Adequacy of Services Report - 337 Montgomery Street

Stantec Project No.
160401698

December 16, 2021

Prepared for:

SerCo Realty Group

Prepared by:

Stantec Consulting Ltd.
400-1331 Clyde Avenue
Ottawa ON K2C 3G4

Revision	Description	Author		Quality Check		Independent Review	
1	Rezoning Application 1st submission	2021-12-06	AS, NN	2021-12-17	TR	2021-12-16	AG

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Aminat Shobowale, Civil Designer

Nwanise Nwanise, EIT

Dustin Thiffault, P.Eng.

Approved by _____

Alyssa Gladish, EIT

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1.0 INTRODUCTION

Stantec Consulting Ltd. has been retained by SerCo Realty Group to prepare the following report in support of a re-zoning application for the proposed development. The site is located at 337, 345 Montgomery Street and 94 Selkirk Street in the City of Ottawa.

The proposed site is zoned as R5C H (25) and measures 0.152 ha. The current site has an approximately triangular shape, consisting of 3 contiguous properties (each with an existing residential building) with driveways, surface parking, and landscaped areas. The site is bordered by Selkirk Street to the north, residential properties to the east, and Montgomery Street to the south west (see **Figure 1** below).

The proposed development consists of a twenty-storey high-rise apartment building with 203 units, two levels of underground parking and associated access and servicing infrastructure. The proposed building will include 72 one-bedroom apartments, 36 one-bedroom with den apartments, 95 two-bedroom apartments, 57- resident parking spaces, 19 visitor parking spaces, and 102 bicycle parking spaces. The proposed site plan has been included in **Appendix A**.

Figure 1: Site Location

1.1 OBJECTIVE

This site servicing and SWM report has been prepared to present a servicing scheme that is free of conflicts and utilizes the existing infrastructure. Details of the existing infrastructure were obtained from available as-built drawings and by consultation with City of Ottawa staff. Infrastructure requirements for water supply, sanitary, and storm sewer services are presented in this report.

Criteria and constraints provided by the City of Ottawa have been used as a basis for the detailed servicing design of the proposed development. Specific elements and potential development constraints to be addressed are as follows:

- Prepare a grading plan in accordance with the proposed site plan and existing grades.
- Storm Sewer Servicing
    - Define major and minor conveyance systems in conjunction with the proposed grading plan
    - Determine the stormwater management storage requirements to meet the allowable release rate for the site
    - Coordinate with mechanical engineer to convey drainage from roof tops, amenity areas, and private terrace areas to the internal cistern and discharge to the proposed storm service lateral at the allowable release rate
    - Define and size the proposed storm service lateral that will be connected to the existing 750 mm diameter storm sewer on Montgomery Street.
- Wastewater Servicing
    - Define and size the sanitary service lateral which will be connected to the existing 300 mm diameter sanitary sewer on Selkirk Street.
- Water Servicing
    - Estimate water demands to characterize the proposed feed for the proposed development which will be serviced from the existing 150 mm diameter watermain on Montgomery Street.
    - Watermain servicing for the development is to be able to provide average day and maximum day (including peak hour) demands (i.e., non-emergency conditions) at pressures within the acceptable range of 50 to 80 psi (345 to 552 kPa).
    - Under fire flow (emergency) conditions, the water distribution system is to maintain a minimum pressure greater than 20 psi (140 kPa).

The accompanying drawings included in **Appendix F** of this report illustrate the proposed internal servicing scheme for the site.

2.0 REFERENCE DOCUMENTS

The following background studies have been referenced in preparing this servicing and stormwater management report for 337 Montgomery Street:

- *City of Ottawa Design Guidelines – Water Distribution*, City of Ottawa, July 2010
- *City of Ottawa Sewer Design Guidelines*, City of Ottawa, October 2012
- *Technical Bulletin ISTB-2021-03,* City of Ottawa, August 18, 2021
- *Technical Bulletin ISDTB-2014-01,* City of Ottawa, February 2014
- *Technical Bulletin PIEDTB -2016-01,* City of Ottawa, September 6, 2016
- *Technical Bulletin ISTB-2018-01*, City of Ottawa, March 21, 2018
- *Technical Bulletin ISTB-2018-02*, City of Ottawa, March 21, 2018
- *Technical Bulletin ISTB-2018-03*, City of Ottawa, March 21, 2018
- *Geotechnical Investigation Proposed Multi-Storey Building 337 & 345 Montgomery Street and 94 Selkirk Street – Ottawa,* Paterson Group, September 30, 2021

3.0 POTABLE WATER SERVICING

3.1 BACKGROUND

The proposed building is located in Pressure Zone 1E of the City of Ottawa's Water Distribution System. The proposed development will be serviced through the existing 150 mm diameter watermain on Montgomery Street as shown on the Site Servicing Plan (see **Drawing SSGP-1** in **Appendix F**).

3.2 DOMESTIC WATER DEMANDS

The proposed twenty-storey building consists of one-bedroom (72 units), one-bedroom with den (36 units) and two-bedroom (95 units) with about 2,028m^2 of amenity space.

The City of Ottawa Water Distribution Guidelines (July 2010) and ISTB 2021-03 technical bulletin were used to determine water demands based on population densities for residential areas and gross floor areas for amenity spaces. A daily rate of 280 L/cap/day has been applied for residential units, while 28,000 L/ha/day was applied for amenity space. The average daily (AVDY) residential demand was estimated using an occupancy of 1.4 persons per unit for a one-bedroom apartment, 2.1 persons per unit for a one-bedroom apartment with den and 2.1 persons per unit for a two-bedroom apartment. Maximum day (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas and 1.5 for amenity areas. Peak hourly (PKHR) demands were determined by multiplying the MXDY demands by a factor of 2.2 for residential areas and 1.8 for amenity areas. The estimated demands are summarized in **Table 3–1** (for full calculations see domestic water demand sheet in **Appendix B.1**)

Table 3–1: Estimated Domestic Water Demands

	Population/Area	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Residential	376 persons	1.21	3.04	6.70
Amenity areas	2,028 m^2	0.07	0.10	0.18
Total Site	-	**1.28**	**3.14**	**6.88**

The fire flow demand was calculated in accordance with Fire Underwriters Survey (FUS) and determined to be approximately 6,000 L/min (100.0 L/s). The FUS estimate is based on a non-combustible construction building with a two-hour fire separation considered between each floor per requirements for buildings over six-storeys as per the Ontario Building Code (OBC), and vertical openings and external vertical communications properly protected (one-hour rating). As a result, the floor area was estimated as the area of the ground floor (largest floor) plus 25 percent of each of the two immediately adjoining floors. Additionally, it is anticipated that the building will be sprinklered, with final sprinkler design to conform to NFPA 13 (see FUS calculations in **Appendix B.2**).

Table 3–2 outlines the boundary conditions provided by the City of Ottawa on October 4, 2021.

Table 3–2: Boundary Conditions

	Connection @ Montgomery Street
Min. HGL (m)	109.2
Max. HGL (m)	118.5
Available Fire Flow @ 20psi	**112 (L/s)**

3.3 LEVEL OF SERVICE

3.3.1 Allowable Pressures

The desired normal operating objective pressure range as per the City of Ottawa 2010 Water Distribution Design Guidelines is 345 kPa (50 psi) to 552 kPa (80 psi) and no less than 276 kPa (40 psi) at ground elevation. Furthermore, the maximum pressure at any point in the water distribution should not exceed 100 psi as per the Ontario Building/Plumbing Code; pressure reducing measures are required to service areas where pressures greater than 552 kPa (80 psi) are anticipated.

The proposed finish floor of 57.94 m will serve as ground elevation for the calculation of residual pressures at ground level. With respect to the peak hour flow conditions, the resulting boundary condition HGL of 109.20 m corresponds to a peak hour pressure of 51.26 m or 503 kPa (73 psi).

A maximum pressure check was conducted using the building's proposed finished floor elevation and the maximum boundary condition HGL of 118.5 m. This results in a pressure of 60.56 m, or 594 kPa (86 psi). This value is above the limit of 80 psi, therefore pressure reducing valves would be required on the ground floor. Since the proposed building is a 20-storey building, an additional head loss of 34 kPa (5 psi) is anticipated for every additional storey. Assuming the pressure reducing valve lowers the maximum pressure to 80psi, there will be insufficient pressure to reach the floors above level 03 and as a result, pump(s) will be required to maintain an acceptable level of service on the higher floors, as determined by the mechanical consultant.

3.3.2 Fire Flow Demands

Boundary conditions provided by the City confirm that a flow rate of 112 L/s can be provided while maintaining a residual pressure of 20psi, indicating that there is sufficient flow in the adjoining watermain to meet the building's fire flow demand of 6000L/min (100 L/s) calculated using the FUS methodology.

Based on the boundary conditions available, the 150 mm diameter watermain on Montgomery Street provides adequate fire flow capacity as per the Fire Underwriters Survey. In order to meet the City water supply objectives that limits a single feed to 50 m^3/d during basic day demands, two connections to the 150mm diameter watermain on Montgomery Street, separated by an isolation valve, are required to service the proposed building. The service connections will be capable of providing anticipated demands to the lower storeys but will require a booster pump to maintain minimum pressures of 350 kPa (50 psi) for levels 04 to 20.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

As illustrated on **Drawing SSGP-1**, sanitary servicing for the proposed development will be provided through a proposed 150mm diameter service lateral connecting to the existing 300 mm diameter concrete sanitary sewer running west on Selkirk Street. The public sewer on Selkirk Street discharges to a 300 mm diameter clay sanitary sewer on Palace Street, which drains north to the sanitary sewer in the Montreal Road ROW and ultimately to the 2,100 mm diameter North River Road sanitary trunk sewer.

4.2 DESIGN CRITERIA

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP's Design Guidelines for Sewage Works, the following criteria were used to calculate estimated wastewater flow rates and to size the sanitary sewer lateral:

- Minimum Velocity – 0.6 m/s (0.8 m/s for upstream sections)
- Maximum Velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- 1.4 persons/one-bedroom apartment
- 2.1 persons/one-bedroom apartment with den
- 2.1 persons/two-bedroom apartment
- 28,000 L/ha/day for commercial areas
- Harmon's Formula for Residential Peak Factor – Max = 4.0
- Commercial Peak Factor of 1.5
- Extraneous Flow Allowance – 0.33 L/s/ha (conservative value)
- Manhole Spacing – 120 m
- Minimum Cover – 2.5 m
- Harmon correction factor – 0.8

In addition, a residential peak factor based on Harmon's Equation was used to determine the peak design flows, per the City of Ottawa Sewer Design Guidelines.

Refer to **Appendix C** for the 337 Montgomery Street development sanitary sewer design sheet.

4.3 SANITARY SERVICING DESIGN

The proposed 0.15 ha development area will consist of a high-rise residential apartment building consisting of one-bedroom (72 units), one-bedroom plus den (36 units), two-bedroom (95 units) and two levels of underground parking, for a total of 203 units. One-bedroom plus den units were assumed to have the same sanitary generation rate as the two-bedroom units. The anticipated peak wastewater flows generated from the proposed development are summarized in **Table 4–1,** below, while a sanitary sewer design sheet is included in **Appendix C.1.**

Table 4–1: Estimated Wastewater Peak Flows

Residential/Commercial Peak Flows					Infiltration Flow (L/s)	Total Peak Flow (L/s)
	# Of Units/Area	Population	Peak Factor	Peak Flow (L/s)		
Residential	203 units	376	3.23	3.93	0.16	4.09

Notes:
1. Average residential flow based on 280 L/p/day generation rate.
2. Peak factor for residential units calculated using Harmon's formula.
3. Apartment population estimated based on 1.4 persons/unit for one-bedroom apartments, 2.1 persons/unit for one-bedroom with den apartments, and 2.1 persons/unit for two-bedroom apartments.
4. Commercial (amenity areas) peak flows estimated based on 28,000 L/ha/day generation rate.
5. Infiltration flow based on 0.33 L/s/ha.

The proposed sewage peak flows were provided to the City of Ottawa staff to conduct a capacity analysis of the sanitary sewer system in the vicinity of the site and confirmation was received that there are no capacity concerns with respect to adding the proposed sanitary peak flows to the existing sewers on Selkirk Street (see correspondence in **Appendix C.2**).

Detailed sanitary sewage calculations are included in **Appendix C.1**. A backflow valve will be required for the proposed building in accordance with the Ottawa Sewer Design Guide and will be coordinated with the mechanical consultant.

All underground parking drains should be connected to the building's internal plumbing. A sump pump will be required to drain the underground parking levels to the existing sanitary sewer on Selkirk Street.

There is an expected 4.09 L/s sanitary total peak flow estimated for the development it has been confirmed by the City that there is sufficient downstream residual capacity in the public sewer system to accommodate this minor additional peak flow.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The goal of this stormwater servicing and stormwater management (SWM) plan is to determine the measures necessary to control the quantity and quality of stormwater released from the proposed development in line with City of Ottawa Sewer Design Guidelines and established criteria from consultation with the City and Rideau Valley Conservation Authority; and to provide sufficient details required for rezoning approval.

5.2 EXISTING CONDITIONS AND SWM CRITERIA

The existing development area (0.152ha) currently consists of three buildings, paved parking lots and some landscaping. Existing structures will be removed to allow for the proposed development.

The Stormwater Management (SWM) criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), the requirements from the pre-consultation meeting notes (see **Appendix C.3**), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle. (City of Ottawa)
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system. (City of Ottawa)
- The proposed site is not subject to quality control criteria due to the small site size and land usage of the development. (City of Ottawa)

Storm Sewer & Inlet Controls

- Size storm sewers to convey 5-year storm event under free-flow conditions using City of Ottawa IDF parameters. (City of Ottawa)
- Site discharge rates for each storm event to be restricted to the 5-year storm event pre-development rate with a maximum pre-development C coefficient of 0.5. (City of Ottawa)
- Proposed site to discharge into the existing 750mm diameter storm sewer within Montgomery Street ROW. (City of Ottawa)
- The foundation drainage system is to be independently connected to the storm sewer main unless being pumped with appropriate back up power, sufficient sized pump and back flow prevention. (City of Ottawa)
- Time of concentration (Tc) should be not less than 10 minutes since IDF curves become unrealistic at less than 10 min (City of Ottawa).

Surface Storage & Overland Flow

- Any storm events greater than 5 years, up to and including 100-year storm event must be detained on site
- Building openings to be a minimum of 0.30m above the 100-year water level (City of Ottawa)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.30m (City of Ottawa)
- Provide adequate emergency overflow conveyance off-site with a minimum vertical clearance of 15cm between the spill elevation and the ground elevation at the building envelope in the proximity of the flow route or ponding area. (City of Ottawa)

The outlet for the storm system for this site is a stormwater sewer within the Montgomery Street ROW. Separate connections have been proposed for the foundation drain and the on-site storm sewer system (roof drain and cistern discharge). The storm sewer connection to the existing building will be removed in accordance with the City of Ottawa's infrastructure requirements. Full port backwater valves will be installed on the building's storm service to provide protection from the uncontrolled sewer system.

5.3 STORMWATER MANAGEMENT DESIGN

The proposed 0.153 ha development area will be serviced by the existing 750mm diameter storm sewer running southeast wards on Montgomery Street, as shown on **Drawing SD-1** in **Appendix F.** Rooftop storage shall be provided on the building's roof (9th and 20th floors). Rooftop amenity areas on these floors will drain through the internal plumbing of the building for storage in the storm cistern located in the underground parking. The cistern is to be pumped and released to the stormwater sewer at a controlled rate. The external site area (CB-1) shall be drain via a catch basin to the stormwater cistern for storage and controlled release. The remaining areas shall drain uncontrolled to the Montgomery Street and Selkirk Street ROWs.

The proposed site shall consist of uncontrolled areas accounting for 37% (0.056 ha) with a C-value of 0.41. The remaining controlled areas of the site (0.096 ha) with a C-value of 0.9, drains to the stormwater cistern via the building's internal plumbing. No surface storage is anticipated within the site. Excess runoff for events greater than the 100-year storm must overflow to the City ROW (emergency overflow).

5.3.1 Stormwater Quantity Control

The Modified Rational Method (MRM) was used to assess the flow rate and volume of runoff generated under post-development conditions. **Drawing SD-1** delineates the appropriate sub-catchment areas. The MRM spreadsheet is included in **Appendix D.1**

The following assumptions were made in the creation of the storm drainage plan and accompanying MRM spreadsheet:

1) Rooftop storage will be provided on the proposed apartment building.

2) Storm runoff from the available area on the 9th floor and 20th floor roofs will be collected through roof downspouts and directed to a proposed onsite storm cistern.

3) There is no surface ponding on site.

4) Storm cistern will be used for subsurface storage for up to a 100-year post-development peak flow.

5.3.2 Allowable Release Rate

Based on consultation with the City of Ottawa staff, the peak post-development discharge from the subject site is to be limited to that of the 5-year event discharge under pre-development conditions and to a maximum runoff coefficient C of 0.5. The predevelopment release rate for the area has been determined using the rational method based on the criteria above. A Tc of 10 minutes was assigned to the site. Runoff coefficient values have been increased by 25% for the post-development 100-year storm event based on MTO Drainage Manual recommendations. Peak flow rates have been calculated using the rational method as follows:

Q = 2.78 CIA

Where:
Q = peak flow rate, L/s
C = site runoff coefficient
I = rainfall intensity, mm/hr (as per Ottawa IDF curves)
A = drainage area, ha

The target release rate for the site is identified in **Table 5–1** below:

Table 5–1: Target Release Rate

Design Storm	Target Release Rate (L/s)
All Events	22.0

5.3.3 Storage Requirements

The site requires quantity control measures to meet the restrictive stormwater release criteria. It is proposed that rooftop storage via restricted roof release in combination with a stormwater cistern equipped with a mechanical pump will control the site peak outflow to the target rate.

5.3.3.1 Rooftop Storage

It is proposed to retain stormwater on the building's available 9th floor plan designated as Roof 2 and also 20th floor rooftop designated as Roof 1 by installing restricted flow roof drains. The following calculations

assume the roof will be equipped with standard Watts Model R1100 Accutrol Roof Drains or approved equivalent, see **Appendix D.1** for Modified Rational Method design sheet.

Watts Drainage "Accutrol" roof drain weir data has been used to calculate a practical roof release rate and detention storage volume for the rooftops. It should be noted that the "Accutrol" weir has been used as an example only, and that other products may be specified for use, provided that the total roof drain release rate is restricted to match the maximum rate of release indicated in **Table 5–2**, and that sufficient roof storage is provided to meet (or exceed) the resulting volume of detained stormwater. Proposed drain release rates have been calculated based on the Accutrol weir setting at 25% open. Storage volume and controlled release rate are summarized in **Table 5–2**:

Table 5–2: Roof Control Areas (ROOF 1 and ROOF 2)

Design Storm	Depth (mm)	Discharge (L/s)	Volume Stored (m^3)	Volume Available (m^3)
5-Year (ROOF 1)	103.59	4.8	10.2	30.3
100-Year (ROOF 1)	139.51	5.5	24.9	30.3
5-Year (ROOF 2)	51.28	2.7	0.01	4.4
100-Year (ROOF 2)	101.08	4.3	0.6	4.4

5.3.3.2 Stormwater Cistern

As per the modified rational method calculations included as part of **Appendix D.1**, sufficient storage capacity is provided on the roof such that there is no excess discharge anticipated from the roof storage during the 5-year or 100-year event. Scuppers have been provided for emergency overflow from the roof storage area.

A stormwater cistern will attenuate peak flows from the building's rooftops and controlled tributary areas (CB-1). In order to meet the site target release rate for stormwater of 22 L/s, the release rate from the cistern must be restricted to 7.0 L/s, and 6.4m^3 of storage is required. The proposed stormwater cistern will be serviced by the internal plumbing of the building. The use of 7.0 m^3 stormwater cistern within the underground parking level of the building is proposed to achieve this end. The release rate of the stormwater cistern will be controlled to no more than 7.0 L/s by a pump designed by the mechanical consultant.

5.3.4 Results

The combined peak stormwater release rates from the roof drains, cistern, and uncontrolled flow to the outlet is summarized in **Table 5–3**:

Table 5–3: Summary to Outlet (5-year and 100 year)

Area Type	5-yr $Q_{release}$ (L/s)	100-yr $Q_{release}$ (L/s)	Target $Q_{release}$ (L/s)
Uncontrolled Areas (UNC-1)	7.0	14.3	**22**
Controlled Areas (ROOF-1, ROOF-2, CB-1)	7.0	7.0	
Total	**14.0**	**21.3**	

*All Controlled Areas flow directly into the Cistern.

Considering the target release rate of 22 L/s the proposed stormwater management plan demonstrates adherence to the target peak outflow rate for the site.

5.3.5 Water Quality Control

The Rideau Valley Conservation Authority (RVCA) was consulted and confirmed that it does not have any required on-site stormwater quality protections. Best management practices are advised to be integrated where possible (see **Appendix D.4**).

6.0 GEOTECHNICAL CONSIDERATIONS AND GRADING

6.1 GEOTECHNICAL INVESTIGATION

A geotechnical investigation report for 337 & 345 Montgomery Street and 94 Selkirk Street was completed by Paterson Group on September 30, 2021. Field testing consisting of the advancement of six (6) boreholes throughout the subject site was carried out on September 9 and 10, 2021. Data from a previous investigation carried out by others in April 2019 was also referenced. The geotechnical investigation report is included in **Appendix E.1**.

The site is approximately triangular and has 3 existing residential buildings along with driveways and landscaped areas with an existing ground surface at approximate geodetic elevation 57 to 58m. The subsurface profile encountered at the test hole locations consists of thick asphalt pavement structure underlain by fill material followed by a glacial till deposit. The fill layer (depth of 0.2 to 1.3m below ground surface) encountered generally consisted of brown silty sand with trace amounts of clay, crushed stone, and gravel. Fill material in BH 6-21 had Glass fragments while concrete and bricks were observed in fill material of BH 1-21. Underlying the fill material was compact to very dense glacial till which generally consists of brown silty sand with gravel cobbles and boulders. Bedrock was cored in two borehole locations to a maximum depth of 9.1m and consists of interbedded limestone and shale which varied in quality with increased depth.

Based on field observations of the soil samples retrieved, the long-term groundwater table is anticipated to range from 3m to 6m depth, subject to seasonal fluctuations and may vary at time of construction.

According to the geotechnical investigation, the site is considered satisfactory for the proposed development from a geotechnical perspective. It is recommended that the foundation be conventional spread footings placed on clean, surface sounded bedrock. However, as a result of the anticipated excavation depth and the proximity of the proposed development to the site boundaries, a temporary excavation support system will be required to support the overburden during the construction period.

In order to complete the underground levels, bedrock removal will be done. Paterson recommends line drilling and controlled blasting for the removal of large quantities of bedrock; and hoe-ramming for small quantities of bedrock.

6.2 GRADING PLAN

The proposed re-development site measures approximately 0.153 ha in area. A detailed grading plan (see **Drawing SSGP-1**) has been prepared to satisfy the stormwater management requirements described in **Section 5.0** and to allow for positive drainage away from the face of the building.

The site grading along the access road is designed to effectively drain stormwater runoff in the area into proposed catch basins. Grading for the access ramp to the underground parking levels have been coordinated with the architect. The subject site in its majority maintains overland flow routes towards Montgomery to the south and Selkirk Street to the North.

7.0 UTILITIES

Hydro Ottawa, Bell, Rogers, and Enbridge all have existing utility plants in the area, which will be used to service the site. The exact size, location, and routing of utilities will be finalized after design circulation. Existing overhead wires and utility plants may need to be moved/reconfigured to allow sufficient clearance to the proposed building. The relocation of existing utilities will be coordinated with the individual utility providers upon design circulation.

8.0 APPROVALS

The City of Ottawa will review and approve most development applications as they relate to the provision of water supply; wastewater collection and disposal; and stormwater conveyance, detention, and treatment.

An Environmental Compliance Approval (ECA) is not expected to be required from the Ontario Ministry of the Environment, Conservation and Parks (MECP) for the proposed servicing works as the site is expected to qualify under the exemptions within O.Reg. 525/98. The exemption is in place for non-industrial land, held under single ownership with servicing directed to an approved sewer system which is the proposed arrangement for the subject lands.

If the ground or surface water volumes being pumped during the construction phase are between 50,000 and 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the preparation of the Water Taking and Discharge Plan by a Qualified Person as stipulated under O.Reg. 63/16. A Permit to Take Water (PTTW) through the MECP would be required for dewatering in excess of 400,000 L/day, which is unlikely for this site. However, if a PTTW is required, at least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

9.0 EROSION CONTROL

In order to protect downstream water quality and prevent sediment build up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Provide sediment traps and basins during dewatering works.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Schedule the construction works at times which avoid flooding due to seasonal rains.
9. A sump of at least 600mm will be provided in all catch basins in order to minimize the amount of suspended solids entering the sewer system.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing ECDS-1** for the proposed location of silt fences, straw bales, and other erosion control measures.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 POTABLE WATER SERVICING

The proposed twenty-storey high-rise buildings will be serviced by the existing 150mm diameter watermain on Montgomery Street with two connections separated by an isolation valve. Water demand calculation was based on a demand rate of 280 L/cap/day for residential units and 28,000 L/ha/day for commercial and amenity space. As such, total demands for the development are 1.28L/s, 3.14L/s, and 6.88L/s, respectively, for average day, maximum day, and peak hour flow. The fire flow requirement was calculated in accordance with Fire Underwriters Survey (FUS) and determined to be approximately 6,000 L/min (100 L/s) for proposed building. It is anticipated that the building will be sprinklered, with final sprinkler design to conform to the NFPA 13 standard. A booster pump, to be designed by the buildings' mechanical consultant, will be required to maintain minimum required pressures for levels 04 – 20.

10.2 WASTEWATER SERVICING

The estimated sanitary peak flow for the site is 4.09L/s for a projected population of 376 people, this site will be serviced by an existing 300 mm diameter Concrete sanitary sewer flowing westward on Selkirk Street. The development's combined sanitary flows will be routed through a single 150 mm service lateral northward along the pedestrian walkway and connect to the existing Selkirk Street sanitary sewer.

The proposed sanitary service lateral is sufficiently sized to provide gravity drainage for the site. The floor drains in the underground parking will be connected to the building plumbing system and discharged to the sanitary service lateral through a sump pump. A backflow valve will be required for the proposed building in accordance with the Ottawa Sewer Design Guide and will be coordinated with the buildings' mechanical consultant.

10.3 STORMWATER MANAGEMENT AND SERVICING

The proposed 0.153 ha re-development area will be serviced by a proposed 750mm diameter concrete storm sewer running east to west on Montgomery Street. A stormwater cistern will attenuate peak flows from the building's upper, lower roof and controlled tributary areas. In order to meet the site target release rate for stormwater of 22 L/s, on-site storm detention facility will be provided within the proposed development.

The use of 7m^3 stormwater cistern within the respective underground parking level of the building is proposed to achieve this end. The proposed stormwater cistern will be serviced by the internal plumbing of the building and pumped at a controlled rate of no more than 7L/s, as designed by the mechanical consultant.

10.4 GRADING

Grading for the site is designed as per City of Ottawa requirements and provides for outlet of emergency overland flow under extreme flood conditions. Erosion and sediment control measures will be implemented during construction to reduce the impact on existing facilities.

10.5 APPROVALS/PERMITS

The City of Ottawa will review and approve most development applications as they relate to the provision of water supply, wastewater collection and disposal, and stormwater conveyance, detention, and treatment. Rideau Valley Conservation Authority (RVCA) was consulted and confirmed that it does not have any required on-site water quality protections. Best management practices are advised to be integrated where possible. An MECP Permit to Take Water (PTTW) or registration on the Environmental Activity and Sector Registry (EASR) may be required for the site. The geotechnical consultant shall confirm at the time of application whether a PTTW or EASR registration is required.

10.6 UTILITIES

Hydro Ottawa, Bell, Rogers, and Enbridge all have existing utility plants in the area, which will be used to service the site. The exact size, location, and routing of utilities will be finalized after design circulation. Existing overhead wires and utility plants may need to be moved/reconfigured to allow sufficient clearance to the proposed building. The relocation of existing utilities will be coordinated with the individual utility providers upon design circulation.

APPENDICES

Appendix A DRAFT SITE PLAN

337 MONTGOMERY

ADDRESS: **337 MONTGOMERY STREET | OTTAWA, ON**
PROJECT NO: **2106**
DATE: **21-11-11**

RE-ZONING APPLICATION

ARCHITECTURAL DRAWINGS

SP-01	SITE PLAN
A100a	LEVEL P2 - FLOOR PLAN
A100b	LEVEL P1 - FLOOR PLAN
A101	GROUND LEVEL - FLOOR PLAN
A102	LEVEL 02-06 - FLOOR PLAN
A103	LEVEL 07 - FLOOR PLAN
A104	LEVEL 08 - FLOOR PLAN
A105	LEVEL 09 - FLOOR PLAN
A106	LEVEL 10-20 - FLOOR PLAN

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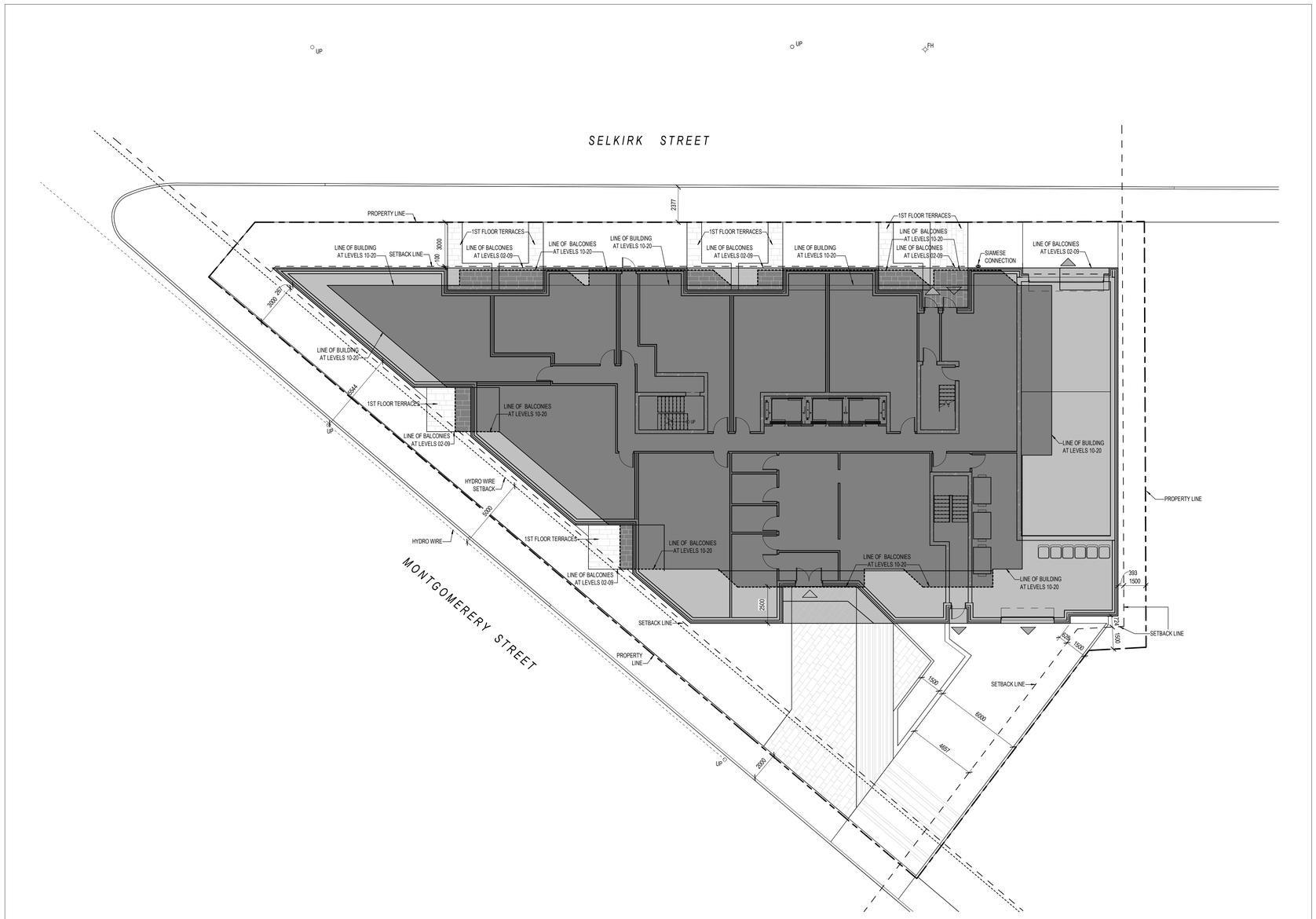
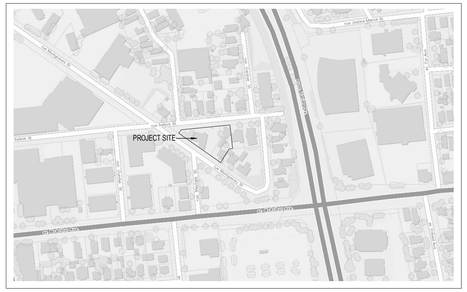


1 SP-01 SITE PLAN
SCALE: 1 : 150



3 SP-01 LOCATION PLAN
SCALE: 1 : 1

SITE & PROJECT STATISTICS

GENERAL INFORMATION
Zoning: R5C H (25)
Min. Lot Area: 675m
Max. Building Height: 25m
Min. Front Yard: 3m
Min. Rear Yard: 3m
Min. Int. Side Yard: 1.5m

PROJECT STATISTICS
Lot Area:
Building Height: 62m
Front Yard: 3m
Rear Yard: 3m
Int. Side Yard: 1.5m
Number of Proposed Units: 203 units

PARKING CALCULATION
As per Section 101

Required Parking: 96 spaces
0 spaces for first 12 units - Section 101(3)
0.5 spaces/ unit beyond 12 units - Table 101

Resident Parking Provided: 57 spaces

VISITOR PARKING CALCULATION
As per Section 102

Required Visitor Parking: 19 spaces
0 spaces for first 12 units - Section 102(2)
0.5 spaces/ unit beyond 12 units - Table 101

Visitor Parking Provided: 19 spaces

Total Parking Provided: 76 spaces

BICYCLE PARKING CALCULATION
As per Table 111A

Required Parking: 102 spaces
0.5sp/dwelling unit [111A(b)(i)]

Total Parking Provided: 102 spaces

AMENITY AREA CALCULATION
As per Table 137

Total Amenity Area Req'd: 1224 m2
6m2/dwelling unit

Communal Amenity Req'd: 612 m2
Min of 50% of Total Amenity Area

Amenity Area Provided: 1611 m2
Level 01: 62 m2
Level 02-07: 88 m2
Level 08-09: 76 m2
Level 10-20: 79 m2

Communal Amenity Provided: 450 m2
Level 01: 72 m2
Level 09 Theatre 52 m2
Level 09 Gym: 67 m2
Level 09 Amenity:80 m2
Level 09 Terrace:159 m2

Total Amenity Area Provided: 2028 m2

2 SP-01 ZONING
SCALE: 1 : 1

TOPOGRAPHIC PLAN OF SURVEY OF
PART OF LOTS 23, 25, 27, 29, 70
AND PART OF LOTS 30 AND 69
REGISTERED PLAN 49
CITY OF OTTAWA

EMAD ALREFAAI
FARLEY, SMITH & DENIS SURVEYING LTD.

SURVEY INFO
SCALE: NTS

SITE PLAN SYMBOLS LEGEND
- BUILDING ENTRANCE
- BUILDING EXIT
- FIRE HYDRANT
- NEW STREET LIGHT
- STREET LIGHT TO BE REMOVED
- BICYCLE PARKING

SYMBOLS LEGEND
SCALE: NTS

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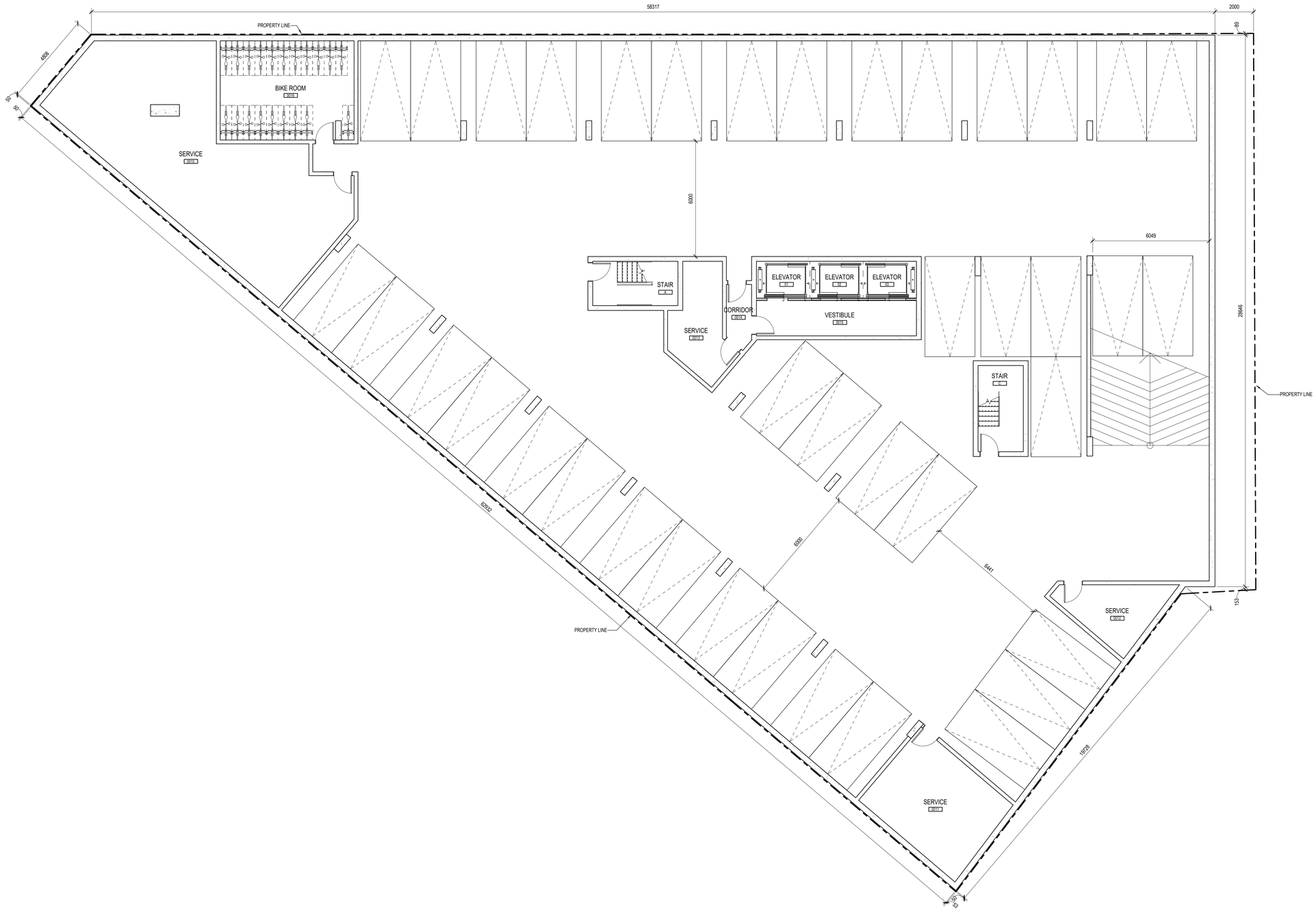
SITE PLAN

SP-01



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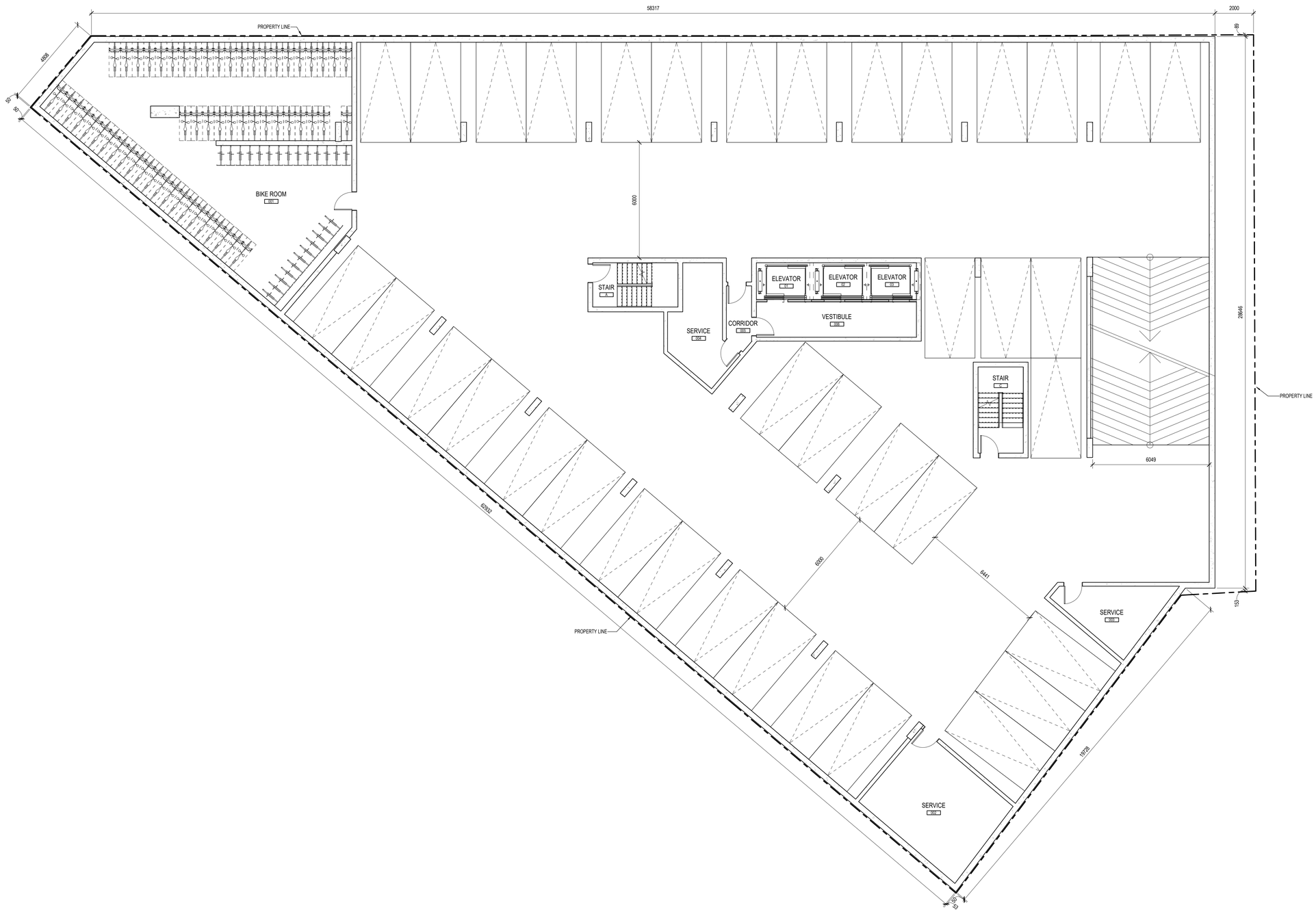
LEVEL P2 - FLOOR PLAN

A100a



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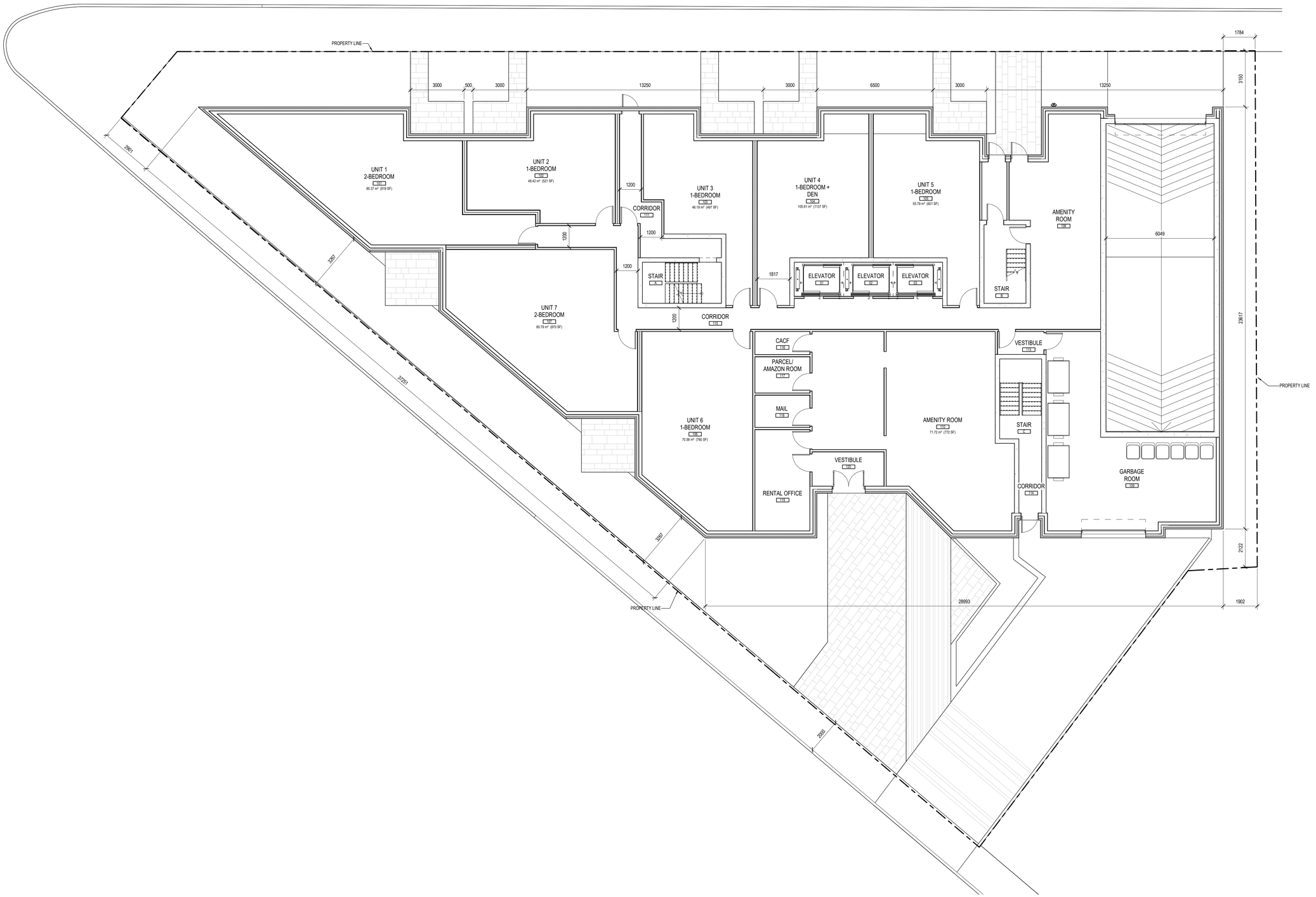
LEVEL P1 - FLOOR PLAN

A100b



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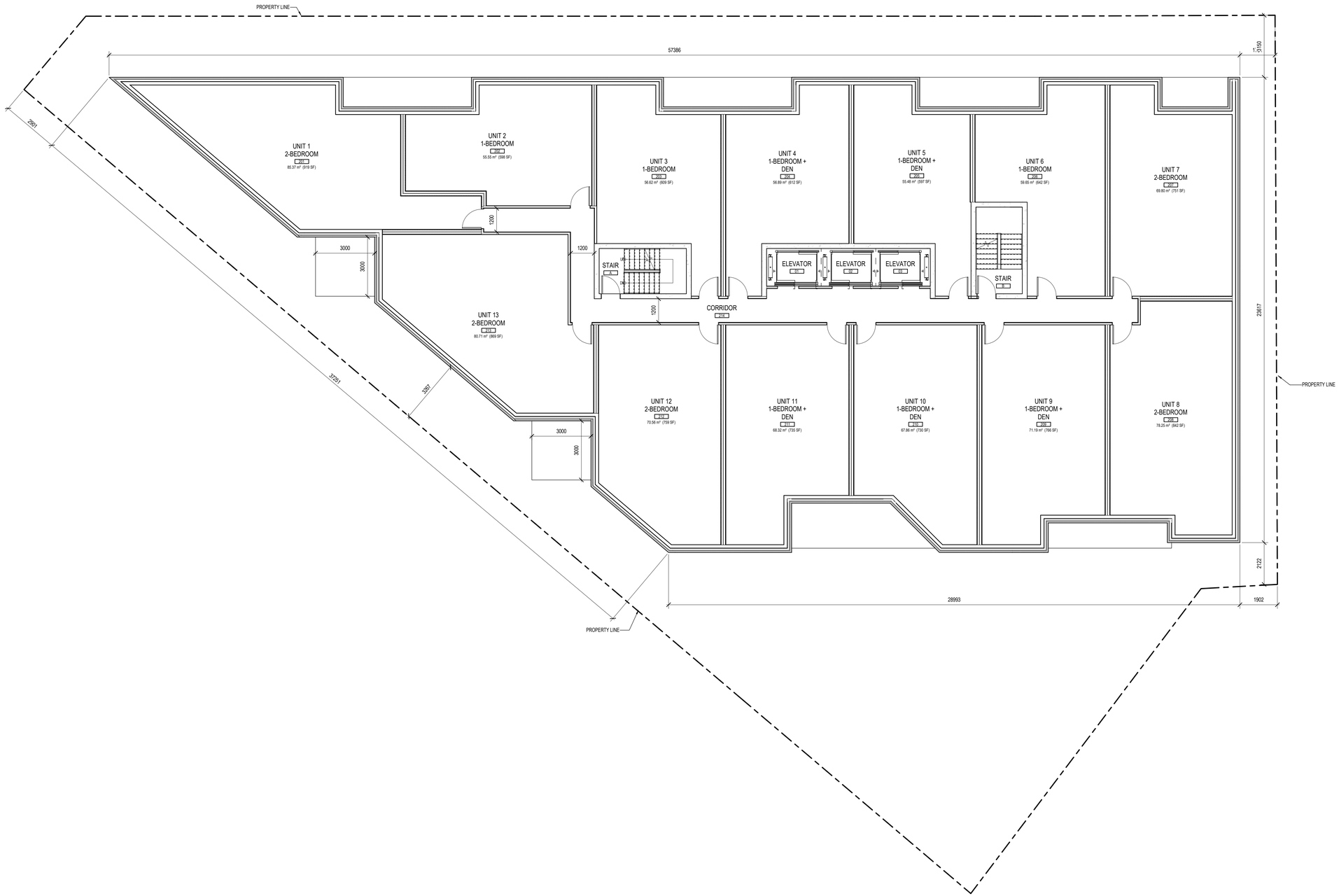
GROUND LEVEL - FLOOR PLAN

A101



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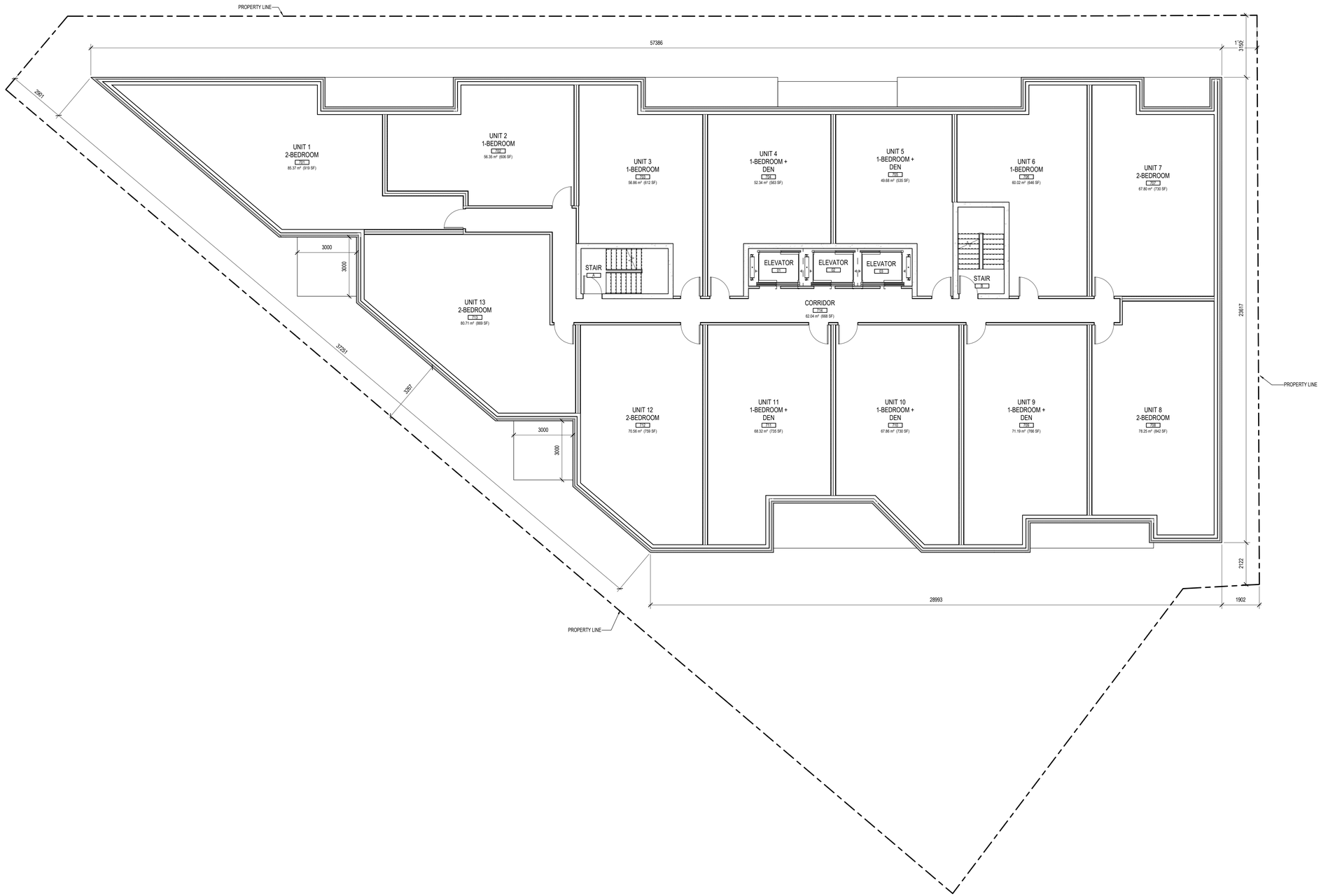
LEVEL 02-06 - FLOOR PLAN

A102



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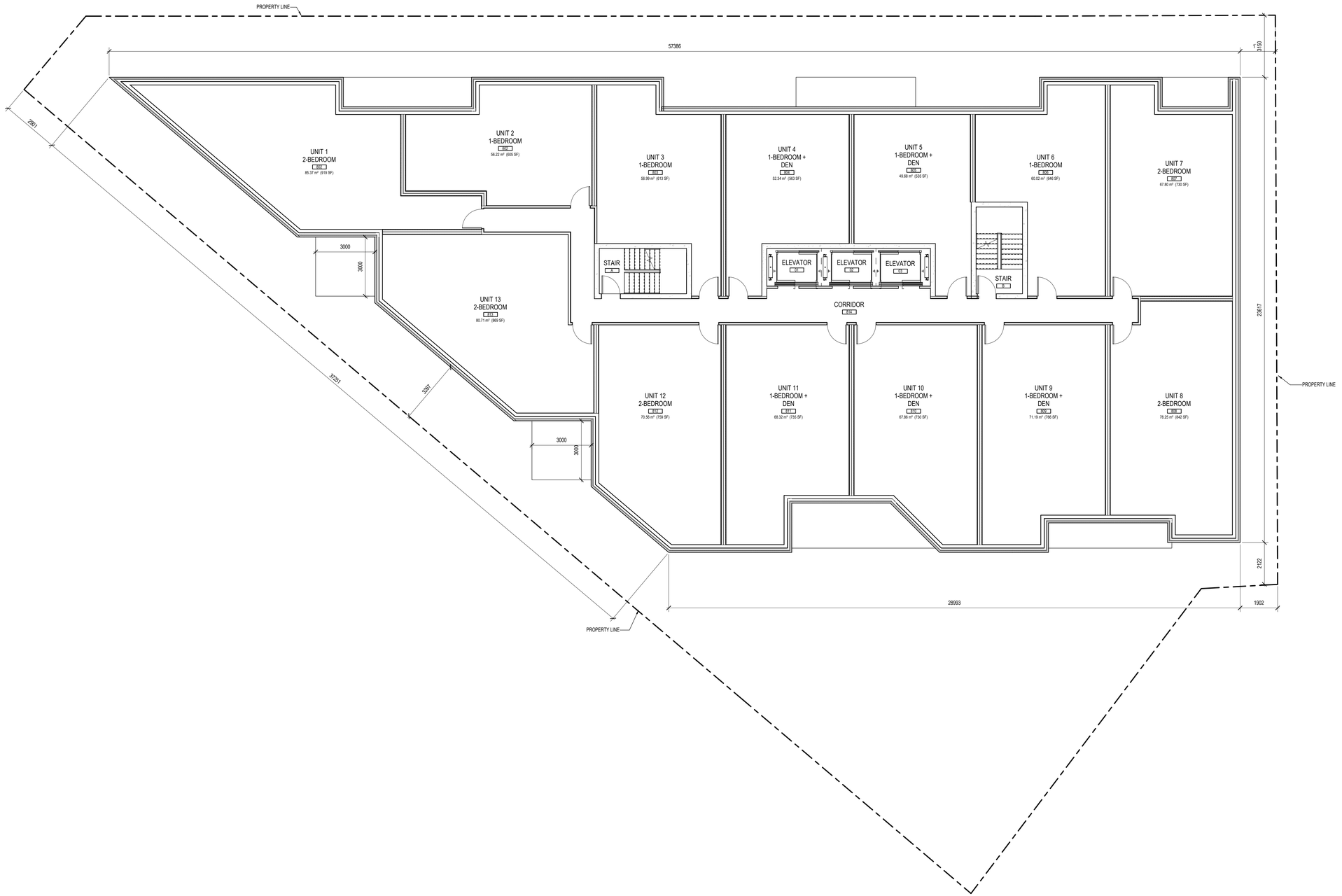
LEVEL 07 - FLOOR PLAN

A103



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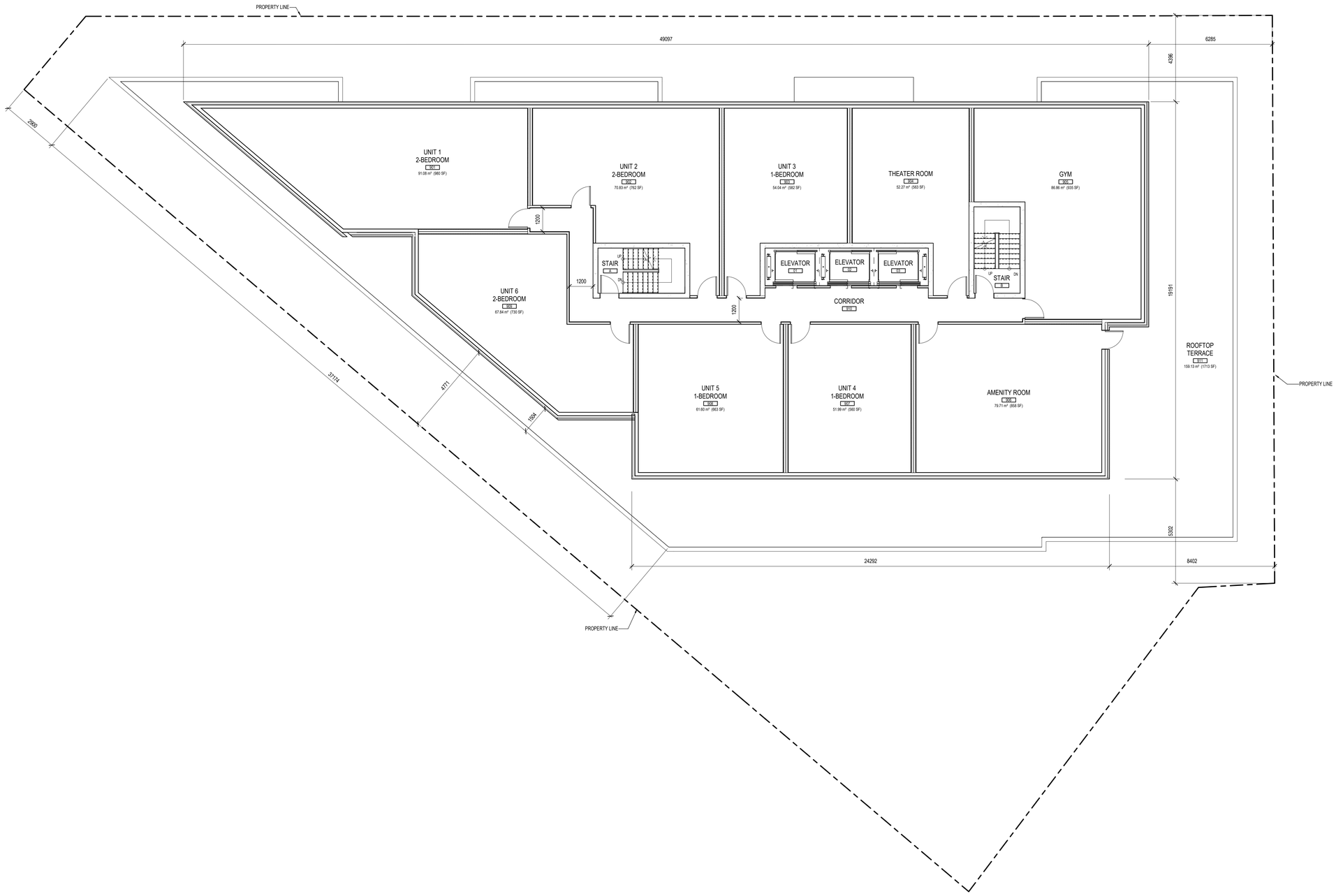
LEVEL 08 - FLOOR PLAN

A104



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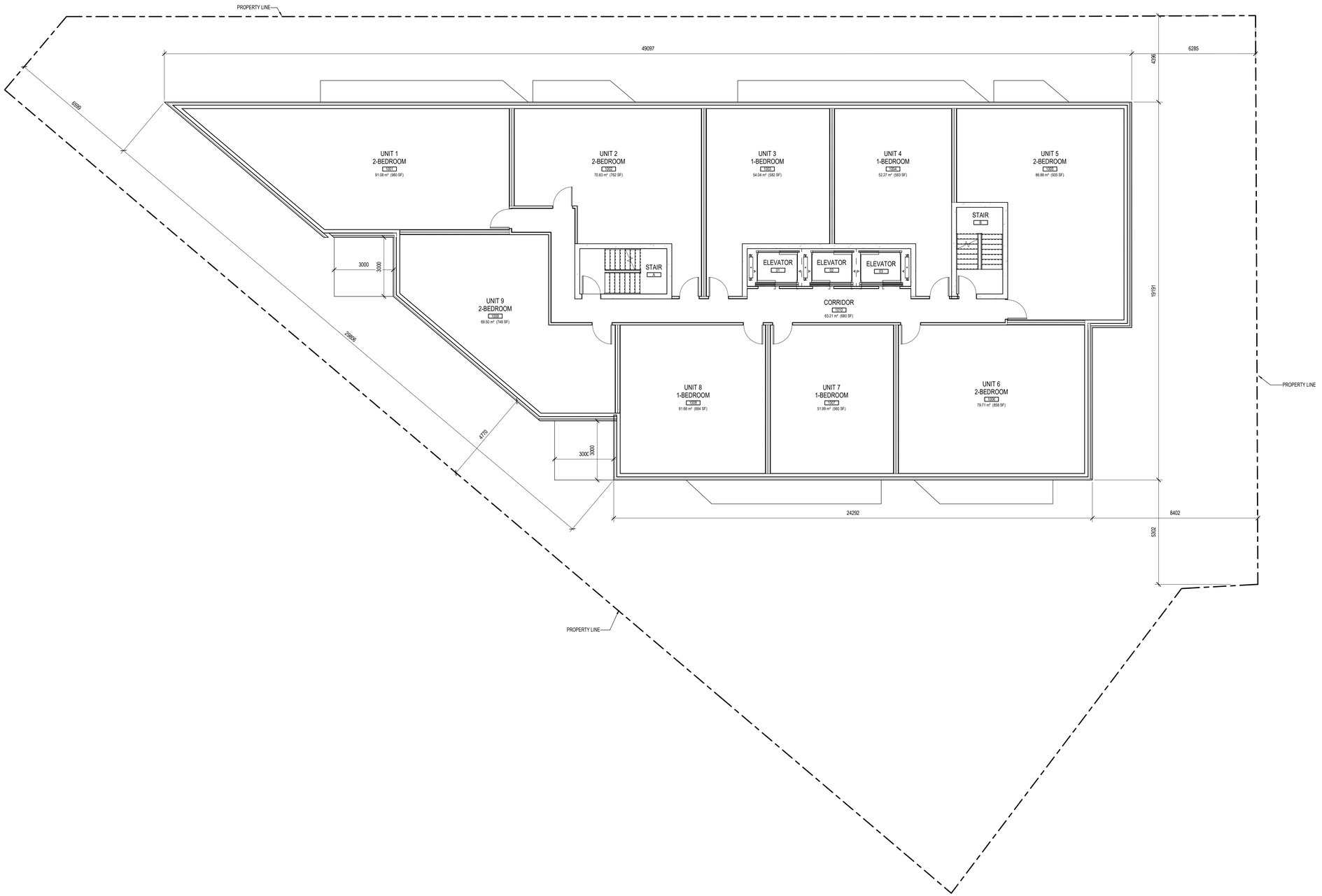
LEVEL 09 - FLOOR PLAN

A105



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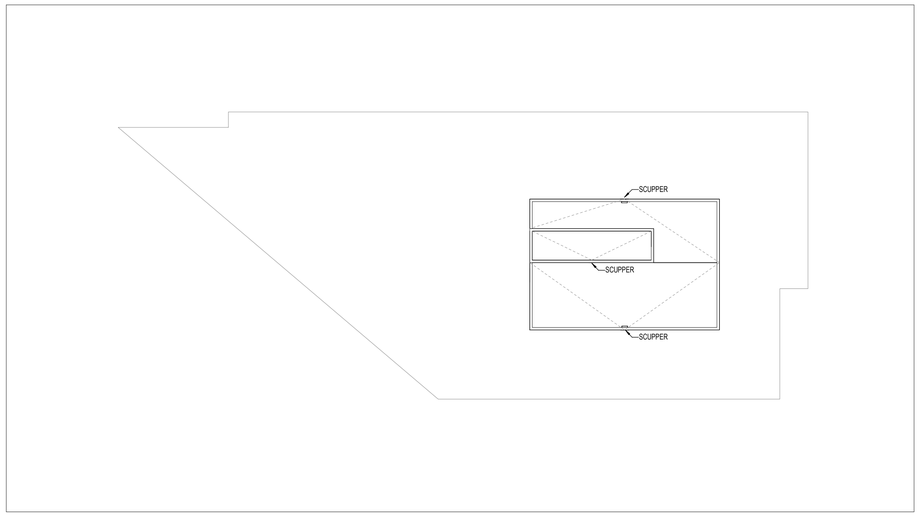
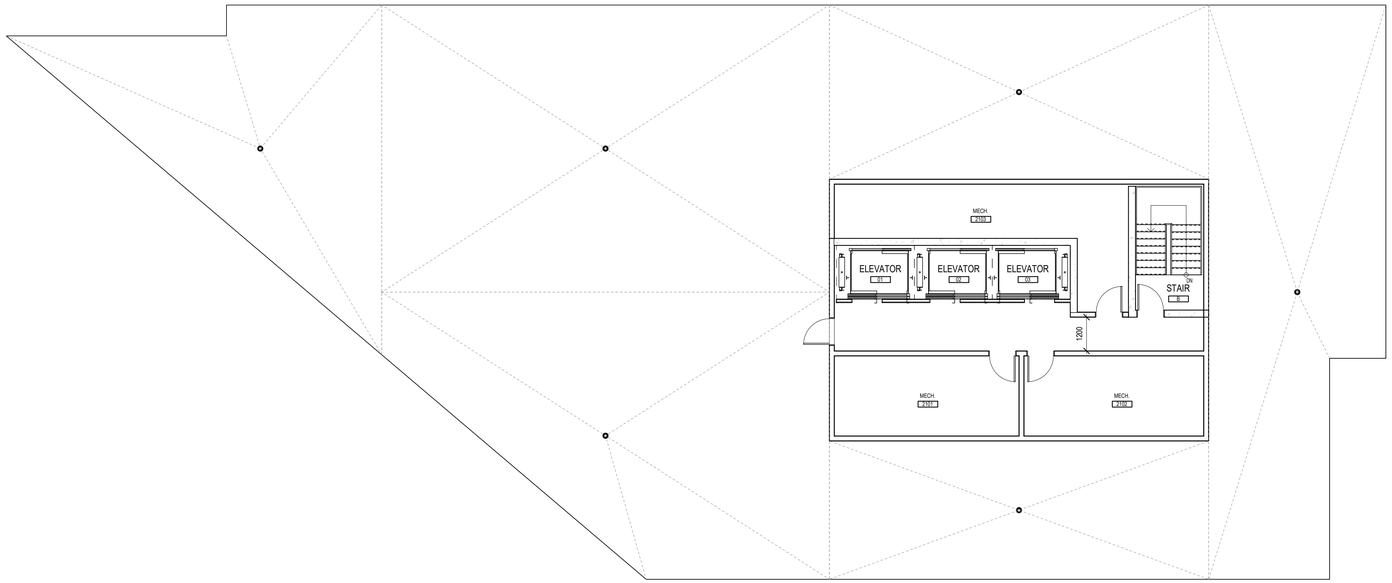
LEVEL 10-20 - FLOOR PLAN

A106



2 A108 UPPER ROOF
SCALE: 1 : 200



1 A108 ROOF PLAN
SCALE: 1 : 100

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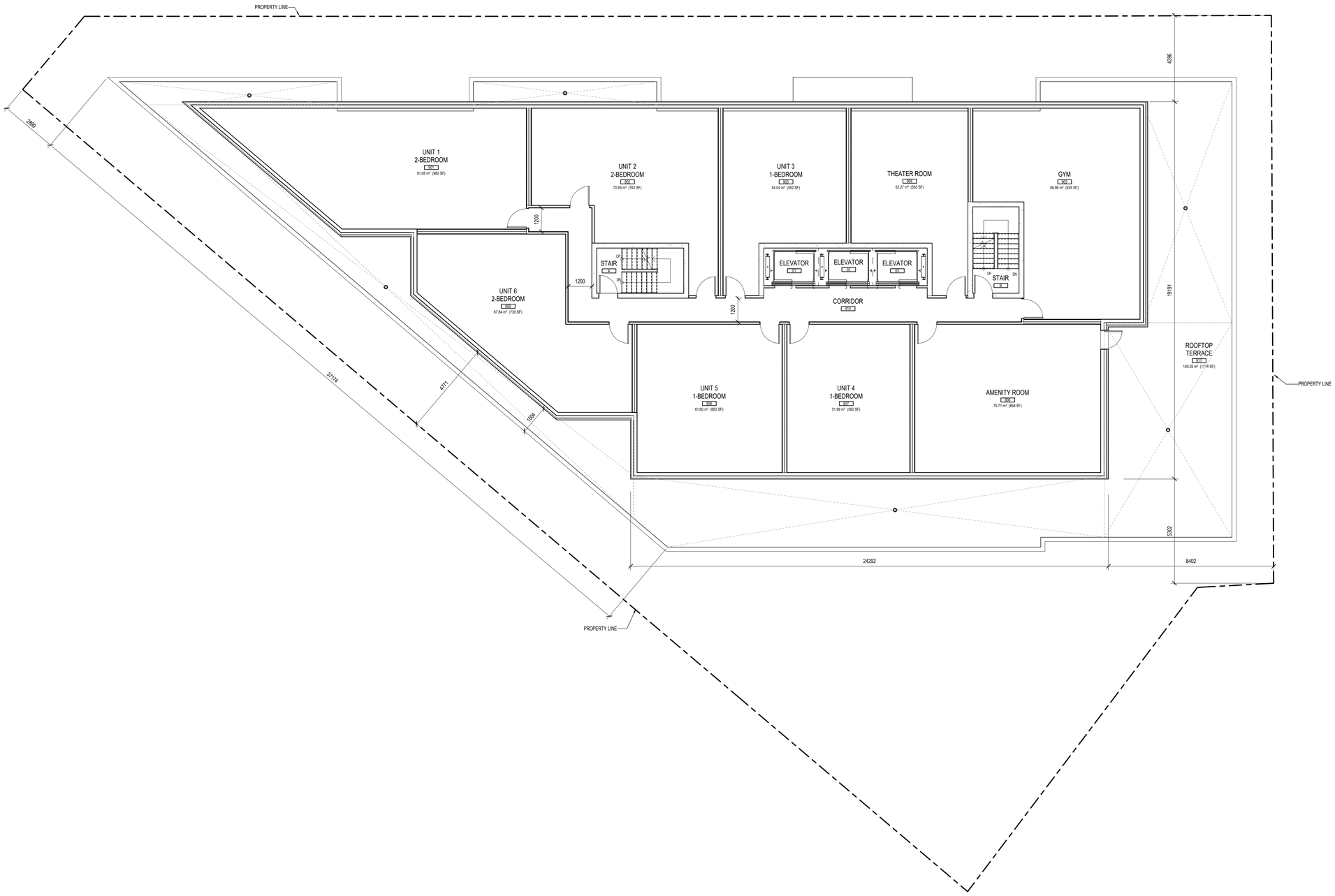
ROOF PLAN & UPPER ROOF

A108



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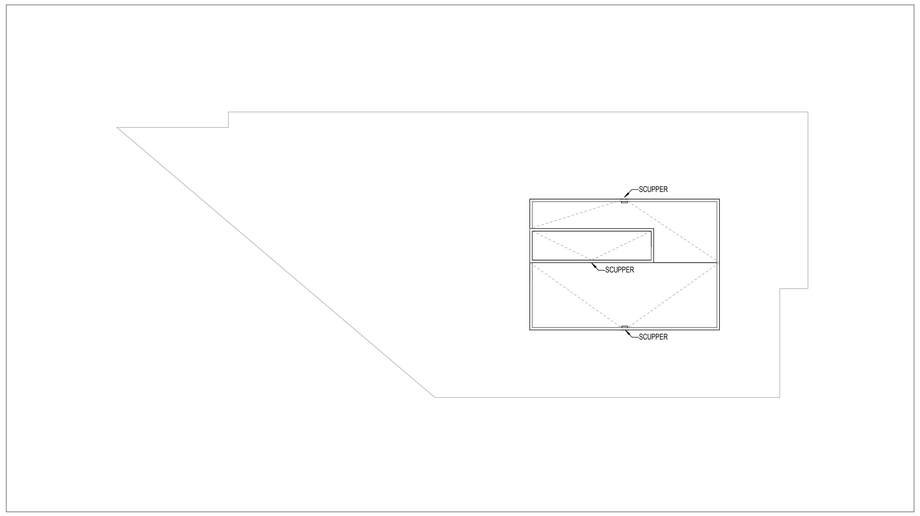
LEVEL 09 - FLOOR PLAN

A105



2 A108 T.O UPPER ROOF
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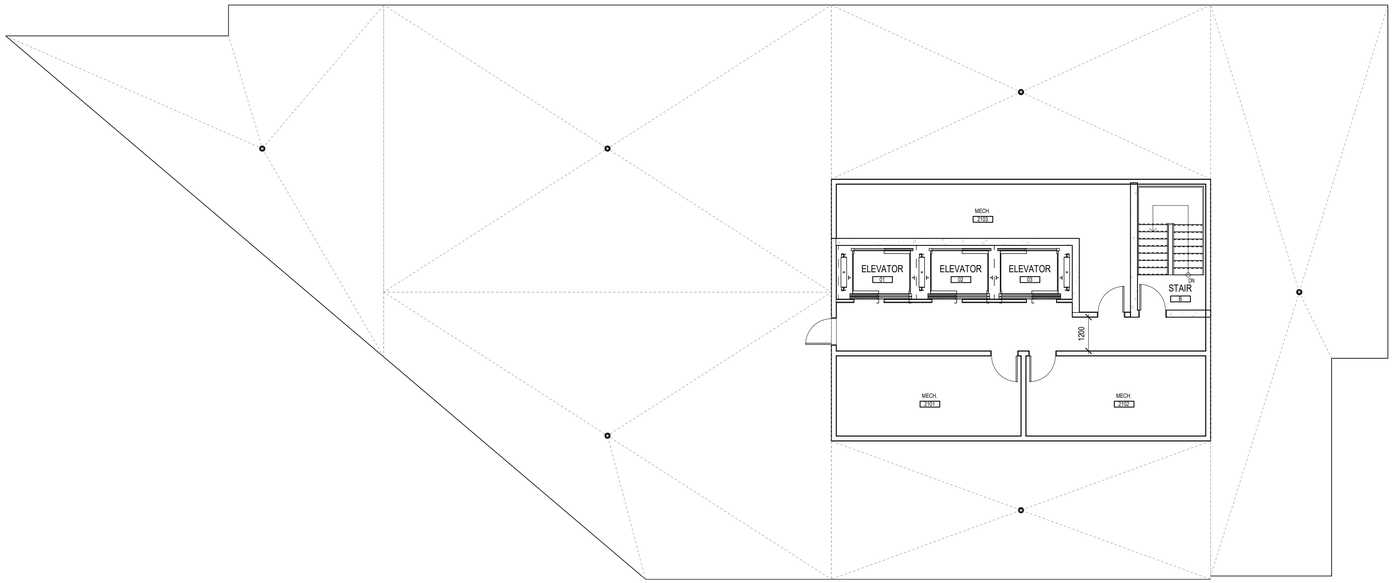

1 A108 ROOF PLAN
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2106	NOTED	IB	RMK

ROOF PLAN & UPPER ROOF

A108

Appendix B POTABLE WATER SERVICING

B.1 DOMESTIC WATER DEMAND CALCULATIONS

337 Montgomery Road - Domestic Water Demand Estimates

Site Plan provided by Project 1 Studio (Dated 2021-11-11)

Project No. 160401698

Densities as per City Guidelines:		
Apartment Units		
1 Bedroom	1.4	ppu
1 Bedroom + Den	2.1	ppu
2 Bedroom	2.1	ppu

Building ID	Amenity Areas (m²)	No. of Units	Population	Daily Rate of Demand [1] [2] (L/cap/day or L/ha/day)	Avg Day Demand		Max Day Demand [3]		Peak Hour Demand [3]	
					(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
1 Bedroom		72	101	280	19.6	0.33	49.0	0.82	107.8	1.80
1 Bedroom with Den		36	76	280	14.7	0.25	36.8	0.61	80.9	1.35
2 Bedroom		95	200	280	38.8	0.65	97.0	1.62	213.4	3.56
Amenity areas	2028			28000	3.9	0.07	5.9	0.10	10.6	0.18
Total Site :		**203**	**376**		**77**	**1.28**	**189**	**3.14**	**413**	**6.88**

1 Average day water demand for Amenity: 28,000 L/ha/d (Based on commercial water demand rates)

2 The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:

maximum day demand rate = 2.5 x average day demand rate for residential

peak hour demand rate = 2.2 x maximum day demand rate for residential

3 Water demand criteria used to estimate peak demand rates for amenity areas are as follows:

maximum daily demand rate = 1.5 x average day demand rate

peak hour demand rate = 1.8 x maximum day demand rate

B.2 FUS CALCULATION SHEETS

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401698
Project Name: 337 Montgomery Street
Date: 11/12/2021
Fire Flow Calculation #: 1
Description: Proposed 20-storey High-rise Apartment Building

Notes: 20-storey residential high-rise with indoor and rooftop amenity areas. Information taken from draft site plan by Project 1 Studio. 2-hour fire separation provided between each floor and 1-hour fire separation provided for exterior vertical communications.

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Non-Combustible Construction						0.8	-
2	Determine Ground Floor Area of One Unit (m^2)	Used the 'gross floor area' of the ground floor (i.e. floor with the largest footprint, 945.25 m^2) + 25% of the gross construction area of the two immediately adjoining floors (the second floor and third floor). Methodology as per Page 17 of the Fire Underwriters Survey's Water Supply for Public Fire Protection, 1999.						1411.4	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	7000
5	Determine Occupancy Charge	Limited Combustible						-15%	5950
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	-2380
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						100%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	38.7	1	31-60	Wood Frame or Non-Combustible	13%	2737
		East	3.1 to 10	38.3	1	31-60	Wood Frame or Non-Combustible	18%	
		South	20.1 to 30	47	5	> 120	Wood Frame or Non-Combustible	10%	
		West	30.1 to 45	5.1	1	0-30	Wood Frame or Non-Combustible	5%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							6000
		Total Required Fire Flow in L/s							100.0
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							720

B.3 BOUNDARY CONDITIONS (CITY OF OTTAWA, SEPTEMBER 2021)

Nwanise, Nwanise

From: Shobowale, Aminat
Sent: Tuesday, October 5, 2021 2:09 PM
To: Rathnasooriya, Thakshika
Subject: FW: Hydraulic Boundary Conditions Request
Attachments: 337 Montgomery Street September 2021.pdf

Kindly find below my email with John Wu so far.

Thank you.

Aminat Shobowale
Civil Designer, Community Development

Mobile: (437) 833-4988
Aminat.Shobowale@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Wu, John <John.Wu@ottawa.ca>
Sent: Monday, October 4, 2021 8:12 AM
To: Shobowale, Aminat <Aminat.Shobowale@stantec.com>
Subject: RE: Hydraulic Boundary Conditions Request

Here is the result:

The following are boundary conditions, HGL, for hydraulic analysis at 337 Montgomery Street (zone 1E) assumed to be a dual connection to the 152 mm watermain on Montgomery Street (see attached PDF for location).

Minimum HGL: 109.2 m

Maximum HGL: 118.5 m

Available Fire Flow at 20 psi: 112 L/s, assuming a ground elevation of 57.3 m.

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

John

From: Shobowale, Aminat <Aminat.Shobowale@stantec.com>
Sent: September 27, 2021 11:36 AM
To: Wu, John <John.Wu@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>
Subject: RE: Hydraulic Boundary Conditions Request

Good morning John,

Here's an updated boundary conditions request for the proposed residential development at 337 Montgomery Street. The proposed development is a 20-storey high rise apartment building comprised of 108 units of 1 bedroom and 95 units of 2 Bedrooms.

We intend to connect to existing 150mm diameter watermain on Selkirk Street and existing 150mm diameter watermain on Montgomery Street.

Estimated domestic demands and fire flow requirements for the site are as follows:

- Domestic demand:
  - Average day: 85.2 L/min (1.42 L/s)
  - Maximum day: 213.1 L/min (3.55 L/s)
  - Peak hour: 468.8 L/min (7.81 L/s)
- Estimated fire flow demand per FUS methodology : 6000 L/min (100 L/s)

Kindly find attached the following:

1) Location map and Site plan
2) Water demand calculation sheets.

Thank you for your help. Kindly contact me if you need any additional information.

Regards,

Aminat Shobowale
Civil Designer, Community Development

Mobile: (437) 833-4988
Aminat.Shobowale@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Wu, John <John.Wu@ottawa.ca>
Sent: Friday, September 24, 2021 3:33 PM
To: Shobowale, Aminat <Aminat.Shobowale@stantec.com>
Subject: RE: Hydraulic Boundary Conditions Request

Please use the FUS method for the fire flow calculation.

John

From: Shobowale, Aminat <Aminat.Shobowale@stantec.com>
Sent: September 24, 2021 3:05 PM
To: Wu, John <John.Wu@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>
Subject: Hydraulic Boundary Conditions Request

Hi John,

We would like to request for hydraulic boundary conditions for a proposed residential development at 337 Montgomery Street. The proposed development is a 20-storey high rise apartment building comprised of 108 units of 1 Bedroom and 95 units of 2 Bedroom.

We intend to connect to existing 150mm diameter watermain on Selkirk Street and existing 150mm diameter watermain on Montgomery Street.

Estimated domestic demands and fire flow requirements for the site are as follows:

- Domestic demand:
  - Average day: 85.2 L/min (1.42 L/s)
  - Maximum day: 213.1 L/min (3.55 L/s)
  - Peak hour: 468.8 L/min (7.81 L/s)
- Estimated fire flow demand per OBC methodology : 9000 L/min (150 L/s)

Kindly find attached the following:

1) Location map and Site plan
2) Water demand calculation sheets.

Thank you for your help. Kindly contact me if you need any additional information.

Regards,

Aminat Shobowale
Civil Designer, Community Development

Mobile: (437) 833-4988
Aminat.Shobowale@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

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Appendix C WASTEWATER SERVICING CALCULATIONS

C.1 SANITARY SEWER DESIGN SHEET

Stantec

SITE: **337 Montgomery Street, Ottawa,ON**

DATE: 11/13/2021
REVISION: 1
DESIGNED BY: AS, NN
CHECKED BY: RT

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401698

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / 1 BEDROOM	1.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / 2 BEDROOM	2.1	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / 3 BEDROOM	3.1				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMM/AMENITY		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE								
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	1 BEDROOM	2 BEDROOM	3 BEDROOM	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)	(l/s)	(l/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)	(m/s)
PROPOSED BLDG	BLDG	EX SAN	0.100	72	131		376	0.10	376	3.23	3.93	0.203	0.203	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.10	0.169	0.17	0.06	4.09	5.5	150	PVC	SDR 35	1.00	15.3	**26.66%**	0.86	0.61

Notes

1. Unit breakdown for proposed 20-storey residential apartment building with 203 apartment units provided by Project 1 Studio in November 2021
2. One bedroom apartments with den counted as two-bedroom apartments
3. Site to outlet to existing 300mm dia. sanitary sewer on Selkirk Street.
4. Entire site area considered as potential source of infiltration.

C.2 CONFIRMATION OF SANITARY SEWER CAPACITY (CITY OF OTTAWA, NOVEMBER 2021)

From: Tousignant, Eric
To: Rathnasooriya, Thakshika
Cc: Gladish, Alyssa
Subject: RE: Sanitary Capacity on Selkirk Street
Date: Tuesday, November 16, 2021 7:17:21 AM

Hi Thakshika

For future reference, you will need to go through the development review group at the city since all of these questions needs to be managed up front by a city project manager. The project manager will then direct the questions to the right people at the city.

With respect to your question, 4.2 L/s at this location should not be a problem.

Eric

Eric Tousignant, P.Eng.
Senior Water Resources Engineer
Infrastructure Services
613-580-2424 ext 25129

From: Rathnasooriya, Thakshika <Thakshika.Rathnasooriya@stantec.com>
Sent: October 29, 2021 3:21 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Gladish, Alyssa <Alyssa.Gladish@stantec.com>
Subject: Sanitary Capacity on Selkirk Street

Hi Eric,

I am currently working on servicing a proposed residential development at 337 Montgomery Street. The proposed 20-storey high rise apartment building comprised of 72 one bedroom units and 132 two bedrooms units.

We intend to connect to the existing 300mm sanitary sewer on Selkirk Street. Can you please confirm if the sanitary sewer on Selkirk Street has the capacity to capture 4.2 L/s from the proposed 20-storey building?

Thanks,

Shika Rathnasooriya , P.Eng.

Direct: 613-668-9635
Thakshika.Rathnasooriya@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

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C.3 PRECONSULTATION NOTES PROVIDED BY THE CITY OF OTTAWA (JUNE 30, 2021)

Pre-Application Consultation Meeting Notes

Property Address: 337, 345 Montgomery Street & 94 Selkirk Street
PC2021-0217
Wednesday, June 30, 2021
9am – 10am via Microsoft Teams

Attendees:

City of Ottawa
Jean-Charles Renaud, File Lead
Holly Newitt, Student Planner
Wally Dubyk, Transportation
John Wu, Engineer
Christopher Moise, Urban Design
Mark Richardson, Forestry

Applicant Team
Ida Badre
Kersten Nitsche
Loredana Serco
Ryan Koolwine

Community Association
Diane Irwin
Chris Greensheilds

Subject: 337, 345 Montgomery Street & 94 Selkirk Street

Meeting Notes:

Opening & attendee introduction

- Introduction of attendees and opening remarks

Overview of proposal

Ryan Koolwine

- Designated general urban area
- Montreal Road District Secondary Plan
- Surrounding sites are being developed/intensified
- At the corner of an a-typical intersection – bow-tie intersection
    - Would like to make the most of it through dynamic architecture
    - Identified Selkirk as needing more active street-edge but sensitive to the existing character
- Proposing a high-rise development
    - 204 units
    - Would like to meet/exceed bike parking
    - Parking under zoning

- Street relief provided by entrance plaza off of Montgomery
- Selkirk and Montgomery have ground floor units with direct street access/private patio space – giving a townhouse feel
    - High ceilings provide mezzanine with possibility for live-work conversion
- Lower floors have in-set balconies, upper floors have angled projected buildings
    - Rooftop terrace and other amenities on 9th floor
- Brick treatment with metallic frame elements on lower floors, podium is not a consistent height
    - Upper balconies will be clad in light translucent materials to contrast with darker façade
    - Giving a sense of verticality to visually reduce the massing and highlight the slender building shape

Technical Comments:

Jean-Charles Renaud, Planner

- While there doesn't seem to be a clear requirement for an OPA in the Secondary Plan, the proposal does not meet the intent of the SP (in staff's opinion). The thrust of the SP obviously targets the highest and densest development to the TM's and gateway sites. Plus the OP designates this area as General Urban which is not a target area for intensification.
- The nearby West Gateway Lands are meant to be unique sites, distinctively different than any other development within the sector.
- The site's Interior of the West Sector policies promote redevelopment that is compatible with residential uses, limits heights to 4 storeys on Palace, and include provisions of building transition to low-rise residential uses.
- An 8-storey podium seems high in this location. Perhaps look to the buildings on the south side of Montgomery, both newly built and existing, for a sense of what an acceptable podium height might be.
- There seems to be alot of hard surfaces along Montgomery, dedicated to an entrance plaza and garbage.
- Bike parking at grade is great, would encourage 1:1

Christopher Moise, Urban Design

- This proposal does not reside along one of the City's Design Priority Areas and need not attend the City's UDRP;
- This proposal is requesting to a whole scale change to the underlying scale and vision for this neighbourhood and we have the following comments and questions about the proposal presented that need to be addressed to help us understand its broader implications:
    - What is the Site size?
    - What is the tower floor-plate?
    - How is tower separation being managed (to the east)?
    - How is transition being considered and shadow impacts being mitigated?
    - How is the question of replicability being considered (on the neighbouring properties)? If other properties on the block are consolidated and another high-rise proposed how would the buildings relate (tower separation, transition, etc.)?
    - How is the pedestrian scale of the neighbourhood being considered, especially along both street frontages? Can grade related units be accessed from the street and articulated to be low-rise scale (two-storey)?
    - How does the eight storey podium support the lower scaled development of the interior of the west sector described in the secondary plan?

    - Whether an OPA is considered or not, how does this proposal have broader impacts and implications on the surrounding properties and surrounding blocks (Views, sight lines, datum lines, existing and planned context, scale, transition, materiality, architectural treatment, etc.)?
    - We recommend that these questions be addressed through illustrations within the overall context of the West Sector described in the City's secondary plan, to assist staff in their review of the proposal, and help create a new vision of this area as a whole.
- A scoped Design Brief is a required submittal for all Site Plan/Re-zoning applications and can be combined with the Planning Rationale. Please see the Design Brief Terms of Reference provided.
- This is an exciting project in an area full of potential. We look forward to helping you achieve its goals with the highest level of design resolution. We are happy to assist and answer any questions regarding the above. Good luck.

Wally Dubyk, Transportation

- The Screening Form has indicated that the TIA Trigger has been met. Please proceed with Step 2 – Scoping report.
- Update to the TIA Guideline Forecasting Report
    - We would like to inform all consultants making TIA Forecasting Report submissions to the City of Ottawa as part of a development application, that all new applications (pre-consultation meetings dated after March 3, 2021) must use the NEW TRANS Trip Generation Manual when forecasting site generated trips using this manual (see attached).
    - The TRANS committee (a joint transportation planning committee serving the National Capital region) finalized a new manual early in March 2021. The document will be available in French and English on the TRANS website http://www.ncr-trans-rcn.ca/surveys/2009-trip-generation.
    - The new manual has simplified the conversion from vehicle trips to person trips and then trips by modal share. The City has also developed a spreadsheet that will apply the factors of location and building type to quickly provide the existing trip numbers by mode share.
- A 3.0 metres x 3.0 metres sight triangle would be required at the intersection of Montgomery Street and Selkirk Street. The sight triangle area is to be conveyed to the City and is to be shown on all drawings.
- The consultant should review the sight distance to the access and any obstructions that may hinder the view of the driver.
- All underground and above ground building footprints and permanent walls need to be shown on the plan to confirm that any permanent structure does not extend either above or below into the existing property lines, sight triangles and/or future road widening protection limits.
- The proponent shall comply with the Private Approach By-Law 2003-447
- No private approach shall be constructed within 0.3 metres of any adjacent property measured at the highway line, and at the curb line.
- Ensure that the driveway grade does not exceed 2% within the private property for a distance of 6.0 metres from the ROW limit; see Section 25 (s) of the Private Approach By-Law #2003-447. Any grade exceeding 6% will require a subsurface melting device. For private property, the mechanism to vary the slope is a minor variance. The consultant would need to provide technical rationale.

- The concrete sidewalk should be 2.0 metres in width and be continuous and depressed through the proposed access.
- The closure of an existing private approach shall reinstate the sidewalk, shoulder, curb and boulevard to City standards.
- Permanent structures such as curbing, stairs, retaining walls, and underground parking foundation also bicycle parking racks are not to extend into the City's right-of-way limits.
- The Owner shall be required to enter into maintenance and liability agreement for all pavers, plant and landscaping material placed in the City right-of-way and the Owner shall assume all maintenance and replacement responsibilities in perpetuity.
- Bicycle parking spaces are required as per Section 111 of the Ottawa Comprehensive Zoning By-law. Bicycle parking spaces should be located in safe, secure places near main entrances and preferably protected from the weather.

John Wu, Engineer

- The servicing needed for water, sanitary and storm sewer are all available on street. Please do the sanitary sewer studies to make sure that there is the capacity for your proposed development. Also water main on street are six inch water main, and over 100 years old. when the design for the building, it needs to consider the fire-resistant design to reduce the firefighting water demand.
- Storm water management is using C, 5 years. To restrict up to 100 year's storm on site.
- Other report is standard requirement for rezoning and site plans.(geotechnical report, phase one ESA, and maybe phase two ESA report needed. noise study etc.)

Mark Robinson, Forestry

TCR requirements:

- The City encourages the retention of healthy trees; the oak tree at 94 Selkirk is large and unique to that area and given it's growing conditions, Ottawa. Please seek opportunities to retain this tree.
- A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    - an approved TCR is a requirement of Site Plan approval.
- As of January 1 2021, any removal of privately-owned trees 10cm or larger in diameter, or publicly (City) owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
- The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
    - If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
    - Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
- The TCR must list all trees on site by species, diameter and health condition
- Please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
- The TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site
- If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained

- All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
    a. the location of tree protection fencing must be shown on a plan
    b. show the critical root zone of the retained trees
    c. if excavation will occur within the critical root zone, please show the limits of excavation
- For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

LP tree planting requirements:
For additional information on the following please contact adam.palmer@Ottawa.ca

- Minimum Setbacks
    - Maintain 1.5m from sidewalk or MUP/cycle track.
    - Maintain 2.5m from curb
    - Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
    - Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.
    - Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.
- Tree specifications
    - Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
    - Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
    - Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
    - Plant native trees whenever possible
    - No root barriers, dead-man anchor systems, or planters are permitted.
    - No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)
- Hard surface planting
    - Curb style planter is highly recommended
    - No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
    - Trees are to be planted at grade

- Soil Volume
    - Please ensure adequate soil volumes are met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

    Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

- Sensitive Marine Clay
    - Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

Community Association

Chris Greensheilds

- Full disclosure: lives next door
- The oak tree is very important both for the canopy and its heritage value
- Would oppose any amendment to the secondary plan
    - Highlighted the 8-storey height limit within the plan and height of surrounding neighbourhood
- Concerned regarding the shadowing effects of the building
- Infrastructure and traffic restrictions of the site is a concern
- Would like to see a narrowing of Selkirk to include bike lanes
- Very little green space and no ground floor amenity space
- Supported the inclusion of ground floor commercial but would like to see more than the possibility of live-work units
- Public consultation on traffic management is predicted

Diane Irwin

- Is there a mix in the size of units?
    - Would like to see units with more bedrooms to accommodate families as there is a neighboring school

Next steps:

- We encourage the applicant to discuss the proposal with the local Councillor and the community association
- We will follow up with meeting minutes and a list of required documents for the submission

Appendix D STORMWATER MANAGEMENT

D.1 MODIFIED RATIONAL METHOD DESIGN SHEET

Stormwater Management Calculations

File No: **160401698**
Project: **337 Montgomery Street**
Date: **17-Nov-21**

SWM Approach:
Post-development to Pre-development flows

Post-Development Site Conditions:

Overall Runoff Coefficient for Site and Sub-Catchment Areas

Runoff Coefficient Table

Catchment Type	Sub-catchment Area ID / Description		Area (ha) "A"		Runoff Coefficient "C"	"A x C"		Overall Runoff Coefficient
Controlled - Tributary	CB1	Hard	0.009		0.9	0.008		
		Soft	0.000		0.2	0.000		
		Subtotal		0.009131			0.0082179	0.900
Uncontrolled - Tributary	UNC-1	Hard	0.017		0.9	0.015		
		Soft	0.039		0.2	0.008		
		Subtotal		0.05638			0.0231158	0.410
Roof	Roof-2	Hard	0.011		0.9	0.010		
		Soft	0.000		0.2	0.000		
		Subtotal		0.0109			0.00981	0.900
Roof	Roof-1	Hard	0.076		0.9	0.068		
		Soft	0.000		0.2	0.000		
		Subtotal		0.07562			0.068058	0.900
Total				**0.152**			**0.109**	
Overall Runoff Coefficient= C:								**0.72**

Total Roof Areas	**0.087 ha**
Total Tributary Surface Areas (Controlled and Uncontrolled)	**0.066 ha**
Total Tributary Area to Outlet	**0.152 ha**
Total Uncontrolled Areas (Non-Tributary)	**0.000 ha**
Total Site	**0.152 ha**

Stormwater Management Calculations

Project #160401698, 337 Montgomery Street
Modified Rational Method Calculatons for Storage

5 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	998.071
b =	6.053
c =	0.814

t (min)	I (mm/hr)
10	104.19
20	70.25
30	53.93
40	44.18
50	37.65
60	32.94
70	29.37
80	26.56
90	24.29
100	22.41
110	20.82
120	19.47

5 YEAR Predevelopment Target Release from Portion of Site

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 0.1520
C: 0.50

Typical Time of Concentration

tc (min)	I (5 yr) (mm/hr)	Qtarget (L/s)
10	104.19	**22.02**

Subdrainage Area: CB1 — Controlled - Tributary
Area (ha): 0.01
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.19	9.82	7.00	2.82	**1.69**
20	70.25	8.30	7.00	1.30	1.56
30	53.93	7.47	7.00	0.47	0.85
40	44.18	6.92	7.00	0.00	0.00
50	37.65	6.49	7.00	0.00	0.00
60	32.94	6.14	7.00	0.00	0.00
70	29.37	5.84	7.00	0.00	0.00
80	26.56	5.58	7.00	0.00	0.00
90	24.29	5.30	7.00	0.00	0.00
100	22.41	5.05	7.00	0.00	0.00
110	20.82	4.81	7.00	0.00	0.00
120	19.47	4.52	7.00	0.00	0.00

Notes:

1). Contributing Subcatchment Areas: ROOF1, ROOF2, CB-1
2). Outflows from the 6.5 cu.m cistern to be set by pump (maximum outflow rate of 7 L/s)

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
5-year Water Level	N/A	N/A	7.00	1.69	7.00	OK

Subdrainage Area: UNC-1 — Uncontrolled - Tributary
Area (ha): 0.06
C: 0.41

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.19	6.70	6.70		
20	70.25	4.51	4.51		
30	53.93	3.47	3.47		
40	44.18	2.84	2.84		
50	37.65	2.42	2.42		
60	32.94	2.12	2.12		
70	29.37	1.89	1.89		
80	26.56	1.71	1.71		
90	24.29	1.56	1.56		
100	22.41	1.44	1.44		
110	20.82	1.34	1.34		
120	19.47	1.25	1.25		

Subdrainage Area: Roof-2 — Roof
Area (ha): 0.01 — Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	104.19	2.84	2.71	0.13	**0.08**	35.8	0.00
20	70.25	1.92	1.90	0.02	0.02	25.1	0.00
30	53.93	1.47	1.46	0.01	0.02	19.3	0.00
40	44.18	1.20	1.20	0.01	0.01	15.8	0.00
50	37.65	1.03	1.02	0.00	0.01	13.5	0.00
60	32.94	0.90	0.90	0.00	0.01	11.8	0.00
70	29.37	0.80	0.80	0.00	0.01	10.6	0.00
80	26.56	0.72	0.72	0.00	0.01	9.5	0.00
90	24.29	0.66	0.66	0.00	0.01	8.7	0.00
100	22.41	0.61	0.61	0.00	0.01	8.1	0.00
110	20.82	0.57	0.57	0.00	0.01	7.5	0.00
120	19.47	0.53	0.53	0.00	0.01	7.0	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	35.75	0.04	2.71	0.08	4.36	0.00

Project #160401698, 337 Montgomery Street
Modified Rational Method Calculatons for Storage

100 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	1735.688
b =	6.014
c =	0.820

t (min)	I (mm/hr)
10	178.56
20	119.95
30	91.87
40	75.15
50	63.95
60	55.89
70	49.79
80	44.99
90	41.11
100	37.90
110	35.20
120	32.89

100 YEAR Predevelopment Target Release from Portion of Site

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 0.1520
C: 0.50

100 Year predevelopment target release rate controlled to the 5 Year Predevelopment release rate

Q100 Yr (L/s)
22.02

Subdrainage Area: CB1 — Controlled - Tributary
Area (ha): 0.01
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	14.13	7.00	7.13	4.28
20	119.95	12.00	7.00	5.00	6.00
30	91.87	10.55	7.00	3.55	**6.39**
40	75.15	9.64	7.00	2.64	6.34
50	63.95	9.00	7.00	2.00	6.00
60	55.89	8.51	7.00	1.51	5.44
70	49.79	8.12	7.00	1.12	4.71
80	44.99	7.80	7.00	0.80	3.84
90	41.11	7.52	7.00	0.52	2.83
100	37.90	7.27	7.00	0.27	1.65
110	35.20	7.04	7.00	0.04	0.27
120	32.89	6.83	7.00	0.00	0.00

Notes:

1). Contributing Subcatchment Areas: ROOF1, ROOF2, CB-1
2). Outflows from the 6.5 cu.m cistern to be set by pump (maximum outflow rate of 7 L/s)

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	N/A	N/A	7.00	6.39	7.00	OK
			Excess storage (cu.m)		0.61	

Subdrainage Area: UNC-1 — Uncontrolled - Tributary
Area (ha): 0.06
C: 0.51

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	14.34	14.34		
20	119.95	9.64	9.64		
30	91.87	7.38	7.38		
40	75.15	6.04	6.04		
50	63.95	5.14	5.14		
60	55.89	4.49	4.49		
70	49.79	4.00	4.00		
80	44.99	3.61	3.61		
90	41.11	3.30	3.30		
100	37.90	3.04	3.04		
110	35.20	2.83	2.83		
120	32.89	2.64	2.64		

Subdrainage Area: Roof-2 — Roof
Area (ha): 0.01 — Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	5.41	4.33	1.08	**0.65**	78.5	0.00
20	119.95	3.63	3.52	0.12	0.14	46.5	0.00
30	91.87	2.78	2.74	0.05	0.08	36.2	0.00
40	75.15	2.28	2.26	0.02	0.05	29.8	0.00
50	63.95	1.94	1.93	0.01	0.02	25.5	0.00
60	55.89	1.69	1.69	0.01	0.02	22.3	0.00
70	49.79	1.51	1.50	0.00	0.02	19.9	0.00
80	44.99	1.36	1.36	0.00	0.01	18.0	0.00
90	41.11	1.25	1.24	0.00	0.01	16.4	0.00
100	37.90	1.15	1.15	0.00	0.01	15.1	0.00
110	35.20	1.07	1.06	0.00	0.01	14.1	0.00
120	32.89	1.00	1.00	0.00	0.01	13.1	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	78.55	0.08	4.33	0.65	4.36	0.00

Stormwater Management Calculations

Project #160401698, 337 Montgomery Street
Modified Rational Method Calculatons for Storage

Subdrainage Area: Roof-1
Area (ha): 0.08
C: 0.90

Maximum Storage Depth: Roof 150 mm

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	104.19	19.71	4.73	14.98	8.99	100.1	0.00
20	70.25	13.29	4.80	8.49	**10.19**	103.6	0.00
30	53.93	10.20	4.78	5.43	9.77	102.4	0.00
40	44.18	8.36	4.71	3.65	8.75	99.0	0.00
50	37.65	7.12	4.60	2.52	7.56	93.2	0.00
60	32.94	6.23	4.49	1.75	6.28	87.1	0.00
70	29.37	5.56	4.37	1.19	4.99	80.8	0.00
80	26.56	5.03	4.25	0.78	3.73	74.5	0.00
90	24.29	4.60	4.08	0.51	2.78	65.6	0.00
100	22.41	4.24	3.92	0.32	1.90	57.3	0.00
110	20.82	3.94	3.77	0.17	1.11	49.8	0.00
120	19.47	3.68	3.54	0.14	1.00	46.8	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	103.59	0.10	4.80	10.19	30.25	0.00

SUMMARY TO OUTLET

			Vrequired	Vavailable*	
Tributary Area	0.096	ha			
Total 5yr Flow to Sewer	7.0	L/s	1.69	7.0 m^3	Ok
Non-Tributary Area	0.056	ha			
Total 5yr Flow Uncontrolled	6.7	L/s			
Total Area	0.152	ha			
Total 5yr Flow	13.7	L/s			
Target	22.0	L/s			

Project #160401698, 337 Montgomery Street
Modified Rational Method Calculatons for Storage

Subdrainage Area: Roof-1
Area (ha): 0.08
C: 1.00

Maximum Storage Depth: Roof 150 mm

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	37.54	5.27	32.26	19.36	128.6	0.00
20	119.95	25.22	5.44	19.78	23.74	137.2	0.00
30	91.87	19.31	5.48	13.83	**24.90**	139.5	0.00
40	75.15	15.80	5.47	10.32	24.77	139.3	0.00
50	63.95	13.44	5.45	8.00	24.00	137.7	0.00
60	55.89	11.75	5.40	6.35	22.85	135.5	0.00
70	49.79	10.47	5.35	5.11	21.48	132.8	0.00
80	44.99	9.46	5.30	4.16	19.98	129.8	0.00
90	41.11	8.64	5.24	3.40	18.39	126.7	0.00
100	37.90	7.97	5.17	2.80	16.81	123.0	0.00
110	35.20	7.40	5.08	2.32	15.30	118.5	0.00
120	32.89	6.92	5.00	1.92	13.79	114.1	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	139.51	0.14	5.48	24.90	30.25	0.00

SUMMARY TO OUTLET

			Vrequired	Vavailable*	
Tributary Area	0.096	ha			
Total 100yr Flow to Sewer	7	L/s	6.4	7.0 m^3	Ok
Non-Tributary Area	0.056	ha			
Total 100yr Flow Uncontrolled	14.3	L/s			
Total Area	0.152	ha			
Total 100yr Flow	21.3	L/s			
Target	22.0	L/s			

Project #160401698, 337 Montgomery Street
Roof Drain Design Sheet, Area Roof1
Standard Watts Model R1100 Accutrol Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0019	0	0.025	17	0	0	0.025
0.050	0.0006	0.0038	1	0.050	67	1	1	0.050
0.075	0.0007	0.0043	4	0.075	151	3	4	0.075
0.100	0.0008	0.0047	9	0.100	269	5	9	0.100
0.125	0.0009	0.0052	18	0.125	420	9	17.50	0.125
0.150	0.0009	0.0057	30	0.150	605	12.74	30	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
1.0	259.0	1.0	0.07193
3.6	624.8	2.7	0.24548
8.8	1095.0	5.2	0.54966
17.4	1641.2	8.5	1.00554
30.1	2244.3	12.7	1.62896

Rooftop Storage Summary

Total Building Area (sq.m)		756.2
Assume Available Roof Area (sq.m)	80%	604.96
Roof Imperviousness		0.9
Roof Drain Requirement (sq.m/Notch)		900
Number of Roof Notches*		6
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		30
Estimated 100 Year Drawdown Time (h)		1.4

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

From Watts Drain Catalogue

Head (m)	L/s Open	0.75	0.5	**0.25**	Closed
0.025	0.3155	0.3155	0.3155	**0.3155**	0.3155
0.05	0.6309	0.6309	0.6309	**0.6309**	0.6309
0.075	0.9464	0.8675	0.7886	**0.7098**	0.6309
0.1	1.2618	1.1041	0.9464	**0.7886**	0.6309
0.125	1.5773	1.3407	1.1041	**0.8675**	0.6309
0.15	1.8927	1.5773	1.2618	**0.9464**	0.6309

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.005	0.005	-
Depth (m)	0.104	0.140	0.150
Volume (cu.m)	10.2	24.9	30.2
Draintime (hrs)	0.6	1.4	

Project #160401698, 337 Montgomery Street
Roof Drain Design Sheet, Area Roof2
Standard Watts Model R1100 Accutrol Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0019	0	0.025	2	0	0	0.025
0.050	0.0006	0.0038	0	0.050	10	0	0	0.050
0.075	0.0007	0.0043	1	0.075	22	0	1	0.075
0.100	0.0008	0.0047	1	0.100	39	1	1	0.100
0.125	0.0009	0.0052	3	0.125	61	1	3	0.125
0.150	0.0009	0.0057	4	0.150	87	2	4	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.1	37.3	0.1	0.010368
0.5	90.1	0.4	0.035384
1.3	157.8	0.7	0.079228
2.5	236.6	1.2	0.14494
4.3	323.5	1.8	0.2348

Rooftop Storage Summary

Total Building Area (sq.m)		109
Assume Available Roof Area (sq.m	80%	87.2
Roof Imperviousness		0.9
Roof Drain Requirement (sq.m/Notch)		900
Number of Roof Notches*		6
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		4
Estimated 100 Year Drawdown Time (h)		0.0

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Watts Drain Catalogue

Head (m)	L/s Open	0.75	0.5	**0.25**	Closed
0.025	0.3155	0.31545	0.31545	**0.31545**	0.315451
0.05	0.6309	0.6309	0.6309	**0.6309**	0.630902
0.075	0.9464	0.86749	0.78863	**0.70976**	0.630902
0.1	1.2618	1.10408	0.94635	**0.78863**	0.630902
0.125	1.5773	1.34067	1.10408	**0.86749**	0.630902
0.15	1.8927	1.57726	1.2618	**0.94635**	0.630902

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.003	0.004	-
Depth (m)	0.036	0.079	0.150
Volume (cu.m)	0.1	0.7	4.4
Draintime (hrs)	0.0	0.0	

D.2 STORM SEWER DESIGN SHEET

Stantec

337, 345 Montgomery Street and 94 Selkirk Street

DATE: 2021-12-02
REVISION: 1
DESIGNED BY: AS
CHECKED BY: NN

FILE NUMBER: 160401698

STORM SEWER DESIGN SHEET
(City of Ottawa)

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013 BEDDING CLASS = B
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min

LOCATION			DRAINAGE AREA																						PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETE (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
CISTERN	SDR 28	EX.STM	0.00	0.11	0.00	0.11	0.10	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	7.0	7.0	7.0	10.0	150	150	CIRCULAR	PVC	-	1.00	15.3	**45.73%**	0.86	0.72	0.23
																				10.23																	

NOTES
1. Areas ID (Cistern) has contributing flows from the Roof and Catch Basin
2. The Cistern release rate is controlled (7 L/S) by a mechanical pump

D.3 CORRESPONDENCE WITH THE RIDEAU VALLEY CONSERVATION AUTHORITY (RVCA) (NOV. 2021)

From: Eric Lalande
To: Shobowale, Aminat
Cc: Gladish, Alyssa
Subject: RE: 337, 345 Montgomery Street & 94 Selkirk street; Stormwater quality control criteria
Date: Tuesday, November 9, 2021 11:10:25 AM

HI Aminat,

Based on the site plan provided, the RVCA does not have any required on-site water quality protections. Best management practices are recommended to be integrated where possible.

Thank you,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Shobowale, Aminat <Aminat.Shobowale@stantec.com>
Sent: Tuesday, November 9, 2021 12:40 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Gladish, Alyssa <Alyssa.Gladish@stantec.com>
Subject: 337, 345 Montgomery Street & 94 Selkirk street; Stormwater quality control criteria

Good morning Eric,

Stantec is preparing a civil engineering design submission in support of a site plan control application for a proposed re-development on 337, 345 Montgomery Street & 94 Selkirk Street in the City of Ottawa.

We have been directed to consult with you to confirm if stormwater quality control requirements are necessary for this site.

Below is a list of some key site information:

i. The existing building will be replaced by a twenty-storey high rise apartment building to be serviced through the existing services on Selkirk and Montgomery Streets.
ii. There is an existing 750mm concrete storm sewer fronting the site on Montgomery Street.
iii. No surface parking spots are proposed on the site.
iv. Stormwater quantity control for the site is anticipated to be provided via rooftop storage and the remaining site uncontrolled.
v. The City of Ottawa has indicated that the allowable stormwater release rate is to be calculated using:
    - Allowable Runoff coefficient (C): 0.5.
    - Allowable flowrate: Control the 100-year storm events to the 5-year storm event.

Thank you in advance for your help.

Please let me know if you require any additional information from our end.

Regards,

Aminat.

Aminat Shobowale
Civil Designer, Community Development

Mobile: (437) 833-4988
Aminat.Shobowale@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

Better Together, Even If We're Apart. Read more about Stantec's COVID-19 response, including remote working and business continuity measures.

Appendix E GEOTECHNICAL INVESTIGATION

E.1 GEOTECHNICAL INVESTIGATION REPORT BY PATERSON GROUP (SEPT. 2021)

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Noise and Vibration Studies

patersongroup

Geotechnical Investigation

Proposed Multi-Storey Building
337 & 345 Montgomery Street and 94 Selkirk Street
Ottawa, Ontario

Prepared For

SerCo Realty Group

September 30, 2021

Report: PG5952-1

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by SerCo Realty Group to conduct a geotechnical investigation for the proposed multi-storey building to be located at 337 & 345 Montgomery Street and 94 Selkirk Street in the City of Ottawa (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objectives of the geotechnical investigation were to:

- Determine the subsoil and groundwater conditions at this site by means of boreholes.
- Provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

2.0 Proposed Development

Based on the available drawings, the proposed development will consist of a multi-storey building with at least two underground levels. Associated access lanes, walkways, and landscaped areas are anticipated at finished grades surrounding the proposed building. It is further anticipated that the proposed building will be municipally serviced.

Construction of the proposed development will involve demolition of the existing buildings presently located at the site.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on September 9 and 10, 2021 and consisted of advancing a total of 6 boreholes to a maximum depth of 9.1 m below existing ground surface. The borehole locations were distributed in a manner to provide general coverage of the subject site, taking into consideration underground utilities and site features. The borehole locations are shown on Drawing PG5952-1 - Test Hole Location Plan included in Appendix 2.

A previous field investigation was carried out on April 4 and 5, 2019 by others. At that time, 3 boreholes were drilled to a maximum depth of 9.1 m below existing ground surface. The borehole logs from that investigation are also shown on Drawing PG5952-1 – Test Hole Location Plan, included in Appendix 2.

The test holes for the current investigation were completed using a low clearance drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The drilling procedure consisted of augering and coring to the required depths at the selected locations, and sampling and testing the overburden.

Sampling and In Situ Testing

The soil samples were recovered either directly from the auger flights or using a 50 mm diameter split-spoon sampler. All samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags and transported to our laboratory for further examination and classification. The depths at which the auger and split-spoon samples were recovered from the boreholes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Rock samples were recovered from boreholes BH 2-21 and BH 5-21 using a core barrel and diamond drilling techniques. The bedrock samples were classified on site, placed in hard cardboard core boxes, and transported to Paterson’s laboratory. The depths at which rock core samples were recovered from the

boreholes are presented as RC on the Soil Profile and Test Data sheets in Appendix 1.

The recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section of bedrock and are presented on the borehole logs. The recovery value is the length of the bedrock sample recovered over the length of the drilled section. The RQD value is the total length of intact rock pieces longer than 100 mm over the length of the core run. The values indicate the bedrock quality.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

Two boreholes were each fitted with a groundwater monitoring well to allow groundwater level monitoring. The observed groundwater levels were recorded in the field. Ground observations are discussed in Subsection 4.3 and presented in the Soil Profile and Test Data sheets in Appendix 1.

Monitoring Well Installation

Typical monitoring well construction details are described below:

- ❏ 3.0 m of slotted 51 mm diameter PVC screen at the base of the borehole.
- ❏ 51 mm diameter PVC riser pipe from the top of the screen to the ground surface.
- ❏ No.3 silica sand backfill within annular space around screen.
- ❏ 300 mm thick bentonite hole plug directly above PVC slotted screen.
- ❏ Clean backfill from top of bentonite plug to the ground surface.

Refer to the Soil Profile and Test Data sheets in Appendix 1 for specific well construction details.

Sample Storage

All samples will be stored in the laboratory for a period of one (1) month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The borehole locations were selected by Paterson to provide general coverage of the proposed development, taking into consideration the existing site features and underground utilities. The test hole locations and ground surface elevation at each test hole location were surveyed by Paterson using a handheld GPS and referenced to a geodetic datum. The test hole locations from the previous investigation by others are understood to be estimated and assumed to be approximate. The location of the boreholes and ground surface elevation at each test hole location are presented on Drawing PG5952-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging. Soil samples will be stored for a period of one month after this report is completed, unless otherwise directed.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures, which was collected from borehole BH 4-21. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the samples. The results are presented in Appendix 1 and are discussed further in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site has an approximately triangular shape, consisting of 3 contiguous properties, and which is occupied by a total of 3 residential dwellings along with driveways and landscaped areas. The site is bordered by Selkirk Street to the north, residential properties to the east, and Montgomery Street to the south and west. The existing ground surface across the site is relatively level at approximate geodetic elevation 57 to 58 m.

4.2 Subsurface Profile

Generally, the subsurface profile encountered at the borehole locations consists of a 20 to 80 mm thick asphalt pavement structure at the ground surface level, underlain by fill material followed by a glacial till deposit.

The fill was generally observed to consist of brown silty sand with trace amounts of clay, crushed stone, and gravel. Glass fragments were also observed in the fill material in borehole BH 6-21, and concrete and bricks were observed in borehole BH 1-21. The fill was generally observed to extend up to approximate depths ranging from 0.2 to 1.3 m below the existing ground surface.

A compact to very dense glacial till deposit was encountered underlying the fill material, which generally consists of brown silty sand with gravel cobbles and boulders.

Practical refusal to augering was encountered at approximate depths ranging from 3 to 5.1 m below the existing ground surface.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for the details of the soil profile encountered at each test hole location.

Bedrock

The bedrock was cored in boreholes BH 2-21 and BH 5-21 beginning at approximate depths of 4.6 and 3.5 m, respectively. Based on the recovered rock core, the bedrock consists of interbedded limestone and shale, varying from poor to excellent in quality, generally increasing in quality with depth. The bedrock was cored to a maximum depth of 9.1 m.

4.3 Groundwater

Groundwater levels were recorded in the monitoring wells installed at Paterson's borehole locations on September 16, 2021, and at the monitoring wells installed by others in April 2019. The groundwater level readings noted at those times are presented in Table 1 below.

Table 1 – Summary of Groundwater Level Readings

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH2-21	57.58	6.20	51.38	September 16, 2021
BH5-21	57.86	6.72	51.14	
Note: The ground surface elevation at each borehole location was surveyed using a handheld GPS using a geodetic datum.				
Groundwater Readings by Others				
BH 1	57.64	3.60	54.04	April 16, 2021
BH 2	57.95	3.20	54.75	
BH 3	57.82	3.20	54.62	
Note: The ground surface elevation at each borehole location are shown on the borehole logs by others and are considered approximate.				

Based on field observations of the recovered soil samples, the long-term groundwater table is anticipated at an approximate depth of 3 to 6 m. However, it should be noted that the groundwater levels are subject to seasonal fluctuations and could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. The proposed building is recommended to be founded on conventional spread footings placed on clean, surface sounded bedrock.

Based on the anticipated excavation depth and the proximity of the proposed development to the site boundaries, it is anticipated that a temporary excavation support system will be required to support the overburden during the construction period.

Furthermore, bedrock removal will be required to complete the underground levels. Line drilling and controlled blasting is recommended where large quantities of bedrock need to be removed. The blasting operations should be planned and completed under the guidance of a professional engineer with experience in blasting operations.

The above and other considerations are discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Asphalt, topsoil, and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Due to the anticipated founding level for the proposed building, it is expected that all existing overburden material will be excavated from within the proposed building footprint.

Existing foundation walls and other construction debris should be entirely removed from within the perimeter of the proposed building. Under paved areas, existing construction remnants such as foundation walls should be excavated to a minimum of 1 m below final grade.

Bedrock Removal

As noted above, where bedrock removal is required, line drilling and controlled blasting may be required where large quantities of bedrock need to be removed.

Where the bedrock is weathered and/or where small quantities of bedrock need to be removed, hoe-ramming may be sufficient.

The blasting operations should be planned and completed under the guidance of a professional engineer with experience in blasting operations.

Prior to considering blasting operations, the blasting effects on the existing services, buildings, and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in the proximity of the blasting operations should be carried out prior to commencing site activities. The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries or claims related to the blasting operations.

The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Vibration Considerations

Construction operations could cause vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels as much as possible should be incorporated into the construction operations to maintain a cooperative environment with the residents.

The following construction equipment could cause vibrations: piling equipment, hoe ram, compactor, dozer, crane, truck traffic, etc. The construction of a temporary shoring system with soldier piles or sheet piling would require these pieces of equipment. Vibrations, whether caused by blasting or construction operations, could cause detrimental vibrations on the adjoining buildings and structures. Therefore, it is recommended that all vibrations be limited.

Two parameters determine the recommended vibration limit: the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz).

It should be noted that these guidelines are for current construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended to minimize the risks of claims during or following the construction of the proposed building.

Fill Placement

Fill placed for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II.

The imported fill material should be tested and approved prior to delivery. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the building should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil could be placed as general landscaping fill and beneath exterior parking areas where settlement of the ground surface is of minor concern. These materials should be spread in lifts with a maximum thickness of 300 mm and compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD.

If excavated rock is to be used as fill, it should be suitably fragmented to produce a well-graded material with a maximum particle size of 300 mm. This material should be used structurally only to build up the subgrade for pavements. Where the fill is open graded, a blinding layer of finer granular fill and/or a woven geotextile may be required to prevent adjacent finer materials from migrating into the voids, with associated loss of ground and settlements. This can be assessed at the time of construction.

Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls, unless a composite drainage blanket connected to a perimeter drainage system is provided.

Excess Soils

Excess soils generated by construction activities that will be transported off-site should be handled as per *Ontario Regulation 406/19: On-Site Excess Soil Management*.

5.3 Foundation Design

Bearing Resistance Values

Footings placed on a clean, surface sounded bedrock surface can be designed using a bearing resistance value at ultimate limits states (ULS) of **2,500 kPa**. A geotechnical factor of 0.5 was applied to the above noted bearing resistance value.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures, or open joints which can be detected from surface sounding with a rock hammer.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to sound bedrock bearing media when a plane extending down and out from the bottom edges of the footing at a minimum of 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as that of the bearing medium. A weathered bedrock bearing medium will require a lateral support zone of 1H:1V (or flatter).

Settlement

Footings bearing on an acceptable bedrock bearing surface and designed for the bearing resistance values provided herein will be subjected to negligible potential post-construction total and differential settlements.

5.4 Design for Earthquakes

Shear wave velocity testing was completed for the subject site to accurately determine the applicable seismic site classification for the proposed building in accordance with Table 4.1.8.4.A of the Ontario Building Code 2012. The shear wave velocity testing was completed by Paterson personnel. The results of the shear wave velocity test are provided in Figures 2 and 3 in Appendix 2 of the present report.

Field Program

The seismic array testing location was placed as presented in Drawing PG5952-1 - Test Hole Location Plan, attached to the present letter report. Paterson field personnel placed 18 horizontal 2.4 Hz. geophones mounted to the surface by means of two 75 mm ground spikes attached to the geophone land case. The geophones were spaced at 1 m intervals and connected by a geophone spread cable to a Geode 24 Channel seismograph.

The seismograph was also connected to a computer laptop and a hammer trigger switch attached to a 12-pound dead blow hammer. The hammer trigger switch sends a start signal to the seismograph. The hammer is used to strike an I-Beam seated into the ground surface, which creates a polarized shear wave. The hammer shots are repeated between four (4) to eight (8) times at each shot location to improve signal to noise ratio.

The shot locations are also completed in forward and reverse directions (i.e.- striking both sides of the I-Beam seated parallel to the geophone array). The shot locations were 1, 1.5, and 15 m away from the first geophone, 1, 1.5 and 14 m away from the last geophone, and at the centre of the seismic array.

Data Processing and Interpretation

Interpretation for the shear wave velocity results were completed by Paterson personnel. Shear wave velocity measurement was made using reflection/refraction methods. The interpretation is performed by recovering arrival times from direct and refracted waves.

The interpretation is repeated at each shot location to provide an average shear wave velocity, V_{s30}, of the upper 30 m profile, immediately below the foundation of the building. The layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave records to compute the bedrock depth at each location.

The bedrock velocity was interpreted using the main refractor wave velocity, which is considered a conservative estimate of the bedrock velocity due to the increasing quality of the bedrock with depth. It should be noted that as bedrock quality increases, the bedrock shear wave velocity also increases.

Based on our testing results, the average overburden shear wave velocity is **268 m/s**, while the bedrock shear wave velocity is **2,050 m/s**. It is anticipated that the overburden will be completely removed as part of the proposed building construction and footings will be placed directly on the bedrock surface.

Based on this, the V_{s30} was calculated using the standard equation for average shear wave velocity provided in the OBC 2012 and as presented below:

$$V_{s30} = \frac{Depth_{of\ interest}(m)}{\left(\frac{Depth_{Layer1}(m)}{V_{S_{Layer1}}(m/s)} + \frac{Depth_{Layer2}(m)}{V_{S_{Layer2}}(m/s)}\right)}$$

$$V_{s30=} \frac{30\ m}{\left(\frac{30\ m}{2{,}050\ m/s}\right)}$$

$$V_{s30=}\ 2{,}050\ m/s$$

Based on the results of the shear wave velocity testing, the average shear wave velocity, V_{s30}, for the proposed building founded on bedrock is **2,050 m/s**. Therefore, a **Site Class A** is applicable for design of the proposed building as per Table 4.1.8.4.A of the OBC 2012.

The soils underlying the subject site are not susceptible to liquefaction.

5.5 Basement Slab

With the removal of all topsoil and deleterious materials within the footprint of the proposed building, the bedrock medium, approved by the Paterson personnel at the time of construction, is considered to be an acceptable subgrade surface on which to commence backfilling for the floor slab construction.

The recommended pavement structures noted in Section 5.7 will be applicable for the founding level of the proposed building if underground parking garage is considered. However, if storage or other uses of the lower level will involve the construction of a concrete floor slab, the upper 200 mm of sub-slab fill should consist of OPSS Granular A crushed stone.

All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of its SPMDD.

A sub-slab drainage system, consisting of lines of perforated drainage pipe sub-drains connected to a positive outlet should be provided under the lowest level floor slab. The spacing of the sub-slab drainage pipes can be determined at the time of the construction to confirm groundwater infiltration levels, if any. This is discussed further in Subsection 6.1.

5.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a bulk (drained) unit weight of 20 kN/m^3.

Where undrained conditions are anticipated (i.e., below the groundwater level), the applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

It is also expected that a portion of the basement walls are to be poured against a composite drainage blanket, which will be placed against the exposed bedrock face. A nominal coefficient of at-rest earth pressure of 0.05 is recommended in conjunction with a dry unit weight of 23.5 kN/m^3 (effective unit weight of 15.5 kN/m^3) where this condition occurs. A seismic earth pressure component will not be applicable for the foundation wall, which is to be poured against the bedrock face. It is expected that the seismic earth pressure will be transferred to the underground floor slabs, which should be designed to accommodate these pressures.

Two distinct conditions, static and seismic, should be reviewed for design calculations. The parameters for design calculations for the two conditions are presented below.

Lateral Earth Pressures

The static horizontal earth pressure (p_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained soil (0.5)
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the “at-rest” case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Earth Pressures

The total seismic force (P_{AE}) includes both the earth force component (P_o) and the seismic component (ΔP_{AE}).

The seismic earth force (ΔP_{AE}) can be calculated using $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45-a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32 g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5\ K_o\ \gamma\ H^2$, where $K_o = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2012.

5.7 Rock Anchor Design

Overview of Anchor Features

The geotechnical design of grouted rock anchors in sedimentary bedrock is based upon two possible failure modes. The anchor can fail either by shear failure along the grout/rock interface or a 60-to-90-degree pullout of rock cone with the apex of the cone near the middle of the bonded length of the anchor. Interaction may develop between the failure cones of anchors that are relatively close to one another resulting in a total group capacity smaller than the sum of the load capacity of each individual anchor.

A third failure mode of shear failure along the grout/steel interface should be reviewed by the structural engineer to ensure all typical failure modes have been reviewed.

The anchor should be provided with a bonded length at the base of the anchor which will provide the anchor capacity, as well an unbonded length between the rock surface and the top of the bonded length.

Permanent anchors should be provided with corrosion protection. As a minimum, the entire drill hole should be filled with cementious grout. The free anchor length is provided by installing a plastic sleeve to act as a bond breaker, with the sleeve filled with grout or a corrosion inhibiting mastic. Double corrosion protection can be provided with factory assembled systems, such as those available from Dywidag Systems or Williams Form Engineering Corp. Recognizing the importance of the anchors for the long-term performance of the foundation of the proposed building, the rock anchors for this project are recommended to be provided with double corrosion protection.

Grout to Rock Bond

The Canadian Foundation Engineering Manual recommends a maximum allowable grout to rock bond stress (for sound rock) of 1/30 of the unconfined compressive strength (UCS) of either the grout or rock (but less than 1.3 MPa) for an anchor of minimum length (depth) of 3 m. Generally, the UCS of sound limestone and shale is stronger than most routine grouts. A factored tensile grout to rock bond resistance value at ULS of 1.0 MPa, incorporating a resistance factor of 0.4, can be calculated. A minimum grout strength of 40 MPa is recommended.

Rock Cone Uplift

As discussed previously, the geotechnical capacity of the rock anchors depends on the dimensions of the rock anchors and the configuration of the anchorage system. Based on existing bedrock information, a Rock Mass Rating (RMR) of 65 was assigned to the bedrock, and Hoek and Brown parameters (m and s) were taken as 0.575 and 0.00293, respectively.

Recommended Rock Anchor Lengths

Parameters used to calculate rock anchor lengths are provided in Table 2 below:

Table 2 – Parameters used in Rock Anchor Review

Grout to Rock Bond Strength – Factored at ULS	1.0 MPa
Compressive Strength - Grout	40 MPa
Rock Mass Rating (RMR) – Good quality Limestone Hoek and Brown Parameters	65 m=0.575 and s=0.00293
Unconfined Compressive Strength – Limestone or Shale bedrock	40 MPa
Unit weight – Submerged Bedrock	15.5 kN/m^3
Apex angle of failure cone	60°
Apex of failure cone	Mid-point of fixed anchor length

The fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75 mm and 125 mm diameter hole are provided in Table 3 below. The factored tensile resistance values given in Table 3 are based on a single anchor with no group influence effects. A detailed analysis of the anchorage system, including potential group influence effects, could be provided once the details of the loading for the proposed building are determined.

Table 3 - Recommended Rock Anchor Lengths - Grouted Rock Anchor

Diameter of Drill Hole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	2.0	0.8	2.8	450
	2.6	1.0	3.6	600
	3.2	1.3	4.5	750
	4.5	2.0	6.5	1000
125	1.6	1.0	2.6	600
	2.0	1.2	3.2	750
	2.6	1.4	4.0	1000
	3.2	1.8	5.0	1250

Other considerations

The anchor drill holes should be within 1.5 to 2 times the rock anchor tendon diameter, inspected by geotechnical personnel and should be flushed clean prior to grouting. A tremie tube is recommended to place grout from the bottom of the anchor holes. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day that grout is prepared.

The geotechnical capacity of each rock anchor should be proof tested at the time of construction. More information on testing can be provided upon request. Compressive strength testing is recommended to be completed for the rock anchor grout.

5.8 Pavement Design

For design purposes, it is recommended that the rigid pavement structure for the lowest level of the underground parking structure should consist of Category C2, 32 MPa concrete at 28 days with air entrainment of 5 to 8%. The recommended rigid pavement structure is further presented in Table 4 below. The flexible pavement structure presented in Tables 5 and 6 should be used for exterior, at-grade parking and access lanes, respectively.

Table 4 - Recommended Rigid Pavement Structure - Lower Parking Level	
Thickness (mm)	**Material Description**
150	**Exposure Class C2 – 32 MPa Concrete** (5 to 8 % Air Entrainment)
300	**BASE** - OPSS Granular A Crushed Stone
SUBGRADE Fill or OPSS Granular B Type I or II or material placed over bedrock.	

To control cracking due to shrinking of the concrete floor slab, it is recommended that strategically located saw cuts be used to create control joints within the concrete floor slab of the lower underground parking level. The control joints are generally recommended to be located at the center of the column lines and spaced at approximately 24 to 36 times the slab thickness (for example, a 0.15 m thick slab should have control joints spaced between 3.6 and 5.4 m). The joints should be cut between 25 and 30% of the thickness of the concrete floor slab and completed as early as 4 hours after the concrete has been poured during warm temperatures and up to 12 hours during cooler temperatures.

For design purposes, the pavement structure presented in the following tables could be used for the design of exterior car parking areas and access lanes.

Table 5 – Recommended Pavement Structure – Car Only Parking Areas	
Thickness (mm)	**Material Description**
50	**Wear Course –** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE –** OPSS Granular A Crushed Stone
300	**SUBBASE –** OPSS Granular B Type II
Subgrade – Either fill, in-situ soil, or OPSS Granular B Type I or II material placed over in-situ soil, bedrock, or concrete fill.	

Table 6 – Recommended Pavement Structure – Access Lanes	
Thickness (mm)	**Material Description**
40	**Wear Course –** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course –** HL-8 or Superpave 19 Asphaltic Concrete
150	**BASE –** OPSS Granular A Crushed Stone
450	**SUBBASE –** OPSS Granular B Type II
Subgrade – Either fill, in-situ soil, or OPSS Granular B Type I or II material placed over in-situ soil, bedrock, or concrete fill.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable compaction equipment, nothing that excessive compaction can result in subgrade softening.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

For the proposed underground parking levels, it is anticipated that the building foundation walls will be placed in close proximity to the site boundaries. Therefore, it is recommended that the foundation walls be blind poured against a composite drainage board, such as Delta Drain 6000 or approved equivalent, which is fastened to the bedrock face or temporary shoring system.

For the lower portion of the foundation walls, the following is recommended:

- ❑ Line drill the excavation perimeter.
- ❑ Hoe ram any irregularities and prepare the bedrock surface. Shotcrete areas to fill in cavities and smooth out angular features at the bedrock surface, as required based on site inspections by Paterson.

It is recommended that 150 mm diameter sleeves at 3 m centres be cast in the foundation wall at the perimeter footing interface to allow for the infiltration of water to flow to an interior perimeter sub-slab drainage pipe. The perimeter drainage pipe should direct water to the sump pit within the lower basement area.

A waterproofing system should also be provided for the elevator pits (pit bottom and walls).

Sub-Slab Drainage

Sub-slab drainage will be required to control water infiltration under the lowest level floor slab. For preliminary design purposes, we recommend that 150 mm diameter perforated PVC pipes be placed at 6 m centres. The spacing of the sub-slab drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.

Foundation Backfill

Where space is available for conventional wall construction, backfill against the exterior sides of the foundation walls should consist of free-draining, non-frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geocomposite, such as Delta Drain 6000, connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation, should be provided in this regard.

Other exterior unheated footings, such as those for isolated exterior columns, are more prone to deleterious movement associated with frost action. These should be provided with a minimum 2.1 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation.

The foundations for the underground parking levels are expected to have sufficient frost protection due to the founding depth. However, it has been our experience that insufficient soil cover is typically provided at entrance ramps to underground parking garages. Paterson requests permission to review design drawings prior to construction to ensure proper frost protection is provided in these areas.

6.3 Excavation Side Slopes

The side slopes of excavations in the overburden materials should be either cut back at acceptable slopes or should be retained by temporary shoring systems from the start of the excavation until the structure is backfilled.

Unsupported Excavations

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsurface soil at this site is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

Bedrock Stabilization

Excavation side slopes in sound bedrock can be carried out using almost vertical side walls. A minimum 1 m horizontal ledge should be left between the bottom of the overburden excavation and the top of the bedrock surface to provide an area to allow for potential sloughing or to provide a stable base for the overburden shoring system.

Horizontal rock anchors and chainlink fencing are anticipated to be required over the upper 2 to 3 m of the vertical bedrock face, which is generally of lower quality, to prevent pop-outs of the bedrock, especially in areas where bedrock fractures are conducive to the failure of the bedrock surface.

However, the specific requirements for bedrock stabilization measures should be evaluated during the excavation operations and should be discussed with the structural engineer during the design stage.

Temporary Shoring

Temporary shoring will be required for the overburden soil to complete the required excavations where insufficient room is available for open cut methods. The shoring requirements designed by a structural engineer specializing in those works will depend on the depth of the excavation, the proximity of the adjacent structures and the elevation of the adjacent building foundations and underground services. It is the responsibility of the shoring contractor to ensure that the temporary shoring system is in compliance with safety requirements, designed to avoid any damage to adjacent structures and include dewatering control measures.

In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes.

The design and implementation of these temporary systems will be the responsibility of the excavation contractor and their design team. Inspections and approval of the temporary system will also be the responsibility of the designer.

Geotechnical information provided below is to assist the designer in completing a suitable and safe shoring system. The designer should take into account the impact of a significant precipitation event and designate design measures to ensure that a precipitation will not negatively impact the shoring system or soils supported by the system. Any changes to the approved shoring design system should be reported immediately to the owner's structural design prior to implementation.

The temporary shoring system could consist of a soldier pile and lagging system or steel sheet piles. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be included to the earth pressures described below. This system could be cantilevered, anchored or braced. The shoring system is recommended to be adequately supported to resist toe failure, if required, by means of extending the piles into the bedrock through pre-augered holes, if a soldier pile and lagging system is the preferred method.

The earth pressures acting on the temporary shoring system may be calculated with the following parameters.

Table 7 – Soils Parameter for Shoring System Design

Parameters	Values
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-Rest Earth Pressure Coefficient (K_O)	0.5
Unit Weight (g), kN/m^3	20
Submerged Unit Weight (g), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight is calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil/bedrock should be calculated full weight, with no hydrostatic groundwater pressure component.

Generally, it is expected that the shoring system will be provided with tie-backs rock anchors to ensure their stability. However, tie backs may encounter highly fractured shale bedrock for the upper several meters. As a result, extra cementitious grout may be required for the tie backs due to open fractures.

For design purposes, the minimum factor of safety of 1.5 should be calculated.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on soil subgrade. If the bedding is placed on bedrock, the thickness of the bedding should be increased to 300 mm for sewer pipes. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the SPMDD. The bedding should extend at least to the spring line of the pipe.

The cover material, from the spring line to at least 300 mm above the obvert of the pipe, should consist of OPSS Granular A. The bedding and cover materials should be placed in maximum 300 mm thick lifts compacted to a minimum of 99% of the material's standard Proctor maximum dry density (SPMDD).

Any stones greater than 200 mm in their longest dimension should be removed from these materials prior to placement. Well fractured bedrock should be acceptable as backfill for the lower portion of the trenches when the excavation is within bedrock provided the rock fill is placed only from at least 300 mm above the top of the service pipe and that all stones are 300 mm or smaller in their longest dimension.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to reduce potential differential frost heaving. The backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

6.5 Groundwater Control

Groundwater Control for Building Construction

Based on our observations, it is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps and pumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

Permit to Take Water

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

Impacts on Neighboring Properties

Due to the relatively shallow bedrock present at this site and in the general area, no adverse effects to the neighbouring properties are expected as a result of dewatering which may be required for the subject site.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project.

The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

Precautions must be taken where excavations are carried in proximity of existing structures which may be adversely affected due to the freezing conditions. In particular, it should be recognized that where a shoring system is used, the soil behind the shoring system will be subjected to freezing conditions and could result in heaving of the structure(s) placed within or above frozen soil.

Provisions should be made in the contract document to protect the walls of the excavations from freezing, if applicable.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a moderate to aggressive corrosive environment.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

- ❑ Review of the geotechnical aspects of the excavating program, prior to construction.
- ❑ Review of waterproofing details for elevator shafts and building sump pits.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Periodic observation of the condition of the vertical bedrock face during excavation.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations provided herein are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than SerCo Realty Group or their agents is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Fernanda Carozzi PhD. Geoph.

Scott S. Dennis, P.Eng.

Report Distribution:

- ❑ SerCo Realty Group (email copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

BOREHOLE LOGS BY OTHERS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
337 & 345 Montgomery Street and 94 Selkirk Street
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5952

REMARKS

HOLE NO. BH 1-21

BORINGS BY CME-55 Low Clearance Drill **DATE** September 10, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.05		AU	1			0	57.42		
FILL: Dark brown silty sand with crushed stone and gravel, trace clay, concrete and brick		AU	2						
1.07		SS	3	71	19	1	56.42		
		SS	4	78	50+				
GLACIAL TILL: Compact to very dense, brown silty sand with gravel, cobbles and boulders		SS	5	40	50+	2	55.42		
2.95									
End of Borehole									
Practical refusal to augering at 2.95m depth									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
337 & 345 Montgomery Street and 94 Selkirk Street
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5952

REMARKS

HOLE NO. BH 2-21

BORINGS BY CME-55 Low Clearance Drill **DATE** September 9, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.08		AU	1			0	57.58		
		SS	2			1	56.58		
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles and boulders		SS	3		76	2	55.58		
		SS	4		50+				
		RC	1	28		3	54.58		
4.60						4	53.58		
		RC	2	50	50	5	52.58		
BEDROCK: Fair to excellent quality, grey interbedded limestone and shale						6	51.58		
		RC	3	98	82	7	50.58		
		RC	4	100	90	8	49.58		
9.04						9	48.58		
End of Borehole									
(GWL @ 6.20m - Sept. 16, 2021)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
337 & 345 Montgomery Street and 94 Selkirk Street
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5952

REMARKS

HOLE NO. BH 3-21

BORINGS BY CME-55 Low Clearance Drill **DATE** September 10, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.02		AU	1			0	57.75		
FILL: Dark brown silty sand with crushed stone and gravel 0.20		AU	2						
		SS	3	8	14	1	56.75		
GLACIAL TILL: Compact to very dense, brown silty sand to sandy silt with gravel, cobbles and boulders		SS	4	82	50+	2	55.75		
		SS	5	67	50+				
3.05						3	54.75		
End of Borehole									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
337 & 345 Montgomery Street and 94 Selkirk Street
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5952

REMARKS

HOLE NO. BH 4-21

BORINGS BY CME-55 Low Clearance Drill **DATE** September 10, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.02		AU	1			0	57.83		
		AU	2						
FILL: Dark brown silty sand with crushed stone and gravel, trace clay 1.07		SS	3	62	20	1	56.83		
		SS	4	0	50+				
GLACIAL TILL: Compact to very dense, brown silty sand to sandy silt with gravel, cobbles and boulders		SS	5	44	50+	2	55.83		
3.25		SS	6	40	50+	3	54.83		
End of Borehole									
Practical refusal to augering at 3.25m depth									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
337 & 345 Montgomery Street and 94 Selkirk Street
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5952

REMARKS

HOLE NO. BH 5-21

BORINGS BY CME-55 Low Clearance Drill **DATE** September 9, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.08						0	57.86		
FILL: Brown silty sand with crushed stone and gravel 0.60		AU	1						
		SS	2	33	45	1	56.86		
GLACIAL TILL: Dense to very dense, brown silty sand with gravel, cobbles and boulders		SS	3	25	50+	2	55.86		
		SS	4	42	66				
3.53		SS	5	43	50+	3	54.86		
		RC	1	78	73	4	53.86		
		RC	2	95	54	5	52.86		
BEDROCK: Fair quality, grey interbedded limestone and shale						6	51.86		
		RC	3	95	53	7	50.86		
		RC	4	100	75	8	49.86		
9.12						9	48.86		
End of Borehole									
(GWL @ 6.72m - Sept. 16, 2021)									

Shear Strength (kPa) (20 40 60 80 100)
▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
337 & 345 Montgomery Street and 94 Selkirk Street
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5952

REMARKS

HOLE NO. BH 6-21

BORINGS BY CME-55 Low Clearance Drill **DATE** September 10, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.05		AU	1			0	57.69		
FILL: Brown silty sand with crushed stone and gravel 0.23		AU	2						
FILL: Brown silty sand with clay, crushed stone, gravel and glass fragments 0.91		SS	3	52	55	1	56.69		
GLACIAL TILL: Very dense, dark brown silty sand to sandy silt with gravel, cobbles and boulders, trace clay		SS	4	67	71	2	55.69		
		SS	5	62	50+				
3.20		SS	6	29	50+	3	54.69		
End of Borehole									
Practical refusal to augering at 3.20m depth									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

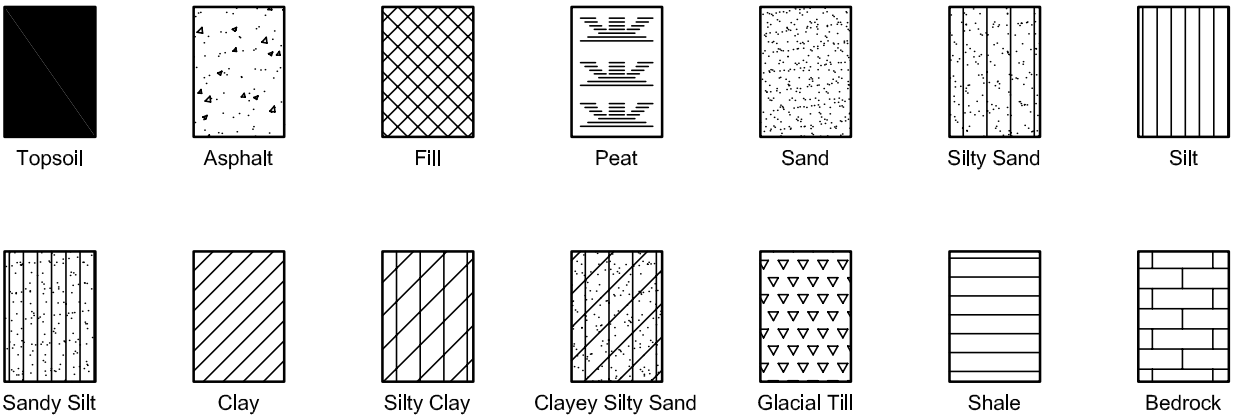
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

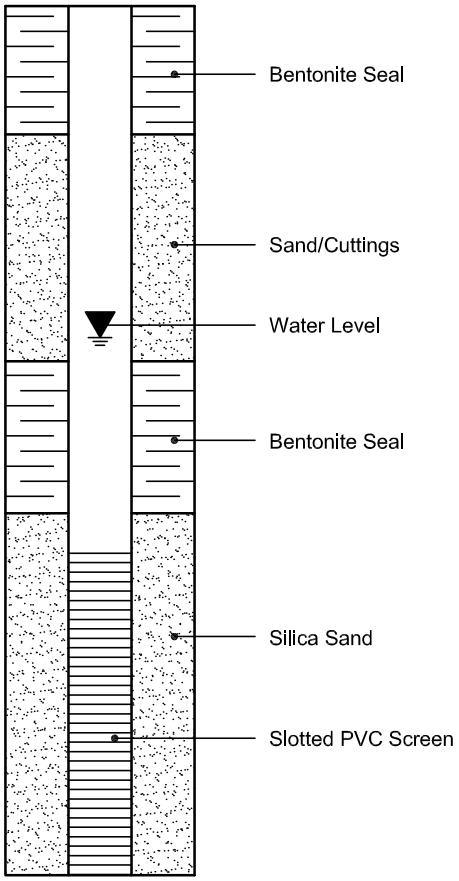
SYMBOLS AND TERMS (continued)

STRATA PLOT

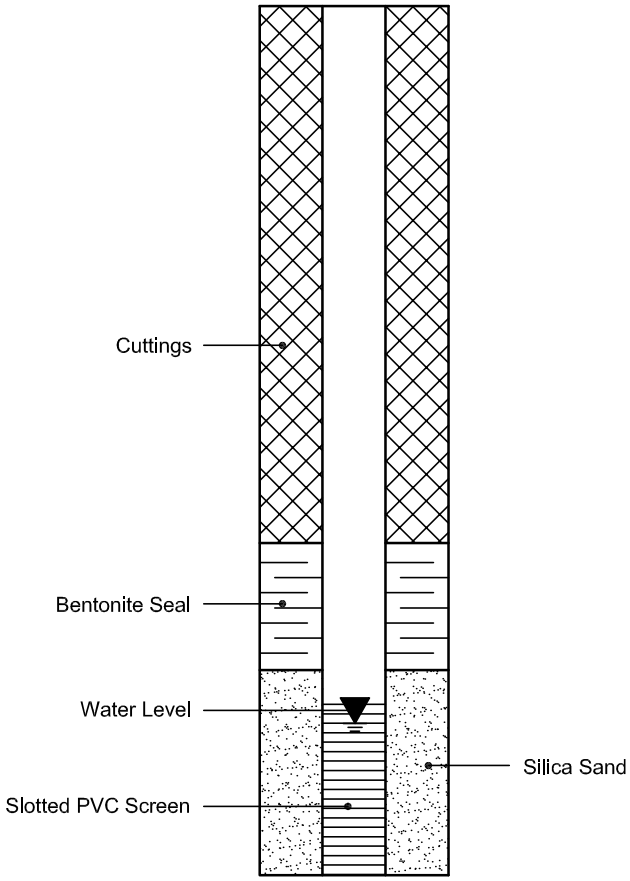


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Log of Borehole BH1

Project No: OTT-00252128-A0

Project: Apartment Building

Location: 337 Montgomery Street, Ottawa, Ontario

Date Drilled: 'April 4, 2019

Drill Type: CME45 Track Mounted Drill Rig

Datum: Approximate Elevation

Logged by: MAD Checked by: SMP

Figure No. 3

Page. 1 of 1

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Approximate Elevation m	Depth
		ASPHALTIC CONCRETE ~ 12 mm	57.64	0
		GRANULAR FILL (BASE) ~ 250 mm Crushed gravel with silt and sand, grey, damp, no odours, no stains	57.6 / 57.3	
		FILL Silty sand with gravel, reddish brown mottling, brown, damp, no odours, no stains, (compact)	56.8	1
		GLACIAL TILL Silty sand with gravel, shale fragments, cobbles, boulders, dark brown to black, moist, no odours, no stains, (dense to very dense)		2
			54.04	3
				4
			52.5	5
		SHALE BEDROCK Rubble-filled rock seams, mud seams, near vertical fractures, dark grey to black, (very poor to good quality)		6
		Weathered from 5.1m to 5.3 m depths		7
				8
			48.5	9
		Borehole Terminated at 9.1 m Depth		

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	Test Values
SS1		13, 5
SS2		40, 5
SS3	22.1	42, 5
SS4	24.3	44, 5
SS5		49, 5
SS6		87, 20
SS7		47, 5
Run 1		
Run 2		
Run 3		

LOG OF BOREHOLE LOGS OF BOREHOLES MONTGOMERY - APRIL 2019.GPJ TROW OTTAWA.GDT 6/11/19

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 mm diameter monitoring well installed in the borehole as shown.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00252128-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
12 days	3.6	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	5.1 - 6.1	100	19
2	6.1 - 7.6	100	78
3	7.6 - 9.1	100	78

Log of Borehole BH2

Project No: OTT-00252128-A0

Project: Apartment Building

Location: 337 Montgomery Street, Ottawa, Ontario

Date Drilled: 'April 4 and 5, 2019

Drill Type: CME45 Track Mounted Drill Rig

Datum: Approximate Elevation

Logged by: MAD Checked by: SMP

Figure No. 4

Page. 1 of 1

Split Spoon Sample ⊠ | Auger Sample ▮▯ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Approximate Elevation m	Depth
		ASPHALTIC CONCRETE ~ 150 mm	57.95	0
		GRANULAR FILL (BASE) ~ 125 mm Crushed gravel with silt and sand, grey, damp, no odours, no stains	57.8	
		FILL Silty sand with gravel, roots, reddish brown mottling, brown, moist, no odours, no stains, (compact)	57.7	
		GLACIAL TILL Silty sand with gravel, cobbles, boulders, dark brown to black, moist, no odours, no stains, (dense)	56.6	1
		DIfficult augering (augers grinding) from 3.2 m to 3.6 m depths	54.75	2
		Cobbles and boulders from 3.6 m to 5.2 m depths		3
		SHALE BEDROCK Weathered, dark grey to black, (very poor quality)	52.8	4
		Borehole Terminated at 6.2 m Depth	51.8	5
				6

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES | Natural Unit Wt. kN/m³

17 | 10 | AS1/SS2

12 | 5 | SS3

50 | 25 | SS4 22.5

50/125 mm | 15 | SS5

70/200 mm | 10 | SS6

Run 1

Run 2

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 mm diameter monitoring well installed in the borehole as shown.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00252128-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
12 days	3.2	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.6 - 3.9		
2	3.9 - 6.2	43	5

LOG OF BOREHOLE LOGS OF BOREHOLES MONTGOMERY - APRIL 2019.GPJ TROW OTTAWA.GDT 6/11/19

Log of Borehole BH3

Project No: OTT-00252128-A0

Project: Apartment Building

Location: 337 Montgomery Street, Ottawa, Ontario

Date Drilled: 'April 5, 2019

Drill Type: CME45 Track Mounted Drill Rig

Datum: Approximate Elevation

Logged by: MAD Checked by: SMP

Figure No. 5

Page. 1 of 1

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content ✕ | Atterberg Limits |—○— | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Approximate Elevation m	Depth
		TOPSOIL ~ 150 mm	57.82	0
		FILL	57.7	
		Silty sand with gravel, roots, brown to dark brown, moist, no odours, no stains, (loose)	57.1	
		GLACIAL TILL		1
		Silty sand with gravel, cobbles, boulders, dark brown to black, moist, no odours, (loose to compact)		
				2
		Difficult augering (augers grinding) from 2.4 m to 3.1 m depths		
		Cobbles and boulders from 3.1 m to 6.0 m depths	54.62	3
				4
				5
			51.8	6
		SHALE BEDROCK	51.6	
		Weathered, dark grey to black		
		Borehole Terminated at 6.2 m Depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength: 50 100 150 200 kPa

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SPT values: 7, 7, 24, 59/280mm

Combustible Vapour Reading values: 10, 15, 15, 10

SAMPLES	Natural Unit Wt. kN/m³
AS1/SS1	
SS2	
SS3	
SS4	
Run 1	
Run 2	
Run 3	
Run 4	

LOG OF BOREHOLE LOGS OF BOREHOLES MONTGOMERY - APRIL 2019.GPJ TROW OTTAWA.GDT 6/11/19

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 mm diameter monitoring well installed in the borehole as shown.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00252128-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
11 days	3.2	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.1 - 3.8		
2	3.8 - 4.6		
3	4.6 - 5.4		
4	5.4 - 6.2		

Certificate of Analysis

Report Date: 20-Sep-2021

Client: Paterson Group Consulting Engineers

Order Date: 14-Sep-2021

Client PO: 33141

Project Description: PG5952

	Client ID:	BH4-21 SS5	-	-	-
	Sample Date:	10-Sep-21 12:00	-	-	-
	Sample ID:	2138240-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	95.1	-	-	-
General Inorganics					
pH	0.05 pH Units	7.87	-	-	-
Resistivity	0.10 Ohm.m	36.3	-	-	-
Anions					
Chloride	5 ug/g dry	57	-	-	-
Sulphate	5 ug/g dry	45	-	-	-

APPENDIX 2

FIGURE 1 – KEY PLAN

FIGURES 2 & 3 – SEISMIC SHEAR WAVE VELOCITY PROFILES

DRAWING PG5952-1 – TEST HOLE LOCATION PLAN

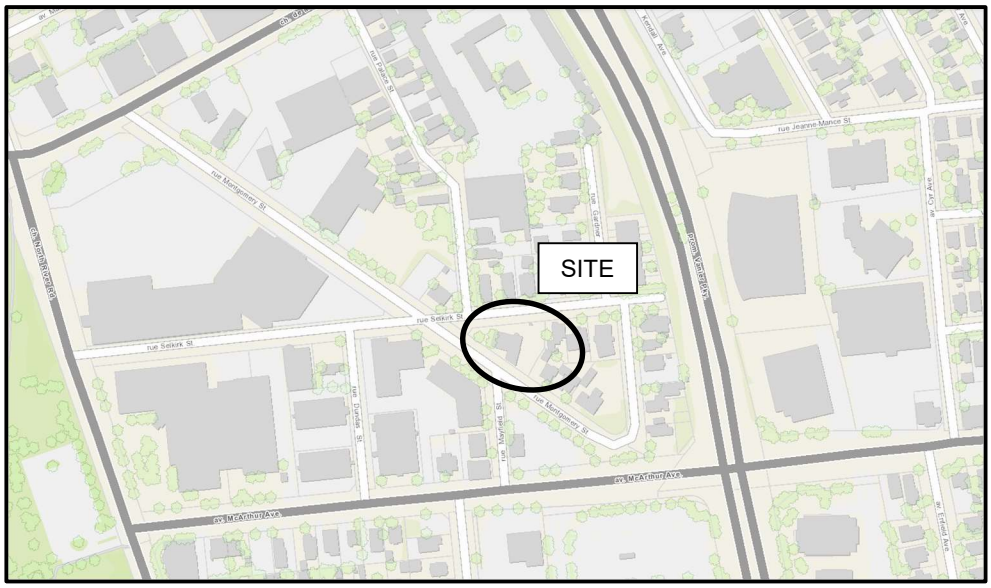


FIGURE 1

KEY PLAN

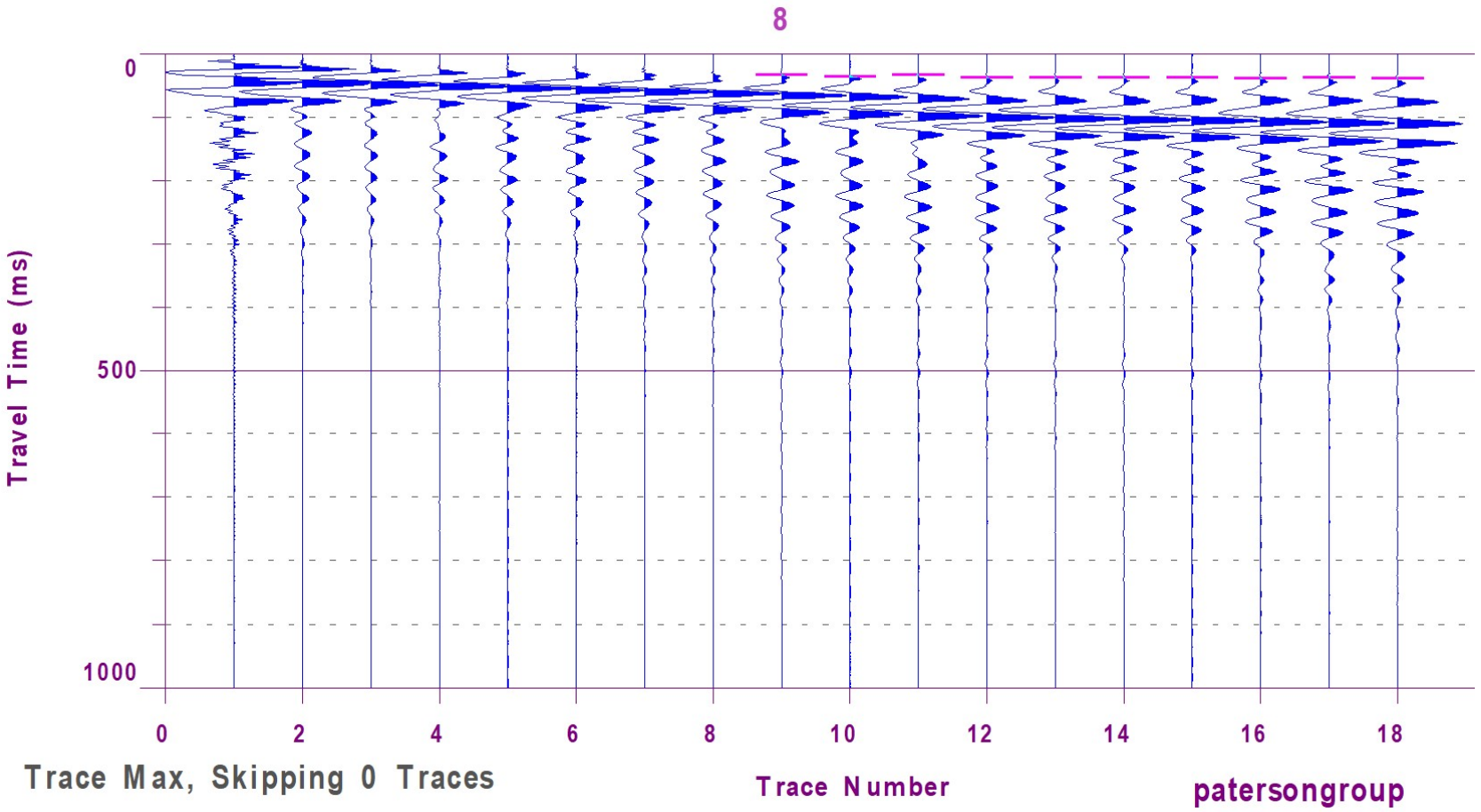


Figure 2 – Shear Wave Velocity Profile at Shot Location -1 m

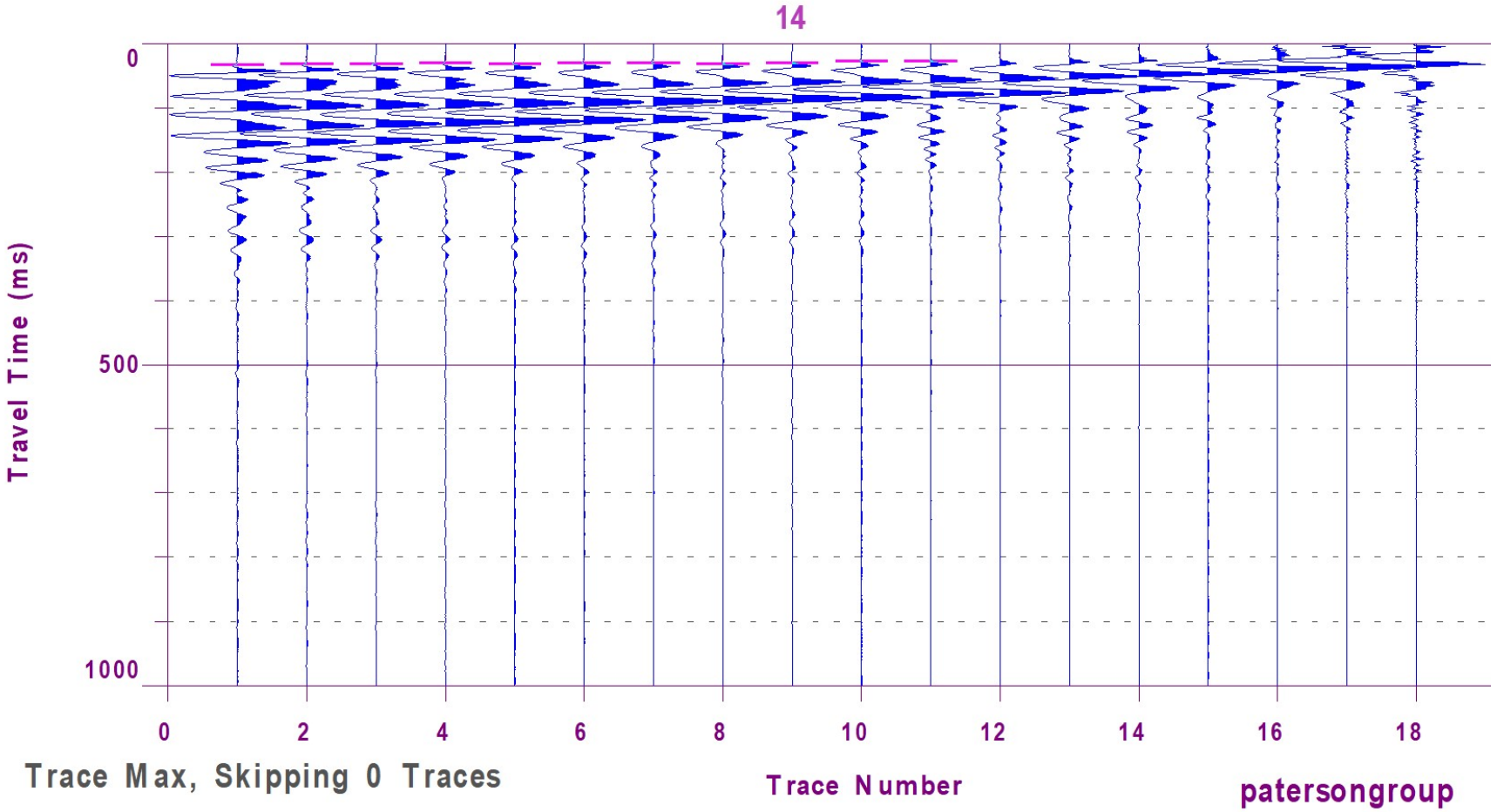
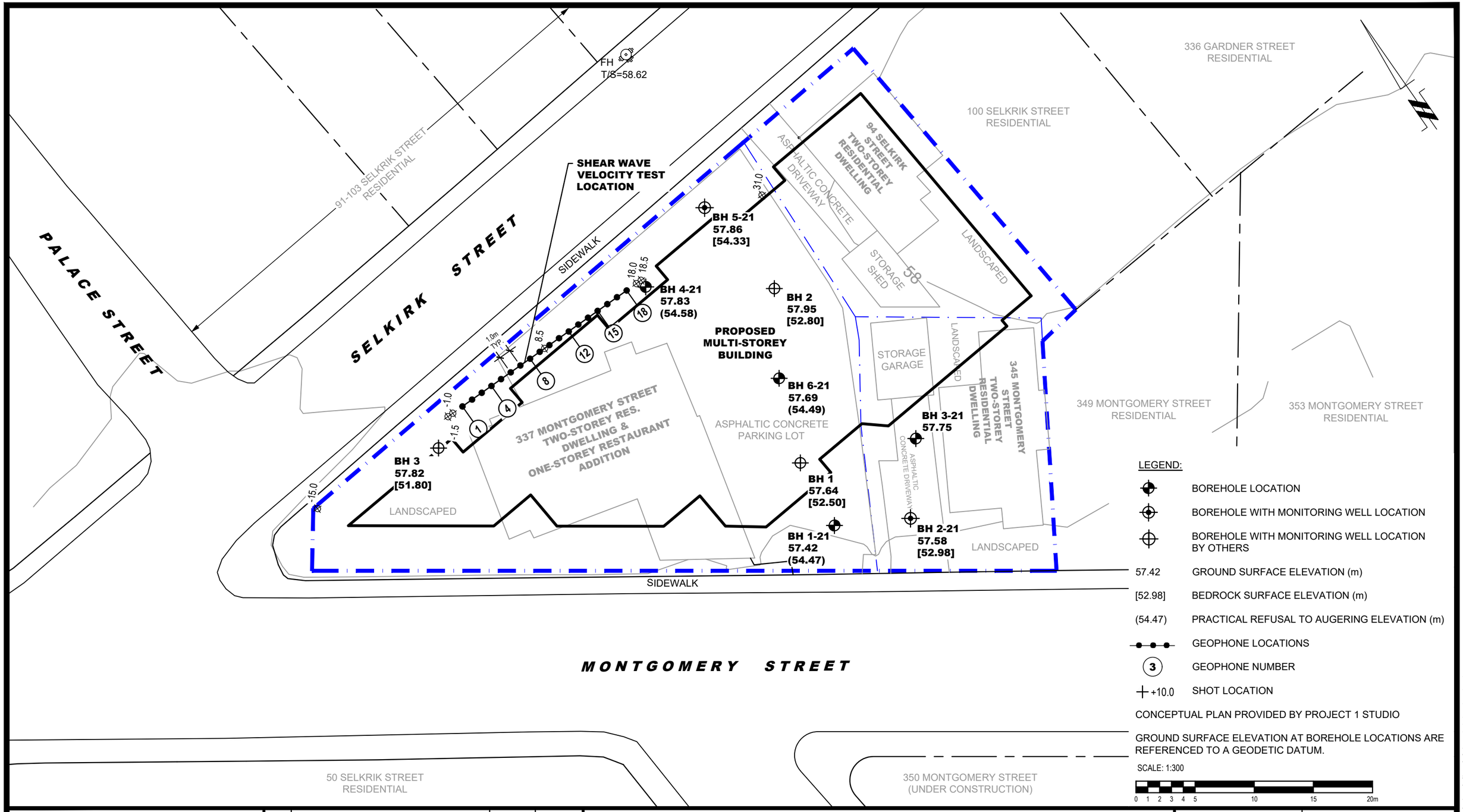


Figure 3 – Shear Wave Velocity Profile at Shot Location 1.5 m



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION BY OTHERS
- 57.42 GROUND SURFACE ELEVATION (m)
- [52.98] BEDROCK SURFACE ELEVATION (m)
- (54.47) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- GEOPHONE LOCATIONS
- (3) GEOPHONE NUMBER
- +10.0 SHOT LOCATION

CONCEPTUAL PLAN PROVIDED BY PROJECT 1 STUDIO

GROUND SURFACE ELEVATION AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:300

0 1 2 3 4 5 10 15 20m

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

SERCO REALTY GROUP
GEOTECHNICAL INVESTIGATION
PROPOSED MULTI-STOREY BUILDING
OTTAWA, 337 AND 345 MONTGOMERY STREET AND 94 SELKIRK STREET ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:300	Date: 09/2021
Drawn by: YA	Report No.: PG5952-1
Checked by: FC	Dwg. No.: PG5952-1
Approved by: SD	Revision No.:

p:\autocad drawings\geotechnical\pg59xx\pg5952\pg5952-1-test hole location plan.dwg

Appendix F DRAWINGS