June 27, 2024 *CCO-18-0534*

Silver Hotel Group
Suite 100, 5830 Campus Road, Mississauga, ON K2G 6J8
Attn: Jay Patel

RE: Geotechnical Investigation and Design Recommendation Report Supplementary – Proposed Retaining Wall – 1305 Maritime Way, Ottawa, ON

Egis Canada Ltd. (former McIntosh Perry Consulting Engineers Ltd.) was retained by Silver Hotel Group (Client) to assess the proposed retaining wall structure and the slope stability for the site development at the property known as 1305 Maritime Way, Ottawa, ON.

The updated Grading, Drainage and Sediment and Erosion Control Plan dated February 7, 2024, was reviewed. This memorandum serves to augment the previous geotechnical design memo and Geotechnical Investigation and Design Recommendation Reports submitted January 2022 and April 2021 respectively. This memo presents the review of regional geology and geotechnical conditions, the site final grade design, retaining wall and slope stability analyses, and geotechnical design recommendations.

1.0 SITE GEOLOGY AND GEOTECHNICAL CONDITION

Based on published physiography maps of the area (Ontario Geological Survey), the site is located within the Ottawa Valley Clay Plains. Surficial geology maps of southern Ontario indicate the site is underlain by Precambrian Bedrock, with expected shallow elevation of bedrock, surrounded by fine-textured glaciomarine deposits and organic deposits. Glaciomarine deposits in this region are predominantly quiet water silt and clay deposited in post glaciation lakes.

The Ottawa Valley between Pembroke and Hawkesbury, Ontario, consists of clay plains interrupted by ridges of rock or sand. It is naturally divided into two parts, above and below Ottawa, Ontario. Within the valley, the bedrock is further faulted so that some of the uplifted blocks appear above the clay beds. The sediments themselves in the valley are deep silty clay. Although the clay deposits are grey in color like the limestones that underlie them in part, they are only mildly calcareous and likely derived from the more acidic rock of the Canadian Shield.

Bedrock geology maps show Clastic metasedimentary rocks, Conglomerate, wacke, quartz arenite, arkose, limestone, siltstone, chert, minor iron formation, minor metavolcanic rocks of Grenville Supergroup and Flinton Group.

Based on seven boreholes information, the site stratigraphy consists of various layers of topsoil, clayey silt and sand, silty sand, and gravelly sand, followed by bedrock, which extends to the maximum depth of investigation in borehole 20-1. Bedrock was cored at three boreholes, BH20-1 through BH20-3, once refusal to auger drilling was encountered. The rock is sedimentary and metasedimentary bedrock.

A monitoring well was installed in borehole BH20-7. The groundwater table was monitored on the following date:

Borehole	Monitoring Date	Surface El. (m)	Groundwater Depth (m)	Water Table El. (m)
BH20-7	2020-05-27	100.0	1.64	98.3

2.0 EARTHQUAKE CONSIDERATION

The earthquake ground motion parameters for the project site are estimated from the 2020 National Building Code (NBC) of Canada Seismic Hazard Calculation.

Based on the subsurface condition and field and SPT values, the site can be classified as Seismic Site Class C supported on the bedrock, using either spread footings or caissons and Site Class D supported on the soil layers.

Based on the site geotechnical condition, the seismic hazard level can be classified as Class D for the project site, a PGA of 0.238g is estimated corresponding to an earthquake having 5 percent probability of exceedance in 50 years (i.e., a return period of 975 years). For slope stability analysis under earthquake load (i.e., pseudo-static analysis), a horizonal PGA of 0.159g (above 1/2 of full PGA) is used. In addition, considering a low seismic level at the project site, the liquefaction is not an issue at this site. The details of Seismic Hazard Calculation form 2020 NBC are shown in the attachments to this memorandum.

3.0 SLOPE STABILITY ANALYSIS

3.1 Methodology

Stability analyses for the proposed retaining wall structure around the building were carried out using the available data. The two critical cross sections A-A' and B-B' for proposed retaining wall are identified based on the final design grades, which are shown in the attachments. The analyses were performed using the computer program GeoStudio Slope/W Version 23. The subgrade profile for the project site is based on the geotechnical data in McIntosh Perry geotechnical report on April 2021.

The soil parameters used in the analysis are given in Table 3a.

The following two scenarios were assessed in the slope stability analyses:

- Static condition: Effective stress analysis during long-term operation.
- Pseudo-Static Conditions: the dynamic loading conditions during an earthquake.

Table 3-1: Geotechnical Model Parameters

He Soil Type	Total Unit Weight (kN/m^3)	Pseudo-Static Conditions (Seismic)		Static Conditions	
		Undrained Shear Strength, S_u (kPa)	Friction Angle, ϕ	Drained Cohesion, c' (kPa)	Friction Angle, ϕ'
Silty Sand to Sand	18.5	0	30	0	30
Gravelly Silty Sand	19.0	0	32	0	32
Bedrock	24.0	200	30	200	30
Retaining Wall	24.0	200	0	200	0

Based on the our Geotechnical Report on April 2021, the groundwater level was measured at elevation 98.3m.

3.2 Results

Table 3b summarizes the calculated factors of safety (FOS) at the three critical retaining wall sections under various loading conditions. Based on the results, the calculated factors of safety meet the design requirement in all loading conditions. The details of the critical slip surface and FOSs are shown in the attachment.

The Factor of Safety under both loading conditions meet the minimum factor of safety requirements as per the City of Ottawa Slope Stability Guidelines for Development Applications (2012).

Table 3-2: Summary of Global Stability Analyses Results at The Proposed Two Retaining Wall Sections

Section	Case Study	Calculated Factor of Safety	Required Factor of Safety
A - A'	Static Analysis with normal surcharge loading	2.23	1.5
	Earthquake loading (Pseudo-Static Analysis)	1.61	1.0
B – B'	Static Analysis with normal surcharge loading	1.68	1.5
	Earthquake loading (Pseudo-Static Analysis)	1.29	1.0
C - C'	Static Analysis with normal surcharge loading	1.70	1.5
	Earthquake loading (Pseudo-Static Analysis)	1.29	1.0

For 4m high retaining wall at Section C-C', the footing of retaining wall should be placed on engineered fill pad. The engineered fill should be constructed of an OPSS 1010 Granular A leveling pad placed over a competent bedrock surface. The pad should be a minimum of 0.3 m thick and extend a minimum of 1.0 m beyond the edge of the footings and slope downwards at 1H:1V. Prior to placement of the granular pad, the exposed surface in the footing areas should be inspected and improved as necessary.

The calculated Factor of Safety based on assumed surcharge loading 12kPa. The computed factor of safety presented in Table 3-2 at the three critical retaining wall sections are considered to be adequate and satisfies the MNR Policy Guidelines and industry standard practice.

4.0 RETAINING WALL CONCLUSIONS

Based on the assessment above, the following conclusions can be made:

- The Factor of Safety of the proposed retaining wall structure and the slope stability meet design criteria for all the loading cases at the end of construction and during long-term operation.
- The backfill material is assumed to be reuse of the excavated native silt clay without organic content. As such the side slopes should be provided with adequate erosion protection against surface water runoff. Proper erosion control measures should be implemented, which can be achieved by prompt seed and cover (OPSS 804) or sodding (OPSS 803).
- The retaining wall structure and slope stability may need to be reassessed if the final grade is revised and/or different material is used for the backfill.

5.0 BLASTING

Bedrock excavation will require pneumatic or hydraulic breakers such as hoe-rams or heavy rock excavation equipment capable of breaking and ripping sound bedrock. Alternatively, controlled blasting techniques may need to be used, subject to the bylaws and blasting restrictions that are in effect for the area. Designers are referred to the OPSS.MUNI 120 specifications for the use of explosives. In general, these documents require a blasting plan to be prepared by a blasting engineer. They also require conducting pre-blast surveys on nearby buildings, utilities, structures, water wells, and facilities likely to be affected by the blast. Vibration monitoring during the blasting in nearby structures or infrastructure is required. The structural engineer shall indicate the maximum allowable PPV tolerance for the adjacent buildings, and this information shall be included in the contract drawings.

Safety precautions taken during all blasts are as follows:

- Blasting followings established federal, provincial, and municipal laws and regulations governing the use of commercial explosives and blasting safety;

- All blasts are carried out with active vibrational monitoring to ensure that industry standard safety limits are met;
- All blasts will be matted with standard rubber blasting mats to prevent the possibility of fly rock and to protect the surrounding public, workers, properties, structures, and utilities;
- During work hours, the blaster-in-charge shall control who enters the site;
- All blasting shall be carried out during working hours Monday to Friday; and
- Standard blasting sirens, including an all-clear siren will be sounded prior to initiation and following the completion of each blast. The blasting siren shall be capable of alerting workers and the public to a radius of 1 km in accordance with Ontario provincial standard (OPSS.MUNI 120).

6.0 SITE PLAN

The geotechnical site plan issued on Feb 07 2024, was revied and minor variations were observed in comparisons to the previous site plan. The changes are noted to be minor and there are no observed conflicts with the recommendations of the geotechnical report.

We hope that the information provided herein is useful and that it suits your purpose at this time. Feel free to contact the undersigned should you have any questions or concerns.

Sincerely,

Michelle Wang, MSc.,P.Eng.
Geotechnical Engineer

Philip Almond, P.Eng.
Manager, Geotechnical