



Geotechnical
Engineering

Environmental
Engineering

Hydrogeology

Geological
Engineering

Materials Testing

Building Science

Noise & Vibration Studies

Displacement Monitoring Plan

Proposed High-Rise Building
1040 Somerset Street West
Ottawa - Ontario

Prepared For

Claridge Homes

Paterson Group Inc.

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February 7, 2022

Report: PG2674-MEMO.12
Revision 1

to:	Claridge Homes - Mr. Shawn Malhotra - shawn.malhotra@claridgehomes.com
re:	Displacement Monitoring Plan Proposed High-Rise Building - 1040 Somerset Street West - Ottawa
date:	February 7, 2022
file:	PG2674-MEMO.12 Revision 1
from:	Scott S. Dennis

Further to your request and authorization, Paterson Group (Paterson) prepared a displacement monitoring plan for adjacent City of Ottawa infrastructure during the construction of the proposed high-rise building to be located at the aforementioned site. Specifically, this memo provides details for settlement monitoring of the 1,372 mm diameter watermain, located underlying Breezehill Avenue, and displacement monitoring of the west retaining wall of the Somerset Street overpass abutment, located at the northern boundary of the site. This memo should be read in conjunction with the Geotechnical Investigation Report (Paterson Group Report PG2674-2 Revision 4 dated October 4, 2021) and the Construction Methodology Report for the Protection of City Infrastructure (Paterson Group Memo PG2674-MEMO.07 Revision 5 dated February 2, 2022).

A vibration monitoring program for the watermain and retaining wall has been prepared by Explotech Engineering Ltd. (Explotech), and will be provided under separate cover.

1.0 Geotechnical Conditions

Paterson completed a geotechnical investigation for the proposed high-rise building to assess the geotechnical conditions at the aforementioned site. As discussed in the above-noted Geotechnical Investigation Report, the subsurface profile within the subject site generally consists of the following (in sequence):

- Approximately 3.0 to 5.9 m of surficial fill material.
- A stiff to firm silty clay deposit ranging in thickness from 0.9 to 5.0 m.
- A glacial till deposit ranging in thickness from 5.5 to 5.8 m.
- Interbedded limestone and shale bedrock was encountered at depths ranging from 13.7 to 14.1 m below the existing grade.
- The groundwater level was measured at a depth of approximately 3.2 to 10.0 m below existing grade.

It is our understanding that the excavation for the proposed high-rise building will extend approximately 21 to 24 m below the existing ground surface to accommodate the underground parking levels.

2.0 Displacement/Settlement Monitoring

During the excavation program, the following items will require displacement/settlement monitoring:

- Settlement monitoring of the existing watermain.
- Settlement/displacement monitoring of the adjacent bridge abutment retaining wall structure.

2.1 Proposed Configuration and Locations - Watermain

Two (2) settlement monitoring points will be installed directly on top of the 1,372 mm diameter watermain for monitoring settlement. Further, it is recommended that two (2) inclinometers be installed adjacent to the watermain and the west shoring face for monitoring lateral deflection. The proposed locations of the settlement monitoring points and inclinometers are shown on the attached Figure 1.

The settlement monitoring points shall consist of a length of 35 mm x 35 mm standard steel bar within a 200 mm diameter corrugated plastic sleeve. An approximately 50 mm thick concrete levelling pad shall be poured directly over the watermain, followed by the placement of a 100 mm x 100 mm x 12 mm steel plate which shall be cast into the top of the concrete levelling pad. The annular spaces between the hydro-vac hole and sleeve pipe will be filled with bentonite. These settlement monitoring points shall be used to monitor vertical displacement (settlement) only. A detail of the settlement monitoring points for the watermain is illustrated on the attached Figure 2.

The settlement monitoring points will be removed at the completion of construction. Rods, survey targets, and sleeve pipes shall be removed and the remaining hole backfilled with bentonite pellets and sand.

The inclinometer casing will consist of 70 mm diameter, PVC or ABS resin pipe, and will be installed to the bedrock surface.

2.2 Proposed Configuration and Locations - Retaining Wall

It is recommended that 3 deflection monitoring points be installed on top of the retaining wall which extends westward from the Somerset Street overpass. The deflection monitoring points would be located at the top vertical edge of the retaining wall, and would consist of steel wedge anchors installed into the concrete. These displacement monitoring points would allow for monitoring of the horizontal deflection and vertical settlement of the retaining wall. The proposed locations of the monitoring points are shown on the attached Figure 1.

2.3 Proposed Monitoring Frequency and Methodology

A baseline survey will be completed daily for 3 days prior to the start of construction.

The settlement monitoring points, inclinometers, and displacement monitoring points will be surveyed daily until the top row of tiebacks are stressed, and then weekly until the foundation construction extends above the exterior finished grade.

All survey measurements will be referenced to a benchmark with an established geodetic elevation, such as a sewer manhole cover, located in the vicinity of the site. The settlement monitoring points will be surveyed using either a traditional manual survey or will utilize remote monitoring with a wireless sensor.

3.0 Settlement/Displacement Criteria

Following the establishment of the baseline elevation (average of the pre-construction readings) at each monitoring point, the following thresholds and exceedance protocol provided in Table 1 below is recommended during construction activities:

Table 1 - Settlement/Displacement Criteria & Associated Actions		
Displacement Value	Description of Event	Contractor Required Action
Up to 10 mm	<i>Allowable Level</i>	- Work may continue, no action required.
10 to 14 mm	<i>Review Limit</i>	<ul style="list-style-type: none"> - Immediately notify all relevant emergency contact parties within 24 hours of the survey. - Complete an additional survey of all monitoring points for confirmation of the readings. Give verbal notification of the results to the Contract Administrator within 1 hour of the additional survey and a written report within 24 hours. - Review the potential cause of the displacement and adjust the monitoring program as required. - Work may continue, however the contractor should give consideration to adjusting construction activities accordingly to minimize potential further movement.

Over 15 mm	<i>Alert Limit</i>	<ul style="list-style-type: none"> - Stop excavation work immediately. - Immediately notify all relevant emergency contact parties within 2 hours of the survey. - Complete an additional survey of all monitoring points for confirmation of the readings. Give verbal notification of the results to the Contract Administrator within 1 hour of the additional survey and a written report within 24 hours. - Complete a geotechnical review of the site within 12 hours to identify any obvious visual indications of ground subsidence, movement, sink holes, etc. - Complete a structural review of the affected structure(s) within 12 hours. - Notify all relevant emergency contact parties of the additional survey, geotechnical, and structural reviews within 24 hours. - Coordinate a meeting with the owner, construction manager, and all relevant emergency contact parties to discuss the results, mitigative actions, and plan for moving forward. - Construction work shall not begin until the meeting group has reached a conclusion and appropriate actions are implemented.
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4.0 Monitoring Reports

Weekly settlement monitoring reports will be prepared by Paterson and will be submitted to the construction manager presenting the following information:

- Settlement data
- Summary of non-compliance, where applicable
- Mitigation measures, where applicable (when review and action levels are exceeded)

Mr. Shawn Malhotra
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We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.



Nicole R.L. Patey, B.Eng.



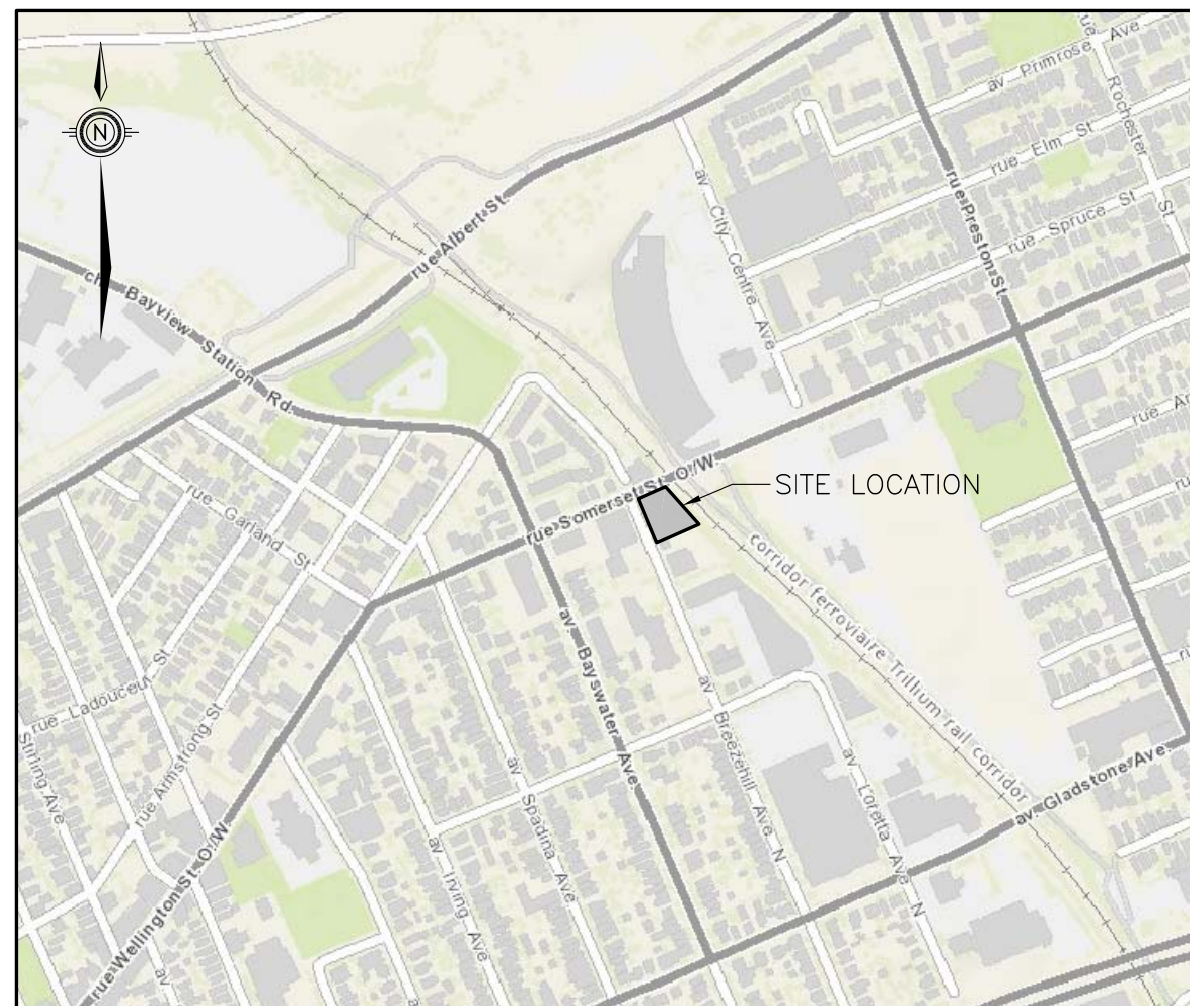
Scott S. Dennis, P.Eng.

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KEY-PLAN
N.T.S.

FIGURE 1
Settlement & Deflection Monitoring Plan
Paterson Group
February 1, 2022

Deflection Monitoring Points.
Both vertical (settlement) and horizontal deflection will be measured at these locations.

Inclinometers.
Lateral deflection of the temporary shoring system will be measured at these locations.

Settlement Monitoring Points.
These monitoring points will be setup directly on top of the 1,372 mm diameter watermain.

MONITORING:

MONITORING: RECORD PILE LENGTHS, ELEVATIONS AND TIE-BACK LENGTHS AND REPORT TO ENGINEER. MONITOR ALIGNMENT OF PILES AT EXTERIOR GRADE LEVEL. MEASUREMENTS TO BE TAKEN BEFORE EXCAVATION COMMENCES AND AT WEEKLY INTERVALS THEREAFTER. RECORD MEASUREMENTS AND REPORT TO ENGINEER. EXACT MONITORING PROGRAM SHALL BE PROPOSED BY CONTRACTOR ACCORDING TO OPSS 539.07.03.03 AND SUBMITTED TO ENGINEER FOR APPROVAL.

A FIELD REVIEW OF SHORING INSTALLATION AND REMOVAL SHALL BE CARRIED OUT ON A CONTINUOUS BASIS.

GEOTECHNICAL INVESTIGATION:

GEOTECHNICAL INVESTIGATION PROPOSED MULTI-STORY BUILDING 1040 SOMERSET STREET WEST OTTAWA, ONTARIO PREPARED BY: PATERSON GROUP REPORT No.: PG2674-2 REVISION 2 DATED: MAR. 11, 2021

PLAN
1:150

THE LOCATION OF UTILITIES IS APPROXIMATE ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.

GENERAL NOTES:

- DIMENSIONS ARE SHOWN IN MILLIMETRES, ELEVATIONS ARE SHOWN IN METRES.
- CHECK FOR EXISTING SERVICES BEFORE INSTALLING PILES. LOCATIONS SHOWN ON THIS DRAWING ARE FOR GENERAL INFORMATION ONLY AND MUST NOT BE RELIED UPON.
- CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS AND CONDITIONS ON SITE. ANY DISCREPANCY SHALL BE REPORTED TO ENGINEER.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL MATERIAL RELEVANT TO PROJECT. ANY DEVIATION FROM CONDITIONS SHOWN ON THIS DRAWING MUST BE REPORTED TO ENGINEER.

5. **LOADING:**

$K_s = 0.33$
 $K_s = 0.50$ (AT BUILDING)
 $\gamma = 20 \text{ kN/m}^3$
 $\gamma_s = 13 \text{ kN/m}^3$
 $\gamma_w = 10 \text{ kN/m}^3$
 $q = 16 \text{ kPa}$
 $K_s \times (0.65\gamma H + q) + \gamma_w H = 40 \text{ kPa}$ (AT BUILDING)

6. **MATERIALS:**

- STEEL: - CAN/CSA S16-09
-ROLLED SECTIONS
-G40.21-44W(300W)
-PLATES A36
- CABLES:.....HIGH TENSILE WIRE
-ROPE $\phi 3/4"$ ($\phi 16 \text{ mm}$)
-MAX. ALLOWABLE TENSION 35K (156 kN)
- LAGGING:.....HARDWOOD
- CABLE GROUT:.....40 MPa

- EXCAVATE AND INSTALL LAGGING IN 4' (1.2 m) DEEP SECTIONS. BACKFILL WITH GRANULAR MATERIAL BEHIND LAGGING. WEDGE LAGGING TIGHTLY IN PLACE.
- ALL WELDING TO BE DONE ACCORDING TO CSA W59-13 BY A CERTIFIED PROFESSIONAL.
- DESIGN IN CONFORMANCE WITH ONTARIO BUILDING CODE 2012.
 - OPSS/MUNI 539, NOV. 2014
 - FOR PERFORMANCE LEVEL 2.
 - OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATION FOR CONSTRUCTION PROJECTS ISSUE DATE APRIL 2012.

No.	Date	Revision	By:
3	JUL 19/21	UPDATED GEOTECH REPORT DATA	R.P.
2	MAY 27/21	REVISED FOR NEW UNDERGROUND	R.P.
1	MAR. 10/21	REVISED FOR SHEET PILES E&W	R.P.
0	FEB. 22/21	PRELIMINARY	R.P.



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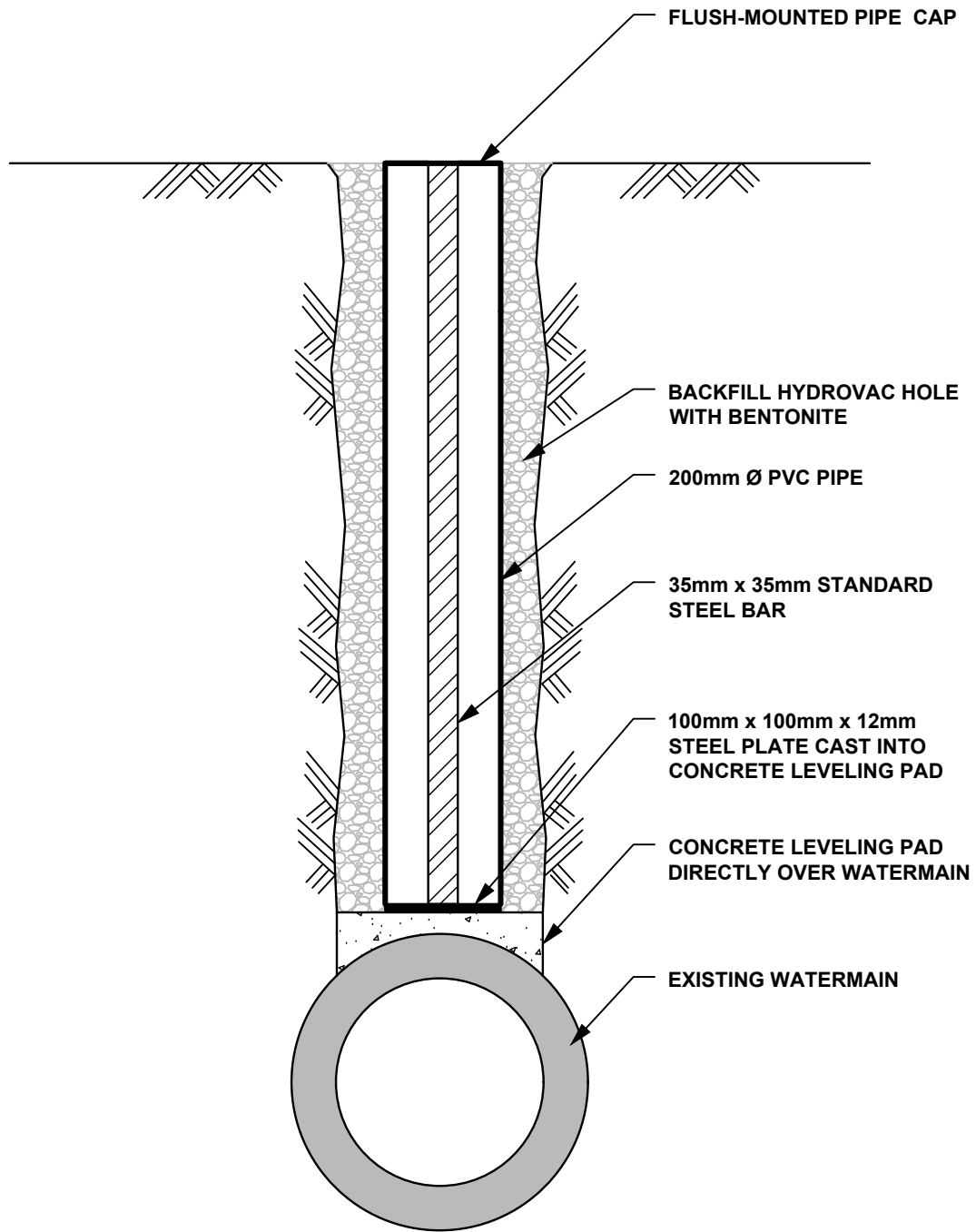
Client
CLARIDGE HOMES

Project
**1040 SOMERSET St. W
OTTAWA, ONTARIO**

Drawing
**EXCAVATION PROTECTION SYSTEM
PLAN**

Designed	R.P.	Date	JAN. 2021
Drawn	R.P.	Scale	AS SHOWN
Checked	B.U.	Sheet	1 OF 9
Project No.	2021-010-3	Dwg. No.	C-01





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CLARIDGE HOMES
PROPOSED HIGH-RISE BUILDING
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OTTAWA, ONTARIO

Title:
**WATERMAIN SETTLEMENT
MONITORING POINT INSTALLATION**

Date:
01/2022

Scale:
N.T.S.

Drawn by:
NFRV

Checked by:
SD

Report No.:
PG2674-MEMO.12

Drawing No.:
FIGURE 2