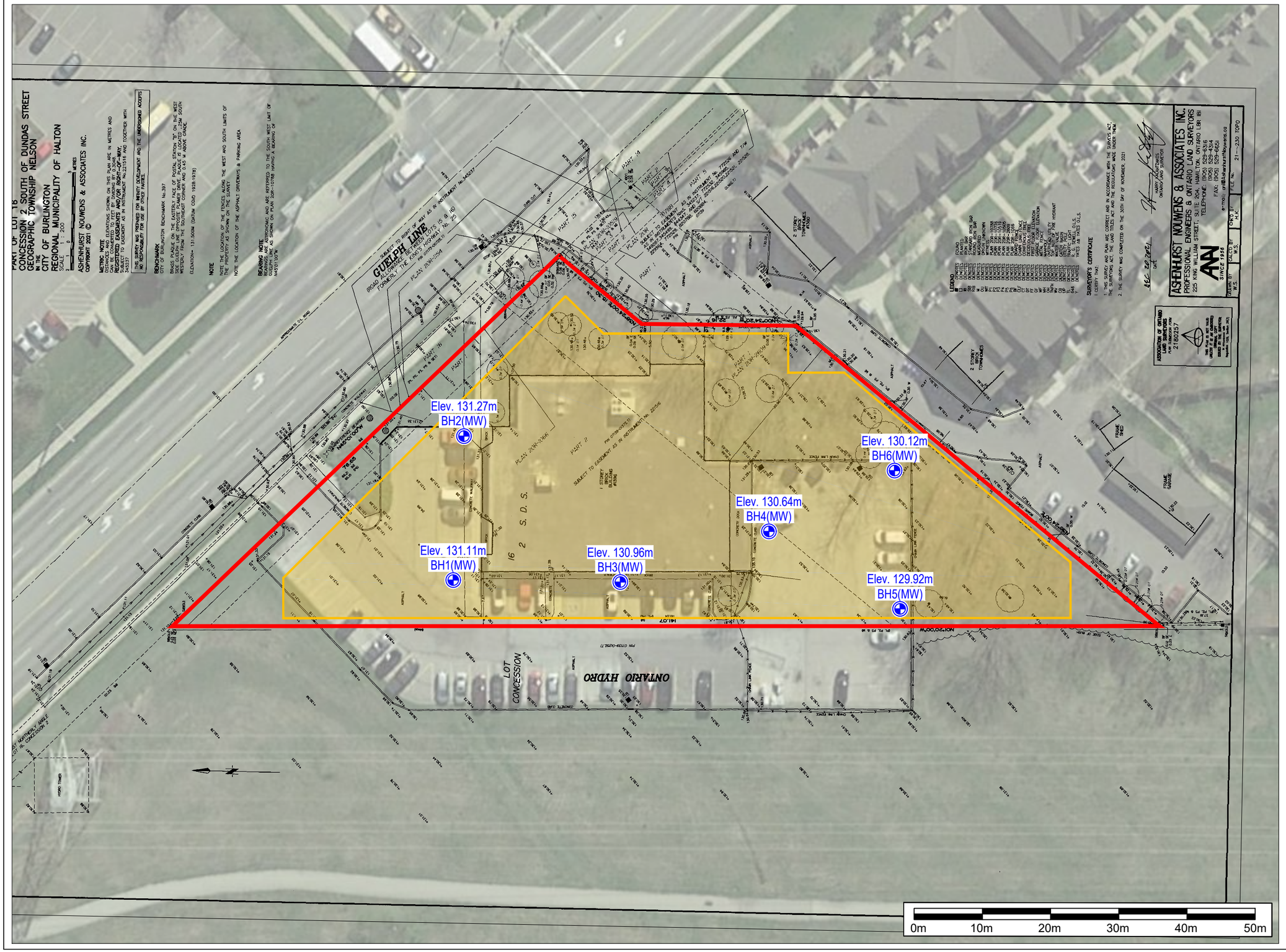
DATE

MARCH 2022

SCALE

AS SHOWN

A1



FISHER ENGINEERING

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718

NORTH

LEGEND

- PROPERTY BOUNDARY
- PROPOSED BUILDING FOOTPRINT (PARKING GARAGE BELOW)
- BOREHOLE WITH MONITORING WELL LOCATION

PROJECT NAME AND ADDRESS

GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

1396 Guelph Line,
Burlington, ON

FIGURE 1.1:

SITE PLAN WITH BOREHOLE MONITORING WELL LOCATIONS

PROJECT NO.	SHEET NO.
FE-P 22-11966/67	A2
DATE: 4 March 2022	
SCALE: AS SHOWN	



Infinity Development Group

1396 Guelph Line
Burlington, Ontario

21-027

March 08, 2022

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PROJECT STATISTICS

PROJECT#: 21-027
MARCH 04 2022

1396 GUELPH LINE
BURLINGTON

SITE

	Acre	Hectare	ft²	m²
TOTAL SITE AREA	**1.03**	**0.4168**	**44,867**	**4,168**

LOT COVERAGE (%)	33% (1,392 m²)
BUILDING HEIGHT (m)	42.37 (11 STOREYS)
VEHICLE PARKING	236 (1.00 PER UNIT)
BICYCLE PARKING	85 (0.36 PER UNIT)
DENSITY (UNITS PER HECTARE)	566
FLOOR SPACE RATIO (m²) (ABOVE GRADE GFA / SITE AREA)	4.02
OUTDOOR AMENITY	1,807 m² (7.66 m² PER UNIT)
INDOOR AMENITY	446 m² (1.89 m² PER UNIT)

BUILDING

FLOOR AREAS (m²)		**BELOW GRADE**	**ABOVE GRADE**
P.03		3,326	0
P.02		3,326	0
P.01		3,326	0
LV.01		0	1,392
LV.02-LV.06 (x5)		0	1,679 (8,395)
LV.07-.LV.10 (x4)		0	1,450 (5,800)
LV.11		0	1,160
TOTAL GFA	**26,725**	**9,978**	**16,747**

UNITS	**TOTAL**	**3 BED**	**2 BED**	**1 BED**	**BACHELOR**
LV.01	5	0	0	5 (100%)	0
LV.02-LV.06 (x5)	26 (130)	0	5 (25) (19%)	20 (100) (77%)	1 (5) (4%)
LV.07-.LV.10 (x4)	21 (84)	0	6 (24) (28%)	13 (52) (62%)	2 (8) (10%)
LV.11	17	0	7 (41%)	10 (59%)	0
TOTAL UNITS	**236**	**0**	**56 (24%)**	**167 (70%)**	**13 (6%)**

AMENITY (m²)	**BALCONIES & TERRACES**	**INTERIOR SPACE**
LV.01	60	446
LV.02-LV.06 (x5)	218 (1,090)	0
LV.07	393	0
LV.08-LV.10 (x3)	114 (342)	0
LV.11	315	0
TOTAL AMENITY	**1,807**	**446**

PARKING		**BICYCLE**	**BARRIER-FREE** (2.75m x 5.6m)	**STANDARD** (2.6m x 5.6m)
P.01		80	4	88
P.02		0	4	90
P.03		0	1	41
LV.01		5	0	8
TOTAL PARKING	**236V / 85B**	**85**	**(4%) 9**	**227**

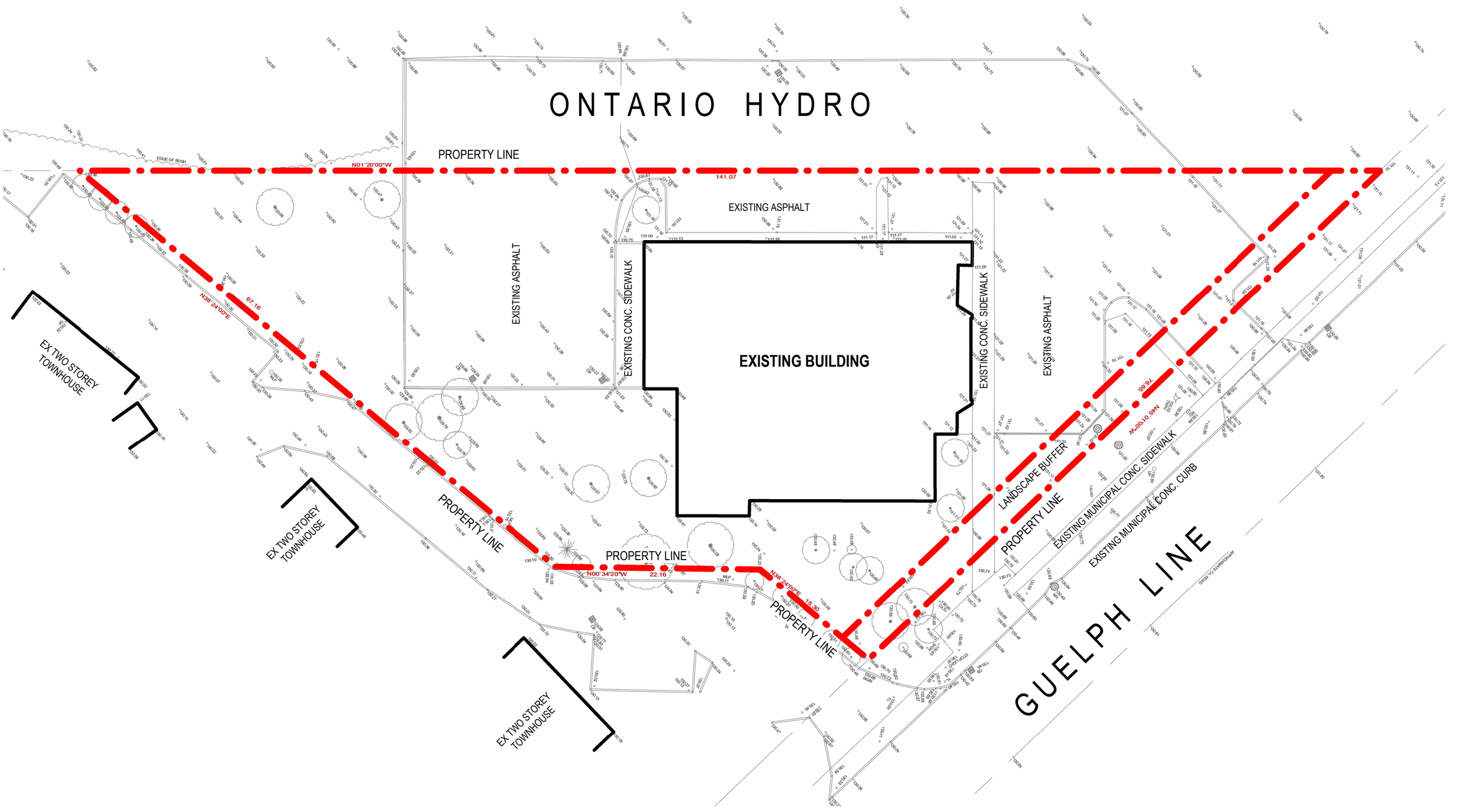
NOTE:
- GROSS FLOOR AREA INCLUDES ALL BELOW AND ABOVE GRADE SPACES WITHIN EXTERIOR WALLS AND IS CALCULATED TO THE EXTERIOR FACE OF EXTERIOR WALL.
- ROOM CALCULATIONS ARE MADE TO INTERIOR FACE OF DEMISING, CORRIDOR AND EXTERIOR WALLS.
- AMENITY AREAS ARE CALCULATED TO CENTERLINE OF DEMISING WALLS, EXTERIOR FACE OF CORRIDOR AND EXTERIOR WALLS.

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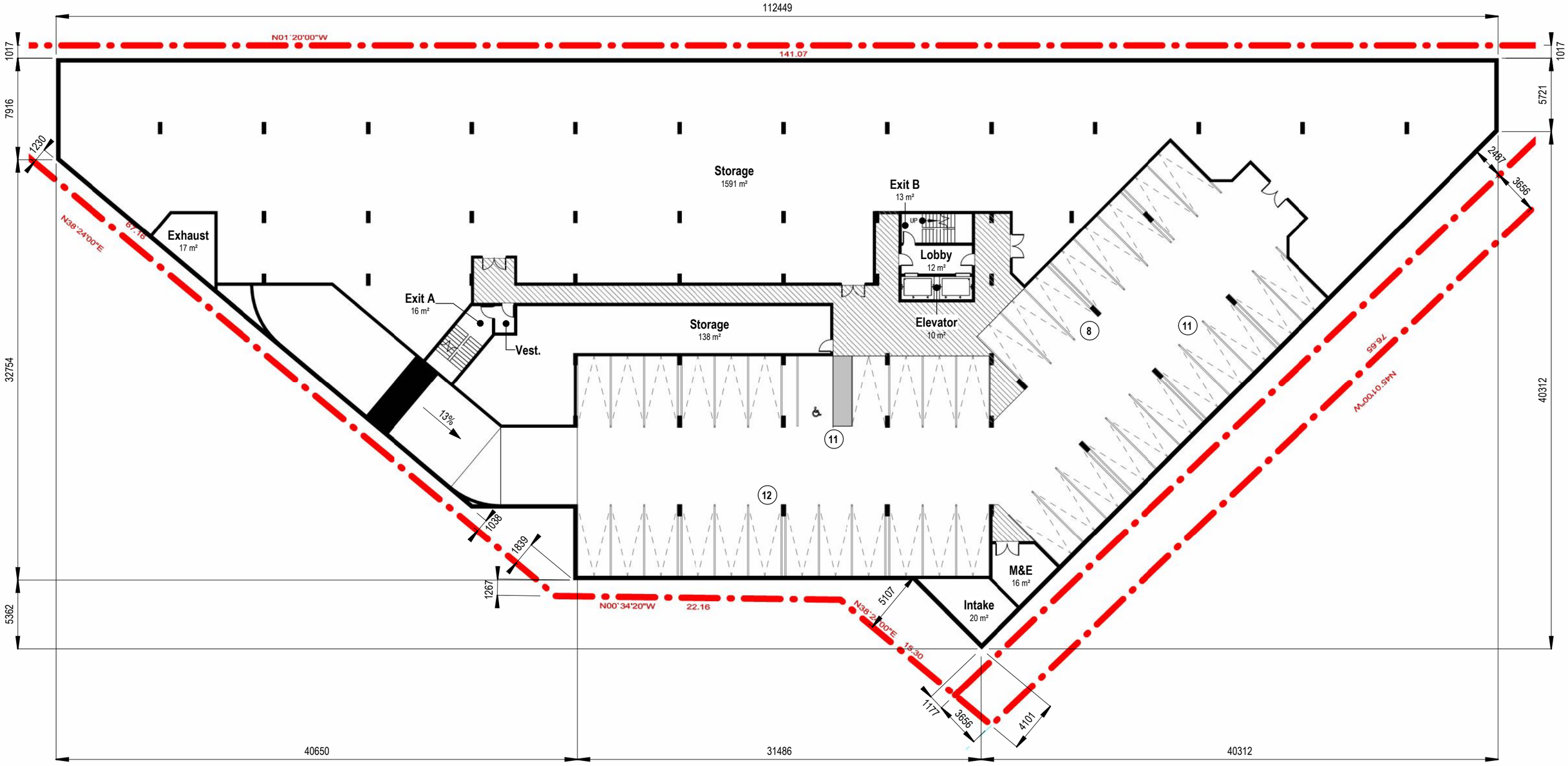
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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Existing Site	March 08, 2022	SD1.1

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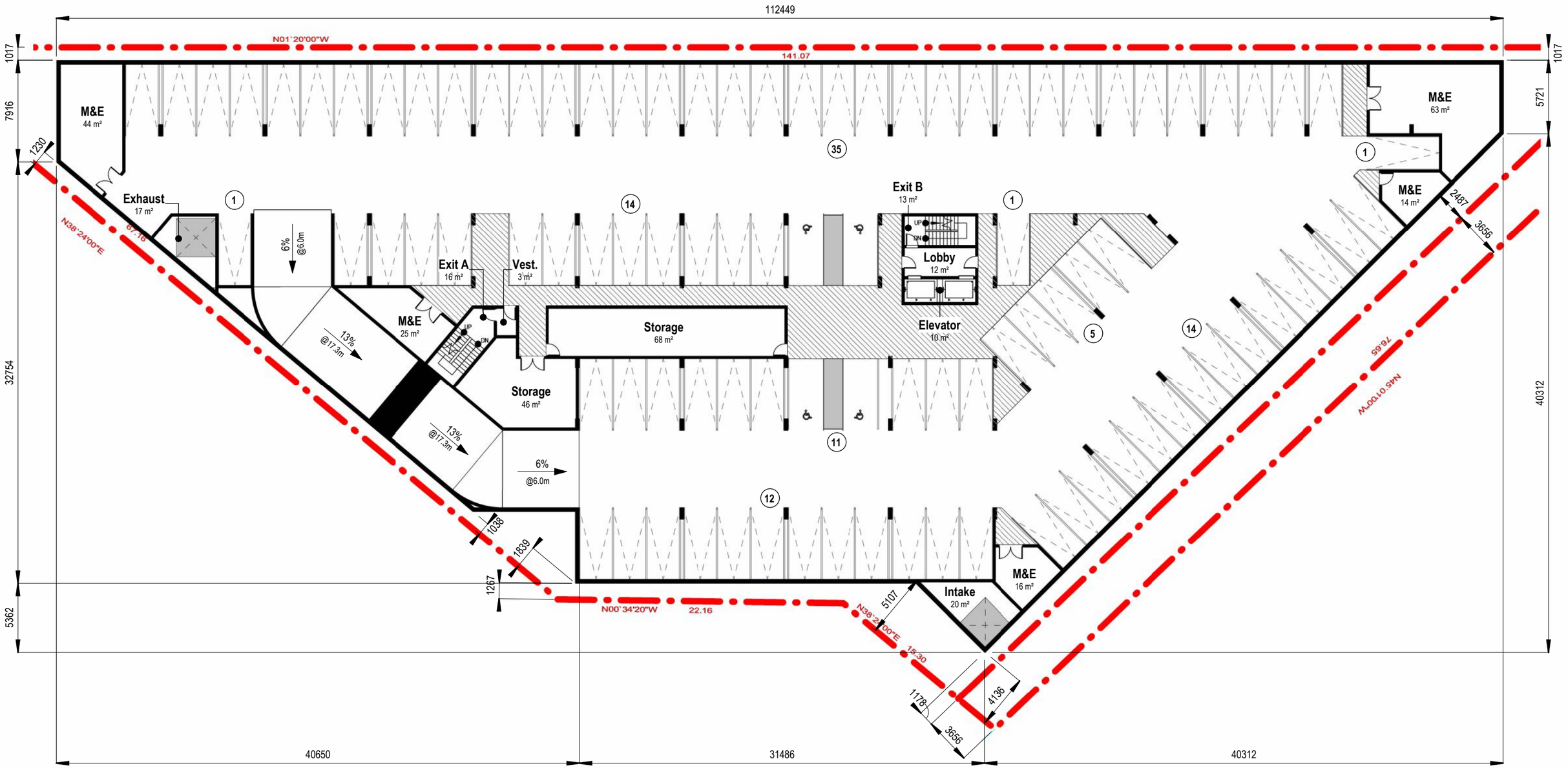


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21-027 | Infinity Development Group | 1396 Guelph Line Burlington, Ontario | Parking Level P3 Floor Plan | March 08, 2022 | SD2.1

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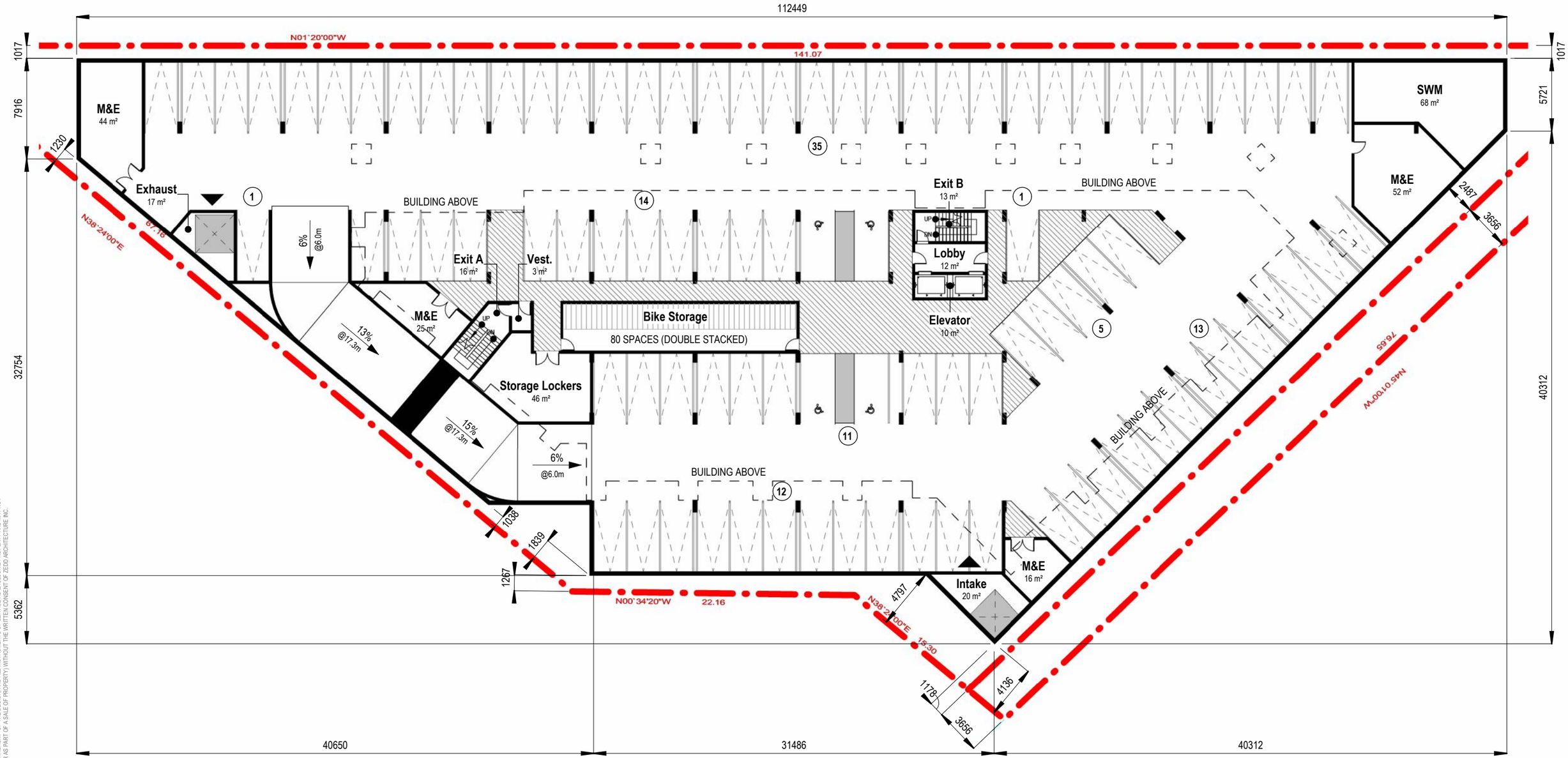
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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Parking Level P2 Floor Plan	March 08, 2022	SD2.2

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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Parking Level P1 Floor Plan	March 08, 2022	SD2.3

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SD4.3
1
1
SD5.2
PROPERTY LINE
OUTLINE OF PARKING BELOW
1
SD5.1
N01°20'00"W
141.07
73115
13096
11381
11381
CANTILEVER ABOVE
CANTILEVER ABOVE
DN
1
SD5.3
N36°24'00"E
67.15
M&E
40 m²
M&E
36 m²
Garbage & Recycling
Amenity
111 m²
Exit B
13 m²
Mail
13 m²
Parcel
24 m²
Exit C
15 m²
CACF
13 m²
Vest.
26 m²
Lobby
141 m²
Elevator
Loading Bay
154 m²
HATCH DENOTES
FFE = 131.10m
GARBAGE CHUTE
SD4.4
1
22860
UP
DN
Exit A
14 m²
Exit
14 m²
7375
8412
7398
M&E
38 m²
Unit Th-1
46 m²
Unit Th-1
46 m²
Unit Th-1
46 m²
Unit Th-1
46 m²
Unit Th-1
48 m²
FFE - 131.45m
Amenity
335 m²
7952
5586
76.65
N45°01'00"W
29225
LANDSCAPE BUFFER
34463
PROPERTY LINE
PROPERTY LINE
8709
9049
7729
5500
9274
N00°34'20"W
22.16
PROPERTY LINE
N36°24'00"E
15.30
17447
32432
23236
1
SD4.2
2
SD4.1
APPROACH ROAD
N

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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Level 1 Floor Plan	March 08, 2022	SD2.4

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Exterior Finish Legend

1	BRICK
2	PAINT
3	ARCHITECTURAL PANEL 1
4	ARCHITECTURAL PANEL 2
5	VISION GLASS HANDRAIL
6	DOUBLE GLAZED ALUMINUM VISION GLASS
7	ALUMINUM FRAME WITH METAL SPANDREL PANEL - WOOD GRAIN PANEL
8	DOUBLE GLAZED ALUMINUM ALUMINUM WINDOW WALL SYSTEM
9	METAL SLAB EDGE COVER
10	EXTRUDED ALUMINUM PENTHOUSE

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Scale : As indicated

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Northeast Elevation	March 08, 2022	SD4.1

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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	East Elevation	March 08, 2022	SD4.2

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Scale : 1 : 300

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	West Elevation	March 08, 2022 SD4.3

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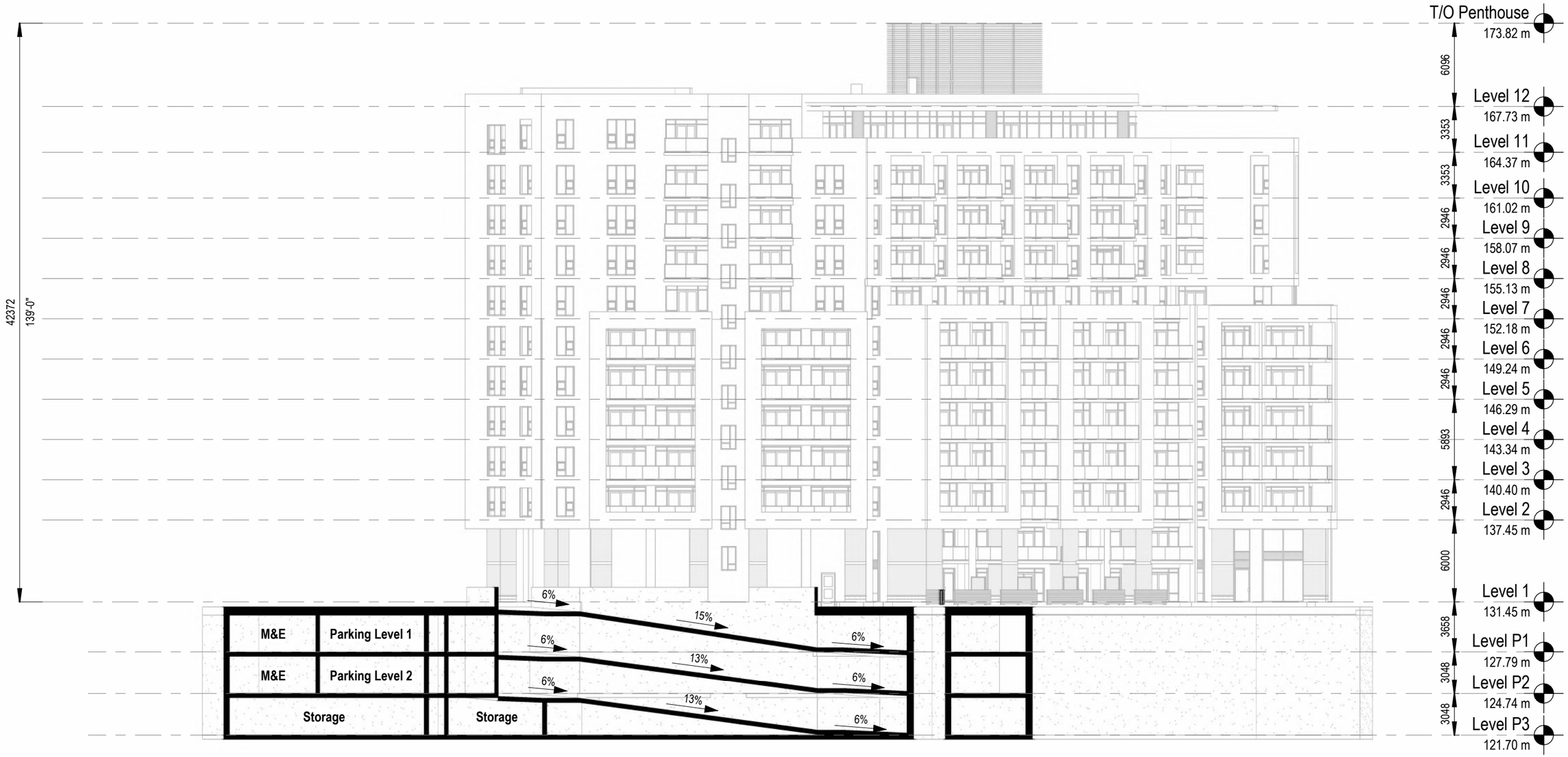


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Scale : 1 : 300

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	South Elevation	March 08, 2022	SD4.4

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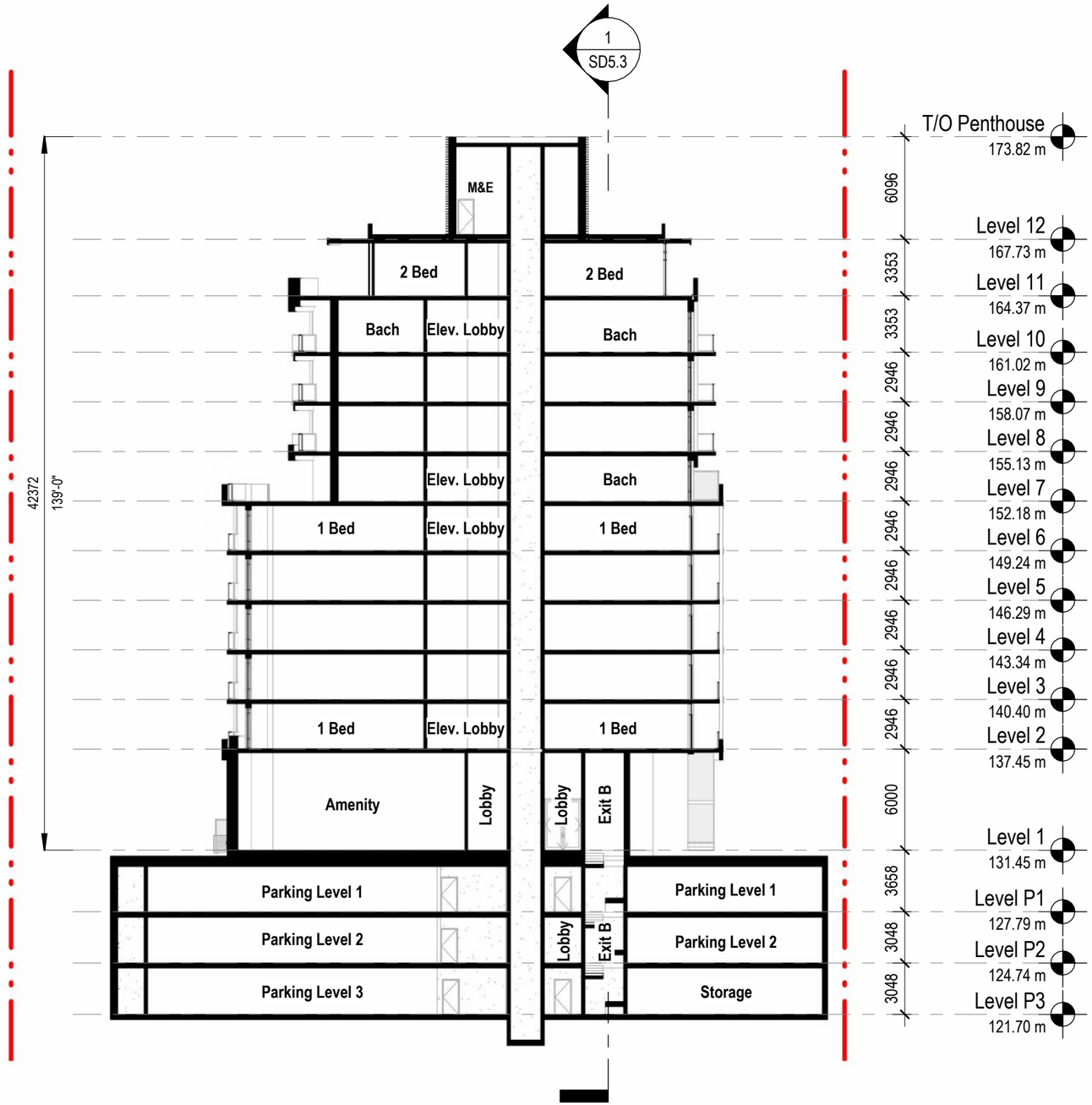


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Scale : 1 : 300

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Parking Ramp Section	March 08, 2022	SD5.1

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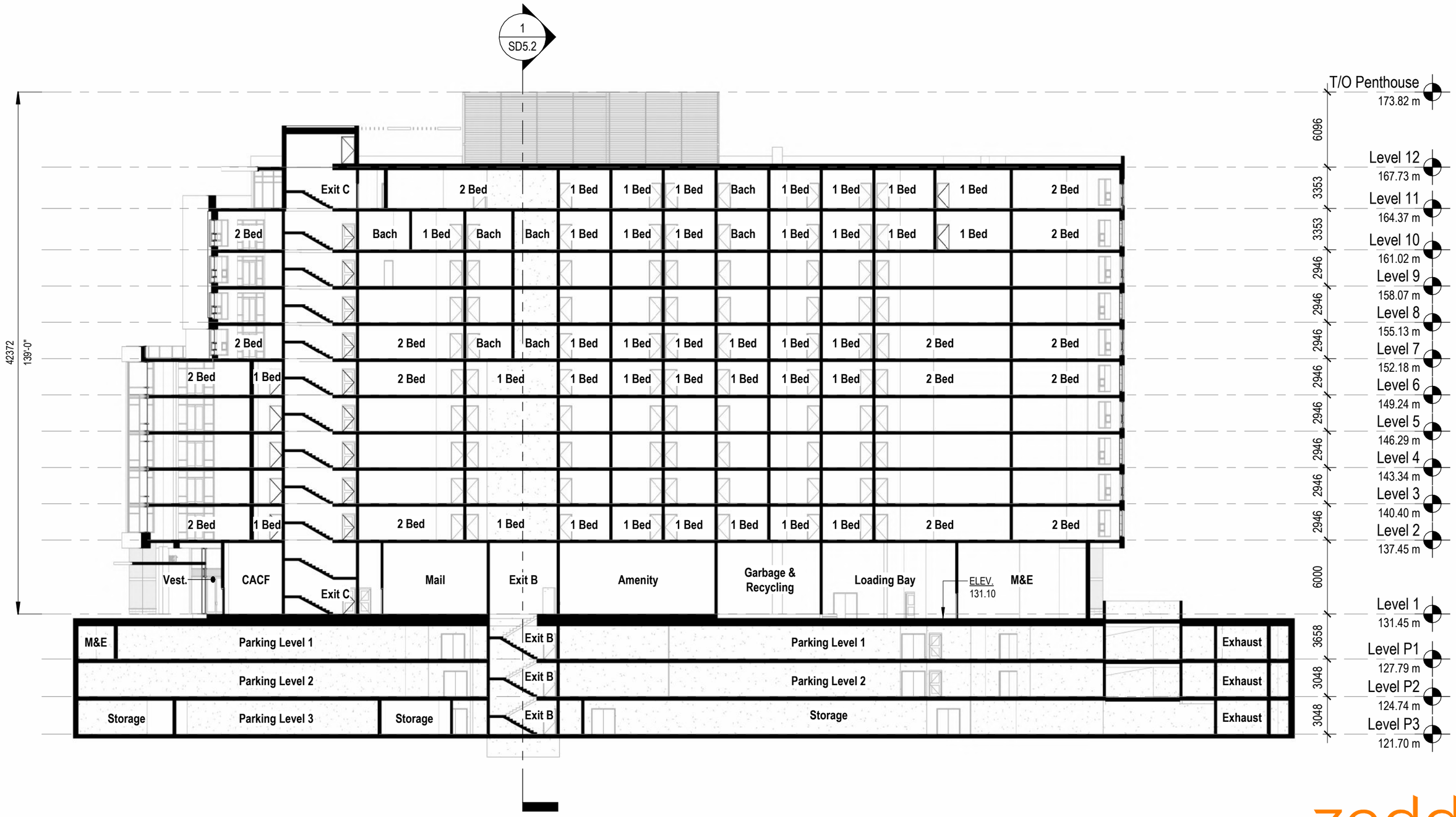


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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Building Section	March 08, 2022	SD5.2

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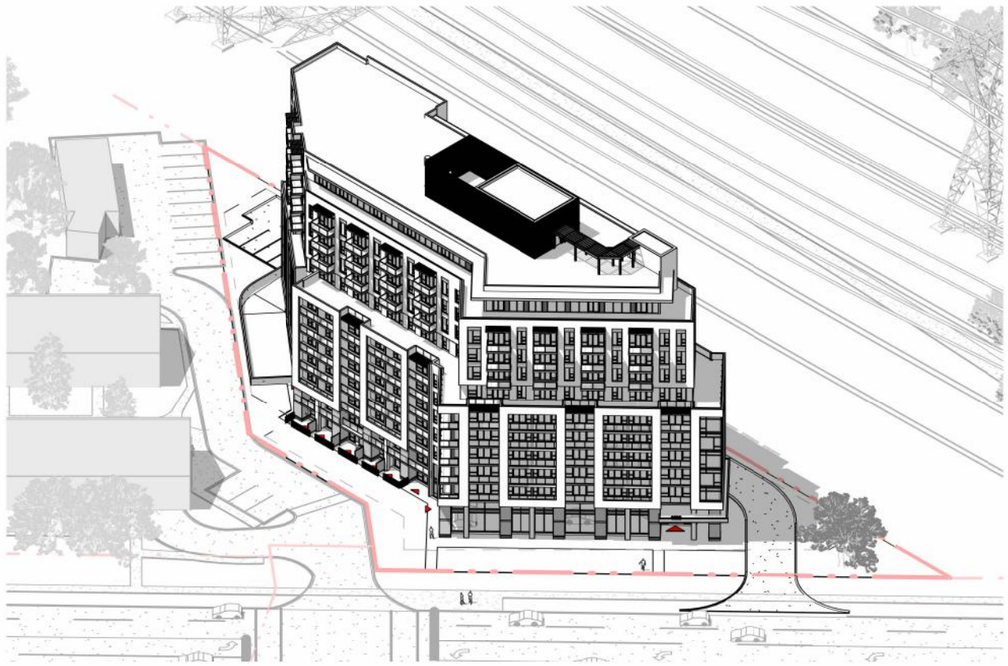
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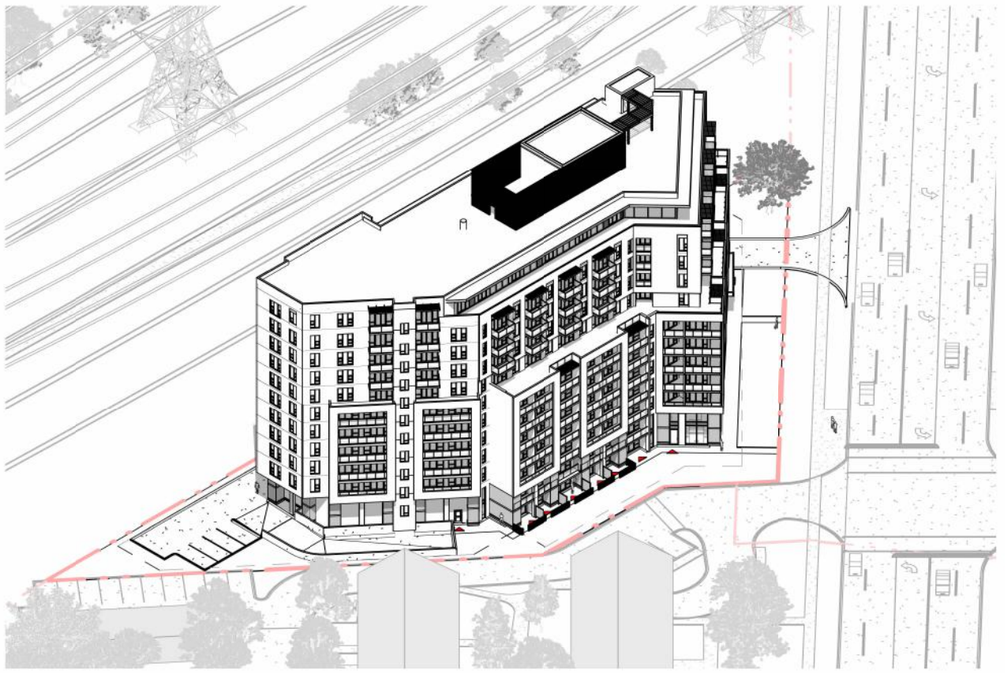
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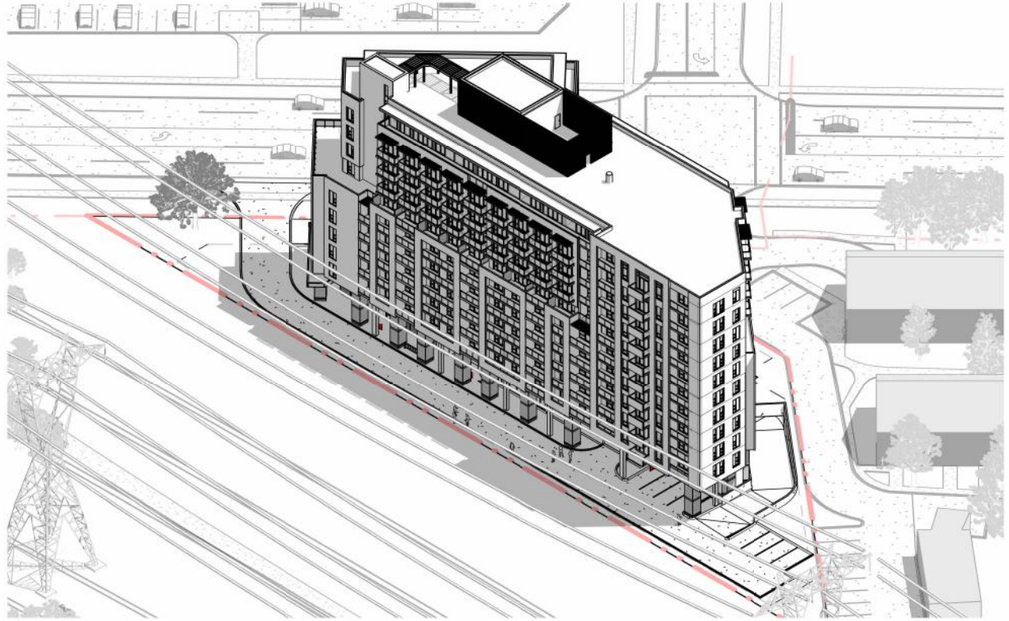
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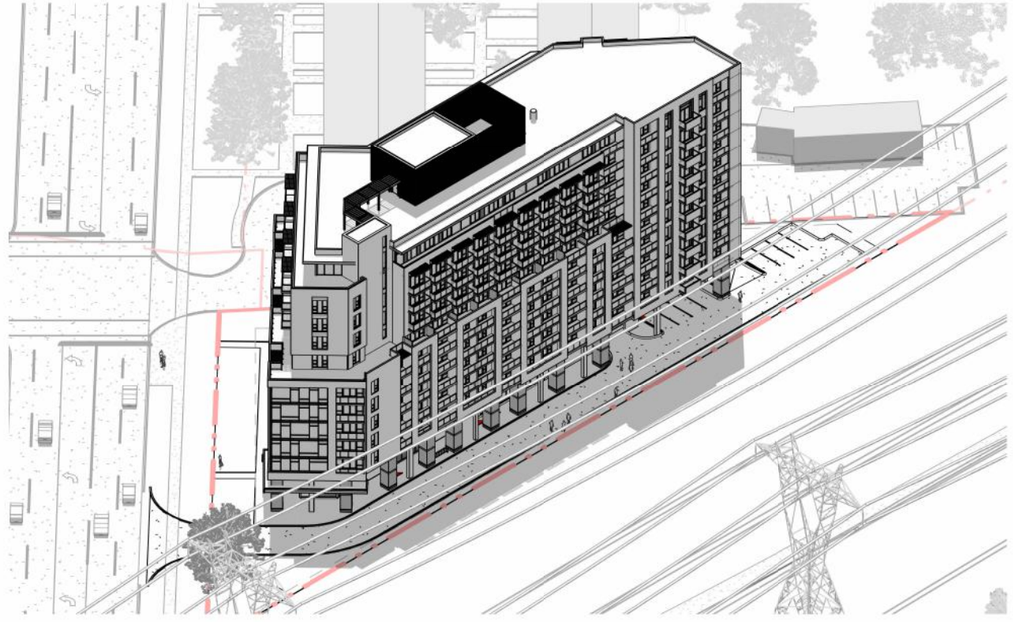
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Scale :

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NORTHWEST ISOMETRIC



SOUTHWEST ISOMETRIC

Scale :

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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Render Isometrics	March 08, 2022	SD6.2

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APPENDIX B: LOG OF BOREHOLES

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH1(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		131.11			
0	0	2" ASPHALT GRANULAR MATERIAL		130.60/ 0.51		SS-1	56
2	1	FILL: Dark grey to black clayey silt, trace gravel & organics, moist, stiff		130.20/ 0.91		SS-2	11
4		SANDY SILT TILL: Grey, trace clay & gravel, moist, compact		129.13/ 1.98	22-8059-1	SS-3	24
6	2	SILT TO CLAYEY SILT TILL: Reddish brown, trace sand, pieces of shale/cobbles, slightly moist to dry, hard to very stiff				SS-4	31
8					22-8059-2	SS-5	42
10	3						
12	4						
14					22-8059-3	SS-6	23
16	5						
18				125.32/ 5.79			
20	6	WEATHERED SHALE: Red with grey seams/layers, slightly moist to dry, hard				SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

13.7

12.5

10.8

PIEZOMETER OR WELL CONSTRUCTION

Concrete

1.39m

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: dry; on March 9, 2022: 1.39m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH1(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey seams/layers, slightly moist to dry, hard					
34				120.36/ 10.75			
36	11	Refusal to auger at 10.75m				SS-10	100+
		End of Borehole at 10.75m					
38	12						
40							
42	13						
44							
46	14						
48							
50	15						
52	16						
54							
56	17						
58							
60	18						
62							
64	19						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

2" Slotted Pipe

Silica Sand

10.67m bgs

Groundwater Depth (m): on completion: dry; on March 9, 2022: 1.39m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH2(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		131.27			
0	0	1½" ASPHALT		130.93/ 0.34		SS-1	31
2		GRANULAR FILL: Grey gravelly sand, moist, dense					
4	1	SANDY SILT TILL: Grey to brown, trace clay, trace gravel, moist, compact Signs of oxidation @ 1.52m				SS-2	24
6	2					SS-3	25
				129.14/ 2.13			
8		SILT TO CLAYEY SILT TILL: Reddish brown, trace sand, pieces of shale/cobbles, slightly moist to dry, hard				SS-4	38
10	3					SS-5	59
12	4						
14							
16	5					SS-6	32
18							
20	6			125.17/ 6.10		SS-7	100+
22		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
24	7						
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

1.05m

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: 5.18m; on March 9, 2022: 1.05m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH2(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard Grey shale at the bottom		120.91/ 10.36			
34		Refusal to auger at 10.36m					
36	11	End of Borehole at 10.36m					
38	12						
40							
42	13						
44							
46	14						
48							
50	15						
52							
54	16						
56							
58	17						
60							
62	18						
64	19						

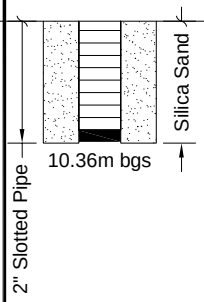
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: 5.18m; on March 9, 2022: 1.05m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

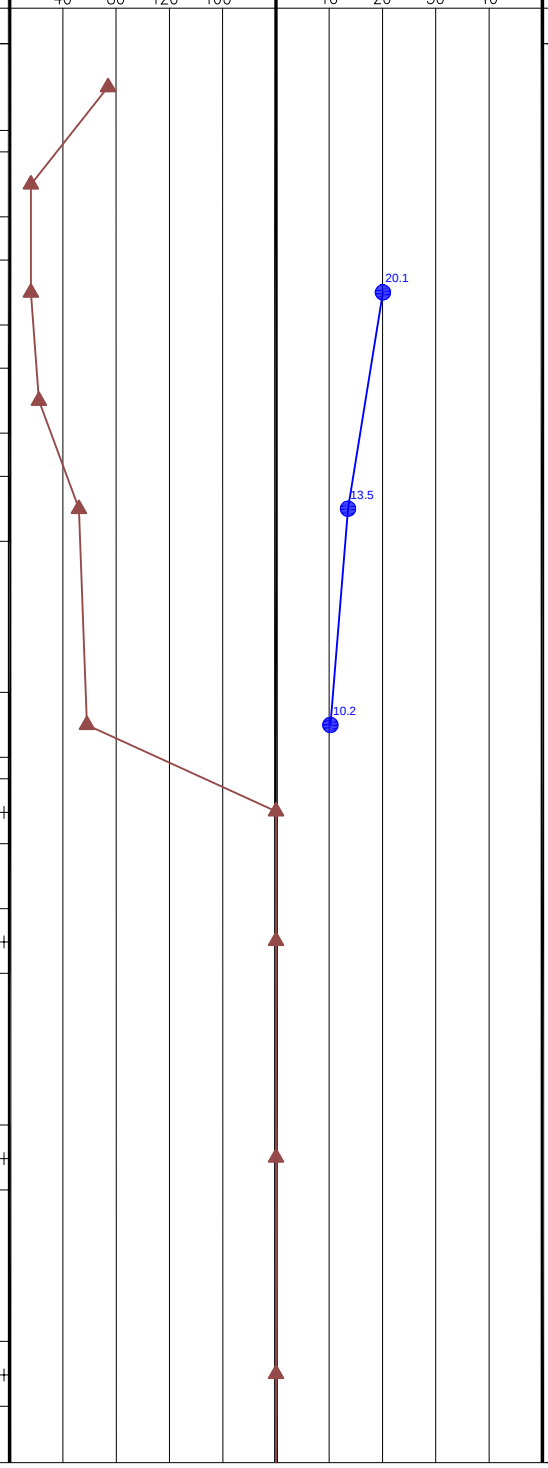
PROJECT NAME: Geotechnical & Hydrogeological Investigations

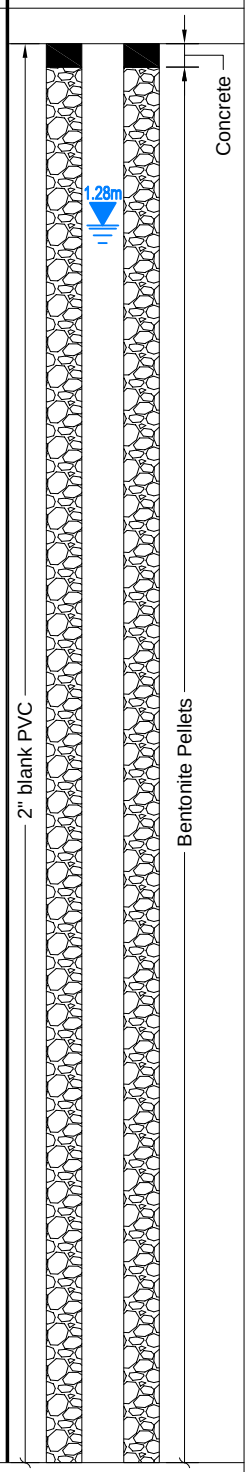
LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.96			
0	0	1½" ASPHALT				SS-1	37
2		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		130.50/ 0.46			
4	1	FILL: Dark grey clayey silt, trace gravel, brick, organics & rootlets, moist, loose				SS-2	8
6	2	CLAYEY SILT TILL: Grey, trace gravel, moist, firm to stiff		129.28/ 1.68	22-8059-4	SS-3	8
8		SILTY SAND: Light brown, trace gravel, wet, compact		128.52/ 2.44		SS-4	11
10	3	SANDY TO CLAYEY SILT TILL: Reddish brown, with pieces of shale, moist, compact to very dense (very stiff to hard)		127.91/ 3.05	22-8059-5	SS-5	26
12	4						
14							
16	5				22-8059-6	SS-6	29
18		Mixed with weathered red shale @ 5.33m				SS-7	100+
20	6	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		124.86/ 6.10		SS-8	100+
22	7						
24							
26	8					SS-9	100+
28							
30	9					SS-10	100+
32	10						





Groundwater Depth (m): on completion: dry; on March 2, 2022: 12.64m; on March 9, 2022: 1.28m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	"N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-11	100+
38							
40	12					SS-12	100+
42	13						
44							
46	14					SS-13	100+
48							
50	15	Augered to 15.24m		115.59/ 15.37		SS-14	100+
		End of Borehole at 15.37m					
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

14.63m bgs

Groundwater Depth (m): on completion: dry; on March 2, 2022: 12.64m; on March 9, 2022: 1.28m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.64			
0	0	2" ASPHALT					
		FILL: Granular fill, gravelly sand, moist Dark brown to black, brown stones, fill material mixed of asphalt, wooden pieces				SS-1	20
2	1					SS-2	4
4				129.12/ 1.52			
		FILL: Dark brown clayey silt, moist, firm				SS-3	8
6	2			128.35/ 2.29			
		SANDY SILT TILL: Grey, trace gravel, moist, dense				SS-4	40
8				127.59/ 3.05			
10	3	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard				SS-5	44
12	4						
14							
16	5					SS-6	47
18							
20	6			124.54/ 6.10			
		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard				SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32							
	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: 5.18m; on March 2, 2022: 11.17m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-10	100+
38							
40	12					SS-11	100+
42	13						
44							
46	14					SS-12	100+
48							
50	15	Augered to 15.24m		115.40/ 15.24			
		End of Borehole at 15.24m				SS-13	100+
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

SOIL PROFILE | SAMPLES

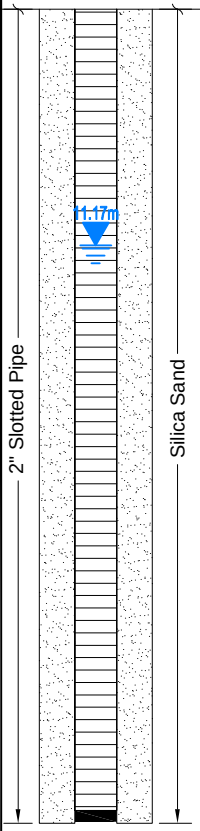
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: 5.18m; on March 2, 2022: 11.17m

DRAWN: DC | LOGGED: BS | CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		129.92			
0	0	1½" ASPHALT		129.62/ 0.30		SS-1	15
2		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		129.31/ 0.61			
4	1	FILL: Brown sandy silt, trace clay & gravel, moist, compact				SS-2	25
6	2	SANDY SILT TILL: Grey, trace gravel, moist, compact				SS-3	29
8						SS-4	28
10	3	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard to very stiff		126.87/ 3.05		SS-5	38
12	4						
14							
16	5			124.74/ 5.18		SS-6	27
18		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
20	6					SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

2" blank PVC

Bentonite Pellets

Groundwater Depth (m): on completion: dry

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-10	100+
38							
40	12					SS-11	100+
42	13						
44				116.12/ 13.80			
46	14	Refusal to auger at 13.80m End of Borehole at 13.80m				SS-12	100+
48							
50	15						
52	16						
54							
56	17						
58							
60	18						
62							
64	19						

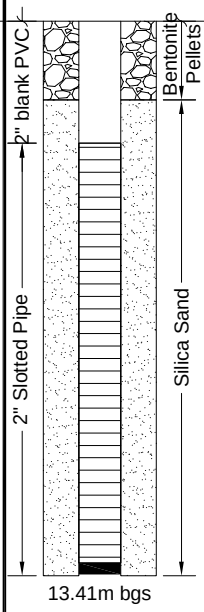
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: dry

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH6(MW) SHEET. 1 of 1

PROJECT NO.: FE-P 22-11966/67

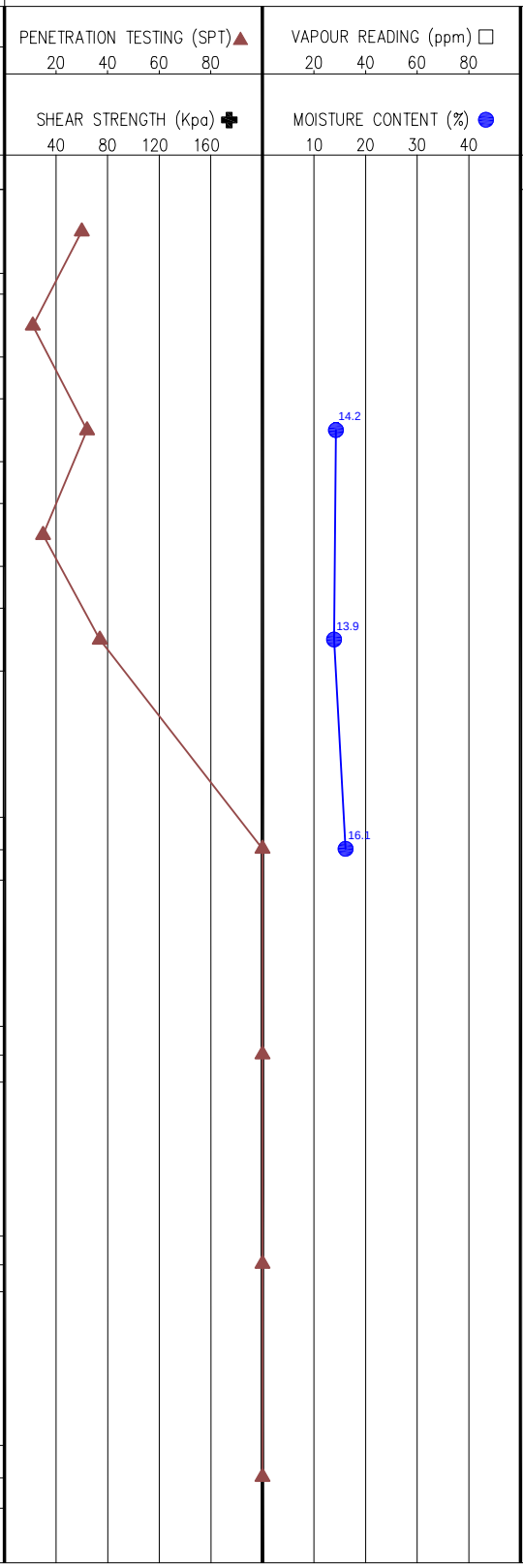
PROJECT NAME: Geotechnical & Hydrogeological Investigations

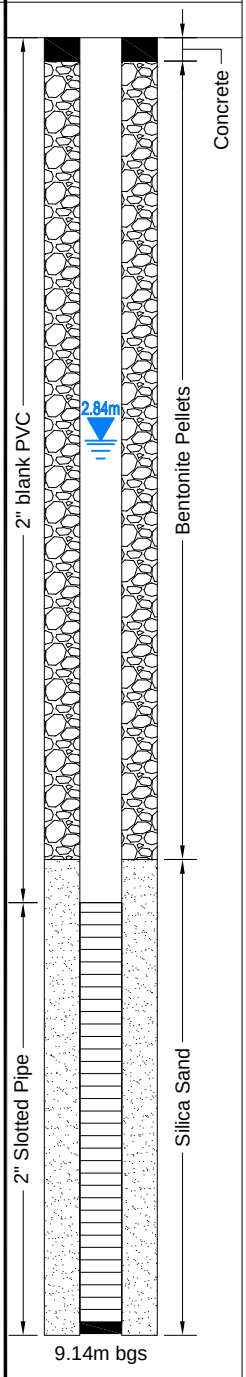
LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.12			
0	0	3" ASPHALT					
		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		129.76/ 0.36		SS-1	30
2	1	FILL: Black sandy silt, trace clay, gravel, topsoil & organics, moist, compact		129.21/ 0.91		SS-2	11
4				128.75/ 1.37			
6	2	FILL: Grey silty sand, trace gravel & rootlet, moist, loose			22-8059-7	SS-3	32
8		SANDY SILT TILL: Grey, trace gravel, moist, compact to dense				SS-4	15
10	3			126.77/ 3.35	22-8059-8	SS-5	37
12	4	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard					
14							
16	5	Wet @ 4.57m			22-8059-9	SS-6	100+
18		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		124.63/ 5.49			
20	6					SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9			120.87/ 9.25		SS-9	100+
32	10	End of Borehole at 9.25m					





Groundwater Depth (m): on completion: 4.57m; on March 2, 2022: 2.84m

DRAWN: DC LOGGED: BS CHECKED: CW

APPENDIX C: GRAIN SIZE, HYDROMETER and CHEMICAL ANALYSES

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Client: Infinity Development Group
Address: 101-2275 Upper Middle Road
Oakville, ON
L6H 0C3
Tel.:
Email:
Attn.:

F.E. Job #: 22-8059
Project Name: Geotechnical
Project ID: FE-P 22-11966
Date Sampled: N/A
Date Received: 3-Mar-2022
Date Reported: 4-Mar-2022
Location: 1396 Guelph Line
Burlington, ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
pH	Soil	2	4-Mar-22	4-Mar-22	pH-EC-SAR F-16	SW-846, 9045D
Chloride	Soil	2	N/A	4-Mar-22	Chloride F-20	SM 4500-Cl-E
Sulphate	Soil	2	4-Mar-22	4-Mar-22	Sulphate F-21	SM 4500-SO_4
Moisture Content	Soil	9	N/A	4-Mar-22	Support Procedures F-99	Carter (1993)
Grain Size	Soil	3	N/A	4-Mar-22	Grain Size F-28	ASTM D6913-04

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:



Roger Lin, Ph. D., C. Chem.
Laboratory Manager

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (***Rush***)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				**Soil Standards** *
pH *(pH unit)*	8.60	6.59				(5-11) 5-9

* Surface soil pH value from 5 - 9, Sub-surface soil pH value from 5-11.

QA/QC Report

Parameter	**LCS**	**AR**	**Duplicate**	**AR**		
	Absolute Difference *(pH Unit)*					
pH *(pH unit)*	7.21	7.00-7.40	0.04	<0.3		

LEGEND:
LCS - Laboratory Control Sample
AR - Acceptable Range

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				
	Concentration (µg/g)					
Chloride in Soil	160.97	795.54				

< result obtained was below RL (Reporting Limit).

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**MS**	**AR**
	(µg/g)		**Recovery (%)**		**Recovery (%)**	
Chloride in Soil	<10	10	96	70-130	87	70-130

Parameter	**Duplicate**	**AR**				
	RPD (%)					
Chloride in Soil	8.7	0-20				

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				
Sulphate *(mg/kg)*	25.5	122.4				

QA/QC Report

Parameter	**Blank**	**RL**	**LCS/Spike**	**AR**	**Duplicate**	**AR**
	(mg/kg)		**Recovery (%)**		**RPD (%)**	
Sulphate	<1	1	100	70-130	4	0-30

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-2*** BH1 SS5 3.05-3.51m	***22-8059-3*** BH1 SS6 4.57-5.03m	***22-8059-4*** BH3 SS3 1.52-1.98m	***22-8059-5*** BH3 SS5 3.05-3.51m	***22-8059-6*** BH3 SS6 4.57-5.03m
Geo Moisture Content (%)	13.7	12.5	10.8	20.1	13.5	10.2

Parameter	***22-8059-7*** BH6 SS3 1.52-1.98m	***22-8059-8*** BH6 SS5 3.05-3.51m	***22-8059-9*** BH6 SS6 4.57-5.03m			
Geo Moisture Content (%)	14.2	13.9	16.1			

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**Duplicate**	**AR**
			Recovery (%)		**RPD (%)**	
Geo Moisture Content (%)	<0.1	0.1	100	70-130	14.5	0-20

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

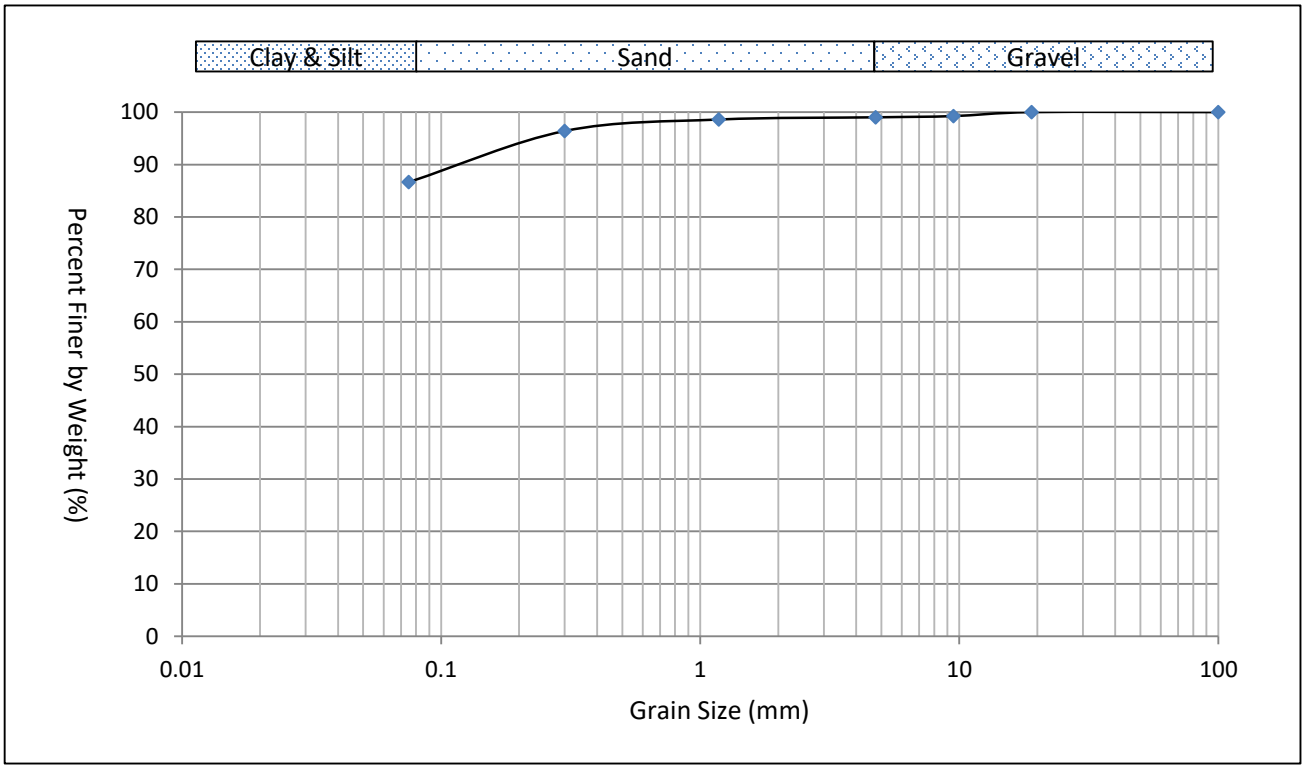
Parameter	***22-8059-4*** BH3 SS3 1.52-1.98m	***22-8059-5*** BH3 SS5 3.05-3.51m	***22-8059-6*** BH3 SS6 4.57-5.03m			
Grain Size (%)						
>19mm	0.0	0.0	0.0			
9.5mm-19mm	0.8	0.0	0.0			
4.75mm-9.5mm	0.2	4.3	4.6			
1.18m-4.75mmm	0.4	6.8	10.7			
300um-1.18mm	2.2	5.5	8.5			
75um-300um	9.8	10.2	8.5			
<75um	86.7	73.2	67.7			
Clay & Silt	**87**	**73**	**68**			
Sand	**12**	**23**	**28**			
Gravel	**1**	**4**	**5**			

Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m

Clay & Silt: 87% Sand: 12% Gravel: 1%

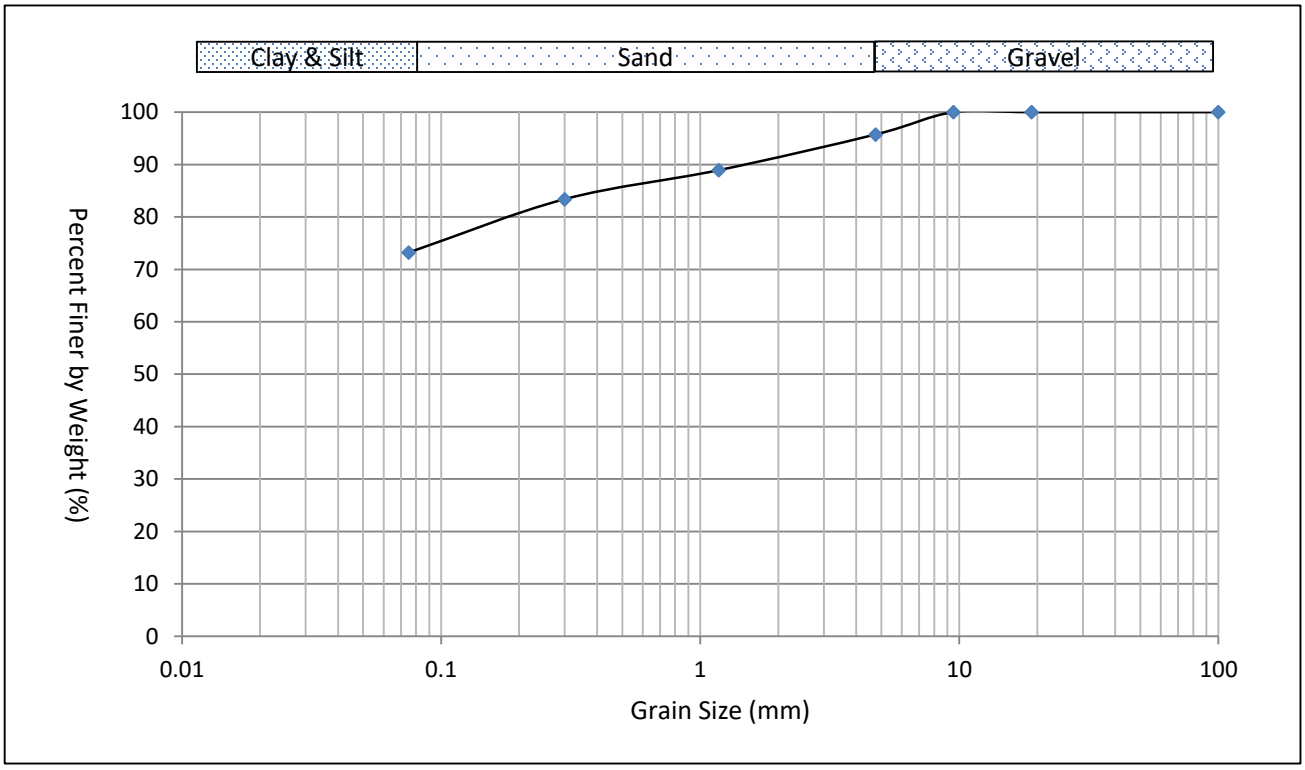


Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-5 BH3 SS5 3.05-3.51m

Clay & Silt: 73% Sand: 23% Gravel: 4%

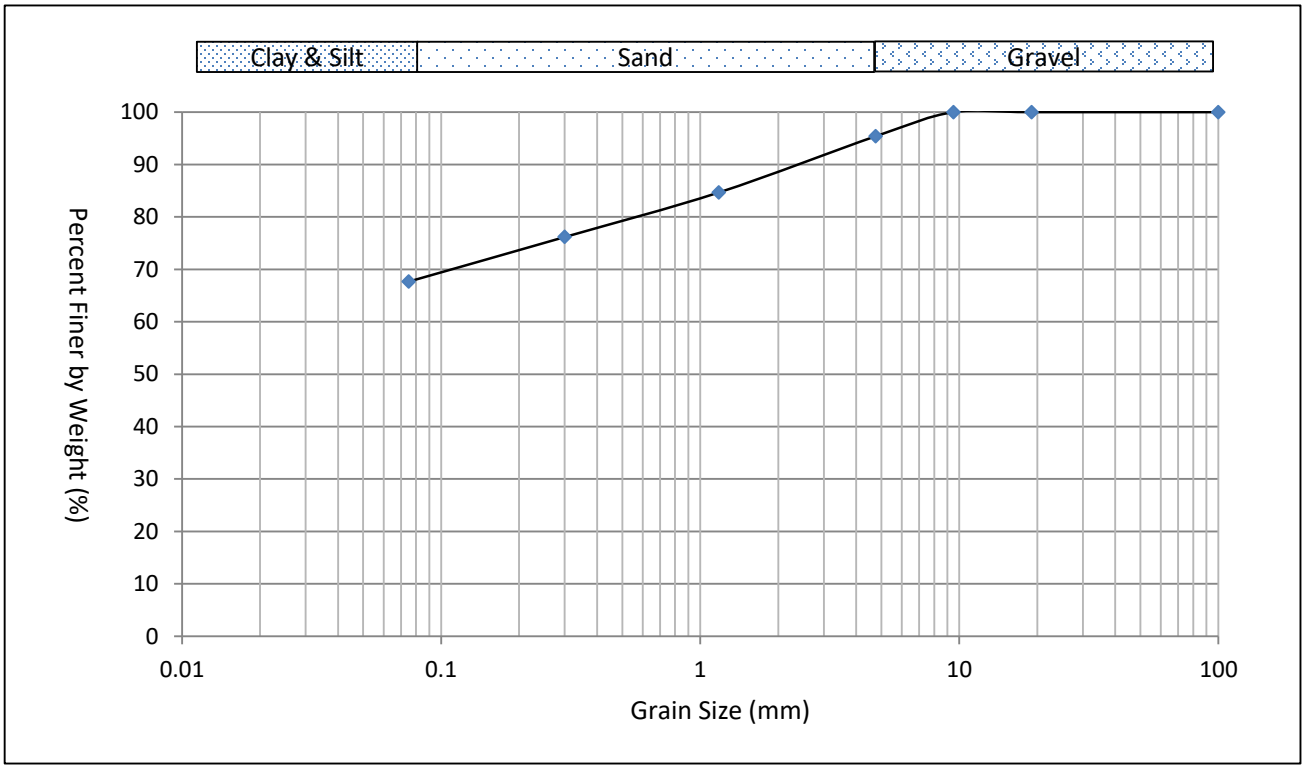


Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-6 BH3 SS6 4.57-5.03m

Clay & Silt: 68% Sand: 28% Gravel: 5%



Results related only to the items tested

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Client:	Infinity Development Group	***F.E. Job #:***	22-8059B
Address:	101-2275 Upper Middle Road	***Project Name:***	Geotechnical
	Oakville, ON	***Project ID:***	FE-P 22-11966
	L6H 0C3	***Date Sampled:***	N/A
Tel.:		***Date Received:***	3-Mar-2022
Email:		***Date Reported:***	10-Mar-2022
Attn.:		***Location:***	1396 Guelph Line
			Burlington, ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
Hydrometer	Soil	1	N/A	9-Mar-22	Hydrometer SOP	ASTM D7928-17

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:



Roger Lin, Ph. D., C. Chem.
Laboratory Manager

Client: Infinity Development Group ***F.E. Job #:*** 22-8059B

Certificate of Analysis

Analysis Requested:	Hydrometer
Sample Description:	1 Soil Sample(s)

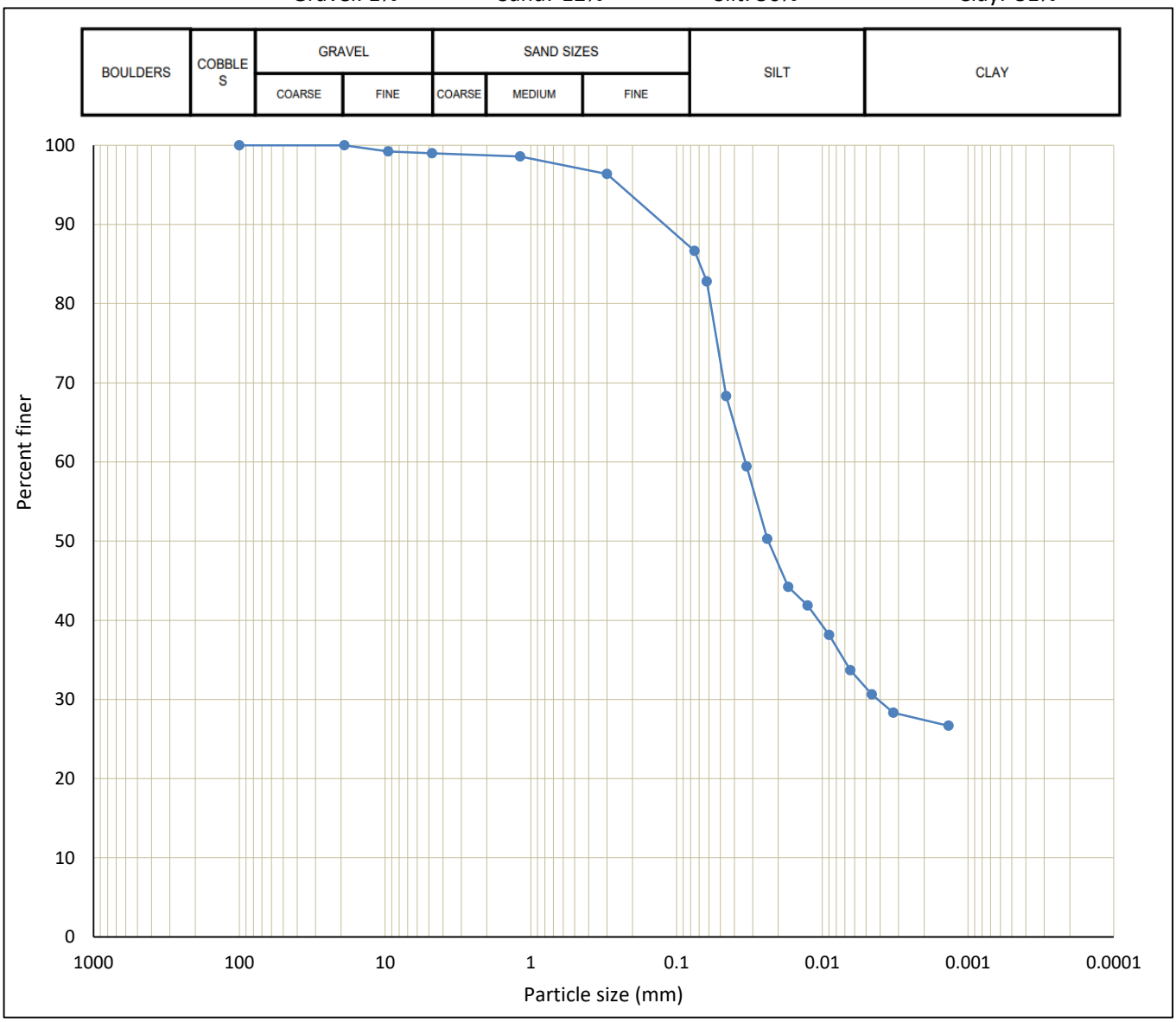
Parameter	***22-8059-4*** BH3 SS3 1.52-1.98m					
Grain Size (%)						
>19mm	0.0					
9.5mm-19mm	0.8					
4.75mm-9.5mm	0.2					
1.18mm-4.75mm	0.4					
300um-1.18mm	2.2					
75um-300um	9.8					
5um-75um	56					
2um-5um	4					
<2um	27					
Clay	**31**					
Silt	**56**					
Sand	**12**					
Gravel	**1**					

Client: Infinity Development Group ***F.E. Job #:*** 22-8059B

Grain Size Distribution

Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m

Gravel: 1% Sand: 12% Silt: 56% Clay: 31%



Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m		
Diameter	***Weight (%)***	***Grain Size***
>4.75mm	1.0	Gravel
1.18mm-4.75mm	0.4	Coarse Sand
300um-1.18mm	2.2	Medium Sand
75um-300um	9.8	Fine Sand
5um-75um	56	Silt
2um-5um	4	Clay
<2um	27	

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LAB JOB #: 8059

CHAIN OF CUSTODY 2588

Page ____ of ____

CLIENT INFORMATION
Company Name:
Contact: Clive 416-605-9722
Address: Rajindra 647-784-2727
Phone:
Fax: Fax results? Y/N
Email: Email results? Y/N

PROJECT INFORMATION
Project Name: 1396 Guelph Line
Project ID: 22-11966
Sampled By:

TURNAROUND TIME (TAT) REQUIRED

STD - Standard (5-7 working days) ✓		Working Time: Monday-Friday 9:00am-5:00pm
SR - Semi Rush (48 hours)	50%	Surcharges apply; Sample received after 2pm will be considered received the next business day
R - Rush (24 hours)	75%	
SD - Same Day - 100%	100%	

BILLING INFORMATION
Purchase Order #:
Verbal Authorization:
Credit Card (type):
Credit Card #:
Expiry Date:

LAB SAMPLE ID	CLIENT'S SAMPLE ID AND DESCRIPTION	SAMPLING DATE/TIME	SAMPLE MATRIX	CONTAINER # & TYPE	TAT (Above)	ANALYSIS REQUESTED (Check or Specify) Metals	PHCs	VOCs	PAHs	PCBs	Asbestos	Moist		Grain	NOTES
1	BH1 SS3 5-6.5'											✓			+ (CL, SO4, PH)
2	SS5 10-11.5'											✓			
3	SS6 15-16.5'											✓			
4	BH3 SS3 5-6.5'											✓		✓	+ (CL, SO4 + PH)
5	SS5 10-11.5'											✓		✓	
6	SS6 15-16.5'											✓		✓	
7	BH6 SS3 5-6.5'											✓			
8	SS5 10-11.5'											✓			
9	SS6 15-16.5'											✓			

Relinquished by: (Signature & Print) Behnam Sayad Pour
Date & Time: March 3, 22
Method of Shipment:

Client's Comments:

Received by: (Signature & Print) Bo
Date & Time: Mar 3. 22

Arrival Temperature (°C): 4°c
Laboratory Remarks:

Regulatory Requirements

Reg. 153
Table ____
☐ Residential / Parkland
☐ Industrial / Commercial
☐ Agricultural
Soil Texture
☐ Coarse ☐ Med/Fine

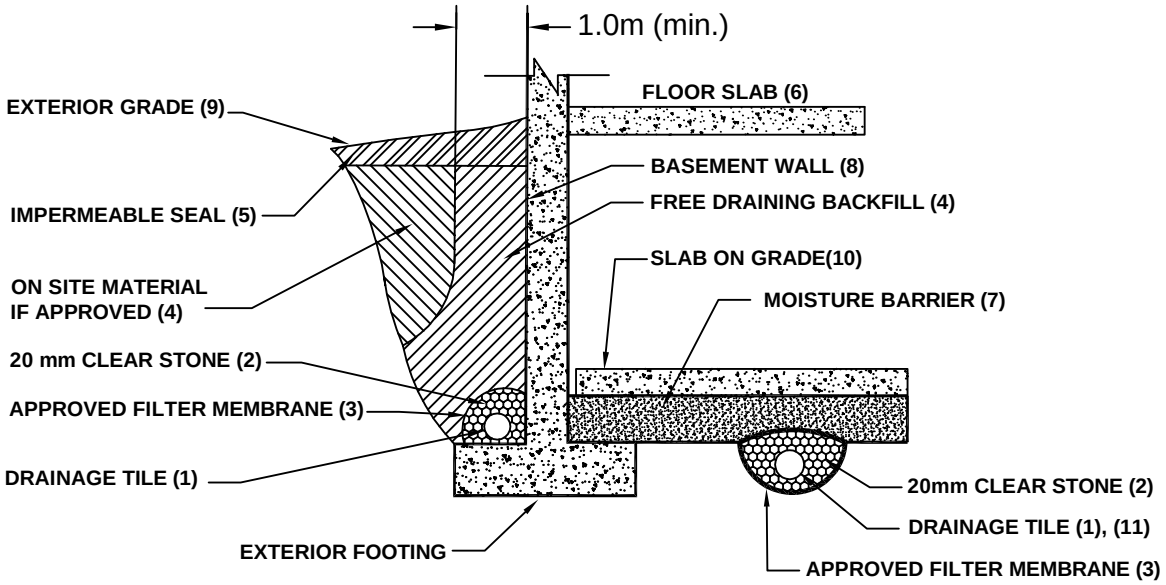
Sewer Use
☐ Sanitary
☐ Storm
Region ____

Reg. 558
☐ TCLP

Revision: 2.2

APPENDIX D – DRAINAGE and BACKFILL RECOMMENDATION

FISHER ENGINEERING



NOTES:

(1) DRAINAGE TILE TO CONSIST OF 100mm (4") DIAMETER WEEPING TILE OR EQUIVALENT PERFORATED PIPE LEADING TO A POSITIVE SUMP OR OUTLET.

(2) 20mm (3/4") CLEAR STONE - 150mm (6") TOP AND SIDE OF DRAIN. IF DRAIN IS NOT ON FOOTING, PLACE 100mm (4") OF STONE BELOW DRAIN.

(3) WRAP THE CLEAR STONE WITH AN APPROVED FILTER MEMBRANE (TERRAFIX 279R OR EQUIVALENT).

(4) FREE DRAINING BACKFILL - OPSS GRANULAR B OR EQUIVALENT COMPACTED TO THE SPECIFIED DENSITY. DO NOT USE HEAVY COMPACTION EQUIPMENT WITHIN 1.8m (6') OF WALL.

(5) IMPERMEABLE BACKFILL SEAL - COMPACTED CLAY, CLAYEY SILT OR EQUIVALENT. IF ORIGINAL SOIL IS FREE-DRAINING, SEAL MAY BE OMITTED. MAXIMUM THICKNESS OF SEAL TO BE 0.5m.

(6) DO NOT BACKFILL UNTIL WALL IS SUPPORTED BY BASEMENT AND FLOOR SLABS OR ADEQUATE BRACING.

(7) MOISTURE BARRIER TO BE AT LEAST 200mm (8") OF COMPACTED CLEAR 20mm (3/4") STONE OR EQUIVALENT FREE DRAINING MATERIAL. A VAPOUR BARRIER MAY BE REQUIRED FOR SPECIALTY FLOORS.

(8) BASEMENT WALL TO BE DAMP PROOFED.

(9) EXTERIOR GRADE TO SLOPE AWAY FROM BUILDING.

(10) SLAB ON GRADE SHOULD NOT BE STRUCTURALLY CONNECTED TO THE WALL OR FOOTING

(11) UNDERFLOOR DRAIN INVERT TO BE AT LEAST 300mm (12") BELOW UNDERSIDE OF FLOOR SLAB. DRAINAGE TILE PLACED IN PARALLEL ROWS 6 TO 8m (20-25') CENTERS ONE WAY. PLACE DRAIN ON 100mm (4") CLEAR STONE WITH 150mm (6") OF CLEAR STONE ON TOP AND SIDES. ENCLOSE STONE WITH FILTER FABRIC AS NOTED IN (3)

(12) THE ENTIRE SUBGRADE TO BE SEALED WITH APPROVED FILER FABRIC (TERRAFIX 270R OR EQUIVALENT) IF NON-COHESIVE(SANDY) SOILS BELOW GROUND WATER TABLE ENCOUNTERED.

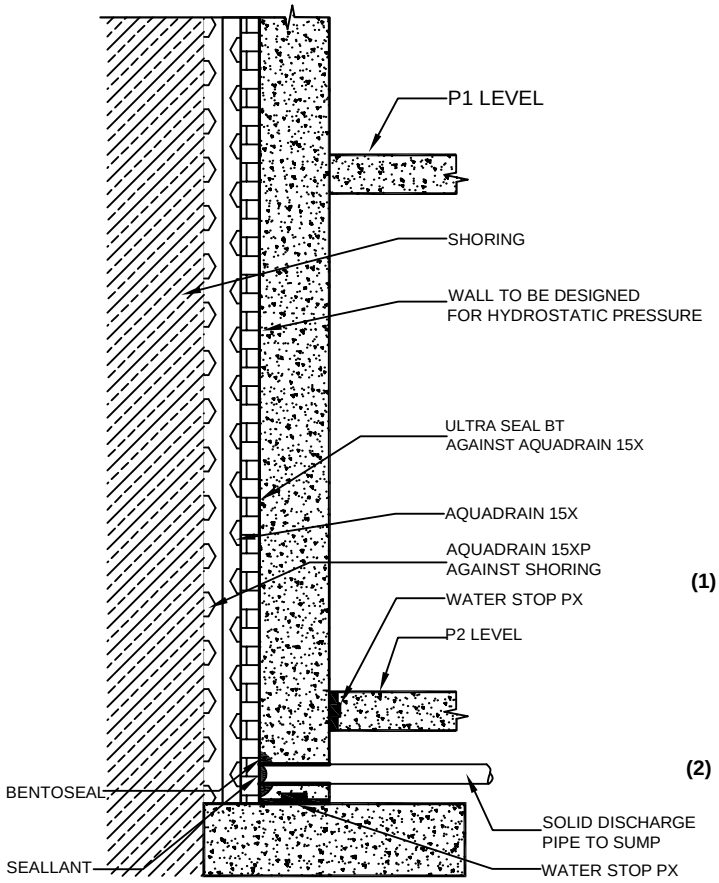
(13) DO NOT CONNECT THE UNDERFLOOR DRAINS TO PERIMETER DRAINS.

(14) REVIEW THE GEOTECHNICAL REPORT FOR SPECIFIC DETAILS.

DRAINAGE AND BACKFILL RECOMMENDATIONS

BASEMENT WITH UNDERFLOOR DRAINAGE

(NOT TO SCALE)



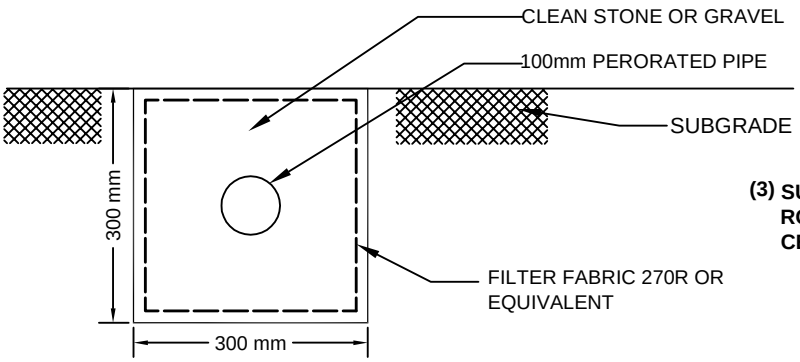
NOTES:

(1) ALL PERMANENT DRAINAGE PIPES MUST HAVE GEOTEXTILE FILTER SLEEVE TO PREVENT LONG TERM SILTING. TO FURTHER MINIMIZE SILTATION OF THE DRAINAGE SYSTEM, ALL DRAINAGE PIPE CONNECTION MUST BE SOLID PVC ELBOWS AND Ts. NO "BUTT" END CONNECTIONS SHOULD BE PERMITTED.

(2) PERIMETER COLLECTION PIPE TO BE SOLID PIPE,

SUGGESTED EXTERIOR DRAINAGE AGAINST SHORING

(NOT TO SCALE)



(3) SUBGRADE DRAIN TO BE PLACED IN PARALLEL ROWS 6-8 m (20'-25'), FROM CENTERLINE TO CENTERLINE.

DETAIL OF SUBGRADE DRAIN

(NOT TO SCALE)