REPORT

665 Albert Street
LeBreton Flats Library Parcel Confederation Line Proximity Study

Presented to:

Andrew McCreight
Development Review Project Manager, Buildings and Parks

Project: 202093300 February 03, 2023

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1. Introduction

Morrison Hershfield Limited (MHL) has been retained by Dream Unlimited to prepare this Confederation Line Proximity Study (CLPS) for the proposed development of the 'LeBreton Library Parcel' at 665 Albert Street ("the development").

The purpose of this CLPS report is to demonstrate that potential impacts of the development on the Confederation Line assets and operations have been identified and addressed, and vice versa.

The City of Ottawa (City) has requested that a CLPS for the development because the site lays partially within the Confederation Line's Development Zone of Influence.

The required scope of a CLPS varies depending on the type of impacts that a development is expected to cause to the Confederation Line assets and operations. In general the scope addresses temporary impacts (during construction) and permanent impacts, and considers issues such as structural/geotechnical interaction (potential settlement, or loading on tunnels and retaining walls), changes to maintenance access routes, changes to station access (including wayfinding and accessibility), and encroachment on the Confederation Line during construction.

This CLPS has been completed in accordance with the City's guidelines (Confederation Line Proximity Study Guidelines, October 2013). The scope of the CLPS was determined based on our understanding of the development (described in **Section 2.1**) and is described in **Section 3**. **Section 4** includes a detailed examination of the potential Confederation Line impacts, and explains how the development will address these.

2. Proposed Development

2.1 Description of Proposed Development

It is understood that the proposed development will include two residential towers with retail uses on the ground floor of each building, and a daycare centre on the second floor of the east building. The two towers (31-storey East Tower and 36-storey West Tower) will be located on top of a common two-level underground parking garage, to be constructed on the 665 Albert Street property which is located just south of the Confederation Line Light Rail Transit (LRT) corridor. **Figure 1** indicates the project location in relation to the LRT corridor and Confederation Line's Development Zone of Influence.

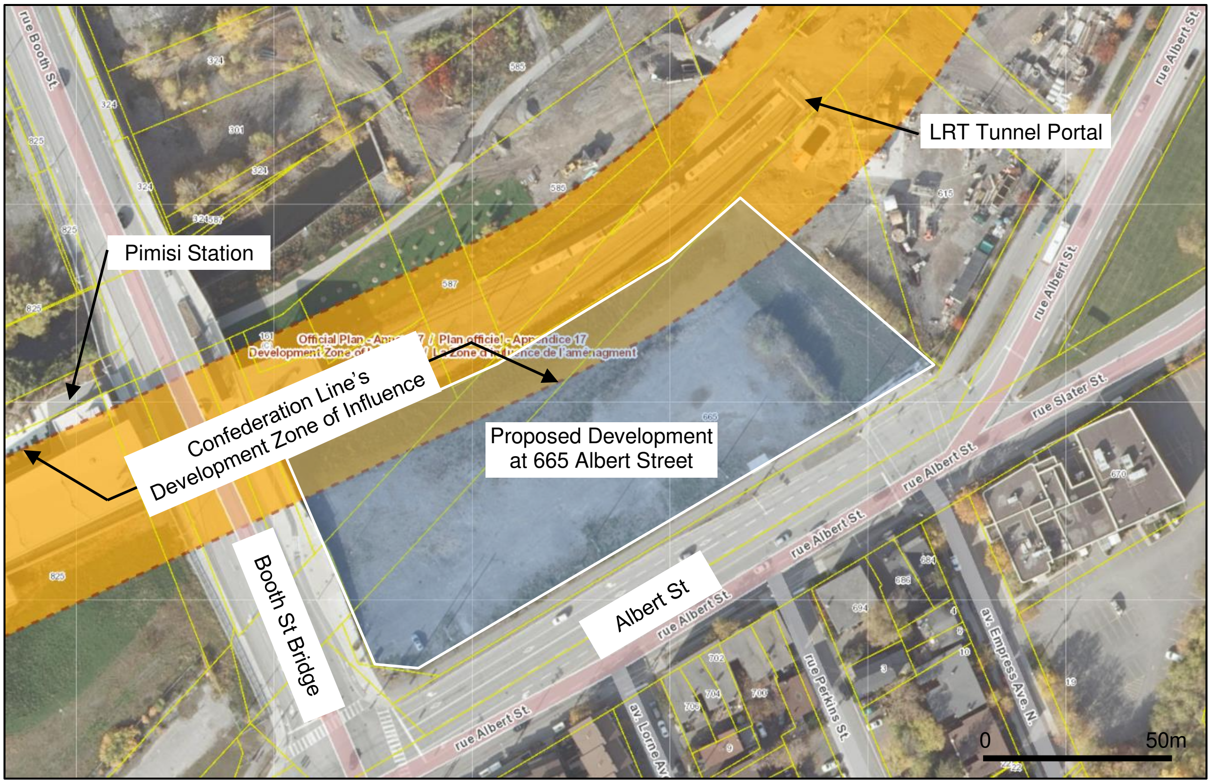


Figure 1 – Project Location

As indicated by the topographic survey (**Appendix A**) the site is at a higher elevation than the LRT tracks, with a slope down to the tracks along the north edge of the site. Adjacent to the site the LRT profile is relatively flat. A slope down towards the tunnel portal begins at approximately the north-east corner of the site.

There are two separate existing retaining walls adjacent to the site:

- From Booth St bridge, continuing approximately 20m east, a small reinforced concrete retaining wall allows for the proposed multi-use pathway (MUP) to be installed at a lower elevation than the tracks.
- From mid-way along the site continuing eastwards, a Mechanically Stabilized Earth (MSE) wall supports the approach to the tunnel portal.

An existing chain-link fence separates the LRT tracks from the development property.

The proposed Site Plan (**Appendix B**) includes the proposed MUP adjacent to the LRT. The MUP will be located within the development property parcel.

Two retaining walls are proposed as part of the development, to manage the elevation transitions along the northern edge of the site. The first of these is set back from the property limits, separating the public realm area from the MUP, running east-west parallel to the LRT. It will be approximately 7m high at the Booth Street end and taper down to zero as it runs east (and the MUP rises). Construction proposals for this structure are still being advanced, however current design intent is to use a precast block product engineered through a supplier-design arrangement.

The second retaining wall will be directly along the property limits to allow the MUP to rise towards the east limit of the site while the LRT drops toward the tunnel portal. This wall will be constructed as a horizontal (westerly) extension of the existing MSE wall and a vertical increase in the height of the existing wall.

Both walls are depicted in the sections included in **Appendix C**.

Within the site, the area above the parking garage and a triangular area between the building and north / west property lines will be landscaped with plantings, paved areas and seating. Because of the elevation difference, along the north side of the site the landscaped areas will form a terrace overlooking the LRT tracks.

An emergency generator is proposed to be located in the north-west corner of the site, at the foot of the new retaining wall, adjacent to the Booth Street bridge and MUP.

There are existing sewers within the former Wellington Street right-of-way which crossed the north-west edge of the site. These include a 2400mm diameter combined sewer from the Booth/Wellington Regulator to the first shaft of the Combined Sewer Storage Tunnel (CSST) the 1800mm diameter Interceptor Outfall Sewer (IOS), and a 3000mm diameter storm sewer. The proposed site plan indicates that the building (including parking garage) will be set back from these sewers.

2.2 Basis of Study

This report is based on MHL's understanding of existing conditions and the proposed development, obtained from review of the following documents.

Existing conditions:

- Topographic Survey of Lots 10, 12, 14, 16, 18, 20 and Part of Lots 7, 8, 9, 11, 13, 15, 17, 19 and 21, Block 'M', Registered Plan 2, City of Ottawa, Stantec Geomatics Ltd., March 24, 2022, Revision 1
- Confederation Line As-built Drawings, HATCH, OLRT Constructors, July 5th, 2019

Proposed development:

- Architectural Plans, 665 Albert Street, KPMB / Perkins & Will, December 16, 2022, Revision 9
- Civil Plans, 665 Albert Street, TMIG, December 16, 2022, Revision 9
- Landscape Plans, 665 Albert Street, PFS Group, November 11, 2022, Revision 2
- Foundation Plans, 665 Albert Street, Read Jones Christoffersen, December 16, 2022, Revision 4
- Geotechnical Investigation Report, 665 Albert Street, Report Number 22511882, Golder Associates Ltd., April 2022
- Constructability Report including appendices, TYLin, December 2022
- Transportation Nose and Vibration Study, Gradient Wind, April 21, 2022

- Excavation Shoring Design, Marathon Underground, December 16, 2022, Revision 1
- Logistics Drawings, Ellis Don, November 16, 2022

3. Proximity Study Requirements

The guidelines identify three levels of CLPS, from the Level 1 (most basic) to Level 3 (most stringent). The CLPS level is selected based on the anticipated degree of impact to the Confederation Line.

For 665 Albert Street a Level 2 review is considered appropriate. While the building itself is set back from the LRT and unlikely to cause substantial impact, replacement of the existing slope from the site down to the Confederation Line will require retaining wall construction in close proximity to the tracks, warranting a Level 2 review.

Table 1 summarizes the three review levels and relevant characteristics of the development.

Table 1 – CLPS Review Level

Level of Review	Type of Review	Relevant Characteristics of Development
1	Development within Development Zone of Influence, minimal impact on Confederation Line structures anticipated	• Proposed 30 and 35 storey towers at 665 Albert Street
2	Development within Development Zone of Influence, substantial impact on Confederation Line structures anticipated	• Proposed MUP and associated grading • Proposed retaining walls
3	On top of or within approximately 1 m of a Confederation Line structure	• None

4. Proximity Requirement Responses

This section lists the CLPS requirements and describes how each requirement will be met for the development.

Table 2 - Level 1 CLPS Requirements and Responses

Requirement (from CLPS Guidelines)	Response
Required for all developments:	
A site plan of the development with the centreline or reference line of the Confederation Line structure and/or right-of-way located and the relevant distances	Presented in **Appendix B**

Requirement (from CLPS Guidelines)	**Response**
between the Confederation Line and developer's structure shown clearly;	
Plan and cross-sections of the development locating the Confederation Line structure/right-of-way and founding elevations relative to the development, including any underground storage tanks and associated piping;	Presented in **Appendices B** and **C.** Note that site service connections (water, sewer) and stormwater detention tanks are proposed to be on the south side of the site, between the building and Albert Street, outside the Confederation Line's Development Zone of Influence.
A geotechnical investigation report showing up-to-date geotechnical conditions at the site of the development. The geotechnical investigation shall be prepared in accordance with the Geotechnical Investigation and Reporting Guidelines for Development Applications in the City;	Presented in **Appendix D**
Structural, foundation, excavation, and shoring drawings; including all associated plans, sections and details, schedules, loads on foundation, shoring design criteria, and description of excavation and shoring method.	Foundations (Building) Refer to **Appendix E.** Note that the lowest level of the parking garage (P2 level) is indicated to be at approximately 54.04m elevation (significantly lower than the LRT tracks which are at approximately 56m elevation). The building will be founded deeper than the LRT tracks and the foundations are therefore not expected to impact the LRT tracks or associated structures. Support-of-Excavation (Building) Refer to **Appendix F.** Shoring is proposed along the south (Albert Street), west (Booth Street) and east elevations of the parking garage wall. Shoring is also proposed along the first 30m of the north (closest to LRT) parking garage wall from the west (Booth Street) end and for the first 20m from the east end. A tied-back soldier pile and lagging system is proposed. Refer to the additional discussion below **Table 3** regarding the north shoring at the east end of the site. Sloped excavations are anticipated along the central portion of the north (LRT) of the parking garage, where sufficient space is available between the property line and planned parking garage wall. Retaining Walls

Requirement (from CLPS Guidelines)	**Response**
	The retaining walls along the north edge of the site will be constructed in relatively close proximity to the LRT (although set back by at least the 3m width of the MUP). A gravity wall system is currently proposed. Excavation may be required for installation of a granular base and/or footing. It is not anticipated that shoring will be required, but this will be confirmed as design progresses.
Acknowledgement that the potential for noise, vibration, electro-magnetic interference and stray current from Confederation Line operations have been considered in the design of the project, and appropriate mitigation measures applied.	A noise and vibration assessment has been completed. Refer to **Appendix G**. The assessment concluded that noise mitigation measures will be required, including control of indoor sound levels, an acoustic barrier to mitigate noise levels at outdoor living areas, central air conditioning to allow occupants to keep windows closed, and appropriate Warning Clauses. These recommendations will be applied.
Required depending on type of development:	
Architectural, mechanical, electrical and utility drawings.	Refer to **Appendix H** for Architectural plans**.** As described above, all main utilities and servicing is planned to be from Albert Street. New services between the building and north property line are expected to be limited to local drainage, lighting, and service connections to the proposed emergency generator. No impact to the Confederation Line is expected.
A National Fire Prevention Association (NFPA) 130 Standard review to ensure design requirements in relation to Confederation Line infrastructure are met.	Not applicable due to the limited impacts of the development on the Confederation Line infrastructure.
Crane locations, loadings.	Refer to **Appendix I** for Construction Logistics Plans.
Up-to-date surveys, signed and sealed by an Ontario Land Surveyor, as follows: o A property survey of existing and proposed property lines prepared to Strata Reference Plan Standards; o A topographic survey of existing surface items, such as buildings, contours, roads, tracks;	An up-to-date topographic and legal survey is provided in **Appendix A**. The Site Plan (**Appendix B**) indicates the location of the Confederation Line and associated structures. These locations were determined from As-Built drawings obtained from the City (**Appendix J**). The use of As-Built drawings is considered sufficiently accurate for the this project, and avoids the complexity and disruption of completing

Requirement (from CLPS Guidelines)	**Response**
o A utility survey of existing building gridlines, including those of Confederation Line structures; o A preliminary gridline layout survey of proposed building gridlines on architectural and structural drawings.	topographic survey within the Confederation Line right-of-way.
Staging of operations.	Refer to **Appendix I** for Construction Logistics Plans. It is currently anticipated that construction will not require any work within the Confederation Line right-of-way, or disruption of Confederation Line operations.
Traffic management plan, which shall included site access provisions during and after construction (ultimate), lane closures and staging of traffic management plan.	No direct impacts on roads servicing Confederation Line facilities are anticipated.

Table 3 - Level 2 CLPS Requirements and Responses

Requirement (from CLPS Guidelines)	**Response**
A structural analysis or calculations of the effects of loadings, including construction loading, on the Confederation Line structure, and demonstrating that the Confederation Line structure will not be adversely affected by the development, including solutions to mitigate any impact on the Confederation Line structure. The documentation must include identification of the "affected" Confederation Line structural units	As described in **Table 2**, the proposed building is not expected to impose any loads on the Confederation Line or related structures due to it being founded at a lower depth.
Documentation showing that the excavation support system and permanent structure adjacent to the Confederation Line property are designated for at-rest earth pressures. Unless otherwise proven through mutually accepted geotechnical analysis, At-rest pressures shall be determined using a pressure coefficient of 0.5 (K0 = 0.5)	Lateral earth pressures for design are recommended within the Geotechnical Report (**Appendix C**). Lateral earth pressures for design of the temporary support-of-excavation systems are detailed in **Appendix F**. It is noted that the proposed support-of-excavation systems are not required for retention of soil directly adjacent to the LRT property. Design of the proposed retaining walls is in progress (currently awaiting receipt of as-built information about the existing MSE wall from the City).
Structural drawings, including caisson/foundation plans, sections and details, floor plans, column and wall	Refer to **Appendix E**. As described in **Table 2**, due to the distance between the building and the Confederation Line, and the depth of

Requirement (from CLPS Guidelines)	**Response**
schedules and loads on foundation for the development. The relationship of the development to the Confederation Line structure should be depicted in both plan and section	the foundations, the building is not expected to impact the Confederation Line. Design of the proposed retaining walls is in progress (currently awaiting receipt of as-built information about the existing MSE wall from the City).
Shoring design criteria and description of excavation and shoring method	The Geotechnical Report (**Appendix C**) provides shoring design criteria. Refer also to the shoring design (**Appendix F**). As described in **Table 2**, shoring is currently not anticipated adjacent to the Confederation Line.
Ground water control plan, including the determination of the short-term (during construction) and long-term effects of dewatering on the Confederation Line structure, and provision of assurances that the influences of dewatering will have no impact on the Confederation Line structure	The Geotechnical Report (**Appendix C**) indicates that both temporary and permanent groundwater control will be required. A groundwater control plan should be prepared prior to construction, and will be required to address the potential for any impacts to the Confederation Line structures.
Proposal to replace/repair waterproofing system of the affected Confederation Line structure, including the Confederation Line expansion joint;	Not applicable.
Identification of utility installations proposed through or adjacent to Confederation Line property. Where known, show Confederation Line utility connections where associated municipal connections are to be modified	No utility installations are expected within the Confederation Line property as a result of the development.
Identification of the exhaust air quality and relationship of air in-take/discharge to the Confederation Line at-grade vent shaft openings and station entrance openings. (Confederation Line shaft openings would typically be located a minimum of 12 meters from entrances or exits because vent shaft openings are used as emergency ventilation in-take or exhaust vents for high temperature smoke in the event of a fire.)	The building is located more than 12 meters from the tunnel portal. There are no other Confederation Line tunnel ventilation facilities in the vicinity.
Proposal for a pre-construction condition survey of the Confederation Line structure, including a survey to confirm locations of existing walls and foundations	The contractor will be required to undertake a pre-construction survey of Confederation Line structures within 30m of the site prior to the start of construction. Pre-construction

Requirement (from CLPS Guidelines)	Response
	surveys will be in accordance with City of Ottawa Special Provision F-1011.
Monitoring Plan for movement of the shoring and Confederation Line structure prior to and during construction of the development, including an Action Protocol	A monitoring plan in relation to the Confederation Line is not proposed because shoring is currently not proposed in the vicinity of the Confederation Line (i.e. along the north property line of the site).

North Shoring at East End of Site

As noted in **Table 2** above, shoring is proposed for approximately the first 20m of the north edge of the excavation starting from the east end of the site. **Figure 2** shows the location of this shoring.

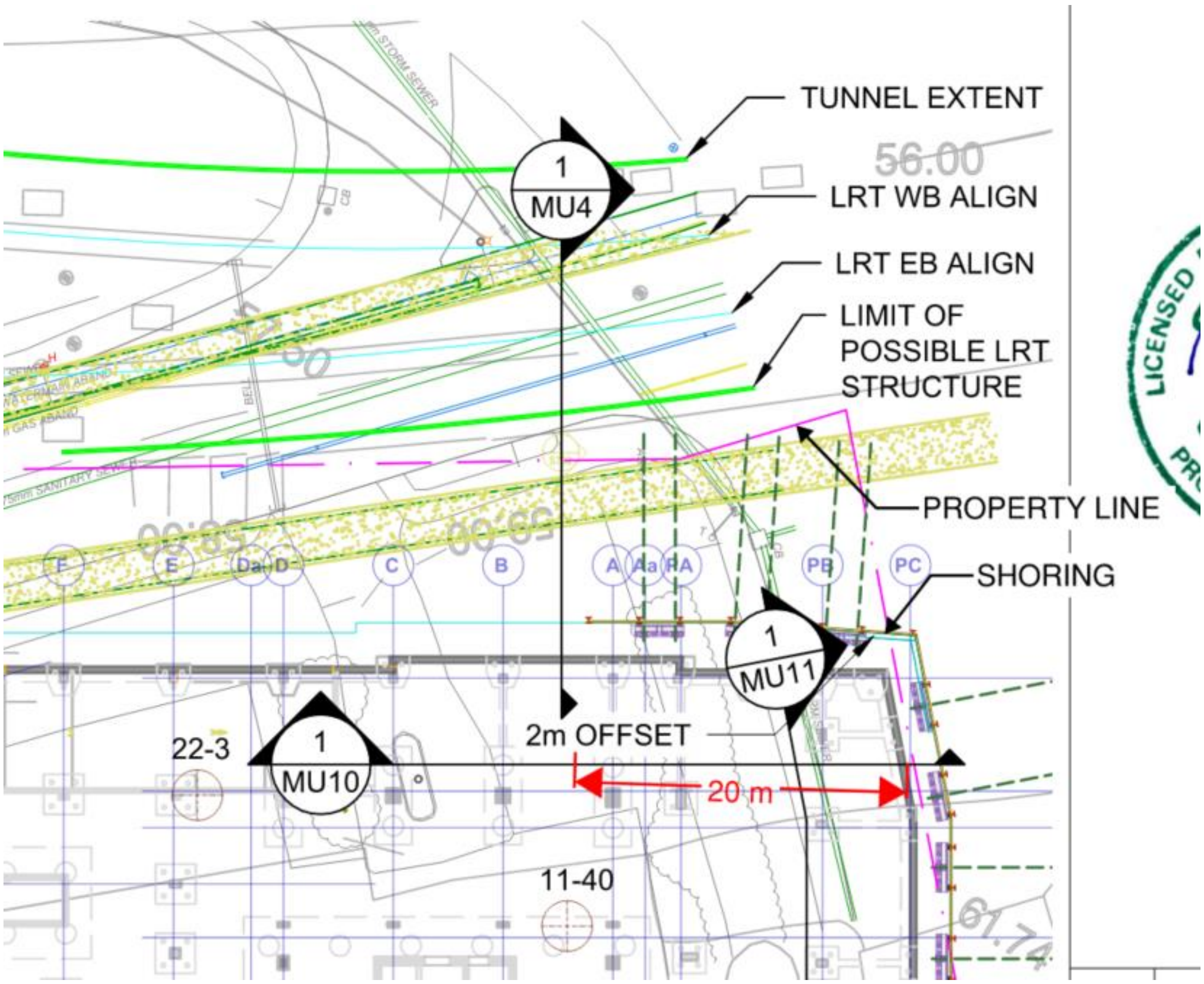


Figure 2 – Extract from proposed Support of Excavation plans showing wall location at north-east of site

It was identified that the tie-backs of the proposed shoring as originally designed (**Appendix F**) would potentially be in conflict with the existing MSE wall. The position, maximum height, and depth of the MSE wall were determined from LRT project 'As Built' drawings: **Figure 3** and **Figure 4**. It is noted that the wall is closer to the property line ('ROW') than indicated by **Figure 3**. The green line labeled "Limit of Possible LRT Structure" on **Figure 2** indicates the actual face of the existing wall.

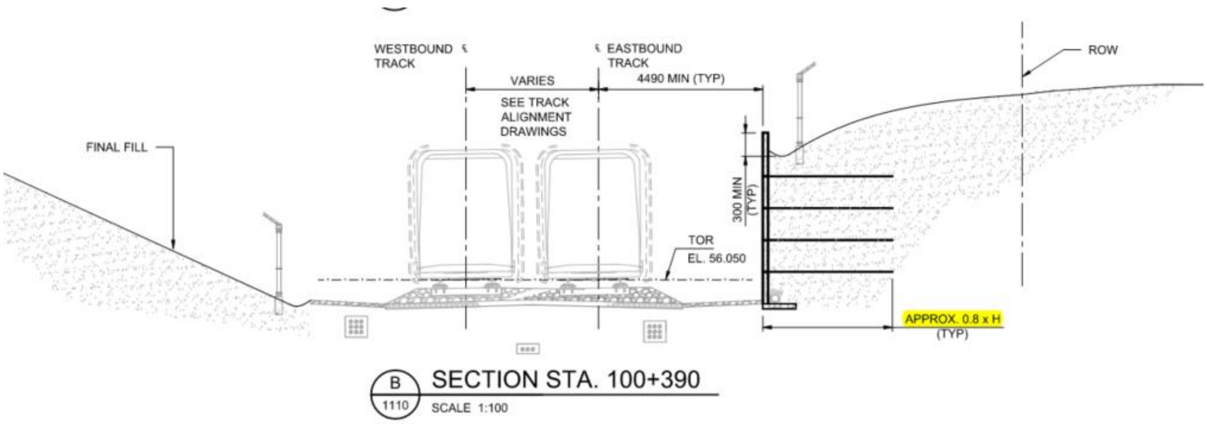


Figure 3 – Extract from LRT drawing REH-87-2-WPTU-DRD-1215 Rev 3, showing MSE wall depth

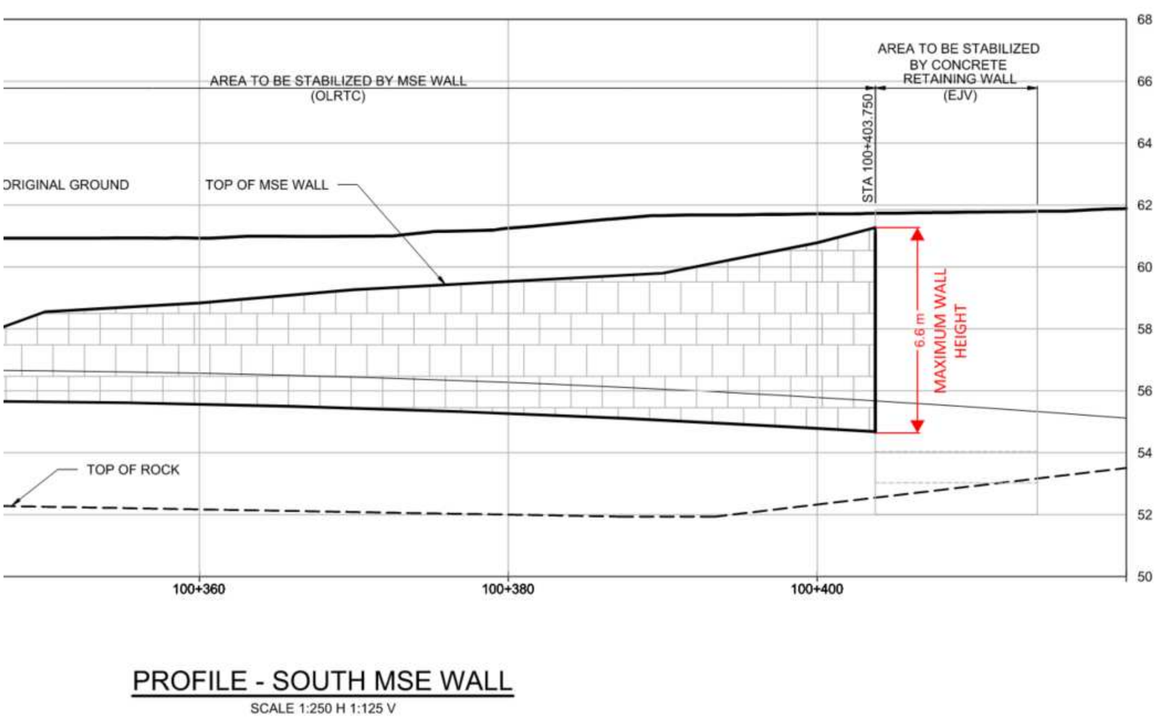


Figure 4 – Extract from LRT drawing REH-87-2-WPTU-DRD-1103 Rev 2, showing MSE footing elevation and maximum height

To avoid conflict between the tie-backs and existing MSE wall, an alternate solution has been developed whereby existing grade at the north edge of the site would be precut down to approximately elevation 59 m. This precut will reduce the shoring height to approximately

6 m, enabling the tiebacks to remain entirely within the project property and clear of the MSE wall, while also not drilling any closer to the EWT/CSST pipe. An updated sketch is included at the end of **Appendix F**. **Figure 5** provides an overlay of the MSE wall (based on available information) on the proposed revised shoring design.

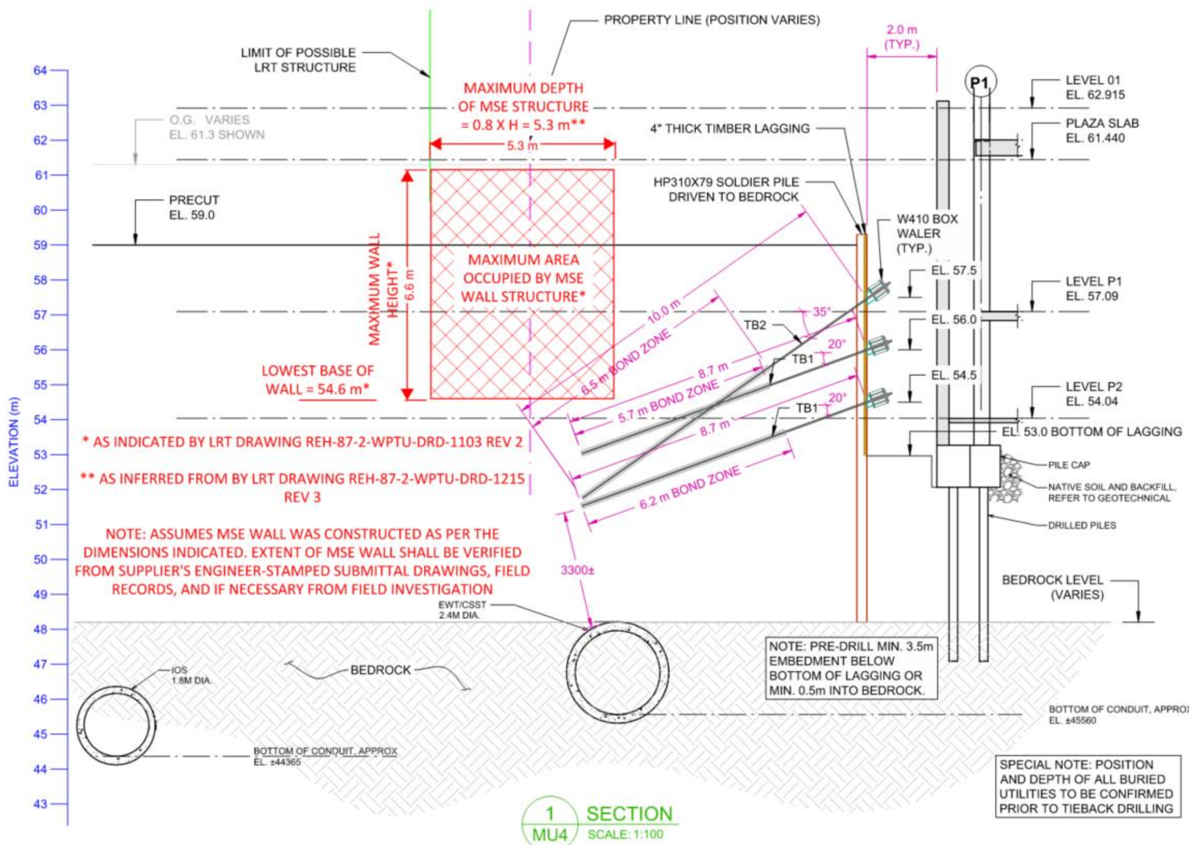


Figure 5 – Overlay of MSE wall on updated proposed Support of Excavation section

If confirmed to be acceptable to the City / OC Transpo, the Support of Excavation design package will be updated to reflect this revised shoring design.

Additionally, as noted in red within **Figure 5**, the exact depth and elevations of the MSE wall must be verified prior to construction of the shoring, and an Engineer shall confirm that neither the proposed shoring nor the proposed precut will adversely impact the MSE wall.

5. Conclusions

Due to the layout of the site, which includes a set-back between the Confederation Line right-of-way and the proposed building, the impacts of the proposed development on Confederation Line structures are expected to be limited.

No construction work is currently proposed within the Confederation Line right-of-way.

The existing slope from the site to the Confederation Line will be replaced by new retaining walls. Subject to review of the detailed design (not available at the time of report preparation) the larger wall is not expected to have any impact on the Confederation Line. Regrading immediately south of the property line will be required for construction of the MUP. An extension of the existing retaining wall will be required between the MUP and property line to accommodate grade differentials. It is anticipated that all grading and retaining walls will be designed to enable construction without impact to the Confederation Line.

The excavation for the proposed building is currently planned to be sloped rather than shored along the much of the north elevation (closest to the Confederation Line). A portion close to the existing MSE retaining wall will be shored. A modified shoring design has been developed to avoid impact to the existing wall. Excavation for the building is not expected to impact the Confederation Line.

Dewatering will be required. The potential for any impacts to the Confederation Line structures should be reviewed through preparation of a Groundwater Control Plan.

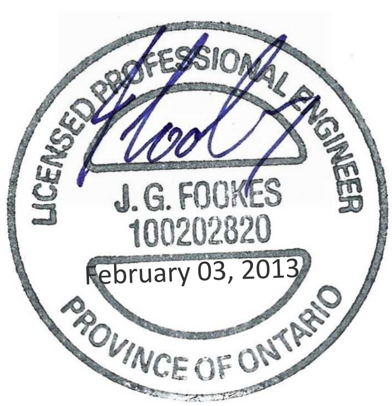
No impacts to Confederation Line operations are expected.

6. Closure

We trust that this report is sufficient for your current requirements. Please contact the undersigned with any questions or clarifications.

Sincerely,

Morrison Hershfield Limited



James Fookes, P.Eng.

Senior Municipal Engineer

APPENDIX A: Topographic and Legal Survey

Stantec

Stantec Geomatics Ltd.
300-1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

TOPOGRAPHIC SURVEY OF

LOTS 10, 12, 14, 16, 18, 20 AND PART OF LOTS 7, 8, 9, 11, 13, 15, 17, 19 AND 21 BLOCK 'M' REGISTERED PLAN 2

CITY OF OTTAWA

Scale 1:250

5 0 5 10 15 METRES

Stantec Geomatics Ltd.
ONTARIO LAND SURVEYORS

METRIC CONVERSION

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

BEARING NOTE

BEARINGS ARE GRID, DERIVED FROM THE CAN-NET VRS NETWORK OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76°30' WEST LONGITUDE MTM ZONE 9. NAD83 (ORIGINAL).

19773035 N:5006060.42 E:324888.04
19680191 N:5033564.26 E:388064.94

ELEVATION NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMENT: OTTAWA ELEVATION=95.230.

LEGEND

■		DENOTES	FOUND MONUMENTS
□		"	SET MONUMENTS
IB		"	IRON BAR
IBø		"	ROUND IRON BAR
SIB		"	STANDARD IRON BAR
SSIB		"	SHORT STANDARD IRON BAR
CC		"	CUT CROSS
RB		"	ROCK BAR
CP		"	CONCRETE PIN
WIT		"	WITNESS
PIN		"	PROPERTY IDENTIFICATION NUMBER
M/MEAS		"	MEASURED
PROP		"	PROPORTIONED
OU		"	ORIGIN UNKNOWN
STANTEC		"	STANTEC GEOMATICS LTD.
P1		"	PLAN 4R-34419
P2		"	PLAN 4R-32006
	AN	"	ANCHOR
	BKR	"	BIKE RACK
	BENCH	"	BENCH
	BOL	"	BOLLARD
	CB	"	CATCH BASIN
	CBSI	"	SIDE INLET CB
	HYD	"	FIRE HYDRANT
	LS	"	LIGHT STANDARD
	MH	"	MAINTENANCE HOLE UNIDENTIFIED
	MHSA	"	MAINTENANCE HOLE SANITARY
	MHST	"	MAINTENANCE HOLE STORM
	MW	"	MONITORING WELL
	SN	"	SIGN
		"	TREE CONIFEROUS (D.B.H. SHOWN)
		"	TREE DECIDUOUS (D.B.H. SHOWN)

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

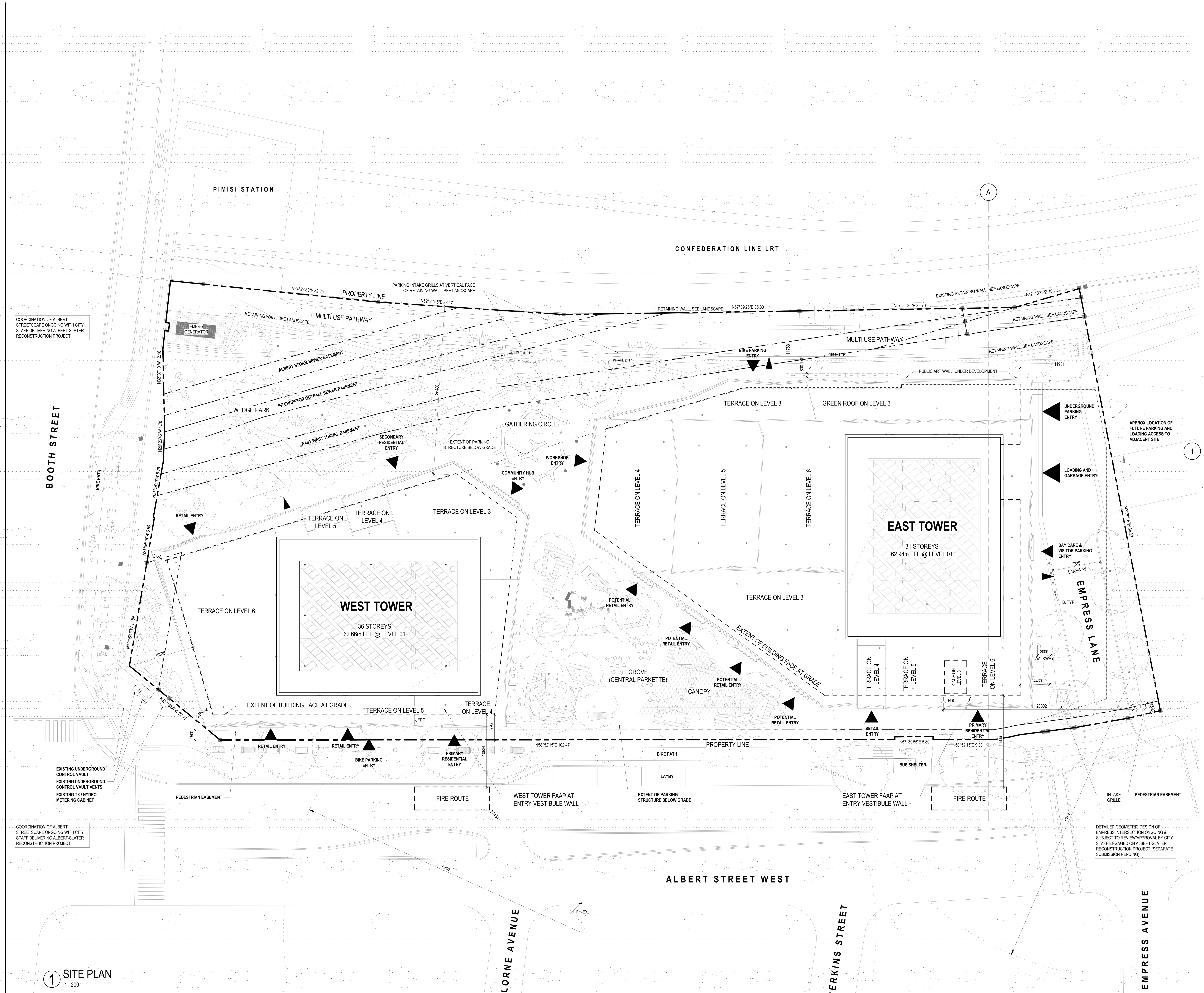
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 24th DAY OF MARCH, 2022.

DATE

R. G. BENNETT
ONTARIO LAND SURVEYOR

DRAWN: ZF CHECKED: CK PM: CT FIELD: ES PROJECT No.: 161614531-111

APPENDIX B: Site Plan



1 SITE PLAN
1 : 200

NOTE
1. REFER TO LANDSCAPE AND CIVIL DRAWING FOR LANDSCAPE DESIGN, SITE LIGHTING, SITE SERVICING, AND GRADING INFORMATION.

NOTES

SITE PLAN BASED ON TOPOGRAPHIC SURVEY BY:	STANTEC GEOMATICS LTD. 300-1331 CLYDE AVENUE, OTTAWA, ON, K2C 0A9 C/O R. G. BENNETT
DATE:	APRIL 7, 2022

SITE / ZONING DATA

	REQUIRED	PROVIDED
TOTAL LOT AREA		9,629 m^2
GROSS FLOOR AREA		38,275.26 m^2
FLOOR SPACE INDEX		3.97
LOT FRONTAGE ON ALBERT STREET		144.0 m
LOT FRONTAGE ON BOOTH STREET		77.9 m
LOT FRONTAGE ON LRT		138.6 m
LOT FRONTAGE ON EAST PROPERTY LINE		63.8 m
PROPOSED BUILDING LENGTH AT GRADE ON ALBERT STREET		
EAST TOWER (PARALLEL)		29.5 m
EAST TOWER (ANGLED)		43.3 m
WEST TOWER (PARALLEL)		42.7 m
WEST TOWER (ANGLED)		30.2 m
PROPOSED BUILDING LENGTH AT GRADE ON BOOTH STREET		
WEST TOWER		24.7 m
PROPOSED BUILDING LENGTH AT GRADE ON LRT		
EAST TOWER (PARALLEL)		42.7 m
EAST TOWER (ANGLED)		21.2 m
EAST TOWER (ANGLED)		15.2 m
WEST TOWER (PARALLEL)		46.2 m
WEST TOWER (ANGLED)		11.4 m
PROPOSED BUILDING LENGTH AT GRADE ON EAST PROPERTY LINE		
EAST TOWER		46.8 m
SETBACK DATA		
FRONT YARD (ALBERT STREET)	NO MIN	1.8 m-4.9 m
CORNER SIDE YARD SETBACK	NO MIN	0.0 m-9.9 m
EASTERLY INTERIOR SIE YARD SETBACK	9.0 m	9.8 m
REAR YARD SETBACK (LRT)	NO MIN	10 m
TOWER SETBACK FROM EASTERLY SIDE YARD	14.5 m	15.7 m
TOWER DATA		
TOWER SEPARATION	23.0 m	55.3 m
TOWER FLOORPLATE AREA	750 m^2 MAX	708 m^2
BUILDING HEIGHT		
EAST TOWER AVERAGE GRADE		62.91 m
MIDPOINT OF EAST TOWER ROOF		167.52 m
EAST TOWER BUILDING HEIGHT	110 m	104.61 m
WEST TOWER AVERAGE GRADE		62.58 m
MIDPOINT OF WEST TOWER ROOF		183.37m
WEST TOWER BUILDING HEIGHT	127 m	120.79 m

AMENITY AREA

AMENITY LOCATION	AMENITY FUNCTION	AREA
INDOOR AMENITY	COMMUNAL AMENITY	1753.91 m^2
OUTDOOR AMENITY	COMMUNAL AMENITY	2474.50 m^2
OUTDOOR AMENITY	PRIVATE AMENITY	986.16 m^2
TOTAL AMENITY SPACE		5214.57 m^2

PARKING SPACES

TYPE	REQUIRED	REQUIRED	PROPOSED
RESIDENT	N/A, MAX 1.5per	0 MIN, 910 MAX	124
RESIDENT BARRIER-FREE	N/A	0	8
TOTAL RESIDENTIAL			132
RES VISITOR	0.1/unit	61	58 (+3 B-F)
RES VISITOR BARRIER-FREE	20-99 = 1	1 of 61	3
RETAIL	N/A, MAX 10	0	8
DAY CARE	N/A	0	6
RETAIL/DAY CARE BARRIER-FREE	N/A	0	1
TOTAL VISITOR			76
GRAND TOTAL		61 MIN	208

NOTES
REFER TO A10-00B FOR FURTHER INFORMATION ON VEHICULAR PARKING SPACE SIZES AND WASTE STATISTICS.

LOADING SPACES

TYPE	REQUIRED	PROPOSED
RETAIL	0	SHARED
OTHER (DAY CARE)	1	1
RESIDENTIAL	0	SHARED
TOTAL TYP LOADING SPACES	1	1

1 TYPE G LOADING SPACE IS PROVIDED FOR WASTE COLLECTION

1 ADDITIONAL LSU LOADING SPACE IS LOCATED IN P1 FOR WEST TOWER LOADING CONVENIENCE

BICYCLE PARKING SPACES

TYPE	PROVISION	REQUIRED	PROPOSED
REQUIRED SPACES			
RESIDENTIAL	0.5/unit	304	
RETAIL	1/250 m^2	6	
DAY CARE	1/250 m^2	5	
TOTAL REQUIRED		315	
PROVIDED SPACES			
INTERIOR SECURE SPACES	MIN 25%	79	640
EXTERIOR SPACES	MAX 50%	N/A	132
TOTAL PROVIDED			772
NUMBER OF SPACES ABOVE AT GROUND LEVEL HORIZONTAL	50% of REQD	158	
INTERIOR			26
EXTERIOR			132
TOTAL			158

STORAGE LOCKERS

TOTAL: 350

SITE PLAN LEGEND

AD	AREA DRAIN
APS	ACCESSSIBLE PARKING SIGNAGE
AW	AREA WELL (GRATE POROSITY LESS THAN 20mm x 20mm)
B	BOLLARD
B-F	BARRIER-FREE
BR	BIKE RACK (SEE LANDSCAPE)
CB	CATCH BASIN
CW	CONCRETE WALKWAY
DC	DEPRESSED CURB
EX-CW	EXISTING CONCRETE WALKWAY
EX-LS	EXISTING LIGHT STANDARD
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FH-EX	FIRE HYDRANT - EXISTING
FR	FIRE ROUTE SIGNAGE
HB	HOSE BIB (SEE MECHANICAL)
MH	MAN HOLE
NIC	NOT IN CONTRACT
TD	TRENCH DRAIN

▶ PRIMARY ENTRY/EXIT
◀ EXIT
PROPERTY AND EASEMENT LINES
FIRE ROUTE

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ONTARIO ASSOCIATION OF ARCHITECTS
MATTHEW JOHNSTON
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KEYPLAN

TRUE NORTH

ISSUE CHART

MARK	ISSUE	DATE
1	ISSUED FOR OPA / ZBA / SPA	2022-04-22
2	ISSUED FOR 66% SD	2022-05-27
3	ISSUED FOR 100% SD	2022-06-10
4	ISSUED FOR 66% DD	2022-08-19
5	ISSUED FOR 100% DD	2022-09-30
6	ISSUED FOR SPA RESUBMISSION	2022-11-09
7	ISSUED FOR NCC 99% FLUDTA	2022-11-09
8	ISSUED FOR FOUNDATION REVIEW	2022-12-09
9	ISSUED FOR SHORING & EXCAVATION PERMIT	2022-12-16

Job Number 442200

TITLE

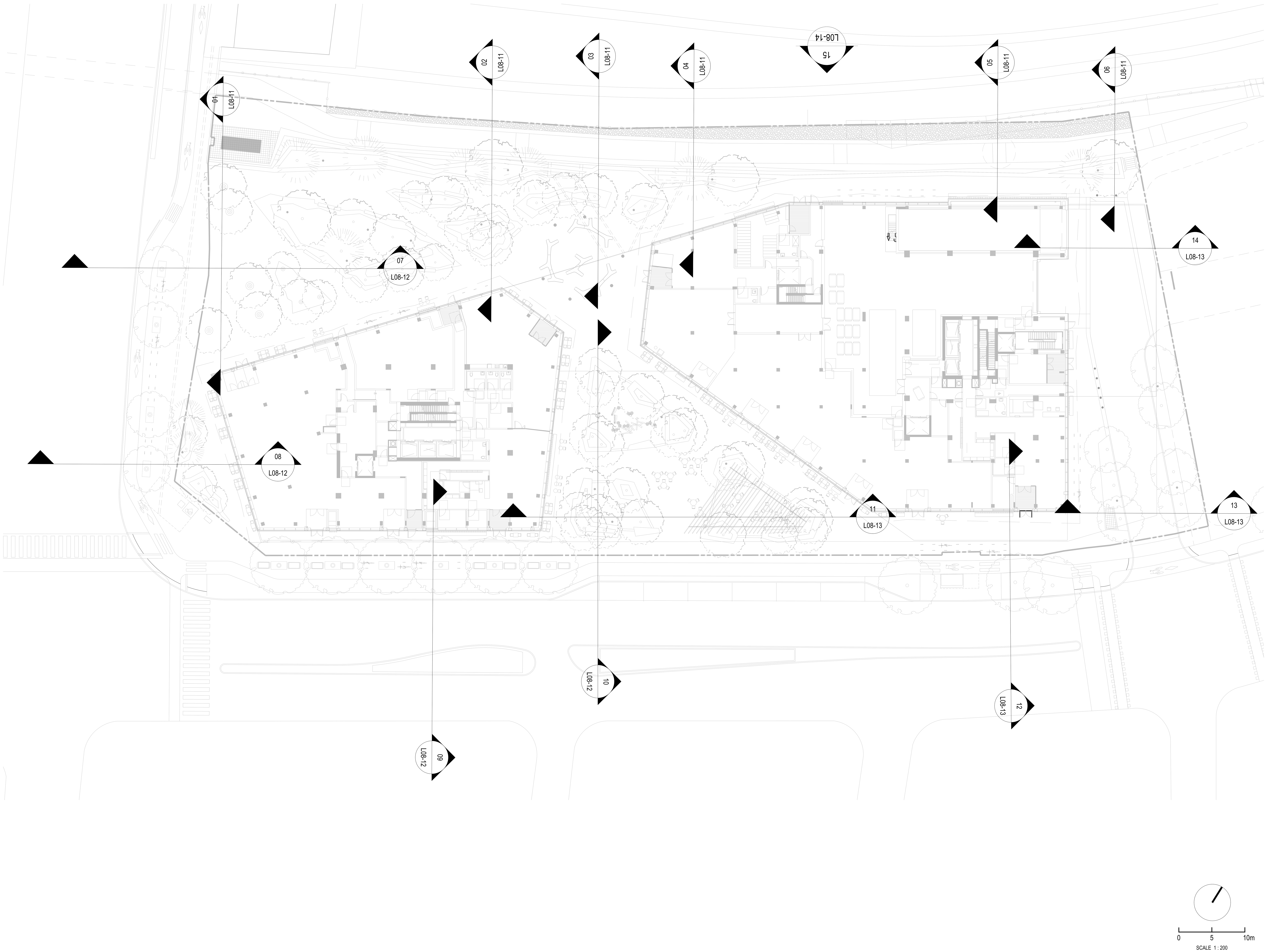
SITE PLAN & STATISTICS

SHEET NUMBER

G01-01

Site Plan Control Application File Nos.: D01-01-22-0005, D02-02-22-0041 & D07-12-22-0069

APPENDIX C: Sections (proposed retaining walls)



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JEFFREY STAATES

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KEYPLAN

ISSUE CHART

2	ISSUED FOR SPA RESUBMISSION	2022-11-09
1	ISSUED FOR OPA / ZBA / SPA	2022-04-22
MARK	ISSUE	DATE

Job Number

TITLE

SECTION

SHEET NUMBER

L08-10

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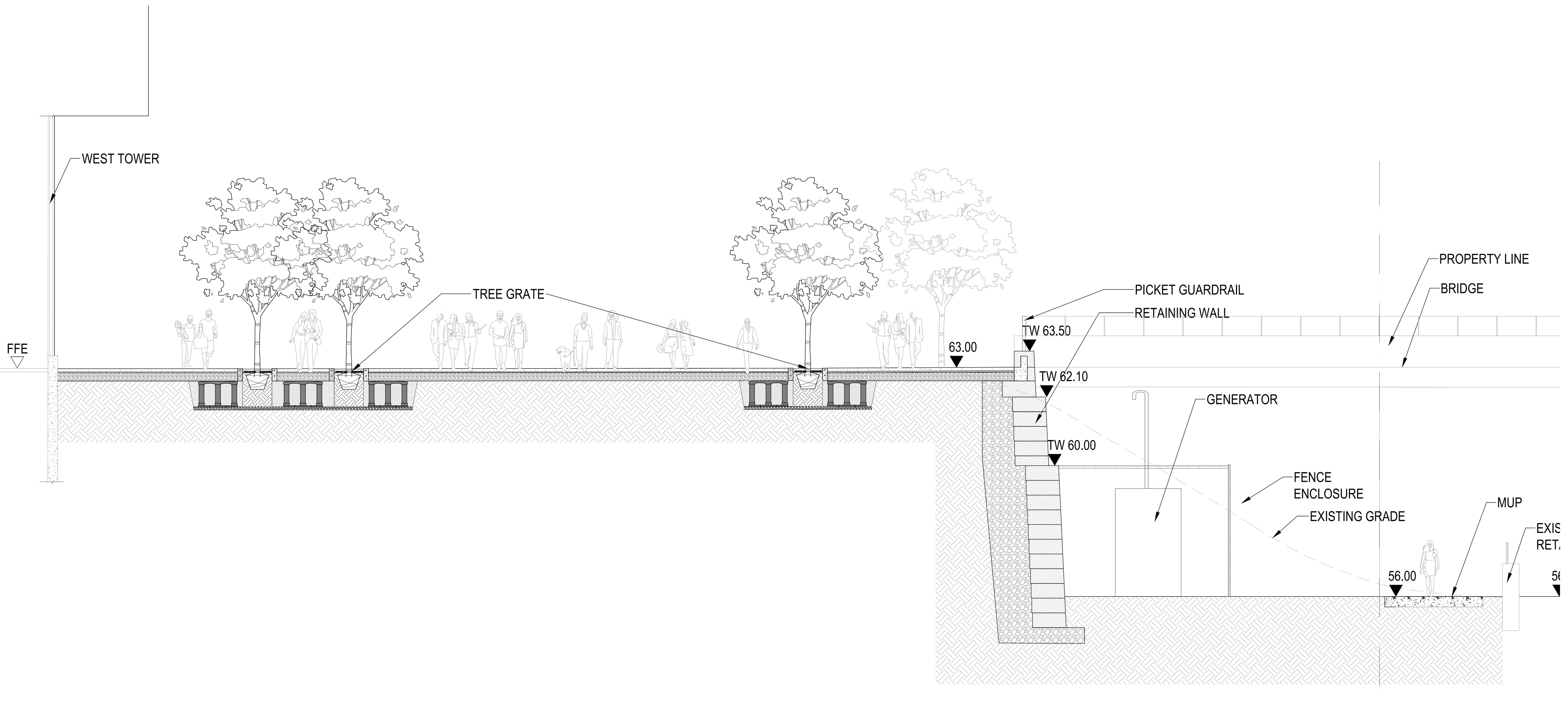

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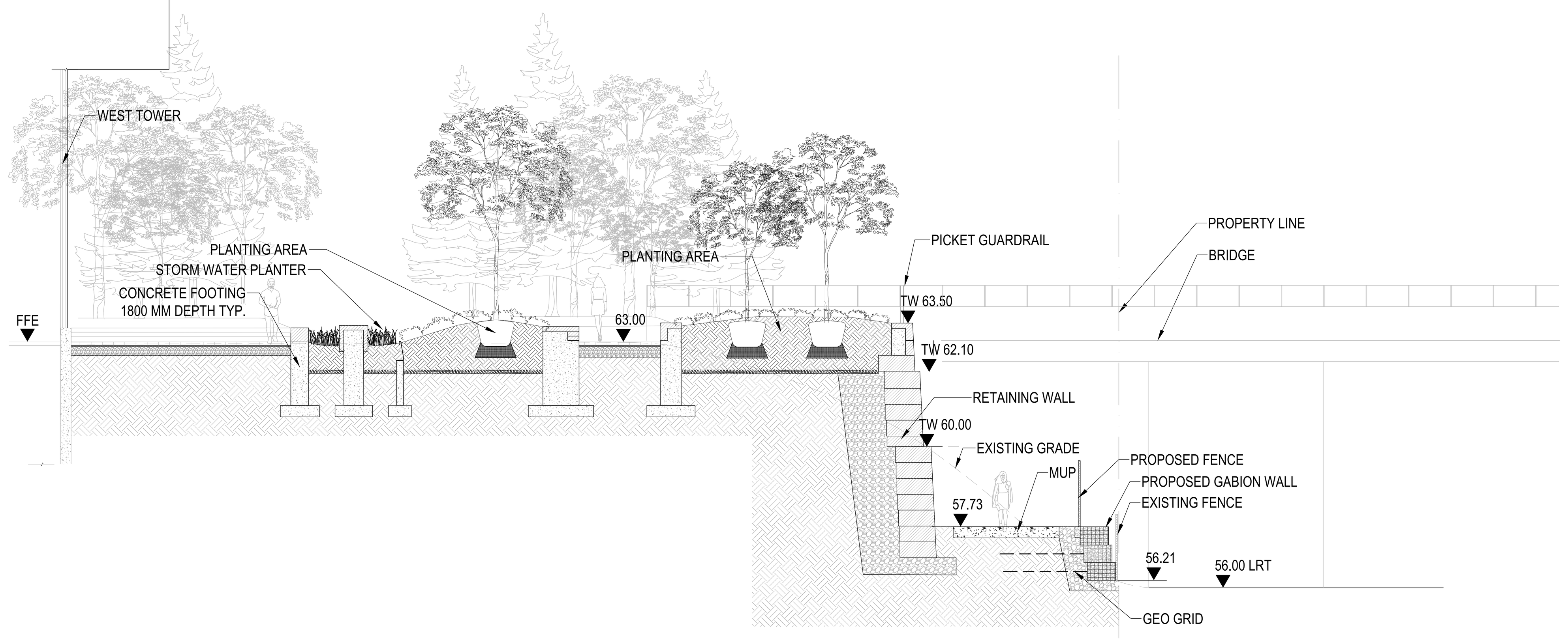

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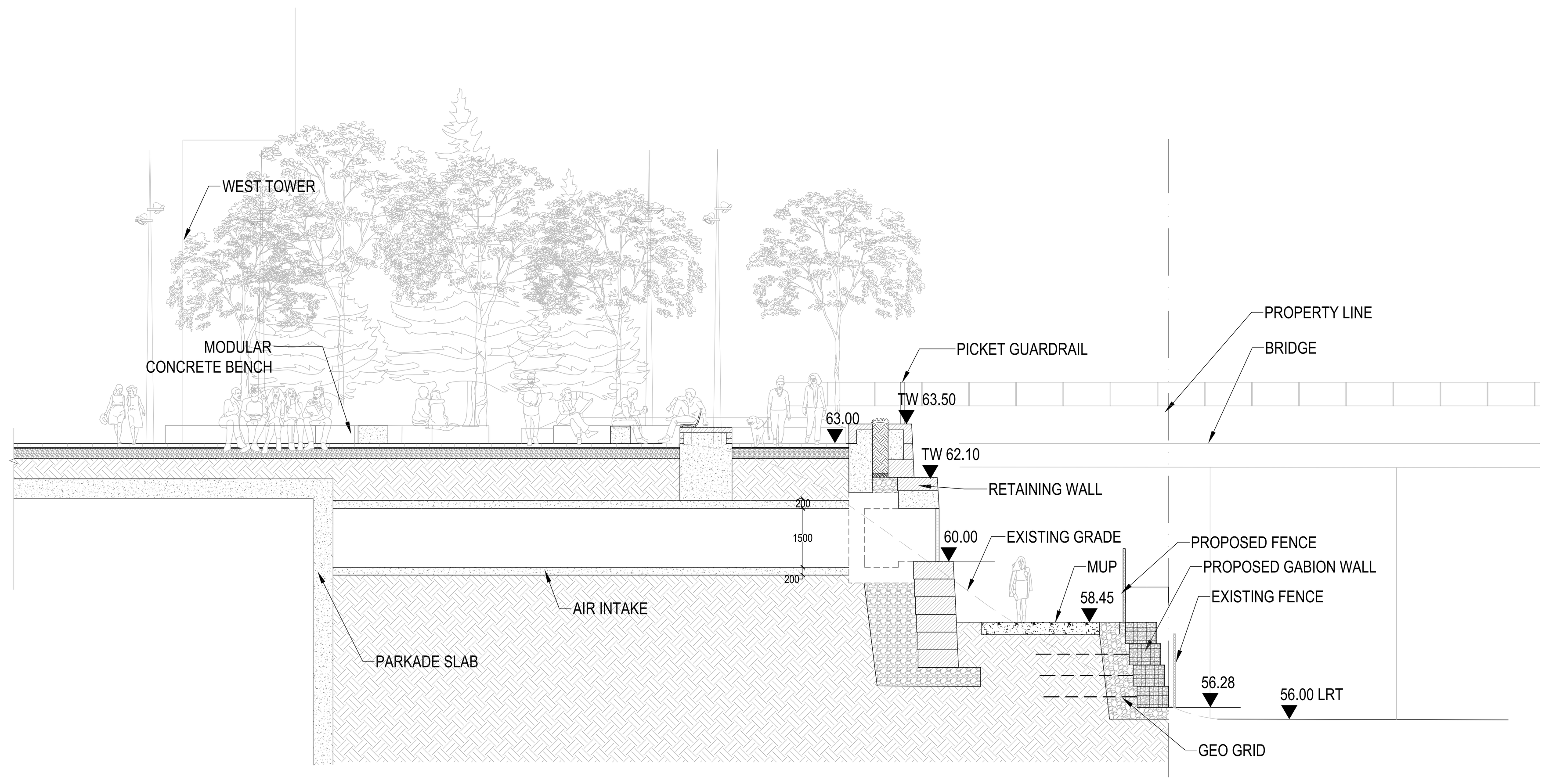

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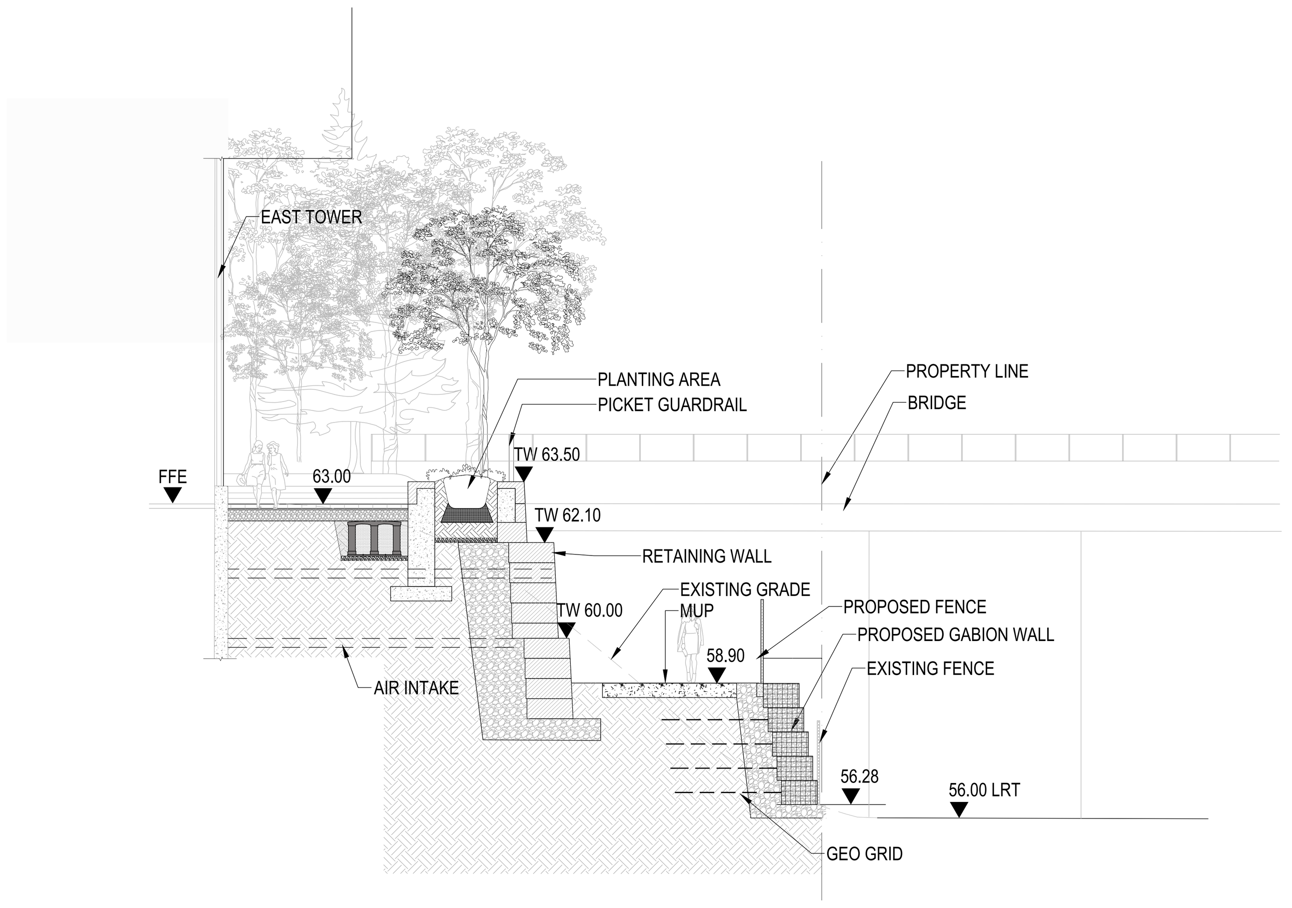

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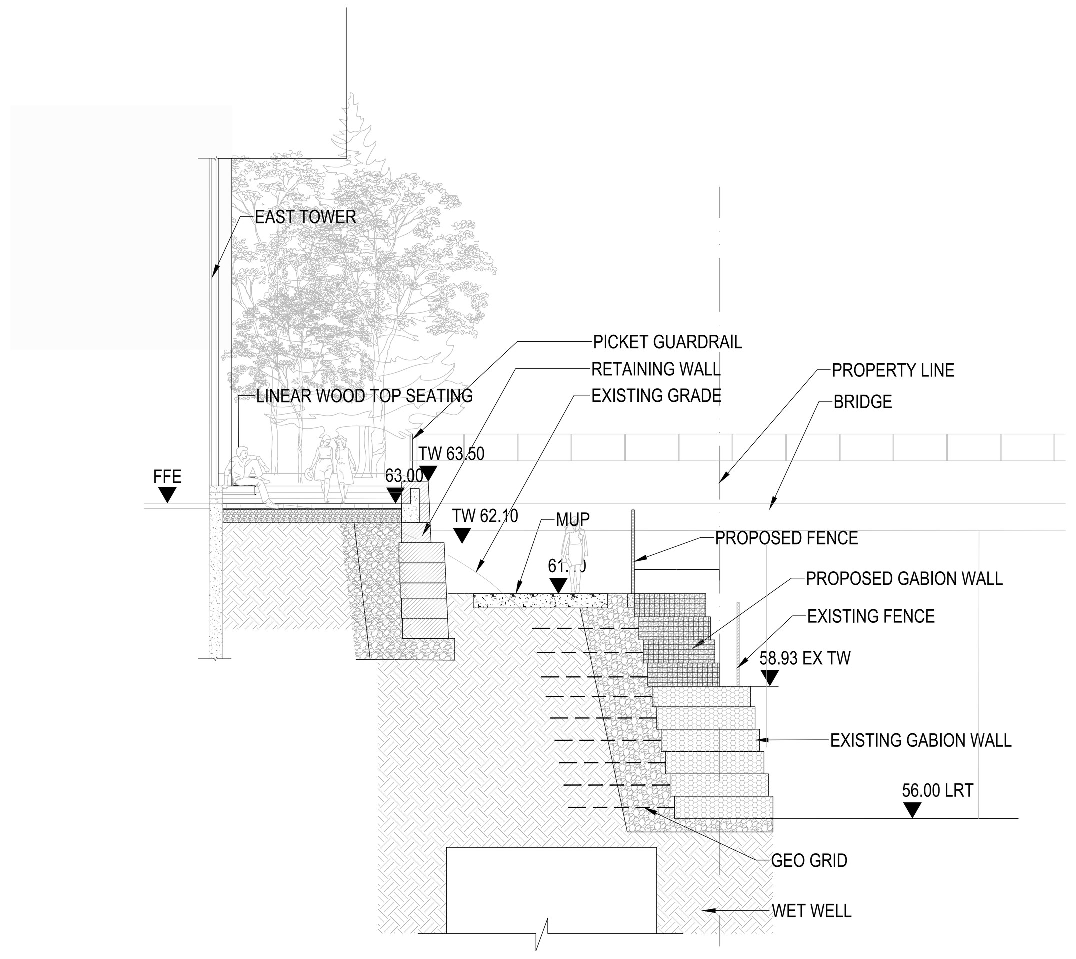

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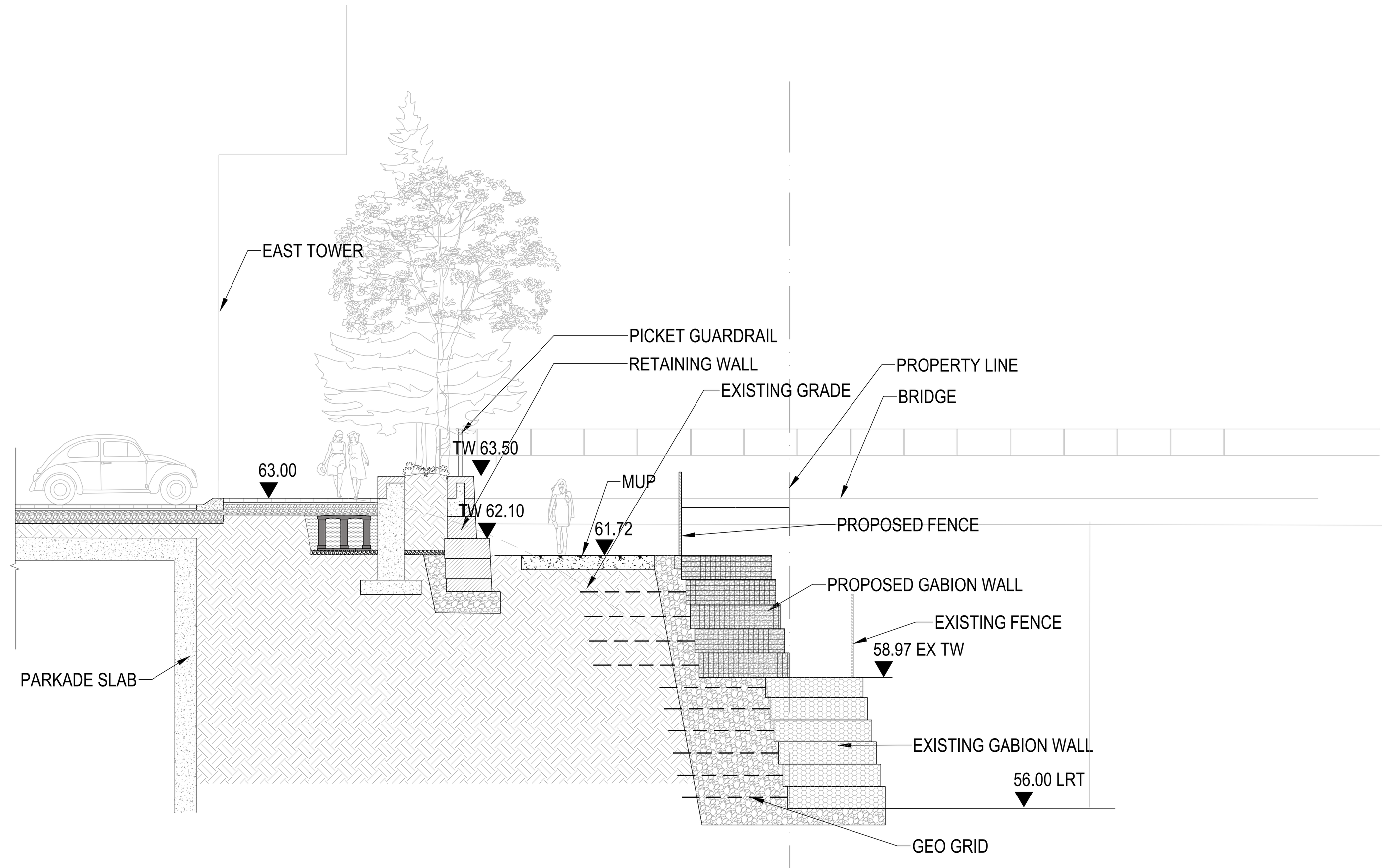

06 MUP TO NORTHEAST UPPER PLAZA
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KEYPLAN

ISSUE CHART

MARK	ISSUE	DATE
2	ISSUED FOR SPA RESUBMISSION	2022-11-09
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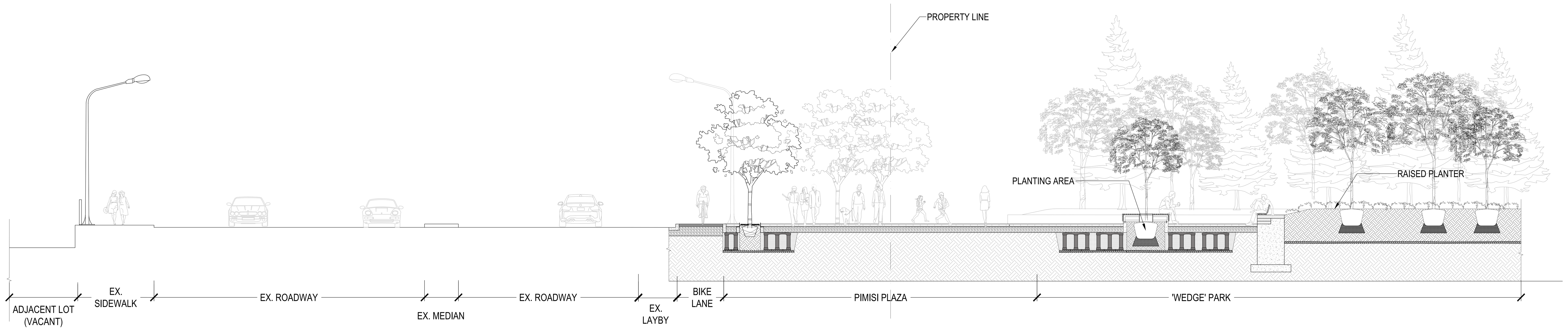

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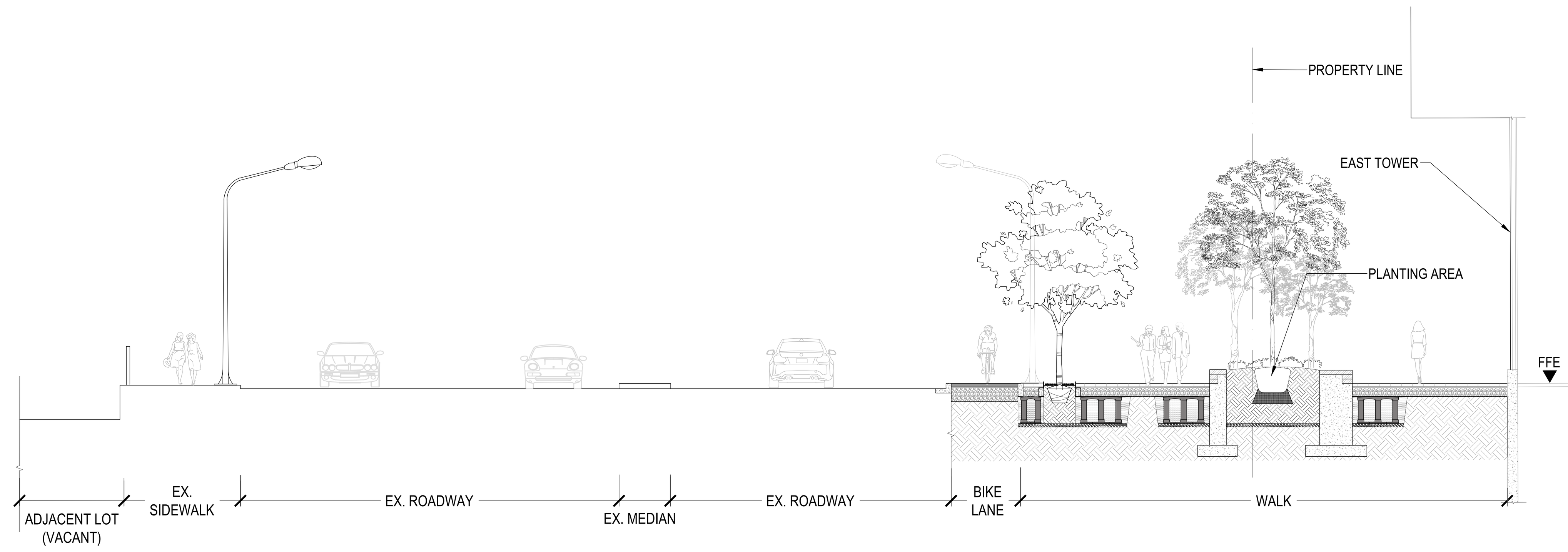

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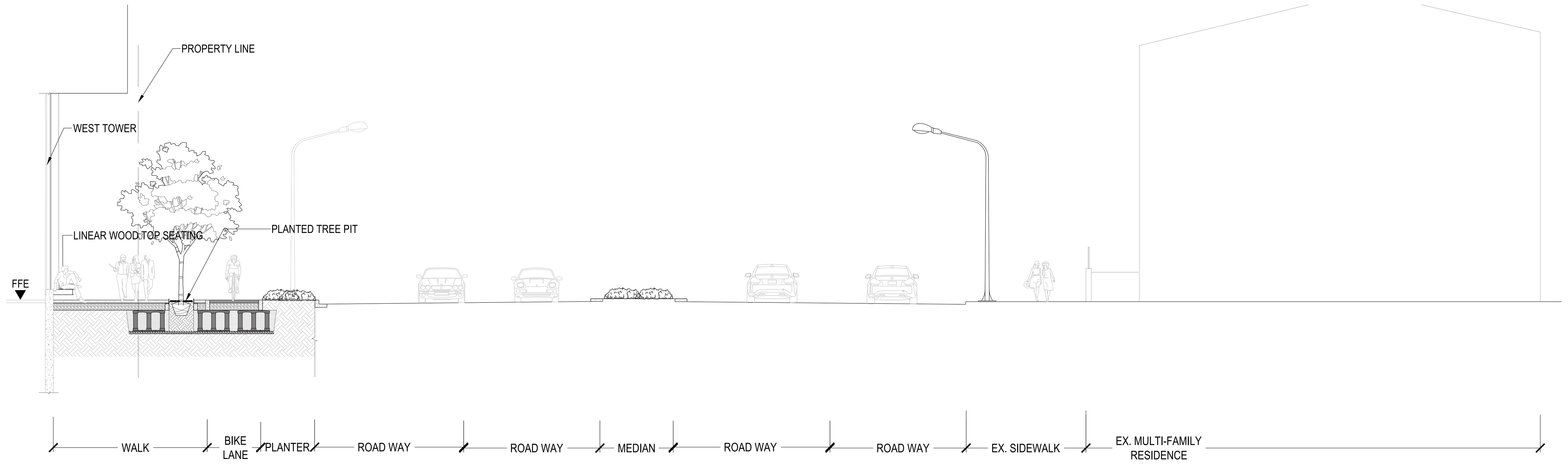

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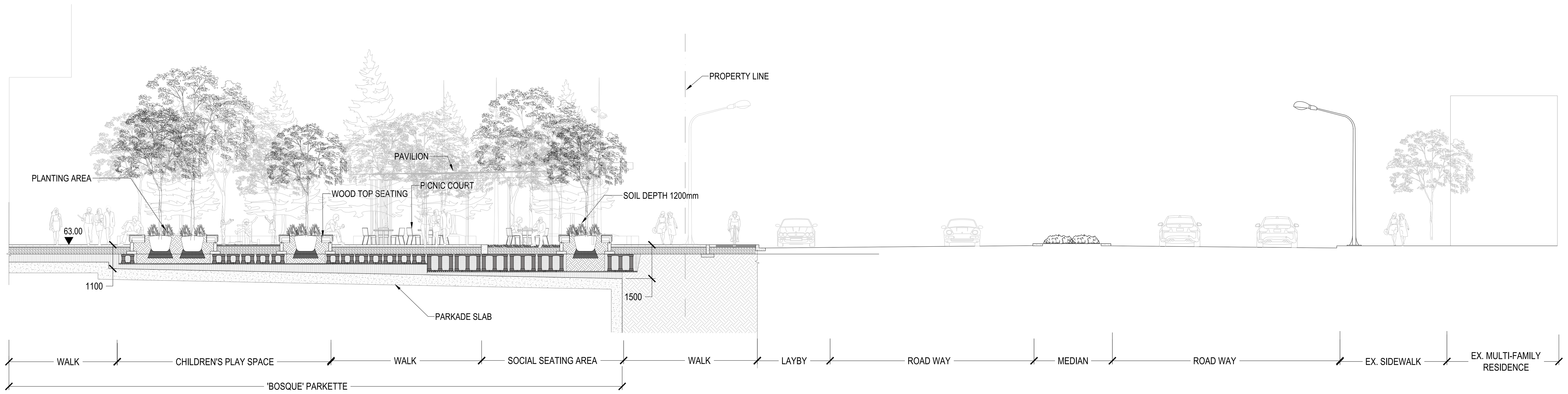

10 ALBERT STREET AND 'BOSQUE'
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KEYPLAN

ISSUE CHART

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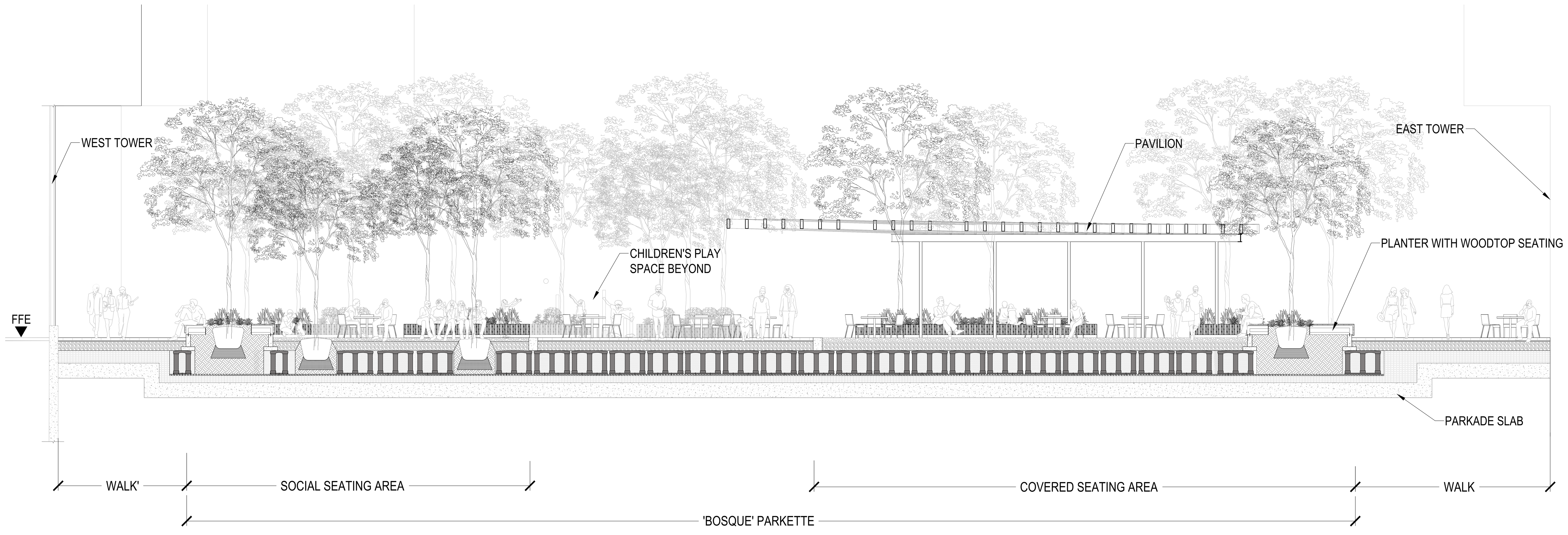
TITLE

SECTION

SHEET NUMBER

L08-12

Site Plan Control Application File Nos.:D01-01-22-0005,D02-02-22-0041 & D07-12-22-0069



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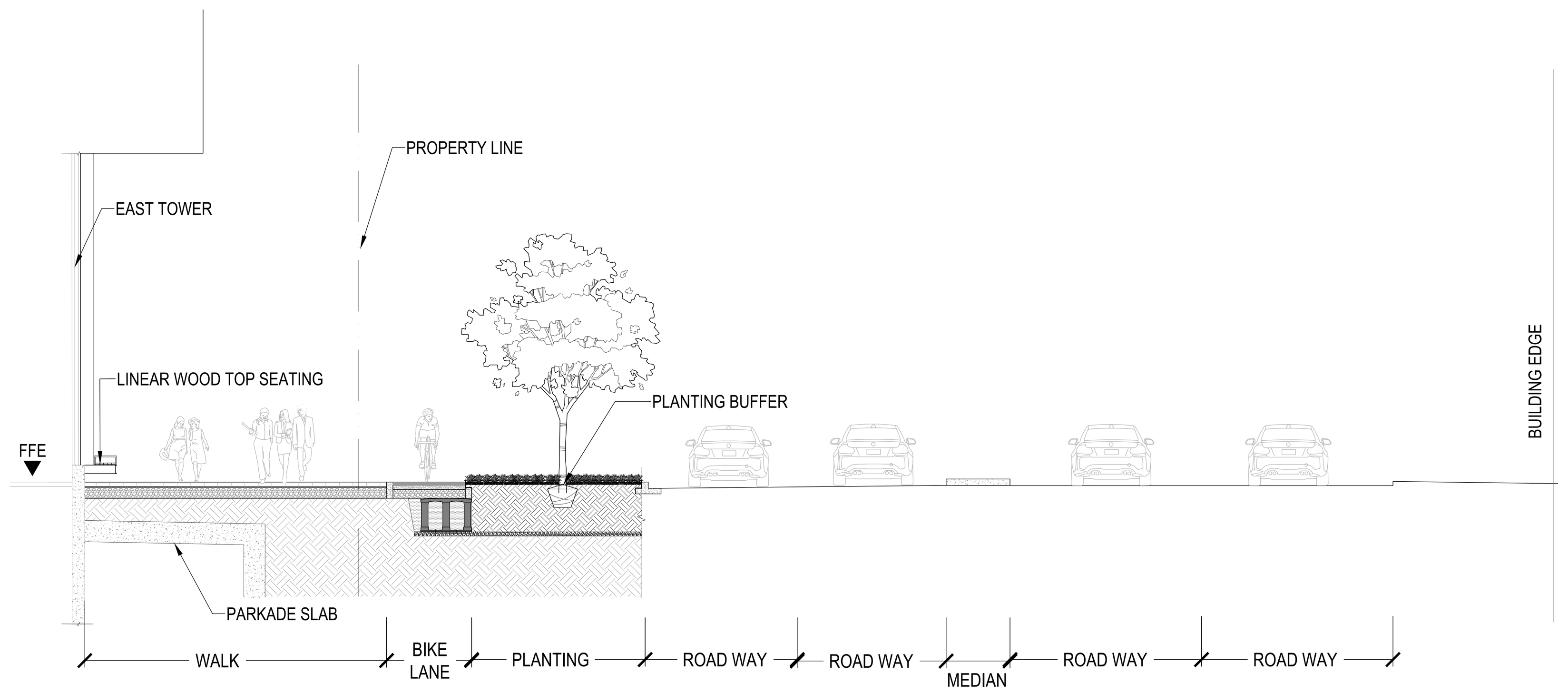

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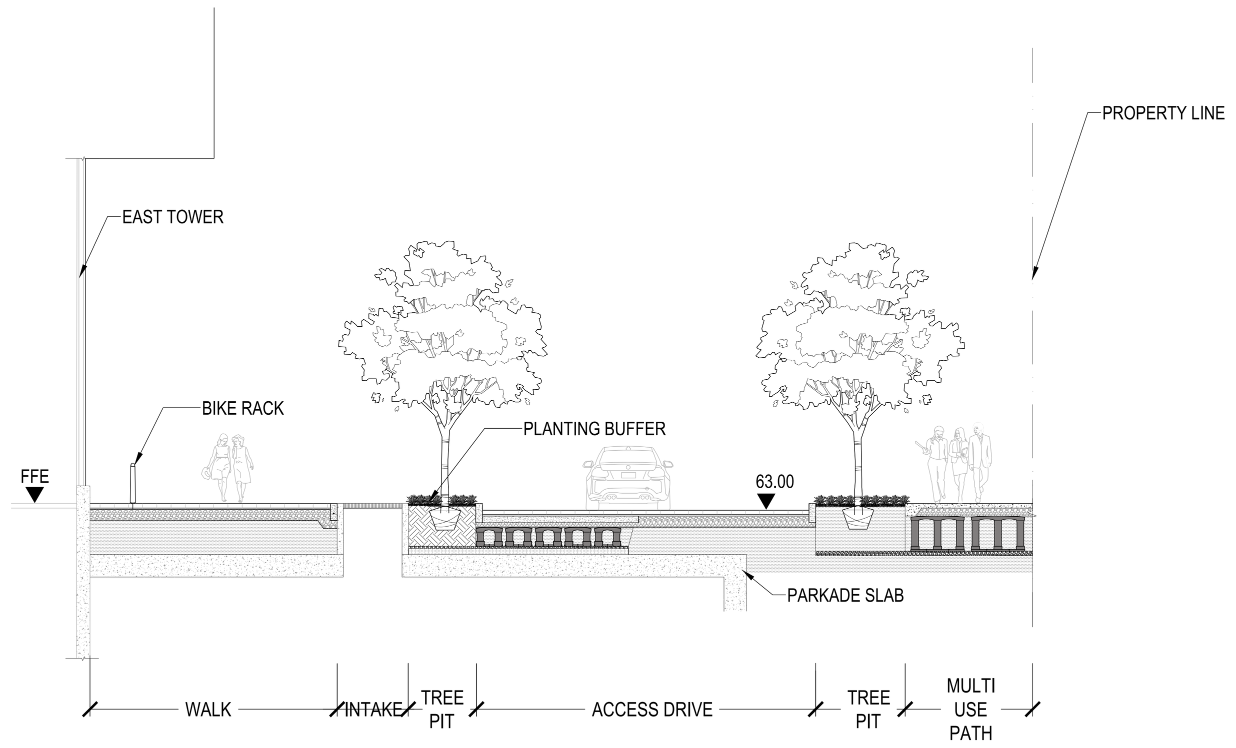

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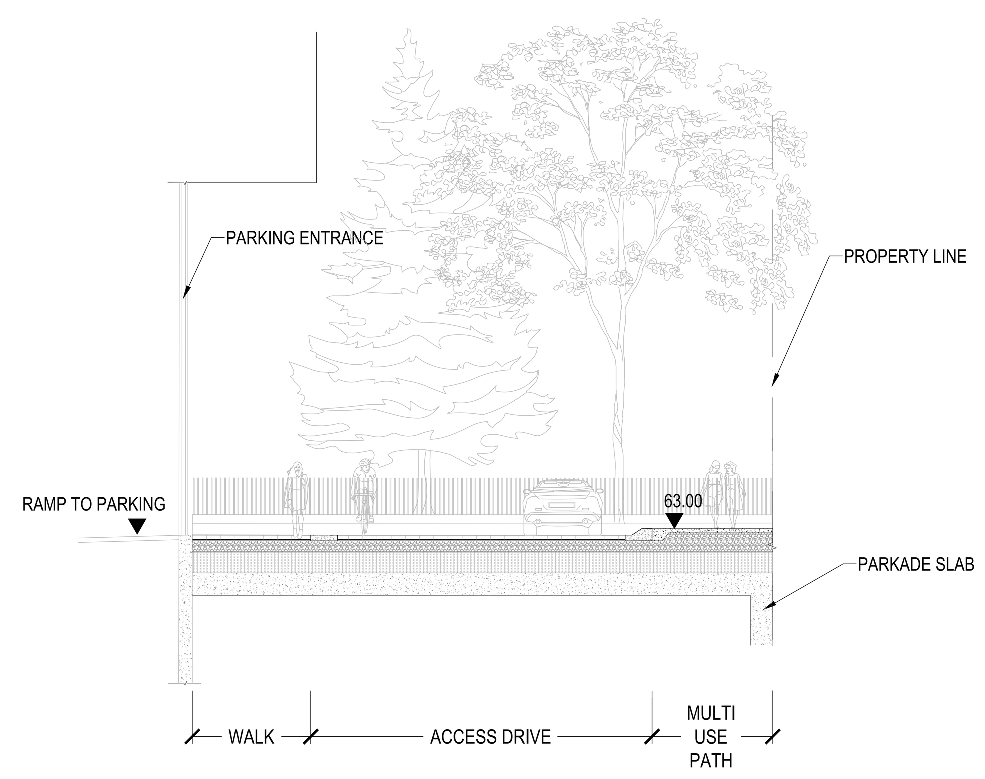

14 - NORTH EMPRESS ACCESS LANE
SCALE: 1:100

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ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS
OALA

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KEYPLAN

ISSUE CHART

2	ISSUED FOR SPA RESUBMISSION	2022-11-09
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Job Number

TITLE

SECTION

SHEET NUMBER

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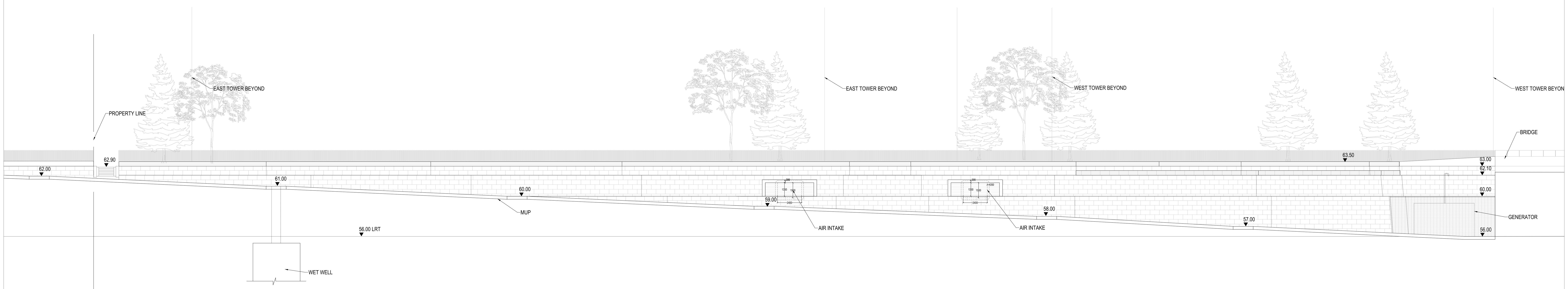

15
-
NORTH RETAINING WALL ELEVATION
SCALE: 1:150

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Job Number

TITLE

NORTH RETAINING WALL ELEVATION

SHEET NUMBER

L08-14

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APPENDIX D: Geotechnical Investigation Report

REPORT

Geotechnical Investigation

LeBreton Library Parcel
665 Albert Street
Ottawa, Ontario

Submitted to:

Dream Impact Master LP
30 Adelaide St. East
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Submitted by:

Golder Associates Ltd.
1931 Robertson Road,
Ottawa, Ontario, K2H 5B7

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22511882

April 2022

Distribution List

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1 e-copy - Dream Impact Master LP

Table of Contents

FIGURES

APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Dream Impact Master LP (Dream) to conduct a geotechnical investigation at the property located at 665 Albert Street. The site is located north of Albert Street, east of Booth Street, south of the Fleet Street Aqueduct (open aqueduct), and west of the site of the new Ottawa Public Library (currently under construction). A Site Location Plan is attached as Figure 1.

The purpose of this investigation was to assess the general subsurface and groundwater conditions within the study area by means of a limited number of boreholes and associated laboratory testing. Based on an interpretation of the factual information obtained during the current investigation, along with the existing subsurface information available for the site from previous investigations, a general description of the soil and groundwater conditions is presented. These interpreted subsurface conditions and available project details were used to prepare engineering guidelines on the geotechnical design aspects of the project, including construction considerations which could influence design decisions. A Phase Two Environmental Site Assessment was completed concurrently with the geotechnical investigation, the results of which are presented under separate cover.

The reader is referred to the 'Important Information and Limitations of This Report' which follows the text but forms an integral part of this document.

2.0 DESCRIPTION OF PROJECT AND SITE

It is understood that the proposed new development is an irregularly shaped structure which will consist of a four-storey podium filling the entire site, above which will be two 30 to 35 storey residential towers, covering a portion of the site. The development will include 2 levels of underground parking (below the entire footprint of the podium). The lowest level of parking is indicated to have a finished floor elevation of 53.6 m. The main ground floor of the development is indicated to be at an elevation of 62.0 m.

The site is currently vacant and forms part of the larger LeBreton Flats area which included a variety of historical industrial uses (past uses of the property are discussed in detail in the Phase One and Two Environmental Site Assessments. The site is unsurfaced and is relatively flat with existing ground elevations ranging from 60.5 m to 62.9 m (based on spot elevations at borehole locations).

Based on the results of previous investigations and the published geology maps available from the Geologic Survey of Canada (GSC) for this area, the subsurface conditions at this site are expected to consist of a surficial layer of fill, overlying a thick deposit of glacial till. The glacial till is underlain by interbedded limestone and shale bedrock of the Verulam formation.

3.0 PROCEDURE

3.1 Desktop Study

A previous geotechnical investigation was completed at the site by Golder Associates in 2011. This investigation included six boreholes located within the subject site. The boreholes (BH11-33, BH11-35 and BH11-37 to BH11-40) have been used to supplement the current investigation. The locations of these previous boreholes are shown on Figure 1. Copies of the previous borehole logs are included in Appendix A.

Based on the results of previous investigations and the published geology maps available from the Geologic Survey of Canada (GSC) for this area, the subsurface conditions at this site are expected to consist of a surficial layer of fill, overlying a thick deposit of glacial till. The glacial till is underlain by limestone and shale bedrock of the Verulam formation.

3.2 Field Investigation

The fieldwork for this current investigation was carried out between February 14th and 24th, 2022. During that time, a total of five boreholes (BH22-01 to BH22-05) were advanced at the approximate locations shown on Figure 1.

The boreholes were advanced using a track-mounted CME-55 hollow-stem auger drill rig with diamond coring capabilities supplied and operated by Downing Drilling of Hawkesbury, Ontario. The boreholes were advanced to depths ranging from 12.2 m to 16.5 m below the existing ground surface using a combination of auger drilling and diamond coring using NQ sized core barrels. Standard Penetration Tests (SPTs) were carried out within the overburden at regular intervals of depth. Samples of the soils encountered were recovered using 35 mm diameter split-spoon sampling equipment.

The fieldwork was supervised by technicians from our staff who located the boreholes, directed the drilling and in-situ testing operations, logged the boreholes and samples, and took custody of the soil and bedrock samples retrieved. On completion of the drilling operations, the soil samples were transported to our laboratory for further examination and laboratory testing. Laboratory testing was carried out on selected soil samples, including natural water content and grain size distribution tests. Basic chemical analysis related to potential sulphate attack on buried concrete elements and potential corrosion of buried ferrous elements was also completed on selected soil samples. Selected rock core samples were tested to determine the Uniaxial Compressive Strength (UCS) of the Rock.

Laboratory testing is in progress at the time of this draft report and the results will be included in the final report.

The borehole locations were selected in consultation with the City of Ottawa, marked in the field, and subsequently surveyed by City of Ottawa personnel. The geodetic reference system used for the survey is the North American Datum of 1983 (NAD83). The borehole coordinates are based on the Modified Transverse Mercator (MTM Zone 9) coordinate system. The elevations are referenced to Geodetic datum (CGVD28).

4.0 SUBSURFACE CONDITIONS

4.1 General

Information on the subsurface conditions is presented as follows:

- Borehole records are provided in Appendix A.
- Results of water content testing, grain size testing, UCS testing and basic chemical analyses will be included in the final report.

The Record of Borehole sheets describe the subsurface conditions at the borehole locations only.
The stratigraphic boundaries shown on the borehole records are inferred from non-continuous sampling in some cases, observations of drilling progress as well as results of SPTs and, therefore, represent transitions between soil types rather than exact planes of geological change. Furthermore, subsurface soil, bedrock and groundwater conditions will vary between and beyond the borehole locations.

Unless otherwise noted, the following sections present an overview of the subsurface conditions encountered in the boreholes advanced during the current investigation. It should be noted that the shallow subsurface conditions noted on the borehole logs from the previous investigations may have changed since the boreholes were drilled, as such only auger refusal/bedrock depths and hydraulic response tests from previous drilling are discussed herein.

4.2 Overview of Subsurface Conditions

In general, the subsurface stratigraphy within the area of the investigation consists of surficial fill materials overlying glacial till, which in turn overlies limestone and shale bedrock.

4.3 Fill Material

Fill material was encountered in each of the boreholes from ground surface. The fill is heterogeneous in nature predominantly ranging from silty sand to sand. The fill also contains gravel, brick fragments, concrete and mortar fragments, glass, wood and layers of organic material and clay. Cobbles and boulders were also encountered during drilling. Fill material is, by its nature a heterogeneous material and other debris or obstructions could also be encountered with the fill.

SPT “N” values measured within the fill ranged from 6 to greater than 50 blows per 0.3 m of penetration during the two investigations (in 2011 and the current 2022 investigation). The SPT “N” values suggest that the fill has a highly variable very loose to very dense state of packing.

The fill material was fully penetrated in all of the boreholes at depths of between 2.1 and 3.7 m below the existing ground surface.

4.4 Glacial Till

A deposit of glacial till was encountered beneath the fill material at all of the boreholes. The glacial till typically consists of a heterogeneous mixture of gravel, cobbles, and boulders in a matrix of sand and silt with a trace to some clay. Cobbles and boulders were encountered throughout the till during drilling and should be expected during construction.

The 2011 boreholes were terminated at auger and/or sampler refusal within the glacial till, and therefore did not fully penetrate the till layer. The five boreholes drilled during the 2022 investigation were all extended through the till and into the underlying bedrock, confirming the till extended to depth of 11.2 to 14.7 m.

SPT “N” values within the glacial till layer gave ‘N’ values ranging from 8 blows to greater than 100 blows per 0.3 m of penetration, and are typically greater than 50 blows per 0.3 m of penetration suggesting the majority of the till has a dense to very dense state of packing. Very high blow counts, however, could be indicative of boulders and cobbles in the till rather than the state of packing.

Borehole 22-04 encountered a layer of “till-like” silty sand and sandy silt which was less dense and not as coarse as the till at lower depths (and at similar depths in the surrounding boreholes) between approximately 2.1 and 6.1 m depth.

4.5 Bedrock

The 2011 boreholes were terminated at refusal in the glacial till layer at depths of 4.2 m to 10.0 m below the existing ground surface. Based on the current 2022 boreholes, it is unlikely that the majority of these refusals were the result of encountering the bedrock surface and were more likely due to cobbles and boulders within the till.

The current 2022 boreholes were extended through the glacial till deposit into the underlying bedrock using rotary diamond drilling techniques, while retrieving NQ core. The depths and elevations to bedrock surface in the current investigation are summarized below:

Borehole No.	Ground Surface Elevation (masl)	Depth to Bedrock (m)	Elevation of Bedrock (masl)
22-01	62.9	14.7	48.2
22-02	62.5	14.2	48.3
22-03	61.7	11.2	50.5
22-04	60.5	11.2	48.3
22-05	62.3	11.2	48.3

The bedrock consists of limestone with shale interbeds of the Verulam formation. Additional description of the bedrock is provided on the Borehole records provided in Appendix A.

4.6 Groundwater Conditions

Monitoring wells were installed in boreholes 22-01 to 22-05 during the current investigation. The groundwater levels observed in the monitoring wells have been summarized in the following table:

Well ID	Geologic Unit of Screened Interval	Groundwater Level		Date of Measurement	Date Well Installed
		Depth (mbgs)	Elevation (masl)		
22-01	Glacial Till	7.8	55.1	February 25, 2022	February 15, 2022
22-02	Glacial Till	7.9	54.6	February 25, 2022	February 16, 2022
22-03	Bedrock	13.0	48.7	February 25, 2022	February 22, 2022
22-04	Glacial Till	10.7	49.8	February 25, 2022	February 22, 2022
22-05	Glacial Till	8.2	54.1	February 25, 2022	February 24, 2022

It should be noted that groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.

4.7 Corrosion Testing

To be included in final report.

5.0

5.0 DISCUSSION AND GEOTECHNICAL RECOMMENDATIONS

This section of the report provides engineering information related to the geotechnical design aspects of the project based on our interpretation of the available subsurface information and on our understanding of the project requirements. The discussion below focuses on the development of the proposed structure.

The information in this portion of the report is provided for detailed design purposes in support of the design by the engineers and architects. Where comments are made on construction, they are provided only in order to highlight aspects of construction which could affect the design of the project. Contractors bidding on or undertaking any work at the site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, equipment capabilities, costs, sequencing and the like.

This report addresses only the geotechnical aspects of the subsurface conditions at this site.
The geo-environmental (chemical) aspects, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources, are outside the terms of reference for this report. The results of concurrent Environmental Site Assessment(s) for this project are provided under separate cover(s).

5.1 Site Grading

It is understood that a grade raise of up to 2.4 m is proposed at the site to match the proposed grade raise of Albert Street. The proposed grade raise is within acceptable limits for the soils at this site. A proposed grading plan was not available for review at the time of writing this report. The currently proposed ground floor level (Level 0) is indicated to have a finished floor elevation of 62.0 m. Based on elevations of the existing boreholes the current site grades are slightly above this (between 62 and 63 m elevation), with localized areas being lower (for example, BH22-02 and BH22-04 at 61.7 m and 60.5 m). The majority of the developed site will be excavated to accommodate the two floors of underground parking.

Based on the underlying soil conditions, there are no significant concerns with settlement due to the relatively minor grade raises required to develop the site.

5.2 Foundation Design

Based on the preliminary drawings provided, the entire footprint of the proposed development includes two floors of underground parking. The finished floor elevation of the lower (P2) parking level is indicated to be 53.6 m elevation. This compares with existing grades of approximately 62 to 63 m elevation based on the borehole elevations, and a bedrock surface at approximately 48 m elevation at the majority of borehole locations.

There are a number of options, from a foundation perspective:

- Assuming the lowest level of parking remains at 53.6 m elevation as shown on the drawings it will be within the glacial till. It is unlikely that the large 30 to 35 storey towers can be founded on conventional spread footings on the glacial till. Deep foundations (piles or caissons) would be appropriate for the high-rise towers. Deep foundations are discussed in Section X.X below.
- It may be feasible to found the lower podium structure (which is only 4 storeys) on shallow foundations (spread footings). Shallow foundations are discussed in Section X.X below.

- It would also likely be feasible to found the podium structure on a raft or mat foundation within the glacial till. Raft/mat foundations are discussed in Section X.X below.
- If the foundations (for the high-rise towers) can be lowered to bedrock (approximately 5 m lower than the current P2 level) it would be feasible to found the large towers on shallow foundations on bedrock).
- It may be feasible to found the entire development (podium and towers) on a single large raft within the till. A raft foundation suitable for the high-rise towers, however, would likely have a significant thickness (potentially several metres) to provide the rigidity required. Given, however, that there is only approximately 5 m of soil between the bedrock surface and the P2 level it is likely that it would be more cost-effective to simply found the building on rock than to construct a very thick continuous raft below the entire development.

5.2.1 Deep Foundations

Assuming foundation level cannot be lowered to bedrock, it is likely that at least the large high-rise towers would need to be founded on deep foundations. Typically, driven steel piles or cast-in-place concrete piles (with rock sockets) would be used.

Driven steel piles are typically more cost-effective for moderate vertical loads, but because of the short length (less than 5 m) they will provide almost no uplift or lateral resistance. Driven steel piles typically require larger groups of piles, with associated pile caps to resist larger loads. Cast-in-place concrete piles tend to be more expensive for resisting purely vertical loading but can provide very large lateral and uplift resistances. Cast-in-place concrete piles can also generate very high compressive resistances and therefore a single pile (or small group) can be used in place of a larger group of driven piles.

5.2.1.1 Driven Steel Piles

The proposed hospital structure may be supported on driven steel piles. Steel H-piles and closed-ended steel pipe piles are both commonly used in the area.

In general, the subsurface conditions in the vicinity of the proposed hospital building consist of variable deposits of fill with some localized areas of silty clay overlying a deposit of glacial till, overlying localized deposits of interlayered sands which in turn overlies shaley limestone bedrock. A piled foundation system could be used to transfer the foundation loads through the overburden soils to the underlying bedrock.

Axial Resistance

Piles driven to sound rock generate high ultimate geotechnical capacities, generally equal to or in excess of the structural capacity of the steel section (i.e., with increased loading or driving stresses, the steel section will become damaged and fail before the bedrock yields). For the purposes of design, the ultimate geotechnical resistance of the rock may be assumed to be equal to the ultimate resistance of the steel section.

A resistance factor of 0.4 should be applied to this value to obtain the factored resistance of a pile driven to sound rock. The resistance factor may be increased to 0.5 if a program of dynamic (PDA) testing is implemented, or 0.6 if static load testing is performed.

As an example, an HP310x79 has an ultimate resistance of 3,493 kN (based on the cross-sectional area, assuming 350 MPa yield stress and ignoring buckling, bending, lateral loads, sacrificial thicknesses or other more complex conditions which may reduce the structural capacity). The factored geotechnical resistance of an HP310x79 driven to sound rock may therefore be assumed to be 1,397 kN (3,493 kN x 0.4). A similar methodology may be used to estimate the geotechnical resistance of other pile sections.

Settlements for piles driven to sound rock are generally negligible, and the geotechnical resistance mobilized at 25 mm of settlement (a typical SLS condition) would be expected to exceed the factored axial resistance at ULS. Geotechnical SLS considerations therefore do not generally govern the design of pile driven to sound rock.

Piles spacings should not be less than three pile diameters (centre-to-centre) to prevent group effects. If closer pile spacings are required they can be accommodated, but the individual pile capacity may need to be reduced to account for the closer spacing. This can be reviewed in detailed design if required.

Uplift Resistance

The uplift resistance of a driven pile is a result of skin friction acting along the surface area of the embedded pile. The unfactored shaft resistance may be assumed to be equal to:

$$q_s = \beta \sigma_v'$$

Where:

q_s = the unfactored shaft resistance (in kPa);

β = a shaft resistance factor based on soil type and strength (use 0.8);

σ_v' = the vertical effective stress at the adjacent to the pile at depth z, equal to $z\gamma'$;

γ'= the effective unit weight of the soil which may be assumed to be 9 kN/m^3

A resistance factor of 0.3 should be applied to this value, to obtain the factored geotechnical uplift resistance. The dead weight of the pile itself, with an appropriate resistance factor for dead weight, may also be added to the geotechnical resistance in calculating the total uplift resistance.

The total uplift resistance of a pile group is the lesser of the sum of the individual pile resistances as described above, or the resistance of a single “block” of soil with a perimeter equal to the perimeter of the pile group (the mass of the soil inside the “block” may be included in the calculation; use a soil weight of 9 kN/m^3).

It should be noted that the uplift resistance of piles is highly dependent upon the installation of the piles as well as the layout of the pile groups. If the piles are relied upon to resist significant uplift loads, and uplift governs the design, consideration may be given to carrying out a tension test to confirm the uplift capacity.

Negative Friction

The raising of the grade or lowering of the groundwater table at or around the site may cause settlement of the existing soils. Localized settlement could also potentially be caused during a seismic event. In any of these cases, the potential will exist to develop negative skin friction (or downdrag) along the piles, and this should be considered in the design.

The magnitude of negative friction depends on the pile loading, pile dimensions and the final configuration of the site as well as the details of the below-grade portions of the building. The location of negative friction forces is also dependent on the location of the neutral axis of the pile which can only be determined once all of the pile details are known. For preliminary design, however, the negative friction can be assumed to be equal to the shaft friction calculated as described above for uplift resistance (the resistance factor of 0.3 should not be applied).

Negative friction is typically only considered in conjunction with dead and sustained live loads (not transient loads such as wind, earthquake and transient live loads) in evaluating the structural capacity of the pile. Negative friction does not impact the geotechnical resistance of the piles.

Lateral Resistance

The lateral resistance of a slender pile is typically governed by limiting the deflection which will occur under loading to some acceptable level. The geotechnical parameter most commonly used to determine lateral deflection of piles is the coefficient of horizontal subgrade reaction (k_h). For this site, k_h may be assumed to be:

$$k_h = \eta_h z$$

Where:

k_h = the modulus of subgrade reaction (kN/m^3);

η_h = a coefficient based on soil type (use 4.4 MPa/m); and,

z = the depth under consideration

The value above is for a single pile group. Group interaction must be considered when piles are spaced closely together. Group effects may be accounted for by reducing the coefficient of horizontal reaction (k_h) by an appropriate factor as follows:

Table 1: Coefficient of Horizontal Subgrade Rection Reduction Factors

Pile Spacing in Direction of Loading (d = Pile Diameter)	Reduction Factor
6d	1.0
3d	0.25

Values for other spacings may be interpolated from the values above. No reduction is required for the first row of piles (i.e., the row which bears against undisturbed soil with no piles in front).

It should be noted that the method of applying a linear "spring" to represent the soil reaction to loading is a significant simplification of the soil/pile behaviour. If lateral load resistance governs the pile design, more rigorous, non-linear methods of analysing resistance exist, one common one being the method of p-y curves. These methods, however, require knowledge of the pile size, location, loading, pile cap construction, etc. and are therefore typically more suited to the detailed design phase when these items are known. Golder can provide additional assistance during detailed design, if required.

Construction Considerations

The piles will be driven to bedrock through a layer of glacial till which is known to contain cobbles and boulders. Piles can deflect or become damaged if they encounter boulders in the glacial till. Piles (both H-piles and pipe piles) should be equipped with pile points (e.g., Titus Standard H Point, or similar) to provide additional protection to the pile tips against damage from boulders during driving. Even with this measure, it should be expected that damage may occur to some piles and replacement piles will be required. For piles driven to refusal on bedrock, and as described in OPSS 903, it is a generally accepted practice to reduce the hammer energy after abrupt peaking is met on the bedrock surface, and then gradually increase the energy over a series of blows to seat the pile.

Provision should be made for restriking all piles at least once to confirm the design set and/or the permanence of the set and to check for upward displacement due to driving adjacent piles. Piles that do not meet the design set criteria on the first restrike should receive additional restriking until the design set is met. All restriking should be performed a minimum of 48 hours after the previous set.

Pile driving criteria depend not only on the details of the pile (size, length, load, etc.) but also on the equipment used for installation. Preliminary pile driving criteria should be established prior to construction using wave equation analysis (WEAP or similar) or other approved means and confirmed through a program of dynamic (PDA) testing carried out at an early stage in the piling program. Additional PDA testing should be used to confirm the pile capacities at regular intervals as the project progresses. As a preliminary guideline, the specification should require that at least 10% of the piles be included in the dynamic testing program. CASE method estimates of the capacities should be provided for all piles tested. These estimates should be provided by means of a field report on the day of testing. As well, CAPWAP analyses should be carried out for at least one half of the piles tested, with the results provided no later than three days following testing. The final report should be stamped by an engineer licensed in the province of Ontario. The PDA testing program will justify an increase in the geotechnical resistance factor to 0.5 as discussed above.

It should be noted that the driving energies required confirm the full ultimate resistance of the pile (typically the testing is intended to prove a load of twice the design load) may be higher than the energy required to install the pile. Insufficient energy is a common problem in demonstrating the true ultimate capacity of piles during PDA testing, and larger pile driving hammers may be required for the testing where piles are driven to rock in order to generate high axial capacities.

The piling specifications should be reviewed by Golder prior to tender, as should the contractor’s submission (shop drawings, equipment, procedures, preliminary set criteria, etc.) prior to construction. Piling operations should be inspected on a full-time basis by geotechnical personnel to monitor the pile locations and plumbness, initial sets, penetrations on restrike, and to check the integrity of the piles following installation.

5.2.1.2 Drilled Cast-in-Place Piles

If drilled piles are used, they should be socketed into the limestone bedrock. The use of a casing will be required to advance the caisson through the glacial till material into the underlying bedrock. The casing should be extended so that it is “seated” a minimum of 500 mm into the bedrock.

5.2.1.3 Axial Geotechnical Resistance

Due to the difficulty in socketing liners into the limestone bedrock to completely cut off the water infiltrations, it may not be feasible to dewater and clean the base of the piles, or to inspect the base prior to concreting. As such, end-bearing support may not be fully developed and should be neglected in the design. The axial geotechnical resistance for rock-socketed caissons is therefore recommended to be based on the side-wall (shaft) resistance of the rock socket rather than end-bearing.

Rock-socketed cast-in-place piles should be designed based on the sidewall (shaft) resistance of the rock socket and a factored geotechnical resistance at ULS of 1.1 MPa, provided that the caisson socket is within competent bedrock (i.e., RQD greater than 50 percent). For preliminary design this condition can be assumed to be 1 m below the bedrock surface. This value assumes that the side wall of the socket will be cleaned of any cuttings or smeared material.

Settlements for rock-socket piles are typically small, and the factored ULS axial resistance will be reached before the pile has experienced 25 mm of settlement (a typical SLS condition). Geotechnical SLS considerations therefore do not generally govern the design of rock-socketed cast-in-place piles.

SLS resistances do not apply to caissons founded within the limestone bedrock, because the SLS resistance for 25 mm of settlement is greater than the factored axial

Pile spacings should not be less than three pile diameters (centre-to-centre) to prevent group effects. If closer pile spacings are required they can be accommodated, but the individual pile capacity may need to be reduced to account for the closer spacing. This can be reviewed in detailed design if required.

5.2.1.4 Lateral Geotechnical Resistance

To provide full fixity, the drilled cast-in-place piles should be provided with a minimum socket length equal to the greater of 2 times the caisson diameter below the depth of any broken or highly weathered surficial bedrock (which may be assumed to be 1 m). The structural engineer should confirm that the shear strength of the concrete is adequate to support these loads. In this condition, the rock sockets may be assumed to be “fixed” at the rock socket for preliminary design. This assumption should be confirmed during detailed design based and the actual pile dimensions, and depths.

The SLS geotechnical response of the soil in front of the caissons under lateral loading may be calculated using subgrade reaction theory where the coefficient of horizontal subgrade reaction, k_h, is based on the equation given below, as described by Terzaghi (1955) and the Canadian Foundation Engineering Manual (3rd Edition). It may be assumed that this resistance (from the soil in front of the piles) will be nearly the same for vertical and inclined piles.

For cohesionless soils:

$$k_h = \frac{n_h z}{B}$$

Where: n_h is the constant of horizontal subgrade reaction, Use 4.4 MN/m^3;

z is the depth (m); and,

B is the pile diameter/width (m)?

The discussion provided in Section 5.2.1.1.4 regarding the use of a “spring constant” to represent the relatively complex behaviour of the soil/rock/pile applies to drilled piles as well. Golder can undertake additional analysis during detailed design if lateral loading is a significant issue.

5.2.2 Shallow Spread Footings

Although not likely suitable for the high-rise towers, it may be feasible to support more lightly loaded parts of the structure on shallow spread footings on the dense glacial till. If lowering the foundations is a feasible option, then shallow foundations on bedrock are also suitable (both for the podium and the towers).

5.2.2.1 Footings on Glacial Till

Spread footings founded on the dense glacial till below the currently proposed P2 level may be a feasible option for lighter parts of the structure. An SLS net bearing resistance of 250 kPa and a factored ULS bearing resistance of 400 kPa can be used for design of pad footings up to 5.0 m in width and for strip footings up to 2.0 m in width placed on native and undisturbed glacial till below this elevation. The SLS values provided correspond to calculated total and differential settlement values of 25 and 19 mm, respectively.

It should be noted that because the expected settlements of any piled foundations are very small, differential settlements of up to about 25 mm may occur between the spread footings placed on glacial till and any parts of the development supported on piles. The design of the new structure will have to consider these differential settlements. Structural separation may be required between the foundations supported on piles, and those supported on glacial till.

For ULS sliding resistance of a cast-in-place footing placed on glacial till, an unfactored friction coefficient of 0.45 can be used. In accordance with OBC 2012 requirements, a resistance factor of 0.8 should be applied to the sliding resistance between the footings and the underlying glacial till.

5.2.2.2 Footings on Bedrock

For spread footings placed on sound bedrock, a factored Ultimate Limit States (ULS) bearing resistance of 4,000 kPa may be used for preliminary design. Serviceability Limit States (SLS) net bearing resistances do not generally apply to the design of foundations on the bedrock, provided the bedrock surface is properly cleaned of soil and loose highly weathered/fractured bedrock at the time of construction. As discussed above, differential settlements of up to 25 mm should be anticipated between areas which are founded on rock (which would be expected to experience negligible settlement) and areas which are founded on the glacial till.

For ULS sliding resistance of a cast-in-place footing placed on bedrock, an unfactored sliding friction coefficient of 0.70 can be used. In accordance with OBC 2012 requirements, a resistance factor of 0.8 should be applied to the sliding resistance between the footings and the underlying bedrock.

5.2.3 Raft or Mat Foundations

It may be feasible to support the structures (or portions of the structures) on a raft or mat foundation on the dense to very dense. A raft or mat foundation would need to be sufficiently rigid to ensure that the loading is uniformly distributed over the entire footprint of the raft, and to minimise the potential for differential settlement between heavily and lightly loaded areas.

Supporting the four-storey podium, plus two levels of parking on a raft foundation would be relatively straight-forward. Supporting the entire structure on a large raft would be more complex and because of the thickness of the heavily reinforced raft which would be required and the relatively thin layer of soil below the building it may be simpler to just lower the foundation level to the bedrock.

The design of a large, rigid raft foundation is not typically governed by an overall bearing capacity of the soil, but rather by the need to limit the differential settlement between different parts of the raft to some acceptable value. A raft foundation in soil typically experiences relatively large total settlement, but due to its stiffness limits differential settlement.

The geotechnical parameter most commonly used in this assessment is the vertical modulus of subgrade reaction (k_{v1}). For the dense glacial till, the vertical modulus of subgrade reaction may be assumed to be 65 MPa/m. This value is for a 300 mm by 300 mm loaded area which has been adopted as a standard for comparison.

The modulus of subgrade reaction is not a fundamental soil property and its value depends, in part, on the size and shape of the loaded area. The design modulus should be adjusted based on the loaded area as outlined in Section 7.7.1 of the CFEM (4th Edition, 2006). For a rectangular loaded area of width b and length mb:

$$k_{vb} = \left(\frac{kv1}{3.28b}\right) * \frac{m+0.5}{1.5m}$$

where

k_{vb} = the modulus for the actual loaded area; and

b = the width of the loaded area

The modulus of subgrade reaction is a significant simplification of actual soil behaviour. The presence of rock at relatively shallow depth as well as the likely variety of differently loaded areas also complicate the analysis. For detailed design a more rigorous design method such as a three-dimensional settlement analysis or finite element model would be more appropriate for a project of this scale. These analyses, however, cannot be undertaken without knowledge of the proposed foundation loading.

For the analysis of the contact stress distribution beneath a slab on grade foundation, the modulus of subgrade reaction value obviously depends on the size of the areas over which increased/concentrated contact stresses are anticipated and the stiffness of the raft itself (analogous to equivalent footings beneath the columns); the size of these areas is in turn related to the value of the modulus of subgrade reaction, i.e., they are inter-related. The design of a raft foundation is therefore typically an iterative process requiring both geotechnical and structural analysis of the settlement, load distribution and stiffness of the structure.

If the preliminary values provided above suggest that a raft foundation may be possible, Golder can assist with additional analysis during detailed design using this iterative approach.

5.3 Rock Anchors

The use of rock anchors to resist uplift forces on the foundations could be considered where additional uplift resistance is required.

In designing grouted rock anchors, consideration should be given to four possible anchor failure modes:

i) Failure of the steel tendon or top anchorage

ii) Failure of the grout/tendon bond

iii) Failure of the rock/grout bond, and

iv) Failure within the rock mass, or rock cone pull-out.

Potential failure modes i) and ii) are structural and are best addressed by a structural engineer.

For potential failure mode iii), the *factored* bond stress at the grout/rock interface may be taken as 1,000 kPa (or 1/30 of the compressive strength of the grout) for ULS design purposes. This value should be used in calculating the resistance under ULS conditions. If the response of the anchor under SLS conditions needs to be evaluated, it may conservatively be taken as the elastic elongation of the unbonded portion of the anchor under the design loading.

For potential failure mode iv), the resistance is calculated based on the weight of the potential mass of rock and soil which could be mobilized by the anchor. This is typically considered as the mass of rock included within a cone (or wedge for a line of closely spaced anchors) having an apex at the tip of the anchor and having an apex angle of 60 degrees. For each individual anchor, the ULS factored geotechnical resistance can be calculated based on the following equation:

$$Q_r = \varphi \frac{\pi}{3} \gamma' D^3 \tan^2\text{–}\theta$$

Where: Q_r = Factored uplift resistance of the anchor (kN);

φ = Geotechnical resistance factor (use 0.4);

γ' = Effective unit weight of rock and soil (use 10 kN/m^3 below the groundwater level);

D = Anchor length in metres; and,

θ = one-half of the apex angle of the rock failure cone (use 30°).

For a group of anchors or for a line of closely spaced anchors, the resistance must consider the potential overlap between the rock masses mobilized by individual anchors. In the case of group effects for a series of rock anchors in a rectangle with width "a" and length "b" installed to a depth "D", the equation for the volume of the truncated trapezoid failure zone would be as follows:

$$V = \frac{4}{3} D^3 sin^2\varphi + aD^2 \sin\varphi + bD^2 \sin\varphi + abD$$

Where: V = Volume of the truncated trapezoid failure zone (m^3);

D = Depth of anchor group (m);

a = Width of anchor group (m);

b = Length of the anchor group (m); and,

φ = ½ of the apex angle of the rock failure cone, use 30°.

The ULS factored geotechnical resistance for the truncated trapezoid failure formed by the group of anchors can then be calculated based on the following equation:

$$Q_r = \varphi \gamma' V$$

Where: Qr = Factored uplift resistance of the anchor (KN);

φ = Geotechnical resistance factor, use 0.4;

γ' = Effective unit weight of rock and soil, use 10 kN/m^3 below the water table; and,

V = Volume of truncated trapezoid (m^3).

It is recommended that proof load tests be carried out on any new anchors to confirm their resistance. The proof load tests should be carried out in accordance with the Post Tensioning Institute (PTI) Recommendations for Prestressed Rock and Soil Anchors (2004).

A geotechnical engineer should be present during the installation and testing of the anchors. Care must be taken during grouting to ensure that the grouting pressure is sufficient to bond the entire length of the grouted area with minimum voids.

Confirmation of sufficient embedment into the rock beneath the foundations should be carried out during construction to make sure that the anchors are being installed in rock of adequate quality. The anchor holes must be thoroughly flushed with water to remove all debris and rock flour. It is essential that rock flour be completely removed from the holes to be grouted to promote an adequate bond between the grout and the rock. Prestressing of the anchors prior to loading will minimize anchor movement due to service loads.

5.4 Frost Protection

All perimeter and exterior foundation elements or interior foundation elements (i.e., footings, pile caps, grade beams, etc.) in unheated areas should be provided with a minimum of 1.5 m of earth cover for frost protection purposes. Isolated, unheated exterior foundation elements adjacent to surfaces which are cleared of snow cover during winter months should be provided with a minimum of 1.8 m of earth cover.

As an alternative to earth cover, consideration could be provided to the use of an insulation detail. Additional guidance on insulation details can be provided if required.

5.5 Seismic Design Considerations

5.5.1 Seismic Liquefaction

There is no significant risk of liquefaction at the site during a seismic event.

5.5.2 Seismic Site Class

The OBC 2012 contains seismic analysis and design methodology. The seismic Site Class value, as defined in Section 4.1.8.4 of the OBC 2012, depends on the average shear wave velocity of the upper 30 m of soil and/or rock below founding level.

Based on the in-situ testing data, this site can be assigned a Site Class of C for seismic design purposes according to the 2012 OBC.

A higher site Class (Site Class A or B) can be assigned for “rock” sites (where the foundations are on, or very close to rock). The lowest level of the currently proposed development is indicated to be at an elevation of 53.6 m. This compares with a rock elevation of approximately 48 m over the majority of the site. If the final design is such that the underside of the foundations is within 3 m of the bedrock (i.e., at or below approximately 51 m elevation) a higher site class (i.e. a Site Class A or B) would apply. This would need to be confirmed with site specific shear wave velocity testing.

5.6 Excavations and Shoring

Based on the preliminary site plan provided, the lowest finished floor elevation is at 52.6 m. The main excavation will be lower than this by at least the thickness of the lower-level slab-on-grade, granular base, drainage, etc. Localized excavations would also be required for pile caps, footings, etc. as well as services. Based on borehole elevations this will require excavations on the order of 9 to 10 m deep over the entire site, with deeper localized excavations for foundations and services.

Excavations for the construction of the foundations and basement levels will be through the existing fill, and into the underlying glacial till. No unusual problems are anticipated with excavating the overburden using conventional hydraulic excavating equipment. Cobbles and boulders should be expected in the fill, glacial till and sand and gravel deposits. Debris (e.g., organics, brick, metal, wood, stone, concrete, etc.) should also be expected in the fill.

It is likely that significant portions of the site will require shoring (due to insufficient space to complete open cut excavations; for example, along Albert St., Booth St., adjacent to the OLRT ROW, etc.). There may be other areas where sufficient space exists for open excavation. Both are discussed below.

5.6.1 Open Cut Excavations

Above the groundwater level and within the fill, silty sand, native silty clay and glacial till side slopes should be stable in the short term at 1 horizontal to 1 vertical; these soils would be classified as Type 3 soils in accordance with the Occupational Health and Safety Act of Ontario (OHSA). This would also apply to areas where the groundwater table was drawn down and maintained below the final excavation depth in advance of excavation (in which case the soils are effectively above the water table at the time of excavation).

Excavations within the silty and sandy soils (both fill and till) *below the water table* would be classified as a Type 4 soil; these excavations would therefore require side slopes at a minimum slope of 3H:1V (i.e., flatter than 3H:1V).

It is expected that open-cut methods will generally be feasible (from a technical perspective) provided sufficient space exists to accommodate the excavations, though given the height they may require benching, access ramps, etc. to be incorporated into the design. It should be noted that the height of the excavations (10 m) exceeds the height for prescriptive design under the OHSA. Deeper portions of the excavation (even if open cut) will require an engineered design to comply with the relevant regulations.

Temporary excavations for foundations or site services (if required) will be through similar soils as discussed above. These excavations can also likely be made with sloping excavations where space permits. Where space does not exist, localized excavations for foundations or temporary services could be carried out with vertical sides and fully braced, steel trench boxes or shoring systems.

5.6.2 Shored Excavations

Where sufficient space does not exist (or if it is preferable to limit the size and impact of the excavation as well as associated excavation and backfilling) the temporary excavations could be carried out using a shoring system to ensure support for the soil and provide for worker safety. This section of the report provides some general guidelines on possible concepts for the shoring to be used by the designers for assessing the possible impacts of the shoring design and site works as well as to evaluate, at the design stage, the potential for impacts of this shoring on the adjacent properties and infrastructure. Temporary shoring can be used in combination with open cuts above the top of shoring, however, the earth pressure distribution must take into account the effects of the soil pressures from the upper sloped section.

This type of shoring system is typically designed and constructed by a specialist contractor who is fully responsible for the detailed design and performance of the temporary shoring systems. In addition to supporting the soils surrounding the excavation, the design of temporary support systems will need to consider the support requirements of adjacent structures, roads, utilities, etc.

The shoring method(s) chosen (and in particular the selection of the appropriate design earth pressures; higher design earth pressures are required if it is necessary to limit the deflection of the shoring) to support the excavation sides must take into account the soil and bedrock stratigraphy, the permissible movement of the shoring, the groundwater conditions, the methods adopted to manage the groundwater and construct the shoring systems, the potential ground movements associated with the excavation and construction of the shoring system, and their impact on adjacent structures and utilities.

The City of Ottawa rights-of-way for Albert Street and Booth Street, which contain below grade services (as well as bridge structures in the case of Booth St.) are located adjacent to the south and west sides, respectively, of the proposed excavation for the building. As such, any services located in close proximity to and/or within the zone of influence of the shoring system could be affected by ground movements behind the shoring. Details on the utilities in these areas should be confirmed during the detailed design studies to better tailor the shoring guidelines provided herein. Additionally, the right-of-way for the OLRT, as well as Pimisi Station is located adjacent to the north side of the proposed development and, if in close proximity to and/or within the zone of influence of the shoring system, could be affected by ground movements behind the shoring.

Shoring for this type of project would typically include tied back sheet pile walls or soldier pile and lagging systems (if a soldier pile and lagging system is employed the potential for flowing sands below the water table must be considered and addressed as part of the shoring/dewatering design). Due to the presence of very dense till with boulders at shallow depth on the site, soldier piles may require predrilling to provide sufficient embedment for toe fixity. Depending on the final design it may also be possible/necessary to socket the toe of the piles into rock. The shoring system must be provided with appropriate lateral support. Steel sheet piles cannot be pre-drilled and may have difficulty penetrating cobbles and boulders within the till (and certainly cannot be extended into rock for additional toe support).

Where foundations or settlement sensitive infrastructure, such as buried utilities, are present within the zone of influence of the shoring system and deflections need to be greatly limited a secant pile wall with pre-stressed tie backs may also be considered. Soldier pile and lagging walls are considered suitable for the sides of the excavations (provided that settlement-sensitive structures or utilities are not present in the zone of influence of the walls) where the objective is to maintain an essentially vertical excavation wall and the movements above and behind the wall need only be sufficiently limited so that relatively flexible features (such as roadways or sidewalks) will not be adversely affected.

Some form of lateral support to the wall is typically required for excavation depths greater than about 3 to 4 m. Lateral restraint could be provided by means of tie-backs consisting of grouted rock anchors. The use of rock anchor tie-backs would require the permission of the adjacent property owners since the anchors would be installed beneath their properties. The presence of utilities beneath the adjacent streets, which could interfere with the tie-backs, should also be considered, though this is typically manageable provided the first row of anchors is below the typical burial depth of municipal services. Alternatively, interior struts can be considered, connected either to the opposite side of the excavation (if not too distant) or to raker piles and/or footings within the excavation.

5.6.3 Ground Movements

During the excavation for the underground levels of the proposed buildings, lateral deformation and vertical settlement of the adjacent ground will occur as a result of installation and deflection of the retaining/shoring system and dewatering activities. The ground movements induced could affect the stability or performance of buildings or underground utilities adjacent to the excavation. Therefore, the magnitude and extent of ground movement and potential impacts on surrounding infrastructure should be assessed prior to construction to confirm movements will be in tolerable limits and monitored during construction.

Based on previous experience with nearby projects, the OLRT right-of-way may require additional analysis and review of the shoring design than is normally the case.

5.7 Groundwater Control

During the current investigation groundwater was encountered within the glacial till as high as 55.1 m. Lower groundwater levels were encountered in some boreholes, but these measurements were taken relatively quickly after drilling and may not represent fully stabilized groundwater levels.

It should also be noted that these represent the groundwater level on a single date (February 2022). These levels may not represent typical groundwater levels (because they were measured in winter) and certainly do not represent the maximum levels which could be encountered. As a comparison, Golder has experience with an adjacent site which encountered groundwater in the large excavation at 57 m elevation.

Based on this it is evident that the proposed development will extend below the groundwater level at the site and temporary and permanent groundwater control will be required.

5.7.1 Temporary Groundwater Control

Given the anticipated size and depth of the excavation, as well as the likely groundwater conditions at the site dewatering of the site will be required during construction to maintain a safe, dry working area and to prevent disturbance of the soil subgrade.

According to O.Reg 63/16 and O.Reg 387/04, if the volume of water to be pumped from excavations for the purpose of construction dewatering is greater than 50,000 litres per day and less than 400,000 litres per day, the water taking will need to be registered as a prescribed activity in the Environmental Activity and Sector Registry (EASR) and requires the completion of a “Water Taking Plan” and a “Discharge Plan”. Alternatively, a Permit to Take Water (PTTW) is required from the Ministry of the Environment, Conservation (MECP) if a volume of water greater than 400,000 litres per day is to be pumped from the excavations.

Calculation of anticipated groundwater flows have not been completed as part of this current phase, however, based on previous experience it is recommended that it be assumed a PTTW will be required. Once the final excavation footprint and depth are confirmed a hydrogeological study will be required to support the permit application.

The rate of groundwater inflow to the excavation will depend on many factors including the contractor’s schedule and rate of excavation, the size of the excavation, the material, incident precipitation, and the time of year at which the excavation is made (e.g., fluctuation in seasonal groundwater elevation). Moderate flows into the main excavation could potentially be managed using properly filtered sumps in closely space trenches or pits. Groundwater inflow for service trenches or smaller localized excavations for foundations, elevator pits, etc., should also be possible to control by pumping from within the excavations.

If higher flows are encountered, then a more active dewatering system (wells or well points) could also be considered to maintain the groundwater level below the base of the excavation. This requirement is particularly critical if shallow foundations (either footings or a raft/mat foundation) are considered as the uncontrolled seepage into the floor of the excavation (even if collected and pumped out in sumps) is likely to cause disturbance and piping of the subgrade resulting in a need to over-excavated and replace soils to maintain a suitable bearing surface.

The contractor should be fully responsible for design of the groundwater control system.

The glacial till soils that will form the floor of the foundation excavations are expected to be sensitive to disturbance. Consideration should therefore be given to protecting the subgrade in foundation areas with a mud slab of lean concrete or a layer of compacted granular fill materials (particularly if the areas will remain open for extended periods of time such as if a raft is used). The thickness of the mud slab and/or compacted granular fill working mat will depend on the size and weight of the equipment to be used at the bottom of the excavation. Any disturbed soil will need to be removed prior to placing the protective layer. That mud slab/granular fill materials should be placed immediately following inspection and approval of the subgrade. The period of time between exposure of the subgrade and covering with the protective layer should be limited to as brief as possible and, in the interim, no construction traffic should be permitted on the subgrade.

5.7.2 Permanent Groundwater Control

The measured groundwater depth at the site is variable, but it is above the lowest level of the proposed underground parking. To manage the long-term groundwater levels a drainage system diverting collected groundwater inflow to the sewer system is recommended. It is recommended that a hydrogeological assessment be completed to provide input toward the volumes of water anticipated to be diverted to the municipal sewer system (this can be done in conjunction with the study for the PTTW discussed above).

The subfloor drainage system (i.e., below the lowest garage level) should consist of a network of robust sub-drain pipes conveying collected groundwater to a sump or sumps from which the groundwater can be pumped to a municipal sewer. The drainage system would consist of interconnected perforated drain pipes (bedded and backfilled with free draining granular soils) installed around the perimeter and within the building footprint.
The capacity of the subfloor drainage system should be initially based on the hydrogeology assessment and then modified during construction if required.

Drainage, such as a composite synthetic drainage system or equivalent, should be provided to the exterior walls. The composite drain must withstand the design horizontal earth pressures used for basement wall design and should be connected to the basement level underslab drainage system. The drainage system collector pipes should drain to a sump for collection and discharge to a sewer.

5.8 Garage Floor Slab

In preparation for the construction of the lowest floor slab, all loose, wet, and disturbed material should be removed from beneath the floor slab down to the undisturbed native soil. Provision should be made for at least 250 mm of OPSS Granular A to form the base of the floor slab. Any bulk fill required to raise the grade up to the underside of the Granular A (as well as any areas where over-excavation and replacement are required) should consist of OPSS Granular B Type II. The under-slab fill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the Standard Proctor Maximum Dry Density (SPMDD) using suitable vibratory compaction equipment.

Provision should be made for drainage underneath the floor slab consisting of perforated pipe subdrains in a surround of 19 mm clear stone, fully wrapped in geotextile, which leads by gravity drainage to an adjacent storm sewer or sump pit from which the water is pumped. For preliminary design purposes, these drains should be placed at approximately 6 m centres.

5.9 Foundation Wall Backfill

Foundation/basement walls should be backfilled with free draining non-frost susceptible granular fill meeting the requirements of OPSS Granular B Type I or II materials. Basement walls should be covered with drainage board such as Miridrain (or equivalent).

Backfill should be compacted to 95% of the material's SPMDD using suitable compaction equipment. To reduce compaction induced stresses, only light compaction rollers or plate tampers should be used within 1 m of the wall.

Beneath hard surfacing (e.g., pavements or sidewalks/walkways), the granular backfill for the foundation wall should be placed to form a frost taper at 3 horizontal to 1 vertical from a depth of 1.8 m (i.e., the frost depth) to the underside of the granular base for the hard surfacing. The purpose of this frost taper is to limit the severity of differential heaving that could occur between areas backfilled with non-frost susceptible engineered fill and the adjacent areas underlain by the existing frost susceptible soils.

5.10 Lateral Earth Pressures for Design

The lateral earth pressures acting on the basement walls and retaining walls will depend on the existing soil conditions, on the magnitude of surcharge including construction loadings, on the freedom of lateral movement of the structure, and on the drainage conditions behind the walls. Seismic (earthquake) loading must also be taken into account in the design.

Where the wall support and structure allow lateral yielding, (e.g., for unrestrained retaining walls), active earth pressures may be used in the design of the wall. Where the support does not allow lateral yielding, (i.e., for typical basement walls) at-rest earth pressures should be assumed. The following parameters (unfactored) may be used for design where there is limited granular material between the basement and the native soil (for example where the site is shored):

Soil	Unit Weight (kN/m^3)	Coefficients of static lateral earth pressure	
		Active, Ka	At rest, Ko
Granular Backfill or Glacial Till	21	0.33	0.50
Glacial Till	22	0.31	0.47

If the garage/foundation wall is backfilled with granular free draining fill either in a zone with width equal to at least 50 percent of the height of the wall or within the wedge-shaped zone defined by a line drawn at 1 horizontal to 1 vertical (1H:1V) extending up and back from the rear face of the footing/pile cap/grade beam, the following parameters (unfactored) may be used:

Material	Unit Weight (kN/m^3)	Coefficients of static lateral earth pressure	
		Active, Ka	At rest, Ko
Granular A or Granular B Type II	22	0.27	0.43
Granular B Type I	22	0.31	0.47

For the purposes of shoring design, the designer (who is entirely responsible for the design including selection of design parameters) should carefully review the subsurface information and determine appropriate earth pressure parameters for use in their design. In particular, higher values than indicated in the tables above may need to be assumed in order to limit deflection of the shoring near existing structures.

Seismic loading will result in increased lateral earth pressures acting on the walls. The walls should be designed to withstand the combined lateral loading for the appropriate static pressure conditions given above, plus the earthquake-induced dynamic earth pressure.

The horizontal seismic coefficient, k_h, used in the calculation of the seismic active pressure coefficient is taken as 1.0 times the design PGA (i.e., $k_h = 0.32$). For structures which allow lateral yielding, k_h is taken as 0.5 times the design PGA (i.e., $k_h = 0.16$).

The following seismic active pressure coefficients (K_{AE}) may be used in design; these coefficients reflect the K_{AE} obtained using the k_h values described above and assumed no vertical acceleration and wall to soil friction. These seismic earth pressure coefficients assume that the back of the wall is vertical and the ground surface behind the wall is flat. Where sloping backfill is present above the top of the wall, the lateral earth pressures under seismic loading conditions should be calculated by treating the weight of the backfill located above the top of the wall as a surcharge.

Wall Type	Site PGA (2475-year Earthquake)	K_{AE}	
		Granular A/Granular B Type II	Granular B Type I
Yielding Wall	0.32g	0.39	0.43
Non-Yielding Wall		0.53	0.59

The earthquake-induced dynamic pressure distribution, which is to be added to the static earth pressure distribution, is a linear distribution with maximum pressure at the top of the wall and minimum pressure at its toe (i.e., an inverted triangular pressure distribution).

A minimum surcharge pressure of 12 kPa due to traffic and compaction induced pressure should be included in the total lateral earth pressures for the structural design of the wall.

The total pressure distribution (static plus seismic) may be determined as follows:

$$\sigma_h(d) = K_o \gamma d + (K_{AE} - K_a) \gamma (H-d) + q$$

Where:

- $\sigma_h(d)$ = Lateral earth pressure at depth, d, (kPa)
- K_o = Coefficient of static earth pressure
- γ = Unit weight of the backfill soil (kN/m^3); as given previously
- d = Depth below the top of the wall (m)
- K_{AE} = Seismic active earth pressure coefficient
- q = Surcharge to account for traffic and compaction pressure, where applicable
- H = Total height of the wall (m)

All of the lateral earth pressure equations are given in an unfactored format and will need to be factored for Ultimate Limit States design purposes.

5.11 Site Servicing

At least 150 mm of OPSS Granular A should be used as pipe bedding for sewer and water pipes. Where unavoidable disturbance to the subgrade surface occurs during construction, it may be necessary to place a sub-bedding layer consisting of 300 mm of compacted OPSS Granular B Type II beneath the Granular A. The bedding material should, in all cases, extend to the spring line of the pipe and should be compacted to at least 95% of the material's SPMDD. The use of clear crushed stone as a bedding layer should not be permitted anywhere on this project since fine particles from the sandy backfill materials and native soils could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support.

Cover material, from the spring line of the pipe to at least 300 mm above the top of pipe, should consist of OPSS Granular A or Granular B Type I with a maximum particle size of 25 mm. The cover material should be compacted to at least 95% of the material's SPMDD.

It should generally be possible to re-use the existing inorganic fill and glacial till as trench backfill provided it is properly moisture conditioned. Where trenches will be covered with hard surfaced areas, the type of material placed in the frost zone (between subgrade level and 1.8 mm depth) should match the soil exposed on the trench walls for frost heave compatibility. Trench backfill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the material's SPMDD using suitable vibratory compaction equipment.

Seepage barriers should be constructed at periodic intervals along the trench and at the connection points to off-site infrastructure to reduce the potential for groundwater level lowering in the surrounding area due to the "french drain" effect on the granular bedding and surround. Groundwater level lowering could lead to long-term settlement of nearby structures that are supported on the sensitive silty clay soil underlying the site.

It is important that these barriers extend from trench wall to trench wall and that they fully penetrate the granular surround materials to the trench bottom. The seepage barriers should be at least 1.5 metres long. In addition to providing a drainage cut-off, these cut-offs also serve as impenetrable cut-offs to stop the potential migration of contaminants along the relatively permeable backfill in the trenches.

Construction of the seepage barriers should also be in accordance with the City of Ottawa's Standard Drawing No. S8 of the Department of Public Works and Services, Infrastructure Services branch.

5.12 Pavement Design

In preparation for pavement construction, all topsoil, unsuitable fill, disturbed, or otherwise deleterious materials (i.e., those materials containing organic material) should be removed from the pavement areas. Some of the existing fill could remain provided that it is free of organic matter, and that the subgrade be subjected to a proof roll with a loaded tandem truck to reveal weak or soft areas prior to the construction of the new pavement structure. Soft or weak areas should be removed and repaired with acceptable earth borrow or OPSS Select Subgrade Material (SSM) or Granular B.

Pavement areas requiring grade raising to proposed subgrade level should be brought to grade using acceptable (compactable and inorganic) earth borrow, OPSS SSM or Granular B. These materials should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the material's SPMDD using suitable compaction equipment.

The surface of the pavement subgrade should be crowned or sloped to promote drainage of the pavement granular structure towards perimeter swales or subdrains placed at the subgrade level

No traffic or paving details are available at the current stage. The following pavement designs are recommended for preliminary purposes based on experience with similar projects and developments. These designs should be confirmed during detailed design based on actual traffic requirements.

Material		Light Duty Pavement Thickness of Pavement Elements (mm)	Heavy Duty Pavement Thickness of Pavement Elements (mm)	Loading Dock Thickness of Pavement Elements (mm)
Bituminous Concrete OPSS 1150	Superpave 12.5 mm	60	40	-
	Superpave 19.0 mm	-	50	-
Portland Cement Concrete	Portland Cement Concrete	-	-	200
Granular Material OPSS 1010	Granular A Base	150	150	150
	Granular B, Type II Subbase	300	450	450
	Prepared and Approved Subgrade			

The granular base and subbase materials should be uniformly compacted as per OPSS 310, Method A. The asphaltic concrete should be compacted in accordance with the procedures outlined in OPSS 310.

The asphaltic cement should consist of PG 58-34 and the design of the mixes should be based on a Traffic Category B.

The Portland cement concrete should meet the requirements of CSA A 23.1 Class C2 exposure. Concrete joint specifications and spacing should be in accordance with OPSD 552.020 and 551.010.

The above pavement designs are based on the assumption that the pavement subgrade has been acceptably prepared (i.e., grade raise fill has been adequately compacted to the required density and the subgrade surface not disturbed by construction operations or precipitation). Depending on the actual conditions of the pavement subgrade at the time of construction, it could be necessary to increase the thickness of the subbase and/or to place a woven geotextile beneath the granular materials.

Where the new pavements will connect to existing pavements, the new pavement structures should be continued at least to the limits of construction, with any longitudinal transitions and/or tapers occurring thereafter. At these locations, the longitudinal transitions should be constructed by cutting the existing pavement structure vertically to the bottom of the existing subbase. The new granular layers should then be tapered up or down, as required, at a slope of 5 horizontal to 1 vertical to match the existing pavement structure. The asphaltic concrete does not need to be tapered between the new construction and the existing pavement. However, the asphaltic concrete of the existing pavement should be milled back an additional 300 mm to a depth of about 60 mm or 40 mm in areas where its thickness is greater than 100 mm, matching the proposed surface course of the new asphaltic concrete. A tack coat should be provided and the new surface course asphaltic concrete placed over the milled surface to form the new pavement joint. Where the existing pavement is less than 100 mm, then a butt joint on a vertical saw cut surface is acceptable. A tack coat should be placed on the vertical saw cut surface. The tack coat should be in accordance with the City SP F-3107.

5.13 Corrosion and Cement Type

To be included in final report.

6.0 ADDITIONAL CONSIDERATIONS

At the time of writing this report, only conceptual details related to the proposed building as well as adjacent significant structures such as the CSST and OLRT were available. Golder Associates should review the final drawings and specifications for this project prior to tendering to confirm that the guidelines in this report have been adequately interpreted.

The construction activities could impact the existing adjacent structures and buildings. Appropriate damage assessments (pre and post condition surveys for example) should be carried out as necessary.

During construction, sufficient foundation inspections, subgrade inspections, in-situ density tests, materials testing, pile and rock anchor installation monitoring should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specifications. Concrete testing should be carried out in a CCIL certified laboratory.

The soils at this site are sensitive to disturbance from ponded water, construction traffic and frost. All bearing surfaces must be inspected prior to filling or concreting to ensure that strata having adequate bearing capacity have been reached and that the bearing surfaces have been properly prepared.

7.0 CLOSURE

We trust that this report provides sufficient geotechnical engineering information to facilitate the design of this project. If you have any questions regarding the contents of this report or require additional information, please do not hesitate to contact this office.

Golder Associates Ltd.

Chris Hendry, P.Eng.
Sr. Principal Geotechnical Engineer

Sarah MacDonald, P.Eng.
Senior Geotechnical Engineer

CH/SM/hdw
https://golderassociates.sharepoint.com/sites/158117/project files/6 deliverables/geotechnical/22511882-rev0-dream lebreton library lands geotechnical report-1806_20.docx

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client **Dream Impact Master LP.** The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then the client may authorize the use of this report for such purpose by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process, provided this report is not noted to be a draft or preliminary report, and is specifically relevant to the project for which the application is being made. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder cannot be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT (cont'd)

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

LEGEND

- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION (GOLDER 2022)
- APPROXIMATE BOREHOLE LOCATION (GOLDER 2011)
- ROADWAY
- FORMER ROADWAY (WELLINGSTON STREET)
- FORMER RAILWAY
- SITE BOUNDARY

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2020
2. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

DRAFT

0 25 50 100

1:1,500 METRES

CLIENT
DREAM

PROJECT
GEOTECHNICAL SITE INVESTIGATION
LEBRETON LIBRARY PARCEL, OTTAWA, ONTARIO

TITLE
BOREHOLE AND MONITORING WELL LOCATION PLAN

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-03-25
DESIGNED	----
PREPARED	JEM/MG
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
22511882	0003	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

25mm

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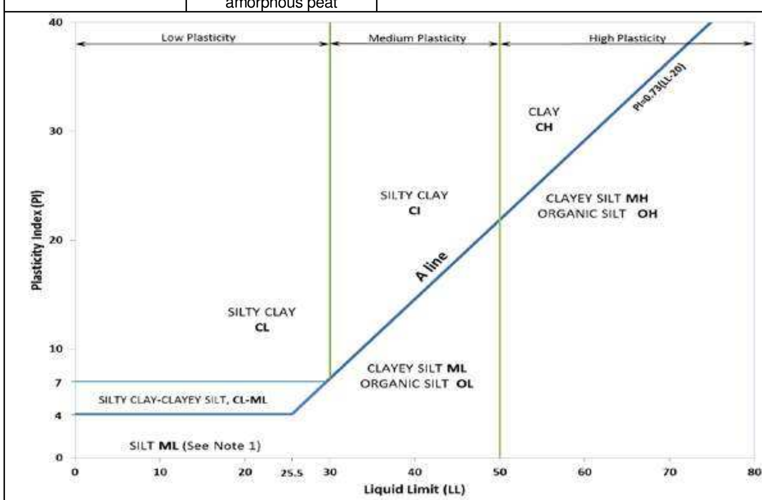
APPENDIX A

Borehole Logs – Current Investigation

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators: Dilatancy	Field Indicators: Dry Strength	Field Indicators: Shine Test	Field Indicators: Thread Diameter	Field Indicators: Toughness (of 3 mm thread)	Organic Content	USCS Group Symbol	Primary Name
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)
An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\,\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma$ - u)
σ'_{vo}	initial effective overburden stress
σ_1, σ_2, σ_3	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$
2 shear strength = (compressive strength)/2

RECORD OF BOREHOLE: 22-01

PROJECT: 22511882
LOCATION: N 5030733.9 ;E 366525.1
SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: February 14-15, 2022

DATUM: Geodetic
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] (ND = Not Detected)	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	62.92					
0	Power Auger, 200 mm Diam. (Hollow Stem)	FILL - SILTY SAND, trace gravel; brown; compact to dense	0.00	1	AS	-	ND	Bentonite Seal
1				2	SS	20		
2				3	SS	33	ND	
				4	SS	58	ND	
3				5	SS	43		
4				6	SS	72		
5		SILTY SAND to sandy SILT, trace clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); very dense	58.04 / 4.88	7	SS	50/0.10		
				8	SS	50/0.13		
6				9	SS	77/0.15		
7				10	SS	50/0.05		Silica Sand
				11	SS	64/0.15		▽
8				12	SS	66/0.13		Screen
9				13	SS	50/0.05		
10				14	SS			

Other columns: HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] (ND = Not Detected) 20 40 60 80; HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3}; WATER CONTENT PERCENT Wp W Wl 20 40 60 80; ADDITIONAL LAB. TESTING; STRATA PLOT.

CONTINUED NEXT PAGE

DRAFT

DEPTH SCALE 1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-01

LOCATION: N 5030733.9 ;E 366525.1

BORING DATE: February 14-15, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

Column headings: DEPTH SCALE METRES | BORING METHOD | SOIL PROFILE: DESCRIPTION, STRATA PLOT, ELEV. DEPTH (m) | SAMPLES: NUMBER, TYPE, BLOWS/0.30m | HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected) 20 40 60 80; HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected) 20 40 60 80 | HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3}; WATER CONTENT PERCENT Wp —○W— Wl 20 40 60 80 | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION

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Depth (m)	Boring Method	Description	Elev. / Depth (m)	Sample No.	Type	Blows/0.30m	Piezometer
10	Power Auger, 200 mm Diam. (Hollow Stem)	SILTY SAND to sandy SILT, trace clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); very dense		14	SS	50/ 0.08	Screen
				15	SS	50/ 0.10	
				16	SS	50/ 0.10	
				17	SS	50/ 0.13	
				18	SS	50/ 0.08	
				19	SS	50/ 0.05	
			48.21 / 14.71				
		Borehole continued on RECORD OF DRILLHOLE 22-01					

Depth scale marks: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

DRAFT

MIS-BHS 001 22511882.GPJ GAL-MIS.GDT 4/4/22 ZS

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: ALB

CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-01

LOCATION: N 5030733.9 ;E 366525.1

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 14-15, 2022
DRILL RIG: CME 55
DRILLING CONTRACTOR: Downing Drilling

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		48.21														
15 16	Rotary Drill, NQ Core	Weathered, thin to medium bedded, grey black LIMESTONE and SHALE		14.71 46.46	1													
17		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 7.78 m (Elev. 55.14 m) on February 25, 2022		16.46														
18																		
19																		
20																		
21																		
22																		
23																		
24																		

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

RECORD OF BOREHOLE: 22-02

PROJECT: 22511882
LOCATION: N 5030713.1 ;E 366476.0
SAMPLER HAMMER, 64kg; DROP, 760mm
BORING DATE: February 16, 2022

DATUM: Geodetic
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

DEPTH SCALE METRES	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] (ND = Not Detected)	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE	62.47					
0	FILL - SILTY SAND, trace gravel; brown	0.00	1	AS	-	ND	Bentonite Seal
1			2	SS	28		
2			3	SS	16		
			4	SS	20	ND	
3	SILTY SAND to sandy SILT, trace gravel, trace clay; grey, contains cobbles and boulders (GLACIAL TILL); very dense	59.42 3.05	5	SS	50/0.15		
4			6	SS	50/0.05		
5			7	SS	50/0.08		
			8	SS	50/0.13		
6			9	SS	50/0.10		
7			10	SS	50/0.13		Silica Sand
	- Auger Refusal on boulder at 7.44 m depth						
8							Screen
9			11	SS	50/0.10		
10							

Other columns: HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] (ND = Not Detected); HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 20, 40, 60, 80); ADDITIONAL LAB. TESTING.

DRAFT

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

RECORD OF BOREHOLE: 22-02

PROJECT: 22511882
SHEET 2 OF 3
LOCATION: N 5030713.1 ;E 366476.0
BORING DATE: February 16, 2022
DATUM: Geodetic
SAMPLER HAMMER, 64kg; DROP, 760mm
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ ND = Not Detected (20 40 60 80); HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ ND = Not Detected (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp —O W— Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND to sandy SILT, trace gravel, trace clay; grey, contains cobbles and boulders (GLACIAL TILL); very dense									Screen
					12	SS	50/ 0.03				
11											
12					13	SS	50/ 0.03				
13											
14				48.27 14.2							
		Borehole continued on RECORD OF DRILLHOLE 22-02									
15											
16											
17											
18											
19											
20											

DRAFT

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

MIS-BHS 001 22511882.GPJ GAL-MIS.GDT 4/4/22 ZS

RECORD OF DRILLHOLE: 22-02

PROJECT: 22511882

SHEET 3 OF 3

LOCATION: N 5030713.1 ;E 366476.0

DRILLING DATE: February 16, 2022

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate, BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage, PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular, PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break, BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	FLUSH
		BEDROCK SURFACE	48.27		
15	Rotary Drill, NQ Core	Grey, thin to medium bedded LIMESTONE and SHALE	14.20 … 46.62 / 15.85	1	
16		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 7.88 m (Elev. 54.59 m) on February 25, 2022			
17					
18					
19					
20					
21					
22					
23					
24					

Other columns: SYMBOLIC LOG; COLOUR % RETURN; RECOVERY (TOTAL CORE %, SOLID CORE %) 80 60 40 20; R.Q.D. % 80 60 40 20; FRACT. INDEX PER 0.25 m 5 10 15 20; DISCONTINUITY DATA (DIP w.r.t. CORE AXIS 0 30 60 90; TYPE AND SURFACE DESCRIPTION; Jcon Jr Ja); HYDRAULIC CONDUCTIVITY K, cm/sec 10^{-6} 10^{-5} 10^{-4} 10^{-3}; Diametral Point Load Index (MPa) 2 4 6; RMC -Q' AVG.

DEPTH SCALE 1 : 50

WSP GOLDER

LOGGED: ALB

CHECKED:

RECORD OF BOREHOLE: 22-03

PROJECT: 22511882

LOCATION: N 5030756.8 ;E 366500.4

BORING DATE: February 22, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

SOIL PROFILE

DESCRIPTION	ELEV. / DEPTH (m)
GROUND SURFACE	61.65
FILL - SILTY SAND, trace gravel and brick; brown	0.00
SILTY SAND to sandy SILT, trace gravel; grey, contains cobbles and boulders (GLACIAL TILL); very dense	59.36 / 2.29

SAMPLES

NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM]
1	AS	-	ND
2	SS	8	
3	SS	11	ND
4	SS	43	ND
5	SS	58	
6	SS	50/0.10	ND
7	SS	50/0.10	
8	SS	50/0.08	
9	SS	50/0.08	
10	SS	50/0.05	
11	SS	50/0.08	ND

HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ ND = Not Detected (20, 40, 60, 80)

HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ ND = Not Detected (20, 40, 60, 80)

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3})

WATER CONTENT PERCENT Wp —O W— Wl (20, 40, 60, 80)

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION: Bentonite Seal

DEPTH SCALE METRES: 0 – 10

CONTINUED NEXT PAGE

RECORD OF BOREHOLE: 22-03

PROJECT: 22511882

LOCATION: N 5030756.8 ;E 366500.4

BORING DATE: February 22, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ ND = Not Detected 20 40 60 80 / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ ND = Not Detected 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp —○W— Wl 20 40 60 80	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND to sandy SILT, trace gravel; grey, contains cobbles and boulders (GLACIAL TILL); very dense			12	SS	61/ 0.15				Bentonite Seal
11				50.48 11.17							
		Borehole continued on RECORD OF DRILLHOLE 22-03									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DRAFT

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: ALB

CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-03

LOCATION: N 5030756.8 ;E 366500.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 22, 2022

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. DEPTH (m)	RUN No.		Piezometer / Standpipe installation
		BEDROCK SURFACE	50.48			
	Rotary Drill, NQ Core	Slightly weathered to fresh, thin to medium bedded, grey black LIMESTONE and SHALE	11.17	1		Bentonite Seal; Silica Sand
12			49.38			
		Fresh, thin to medium bedded, grey to black LIMESTONE and SHALE	12.27	2		
13						Screen
14				3		
			47.10			
		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 13.00 m (Elev. 48.65 m) on February 25, 2022	14.55			
15						
16						
17						
18						
19						
20						
21						

Column headings: SYMBOLIC LOG; FLUSH; COLOUR % RETURN; RECOVERY (TOTAL CORE %, SOLID CORE %); R.Q.D. %; FRACT. INDEX PER 0.25 m; DISCONTINUITY DATA (DIP w.r.t. CORE AXIS; TYPE AND SURFACE DESCRIPTION; Jcon; Jr; Ja); HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); Diametral Point Load Index (MPa); RMC -Q' AVG.

DEPTH SCALE

1 : 50

wsp GOLDER

LOGGED: ALB

CHECKED:

RECORD OF BOREHOLE: 22-04

PROJECT: 22511882
LOCATION: N 5030713.2 ;E 366411.4
SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: February 23, 2022

DATUM: Geodetic
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

Column headings: DEPTH SCALE METRES | BORING METHOD | SOIL PROFILE (DESCRIPTION, STRATA PLOT, ELEV. DEPTH (m)) | SAMPLES (NUMBER, TYPE, BLOWS/0.30m) | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20, 40, 60, 80) | HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (20, 40, 60, 80) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION

Boring method: Power Auger, 200 mm Diam. (Hollow Stem)

Elev. / Depth (m)	Description
60.47	GROUND SURFACE
0.00	FILL - SILTY SAND, trace gravel; brown
58.34 / 2.13	SILTY SAND to sandy SILT, trace gravel, trace clay; (possibly till); loose to compact
54.37 / 6.10	SILTY SAND to sandy SILT, trace gravel, trace clay; grey, contains cobbles and boulders (GLACIAL TILL); dense to very dense

Number	Type	Blows/0.30m
1	AS	-
2	SS	10
3	SS	6
4	SS	8
5	SS	8
6	SS	16
7	SS	7
8	SS	14
9	SS	27
10	SS	78
11	SS	47

Piezometer installation: Bentonite Seal; Silica Sand; Screen

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50

wsp GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-04

LOCATION: N 5030713.2 ;E 366411.4

BORING DATE: February 23, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE - DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (20, 40, 60, 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND to sandy SILT, trace gravel, trace clay; grey, contains cobbles and boulders (GLACIAL TILL); dense to very dense			12	SS	50/ 0.05				Screen
11				49.29							Silica Sand
		Borehole continued on RECORD OF DRILLHOLE 22-04		11.18							
12											
13											
14											
15											
16											
17											
18											
19											
20											

DRAFT

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: ALB

CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-04

LOCATION: N 5030713.2 ;E 366411.4

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: February 23, 2022

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

DATUM: Geodetic

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		49.29														
12	Rotary Drill NQ Core	Fresh, thin to medium bedded, grey black LIMESTONE and SHALE		11.18 / 48.28	1													
		End of Drillhole		12.19														

Note(s):

1. Water level in screen measured at a depth of 10.70 m (Elev. 49.77 m) on February 25, 2022

Depth scale: 13, 14, 15, 16, 17, 18, 19, 20, 21

MIS-RCK 004 22511882.GPJ GAL-MISS.GDT 4/4/22 ZS

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: ALB

CHECKED:

RECORD OF BOREHOLE: 22-05

PROJECT: 22511882
LOCATION: N 5030679.9 ;E 366442.7
BORING DATE: February 24, 2022
SHEET 1 OF 3
DATUM: Geodetic
SAMPLER HAMMER, 64kg; DROP, 760mm
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

Boring method: Power Auger, 200 mm Diam. (Hollow Stem)

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	HEADSPACE VAPOUR (PPM)	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE	62.34					
0	FILL - SILTY SAND, trace gravel; brown	0.00	1	AS	-	ND	Bentonite Seal
1			2	SS	33		
2			3	SS	31		
			4	SS	84		
3	SILTY SAND to sandy SILT, trace gravel, trace clay; grey, contains cobbles and boulders (GLACIAL TILL); very dense	59.29 / 3.05	5	SS	94		
4			6	SS	50	ND	
			7	SS	50/0.05		
5			8	SS	50/0.03		Silica Sand
6			9	SS	50/0.05		
7							Screen
8			10	SS	50/0.10	ND	Water level ▽
9			11	SS	50/0.13		
10	CONTINUED NEXT PAGE						

HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected): 20, 40, 60, 80
HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected): 20, 40, 60, 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}
WATER CONTENT PERCENT (Wp —O W— Wl): 20, 40, 60, 80
ADDITIONAL LAB. TESTING

DRAFT

DEPTH SCALE 1 : 50
wsp GOLDER
LOGGED: ALB
CHECKED:

MIS-BHS 001 22511882.GPJ GAL-MIS.GDT 4/4/22 ZS

PROJECT: 22511882

RECORD OF BOREHOLE: 22-05

LOCATION: N 5030679.9 ;E 366442.7

BORING DATE: February 24, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ ND = Not Detected 20 40 60 80 / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ ND = Not Detected 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp —○W— Wl 20 40 60 80	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND to sandy SILT, trace gravel, trace clay; grey, contains cobbles and boulders (GLACIAL TILL); very dense			12	SS	50/ 0.13				
11											
12					13	SS	86				
13				48.50 13.84	14	SS	50/ 0.13				
14		Borehole continued on RECORD OF DRILLHOLE 22-05									
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-05

SHEET 3 OF 3

LOCATION: N 5030679.9 ;E 366442.7

DRILLING DATE: February 24, 2022

DATUM: Geodetic

DRILL RIG: CME 55

INCLINATION: -90° AZIMUTH: ---

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		48.50														
14–15	Rotary Drill, NQ Core	Slightly weathered to fresh, thin to medium bedded, grey black LIMESTONE and SHALE		13.84	1													
				47.10														
		End of Drillhole		15.24														

Note(s):

1. Water level in screen measured at a depth of 8.22 m (Elev. 54.12 m) on February 25, 2022

DRAFT

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: ALB

CHECKED:

RECORD OF BOREHOLE: 11-33

PROJECT: 11-1122-0199 — SHEET 1 OF 1

LOCATION: See Site Plan — BORING DATE: December 8, 2011 — DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm — PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

DEPTH SCALE METRES	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.30m
0	GROUND SURFACE	62.22			
	Dense dark grey crushed stone (Gravel lot BASE)	0.08	1	50 DO	46
	Dense brown fine to medium sand, some coarse sand, some gravel, trace silt (Gravel lot SUBBASE)	61.69 / 0.53			
1	Loose to very dense dark brown silty sand, trace to some gravel, brick, wood, organics, concrete, occasional grey silty clay layer (FILL)		2	50 DO	9
			3	50 DO	60
2			4	50 DO	12
			5	50 DO	56
3	Compact to very dense brown to grey brown SILTY SAND to SANDY SILT, trace to some gravel (GLACIAL TILL)	59.32 / 2.90	6	50 DO	23
			7	50 DO	48
4			8	50 DO	74
5			9	50 DO	49
			10	50 DO	55
6			11	50 DO	>89
			12	50 DO	>100
7			13	50 DO	>100
			14	50 DO	>100
	Very dense grey brown SILTY SAND, trace to some gravel, occasional grey silt seam, occasional fine to medium sand seam (GLACIAL TILL)	54.60 / 7.62	15	50 DO	>111
8			16	50 DO	>105
			17	50 DO	>50
9			18	50 DO	>100
			19	50 DO	>50
10		52.26	20	50 DO	>110
	End of Borehole Split Spoon Refusal	9.96			
11					

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ — 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp ⊢ ○W ⊣ Wl — 20 40 60 80

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE 1 : 55

Golder Associates

LOGGED: RI

CHECKED: GDC

RECORD OF BOREHOLE: 11-35

PROJECT: 11-1122-0199

LOCATION: See Site Plan

BORING DATE: December 12, 2011

SHEET 1 OF 1

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

Depth scale (metres)	Description	Elev. / Depth (m)	Sample number	Type	Blows/0.30m
	GROUND SURFACE	62.56			
0	Dense grey sand and gravel (Gravel lot BASE)	0.00			
	Compact brown medium to fine sand, trace gravel (Gravel lot SUBBASE)	62.25 / 0.31	1	50 DO	52
1	Compact dark brown to black silty sand, trace gravel, ash, wood, brick, mortar (FILL)	61.65 / 0.91	2	50 DO	17
			3	50 DO	19
2	Compact brown fine to medium sand, trace gravel (FILL)	60.88 / 1.68	4	50 DO	24
	Dense to very dense light brown to brown SILTY SAND, occasional gravel and medium sand layers, trace gravel (GLACIAL TILL)	60.43 / 2.13	5	50 DO	45
			6	50 DO	65
3			7	50 DO	176
4			8	50 DO	>50
	End of Borehole Auger Refusal	58.16 / 4.40			

Depth scale ticks: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Column headings: DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa, nat V. + Q - ● rem V. ⊕ U - ○ (20, 40, 60, 80); HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (20, 40, 60, 80); ADDITIONAL LAB. TESTING; PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: GDC

RECORD OF BOREHOLE: 11-37

PROJECT: 11-1122-0199
SHEET 1 OF 1
LOCATION: See Site Plan
BORING DATE: December 12, 2011
DATUM: Geodetic
SAMPLER HAMMER, 64kg; DROP, 760mm
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

Description	Elev. (m)	Depth (m)
GROUND SURFACE	62.76	0.00
Compact sand and gravel (Gravel lot BASE)	62.46	0.30
Compact brown medium to fine sand, trace gravel (Gravel lot SUBBASE)	61.85	0.91
Loose dark brown to black silty sand, trace gravel, occasional layers of ash, gravel, sandy mortar, glass, construction debris (FILL)	60.63	2.13
Compact brown medium to fine sand, trace gravel (FILL)	60.32	2.44
Dense to very dense grey brown SILTY SAND, some gravel, trace cobbles (GLACIAL TILL)	56.23	6.53
End of Borehole Auger Refusal		

Sample Number	Type	Blows/0.30m
1	50 DO	29
2	50 DO	20
3	50 DO	6
4	50 DO	34
5	50 DO	73
6	50 DO	>75
7	50 DO	>65
8	50 DO	>75
9	50 DO	40
10	50 DO	>50

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○: 20 40 60 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp —○W— Wl: 20 40 60 80
ADDITIONAL LAB. TESTING
PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: BM
CHECKED: GDC

RECORD OF BOREHOLE: 11-38

PROJECT: 11-1122-0199
SHEET 1 OF 1

LOCATION: See Site Plan
BORING DATE: December 19, 2011
DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

Boring method: Power Auger, 200 mm Diam. (Hollow Stem)

Depth (m)	Soil Profile Description	Elev. (m) / Depth (m)	Sample Number	Type	Blows/0.30m
	GROUND SURFACE	62.11			
0.00	Compact to dense brown sand and gravel (Gravel lot BASE)	0.00			
0.10	Loose to compact brown medium to fine sand, some gravel (Gravel lot SUBBASE)	0.10	1	50 DO	35
			2	50 DO	8
1.22	Compact to very dense grey brown sand, some gravel, trace silt (FILL)	60.89 / 1.22	3	50 DO	15
			4	50 DO	52
2.44	Very dense grey brown SILTY SAND, some gravel, medium brown sand seams (GLACIAL TILL)	59.67 / 2.44	5	50 DO	61
			6	50 DO	112
			7	50 DO	148
4.17	End of Borehole Auger Refusal	57.94 / 4.17			

Columns also shown (no data recorded): DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●; rem V. ⊕ U - ○) (20, 40, 60, 80); HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20, 40, 60, 80); ADDITIONAL LAB. TESTING; PIEZOMETER OR STANDPIPE INSTALLATION.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: JDR
CHECKED: GDC

RECORD OF BOREHOLE: 11-39

PROJECT: 11-1122-0199

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 15, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.81							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact sand and gravel (Gravel lot BASE)		0.00							
		Compact brown to red sandy silt, trace gravel (FILL)		0.15	1	50 DO	15				
1		Compact to dense light brown fine to medium sand, trace gravel, silt, and mortar (FILL)		61.90 / 0.91	2	50 DO	20				
					3	50 DO	40				
2		Dense sandy gravel to brown fine to medium sand and gravel (FILL)		60.68 / 2.13	4	50 DO	120				
3					5	50 DO	67				
					6	50 DO	99				
4		Compact to very dense grey SILTY SAND, some gravel (GLACIAL TILL)		59.15 / 3.66	7	50 DO	34				
					8	50 DO	27				
5					9	50 DO	33				
					10	50 DO	>50				
6					11	50 DO	>100				
					12	50 DO	>100				
		End of Borehole Auger Refusal		56.46 / 6.35							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM/JD

CHECKED: GDC

RECORD OF BOREHOLE: 11-40

PROJECT: 11-1122-0199
SHEET 1 OF 1
LOCATION: See Site Plan
BORING DATE: December 16, 2011
DATUM: Geodetic
SAMPLER HAMMER, 64kg; DROP, 760mm
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

SOIL PROFILE: DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.30m
GROUND SURFACE	62.77			
Compact red to fine brown sand, some gravel (Gravel lot BASE)	0.00	1	50 DO	13
Compact fine to medium brown sand, some gravel, red brick (FILL)	62.39 / 0.38	2	50 DO	19
Compact light brown fine to medium sand, trace gravel, silt, red brick (FILL)	61.55 / 1.22	3	50 DO	15
		4	50 DO	25
		5	50 DO	51
Very dense grey brown SAND, some gravel, trace silt (GLACIAL TILL)	59.78 / 2.99	6	50 DO	59
Very dense grey brown SILTY SAND, some gravel (GLACIAL TILL)	59.11 / 3.66	7	50 DO	100
		8	50 DO	>50
		9	50 DO	>100
		10	50 DO	187
		11	50 DO	>50
End of Borehole Auger Refusal	56.52 / 6.25			

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ● ; rem V. ⊕ U - ○ : 20 40 60 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp —○W— Wl : 20 40 60 80
ADDITIONAL LAB. TESTING
PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE METRES: 0 1 2 3 4 5 6 7 8 9 10

DEPTH SCALE
1 : 50

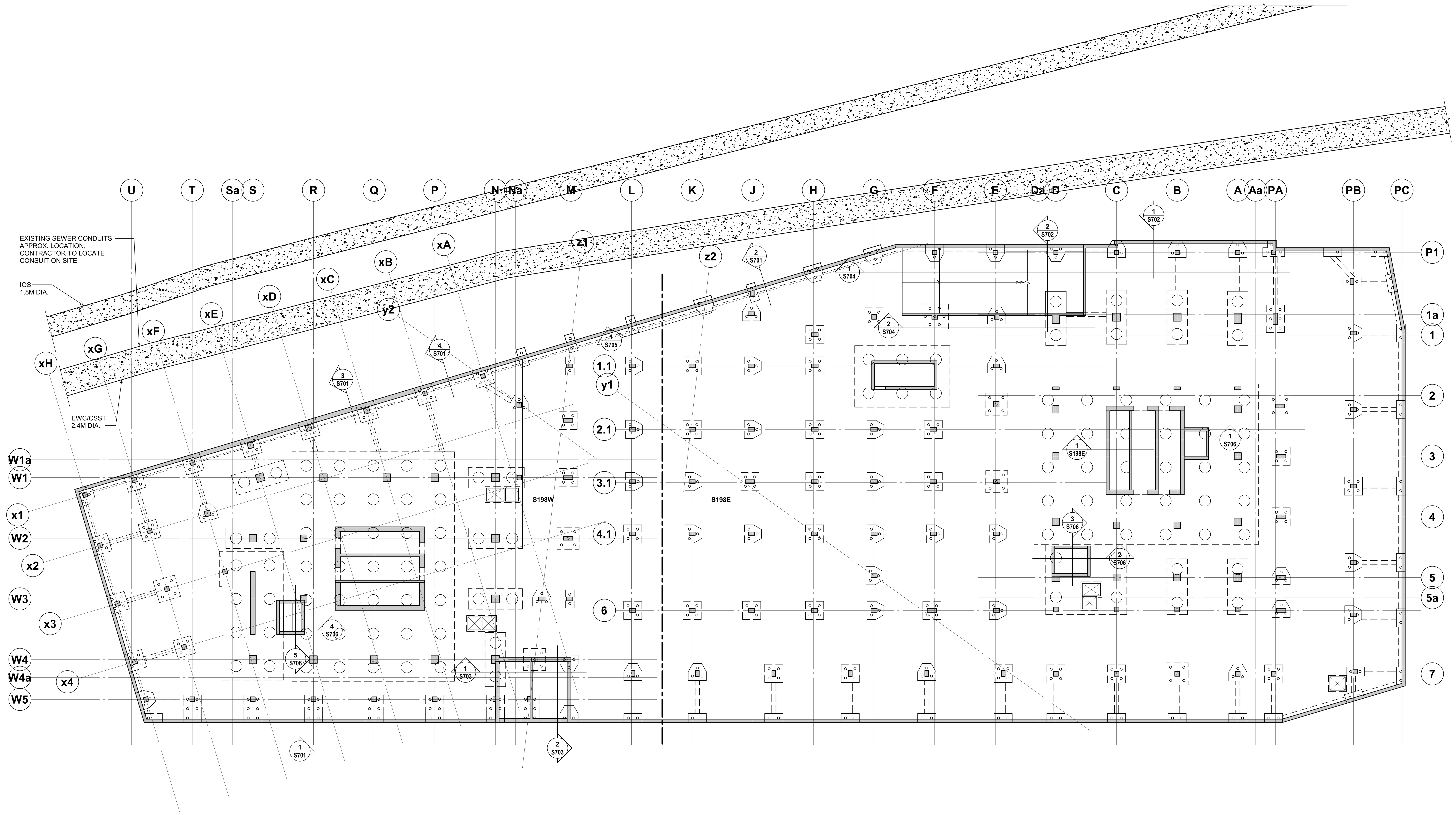
Golder Associates

LOGGED: JD
CHECKED: GDC

GOLDER

golder.com

APPENDIX E: Foundation Plans



OVERALL FOUNDATION PLAN
1 : 200

FOUNDATION PLAN NOTES

1. FOUNDATION ELEVATIONS, BEARING STRATA, BEDROCK DEPTH TO BE VERIFIED BY GEOTECHNICAL ENGINEER ON SITE.
2. FOUND TOP OF CAISSONS (OR PILE) CAP (T.O.C.C.) AT ELEVATIONS SHOWN ON PLAN. BOTTOM OF CAISSON TO BE DETERMINED BASED MINIMUM SOCKET LENGTH INDICATED IN CAISSONS SCHEDULE.
3. THE RESULTING BOTTOM OF CAISSON AND PILES ELEVATIONS ARE ESTIMATES BASED ON THE GEOTECHNICAL REPORT. ALLOWANCE SHOULD BE CARRIED BASED ON VARIATIONS FROM THE ASSUMED SITE CONDITIONS. .
4. CENTRE ALL CAPS, PILASTERS, AND FOOTINGS UNDER COLUMNS EXCEPT AS NOTED ON PLAN.
5. SUBGRADE PREPARATION BELOW THE SLAB ON GRADE IS PER THE GEOTECHNICAL REPORTS. SUB-FLOOR DRAINAGE IS PER THE MECHANICAL DRAWINGS
6. REFER TO MECHANICAL DRAWINGS FOR PITS SIZE AND LOCATIONS. REFER TO GENERAL NOTES FOR CONSTRUCTION DETAILS OF PITS.
7. PROVIDE GROUND SEAL WHERE REQUIRED BY SITE CONDITIONS, GEOTECHNICAL REPORT, OR GEOTECHNICAL CONSULTANT.
8. REFER TO THE FOLLOWING DRAWINGS:
   - GENERAL NOTES – S100 SERIES
   - COLUMN SCHEDULE - S300 SERIES
   - SHEAR WALL ELEVATIONS, ZONE SCHEDULE - S400 SERIES

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f 613.563.7281
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Ottawa, ON K1Z 8P9 Canada
tel 613-714-7000

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1777 W 3rd Ave., Vancouver, BC V6J 1KJ

LANDSCAPING
PFS Studio
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CONSULTANT
Two Row Architect
1804 6th Line, Ohsweken, ON N0A 1M0

CONTRACTOR
EllisDon
2680 Queensview Dr., Ottawa, ON K2B 8J9

PROJECT

LEBRETON LIBRARY PARCEL
665 Albert St
Ottawa, ON
Canada

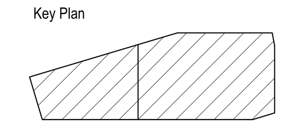
dream

DREAM
30 Adelaide St. E., Suite 301,
Toronto, ON M5C 3H1

KEYPLAN

TRUE NORTH

Key Plan



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUED FOR INFORMATION	2022-10-27
2	ISSUED FOR INFORMATION	2022-12-02
3	ISSUED FOR FOUNDATION REVIEW	2022-12-09
4	ISSUED FOR SHORING AND EXCAVATION PERMIT	2022-12-16

LICENSED PROFESSIONAL ENGINEER 2022/12/16 B. BOULANGER 100215168 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER 2022/12/16 M. CHOINIERE 100589639 PROVINCE OF ONTARIO

Drawn By **M.M.** Scale **As indicated**
Designed By **M.C.** Date **2022-12-16**
Checked By **B.B.**

Job Number OTT.128984.0001

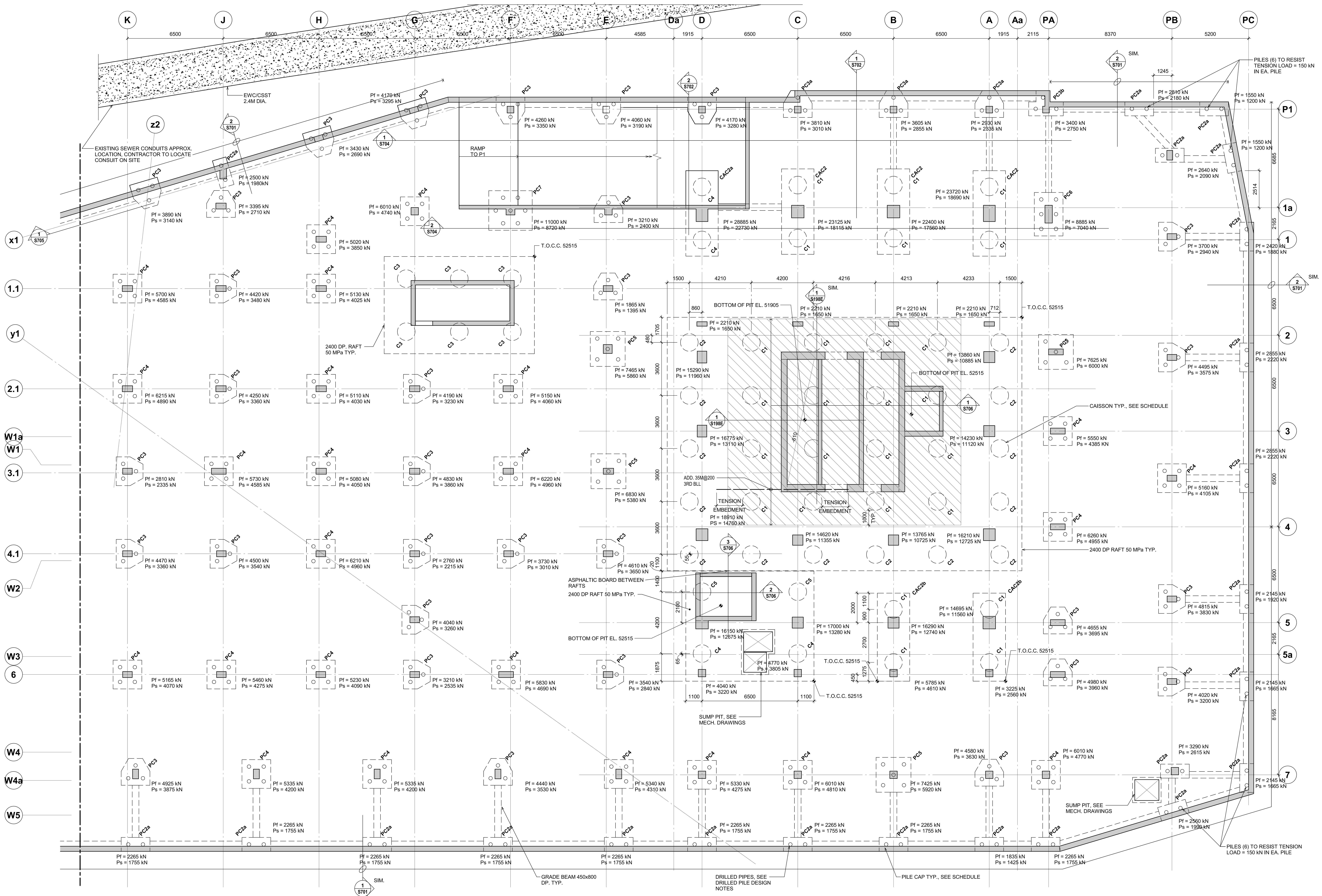
TITLE

OVERALL FOUNDATION PLAN

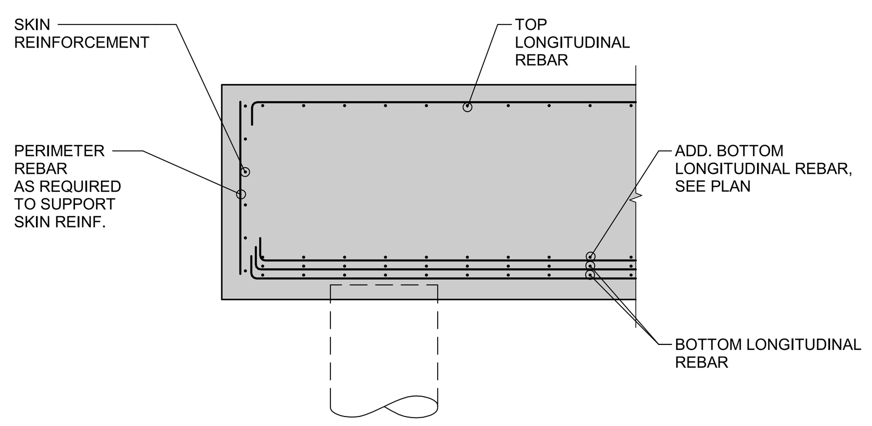
SHEET NUMBER

S198

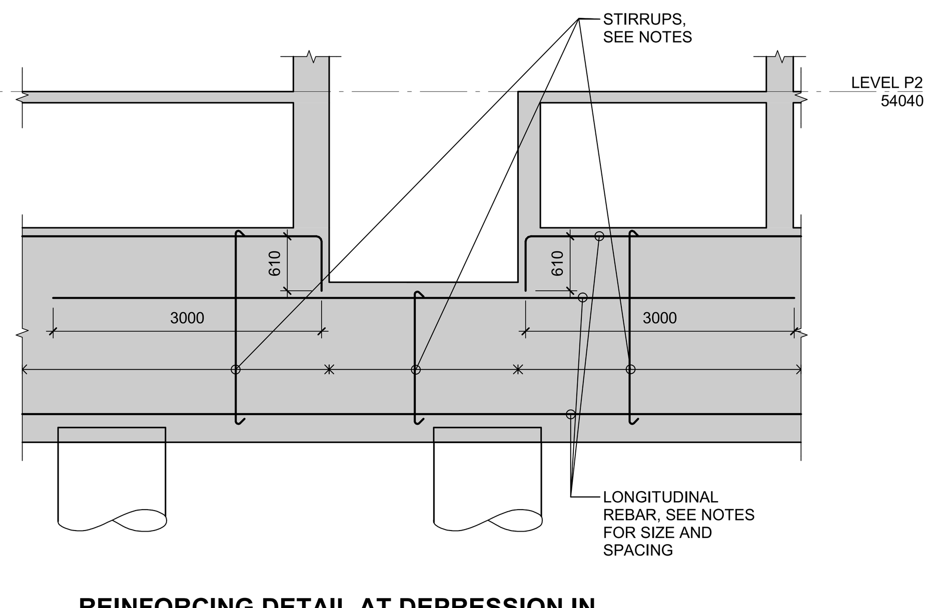
Autodesk Docs://Lebreton Flats Library/STRU_Dream_LeBreton_R22.rvt
2022-12-16 4:18:52 PM



ENLARGED PARTIAL FOUNDATION PLAN, EAST
1 : 100



RAFT EDGE REINFORCEMENT TYPICAL DETAIL
1 : 50



1 S198E REINFORCING DETAIL AT DEPRESSION IN RAFT
1 : 50

2400 DP. RAFT NOTES
CONCRETE STRENGTH 50 MPa

STEEL TO BE GRADE 500 FOR ALL LONGITUDINAL BOTTOM BARS.
ALL OTHER REINFORCEMENT TO BE GRADE 400
CLEAR COVER 55mm TOP & 200mm BOTTOM (DUE TO TOP OF PILE ELEVATION)

2 LAYERS 35M@200 B.E.W.
1 LAYERS 35M@200 T.E.W.
15M@180 SKIN REINF. EACH SIDE
SEE PLAN FOR ADD. REBAR

15M STIRRUPS GRID @200 E.W. [OR] WHERE HATCHED ONLY

BAR PLACING ORDER U.N.O.

TOP UPPER LAYER (TUL)
TOP LOWER LAYER (TLL)
BOTTOM UPPER LAYER (BUL)
BOTTOM LOWER LAYER (BLL)

*STAGGER TENSION SPLICE POSITION

FOUNDATION PLAN NOTES

1. REFER TO S198 FOR FOUNDATION PLAN NOTES.

- TOP OF CAISSON CAP (OR PILE) T.O.C.C TO BE AT EL.53265 TYP. U.N.O ON DRAWINGS WITH THE SYMBOL : ⯐

- 450mm MIN BETWEEN T.O.C.C. AND U/S OF SLAB ON GRADE AT RISERS LOCATION. OTHER PILE CAPS COULD BE POURED HIGHER, TO COORDINATE WHEN RISERS LOCATION IS DETERMINED.

- TOP OF ROCK AVERAGE IS APPROX. AT ELEV. 48.0m, REFER TO GEOTECHNICAL REPORT

- THE GC SHALL MONITOR THE ROCK ELEVATION WHILE DRILLING THE CAISSONS AND ADVISE RJC IF THE ROCK ELEVATION IS FOUND TO BE LOWER THAN THIS VALUE.

- EXCAVATION AND SHORING SYSTEM, WHEN SHOWN, IS SCHEMATIC AND FOR REFERENCE ONLY, REFER TO GENERAL CONTRACTOR'S LOGISTIC PLAN AND SHORING SPECIALTY ENGINEER'S DRAWINGS

- FOR SUMP PITS LOCATIONS AND DIMENSIONS, REFER TO MECHANICAL/ARCHITECTURAL DRAWINGS

- LOADS SHOWN IN THE DRAWINGS ARE FOR THE WHOLE PILE CAP. THESE GRAVITY LOADS ONLY AND DOES NOT ACCOUNT FOR ECCENTRICITY EFFECT ON INDIVIDUAL PILES.
Pf = XXXX kN (ULS)
Ps = XXXX kN (SLS)

- FOR CAISSON SCHEDULE, PILE AND CAISSON CAP SCHEDULES AND PILE DELEGATED DESIGN NOTES, SEE DRAWING S197

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Two Row Architect
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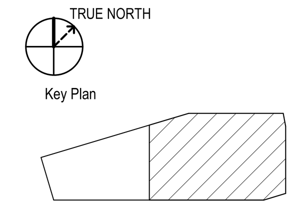
CONTRACTOR
EllisDon
2680 Queensview Dr., Ottawa, ON K2B 8J9

PROJECT

LEBRETON LIBRARY PARCEL
665 Albert St
Ottawa, ON
Canada

DREAM
30 Adelaide St. E., Suite 301,
Toronto, ON M5C 3H1

KEYPLAN



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LICENSED PROFESSIONAL ENGINEER 2022/12/16 M. CHOINIERE 100589639 PROVINCE OF ONTARIO

Drawn By	M.M.	Scale	As indicated
Designed By	M.C.	Date	2022-12-16
Checked By	B.B.		

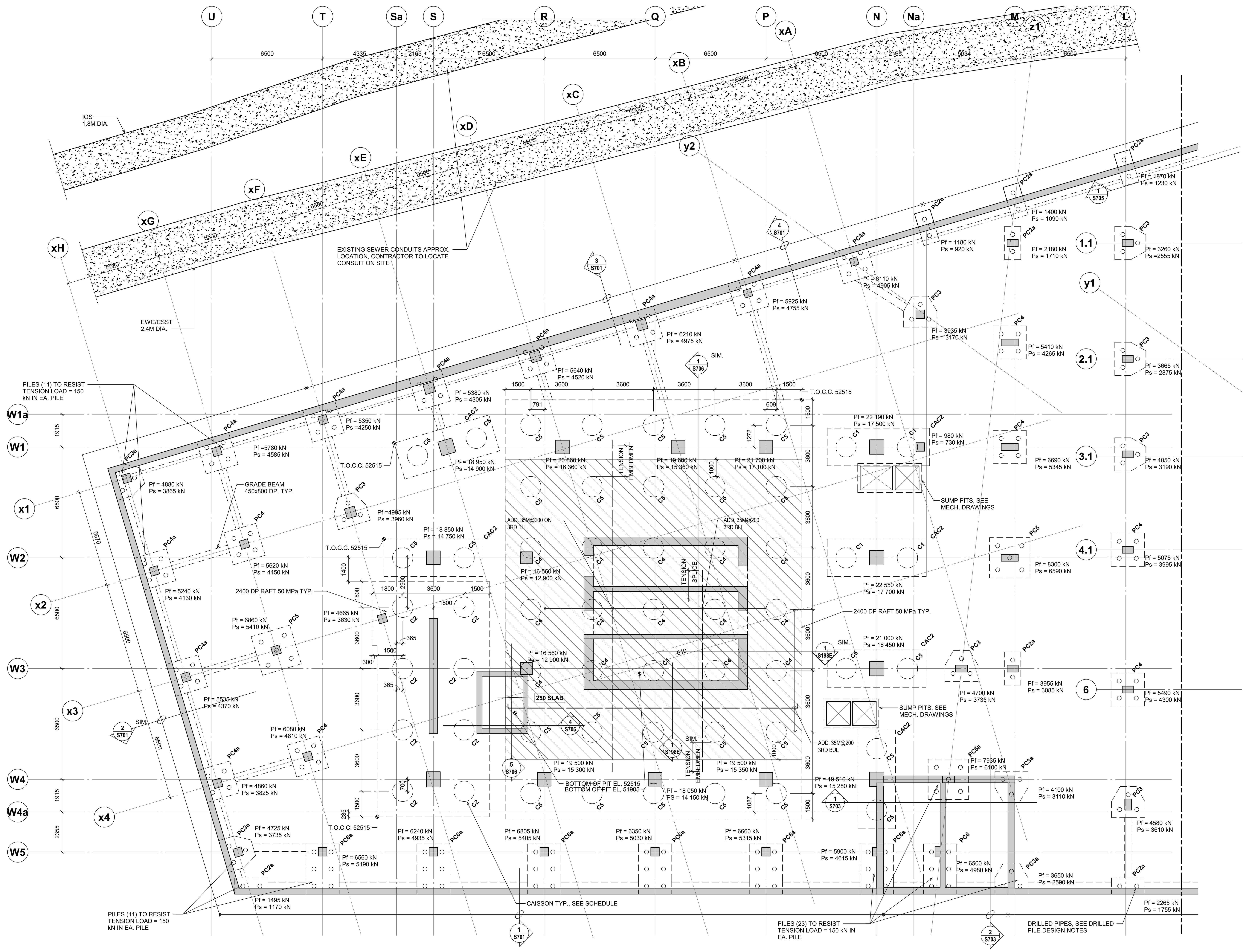
Job Number OTT.128984.0001

TITLE

ENLARGED PARTIAL FOUNDATION PLAN, EAST

SHEET NUMBER

S198E



ENLARGED PARTIAL FOUNDATION PLAN, WEST

1 : 100

2400 DP. RAFT NOTES

CONCRETE STRENGTH 50 MPa

STEEL TO BE GRADE 500 FOR ALL LONGITUDINAL BOTTOM BARS.
TOP LONGITUDINAL BARS OF THE MAIN ELEVATOR RAFT TO BE GRADE 500.
ALL OTHER REINFORCEMENT TO BE GRADE 400
CLEAR COVER 55mm TOP & 200mm BOTTOM (DUE TO TOP OF PILE ELEVATION)

2 LAYERS 35M@200 H.2.E.
1 LAYERS 35M@200 H.2.E.
15M@180 SKIN REINF. EACH SIDE
SEE PLAN FOR ADD. REBAR

15M STIRRUPS GRID @200 E.W. OR WHERE HATCHED ONLY

BAR PLACING ORDER U.N.O.

- TOP UPPER LAYER (TUL)
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- BOTTOM LOWER LAYER (BLL)

*STAGGER TENSION SPLICE POSITION

FOUNDATION PLAN NOTES

1. REFER TO S198 FOR FOUNDATION PLAN NOTES.

- TOP OF CAISSON CAP (OR PILE) T.O.C.C TO BE AT EL.53265 TYP. U.N.O ON DRAWINGS WITH THE SYMBOL :

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- FOR CAISSON SCHEDULE, PILE AND CAISSON CAP SCHEDULES AND PILE DELEGATED DESIGN NOTES, SEE DRAWING S197

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PROJECT

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Canada

dream

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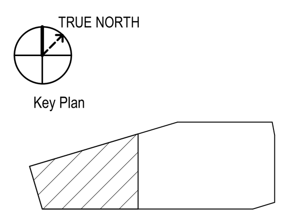
KEYPLAN



ISSUE CHART

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1	ISSUED FOR INFORMATION	2022-10-27
2	ISSUED FOR INFORMATION	2022-12-02
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LICENSED PROFESSIONAL ENGINEER 2022/12/16 B. BOULANGER 100215168 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER 2022/12/16 M. CHOINIERE 100589639 PROVINCE OF ONTARIO

Drawn By **M.M.** Scale **1 : 100**
Designed By **M.C.** Date **2022-12-16**
Checked By **B.B.**

Job Number OTT.128984.0001

TITLE

ENLARGED PARTIAL FOUNDATION PLAN, WEST

SHEET NUMBER

S198W

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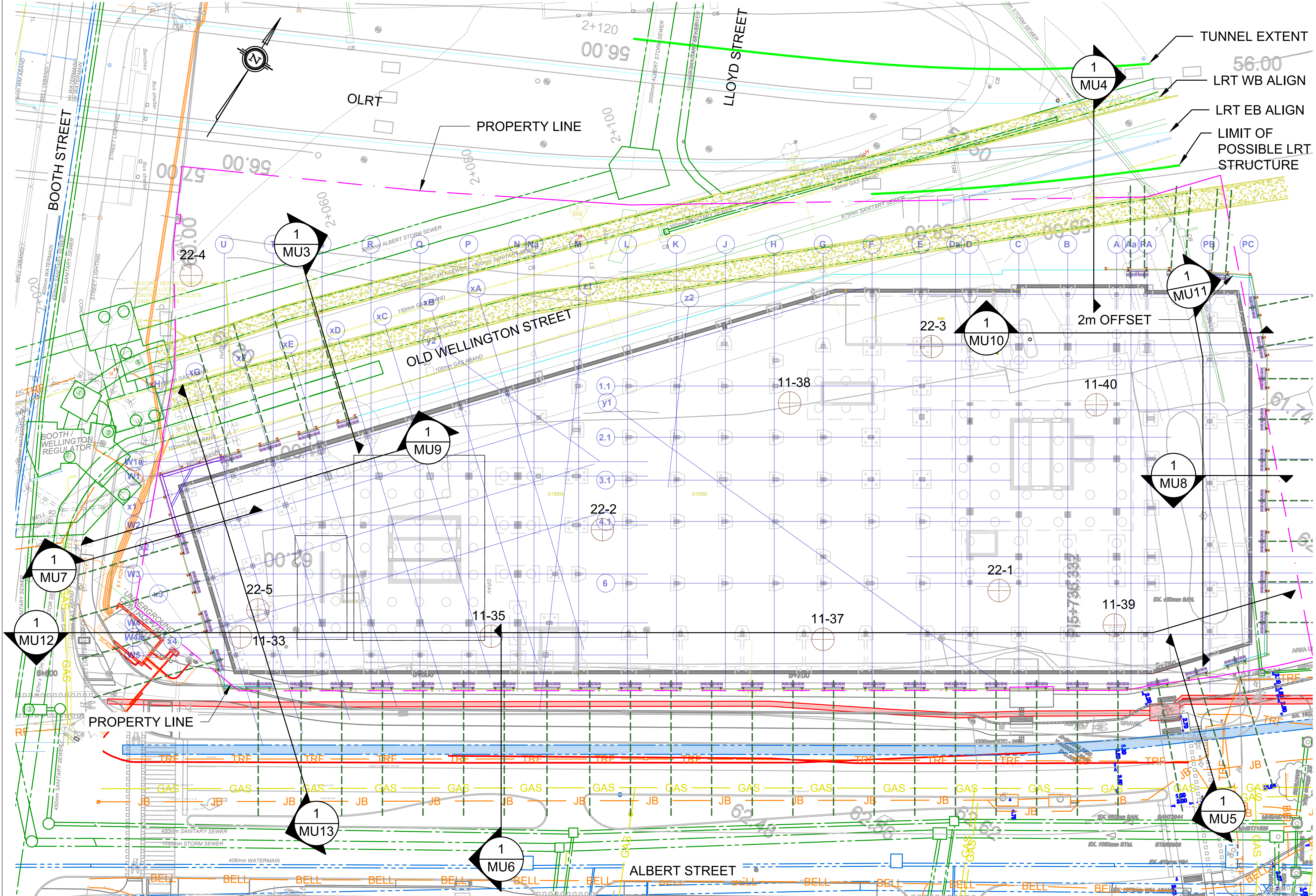
APPENDIX F: Support of Excavation Design



1 MU1 SITE PLAN
SCALE: 1:500

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

No.	REVISION	DATE
1	ISSUED FOR REVIEW/PERMIT	2022.12.16

MARATHON

Marathon Underground Constructors Corporation
6847 Hiram Drive, Greely, ON K4P 1A2
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Fax: (613) 821-3182
www.marathonunderground.com

PROJECT
LEBRETON LIBRARY PARCEL EXCAVATION SHORING

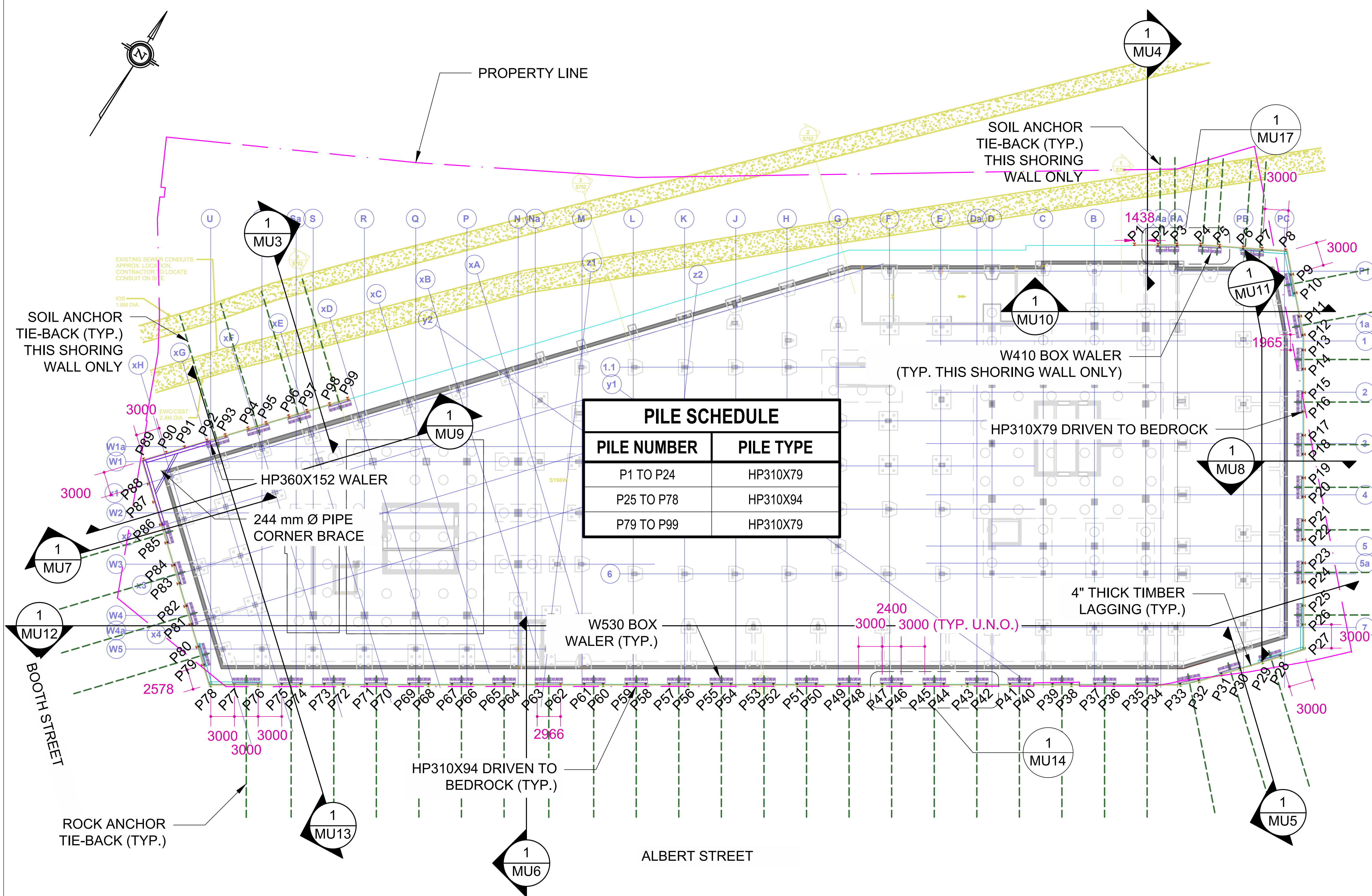
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SITE AND UTILITY PLAN

DRAWN BY: AC
SCALE: AS NOTED
DESIGNED BY: HB
DRAWING No.: MU1
CHECKED BY: MIC

2022-12-16 3:38:56 PM



PILE SCHEDULE	
PILE NUMBER	**PILE TYPE**
P1 TO P24	HP310X79
P25 TO P78	HP310X94
P79 TO P99	HP310X79

1
MU2
SHORING PLAN
SCALE: 1:500

No.	REVISION	DATE
1	ISSUED FOR REVIEW/PERMIT	2022.12.16

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

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www.marathonunderground.com

PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SHORING PLAN

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
DRAWING No. MU2
CHECKED BY MIC

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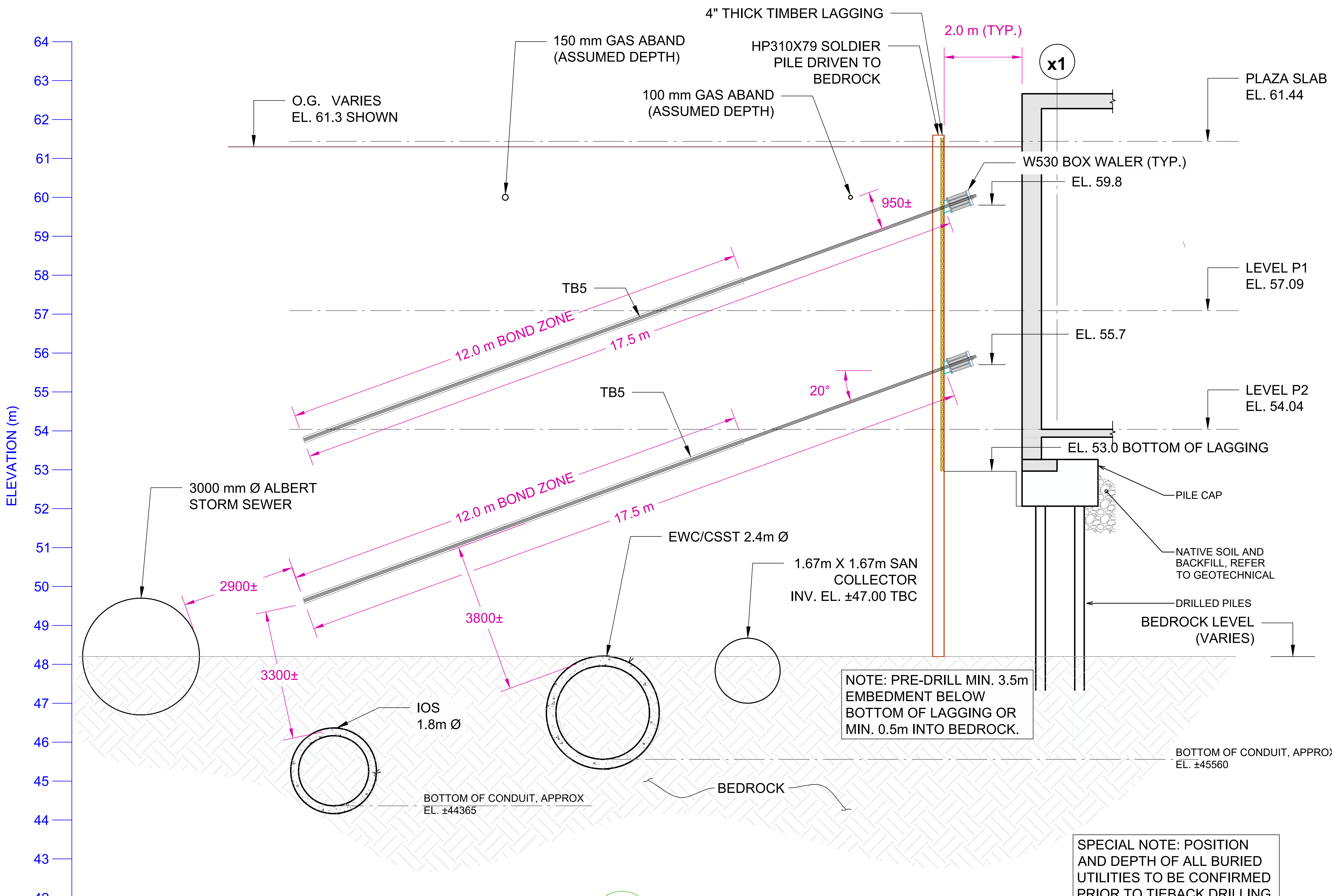

1 MU3 SECTION
SCALE: 1:100

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

No.	REVISION	DATE
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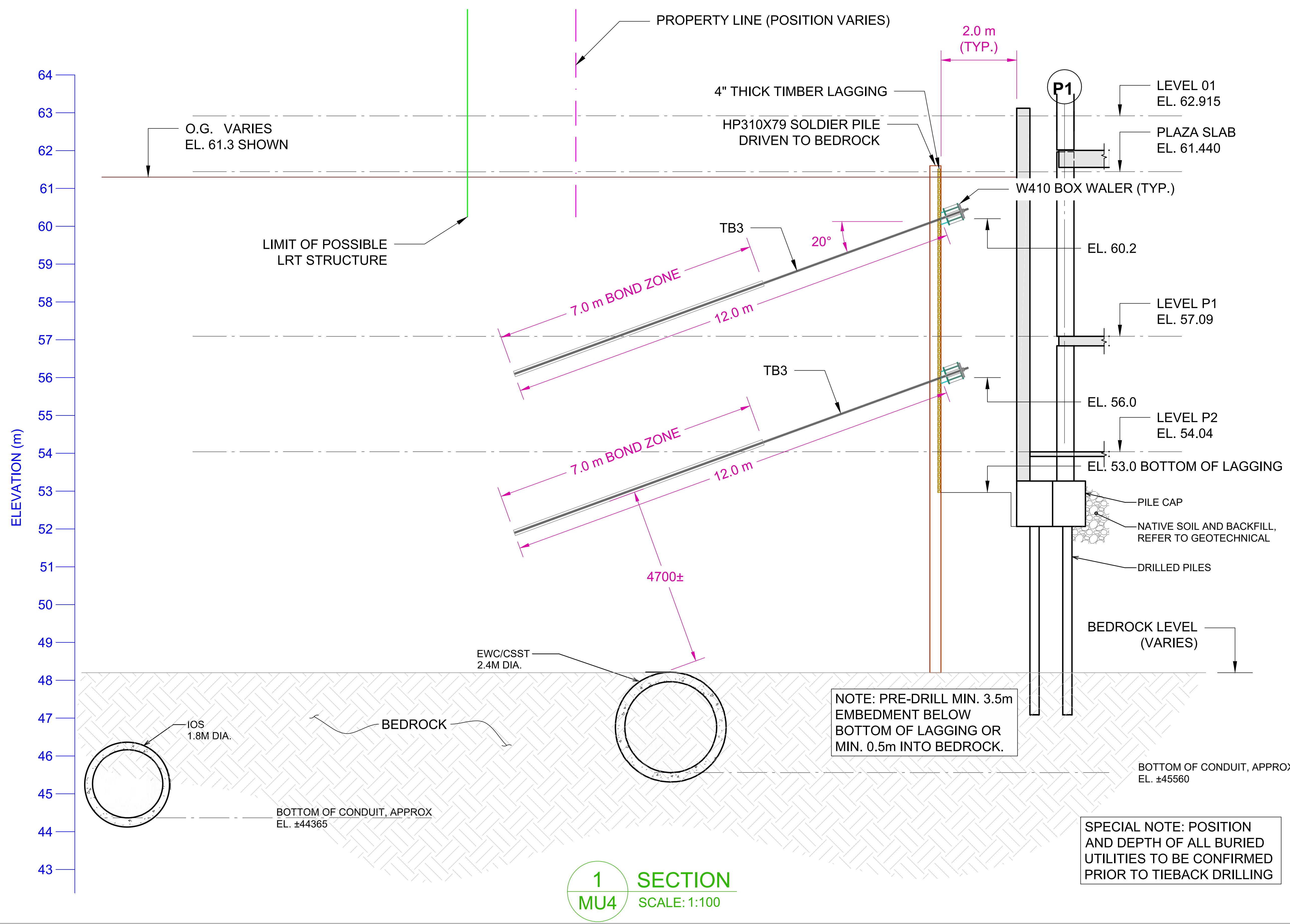
PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SECTION

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
DRAWING No. MU3
CHECKED BY MIC



LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

No.	REVISION	DATE
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www.marathonunderground.com

PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SECTION

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
DRAWING No. MU4
CHECKED BY MIC

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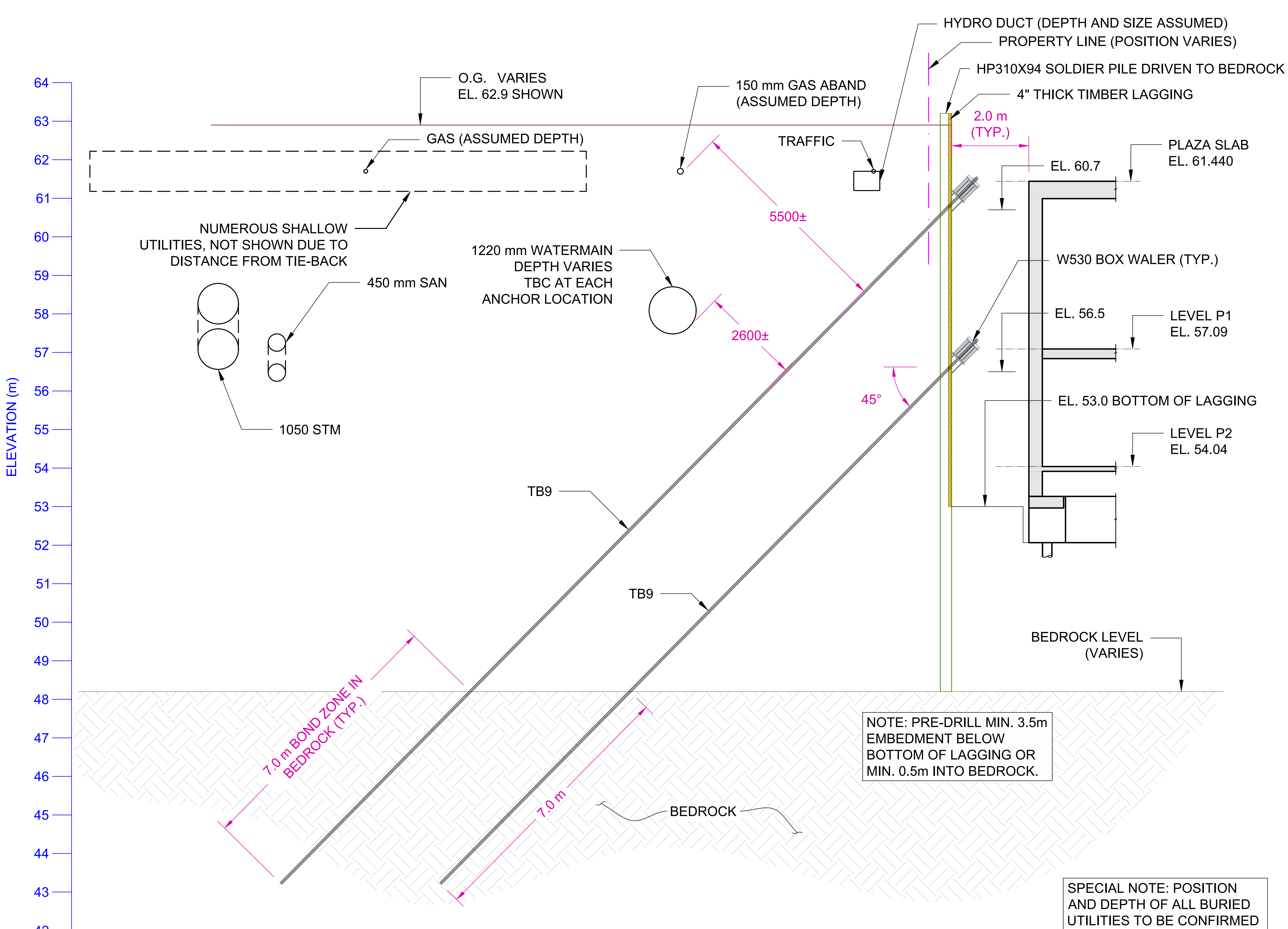

1 MU5 **SECTION**
SCALE: 1:100

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SECTION

DRAWN BY	SCALE
AC	AS NOTED
DESIGNED BY HB	DRAWING No. MU5
CHECKED BY MIC	

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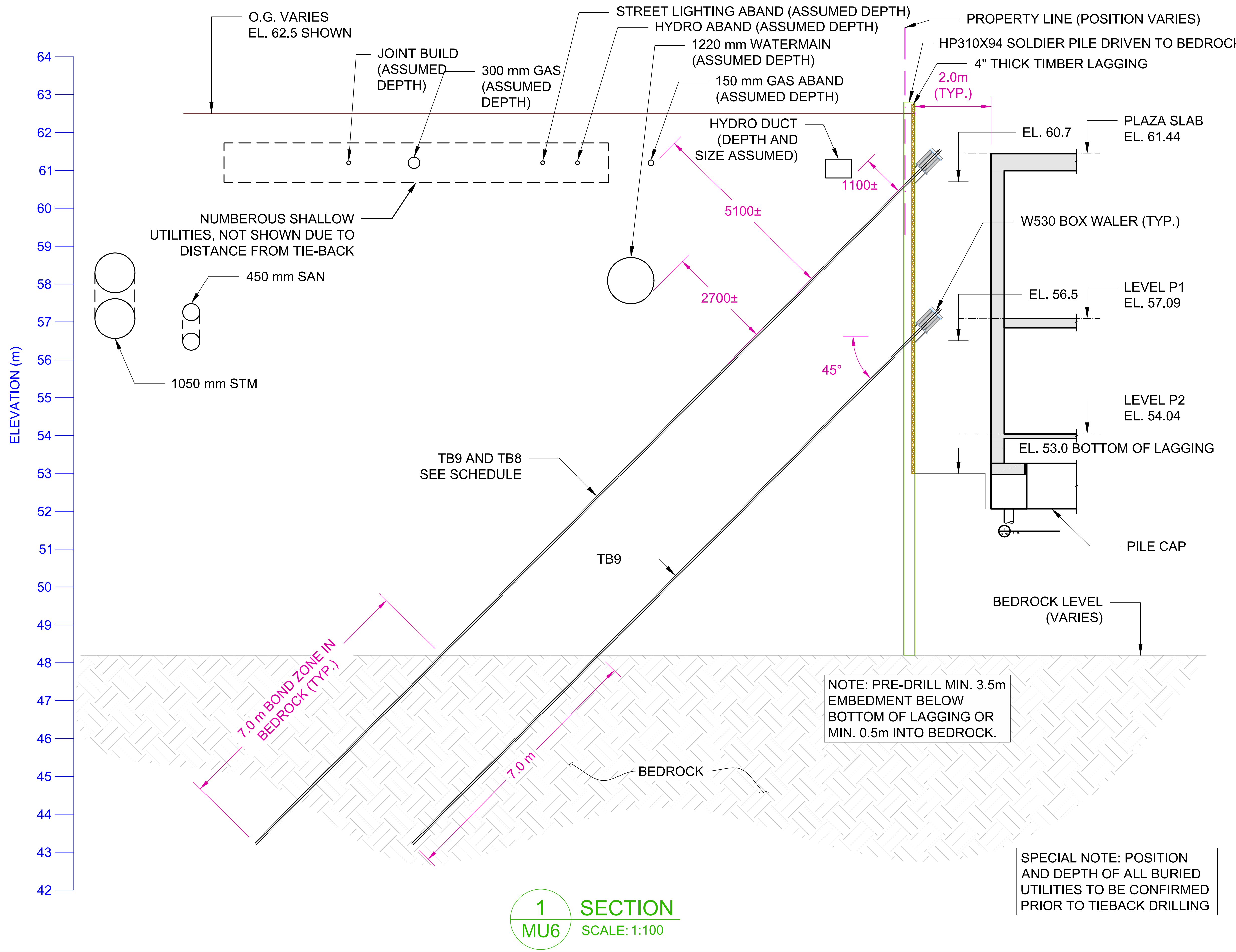

No.	REVISION	DATE
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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

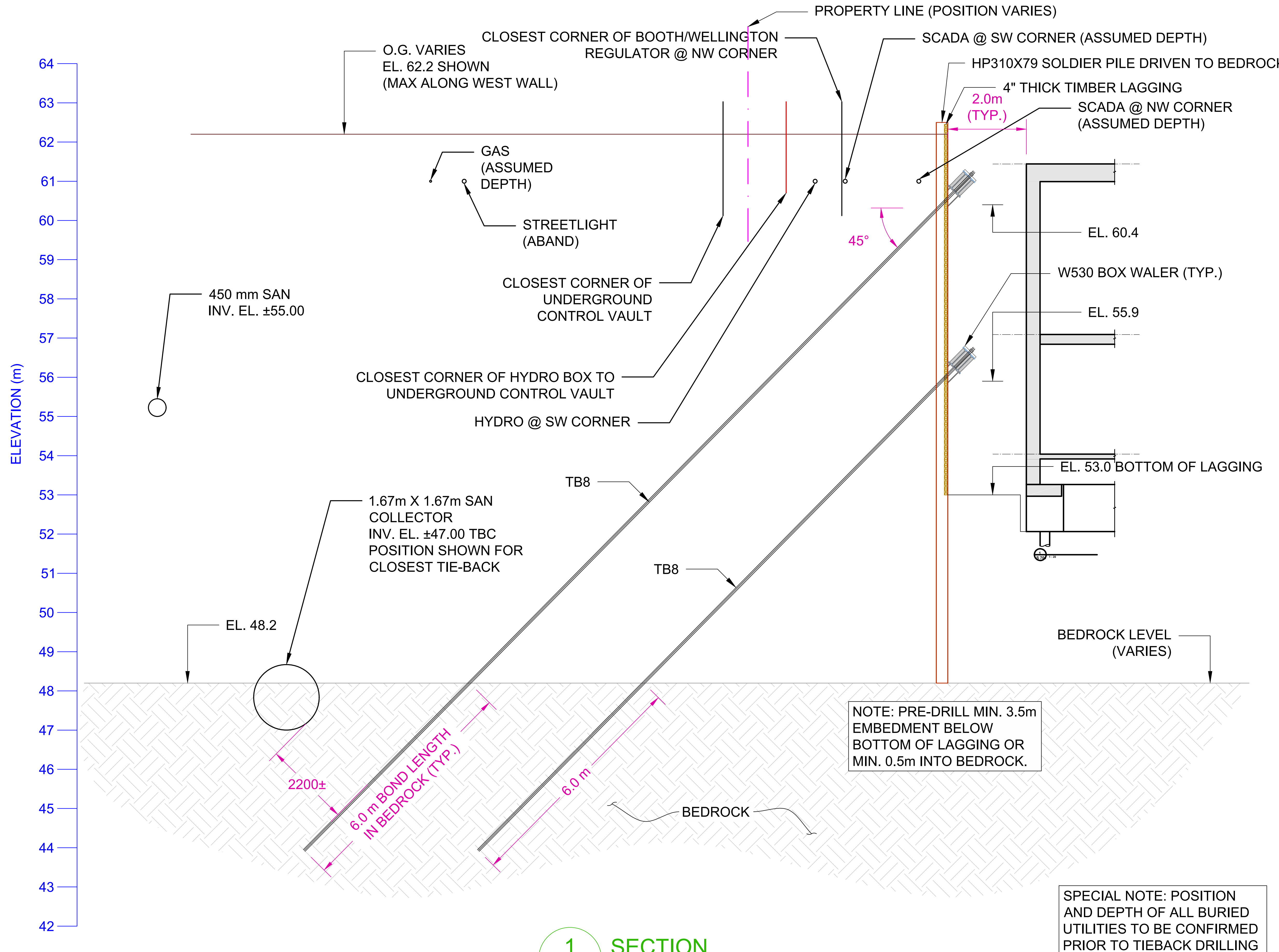
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SECTION

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
CHECKED BY MIC
DRAWING No. MU6

2022-12-16 3:37:08 PM



1 MU7 SECTION
SCALE: 1:100

No.	REVISION	DATE
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PROJECT
LEBRETON LIBRARY PARCEL EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SECTION

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
DRAWING No. MU7
CHECKED BY MIC

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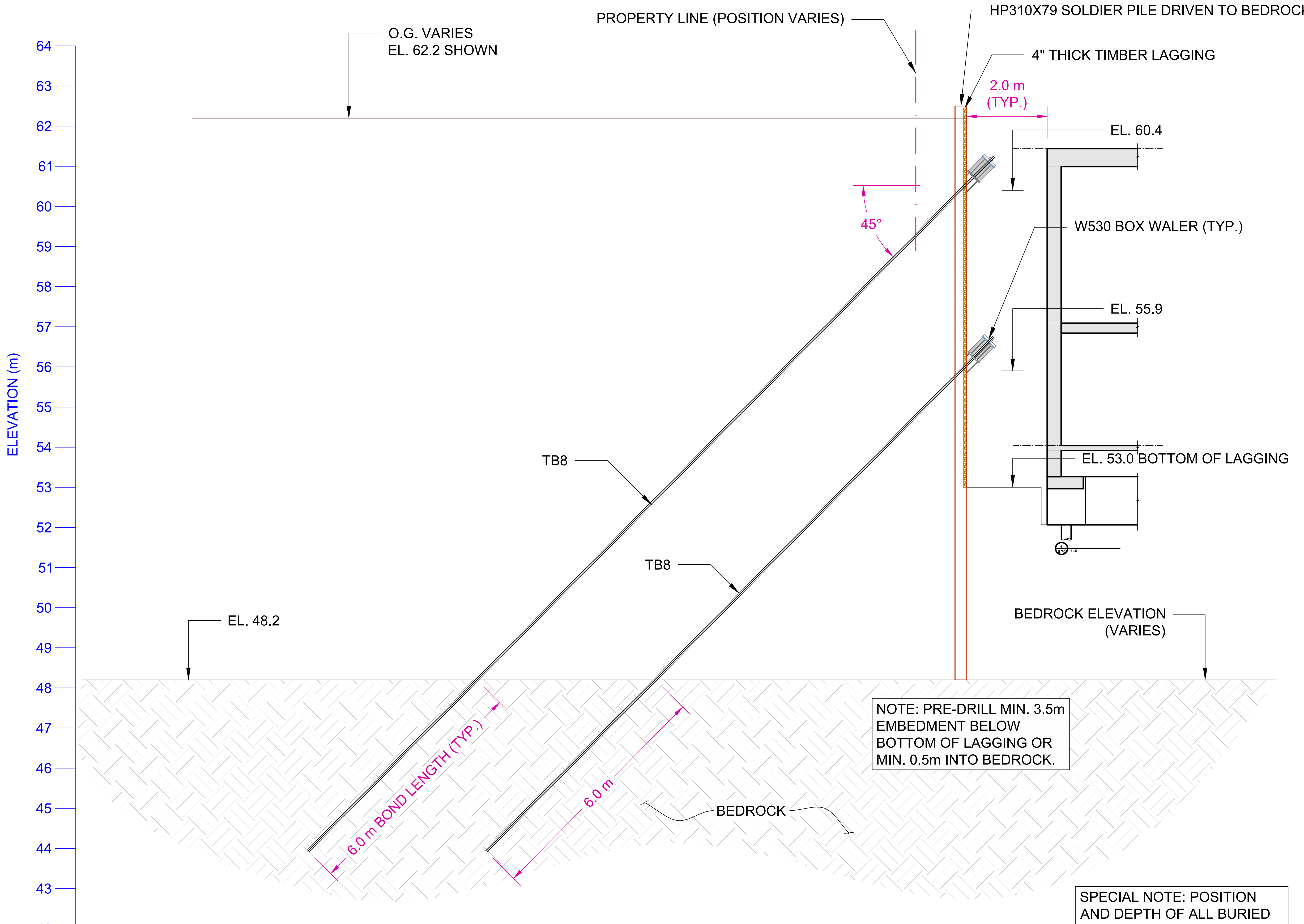

SPECIAL NOTE: POSITION AND DEPTH OF ALL BURIED UTILITIES TO BE CONFIRMED PRIOR TO TIEBACK DRILLING

1 / MU8 SECTION
SCALE: 1:100

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

No.	REVISION	DATE
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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SECTION

DRAWN BY: AC
SCALE: AS NOTED
DESIGNED BY: HB
DRAWING No.: MU8
CHECKED BY: MIC

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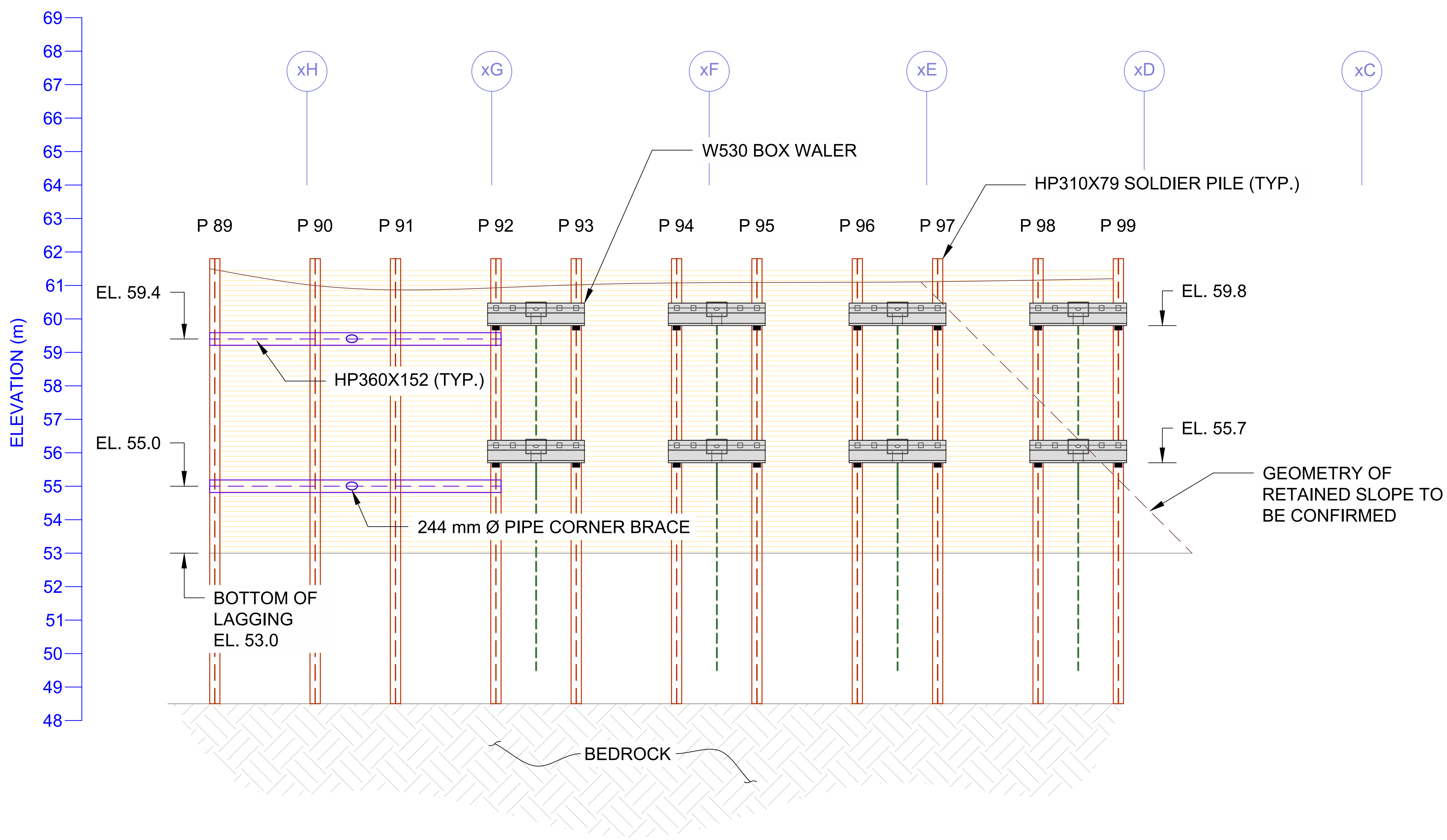

1 MU9 ELEVATION
SCALE: 1:150

No.	REVISION	DATE
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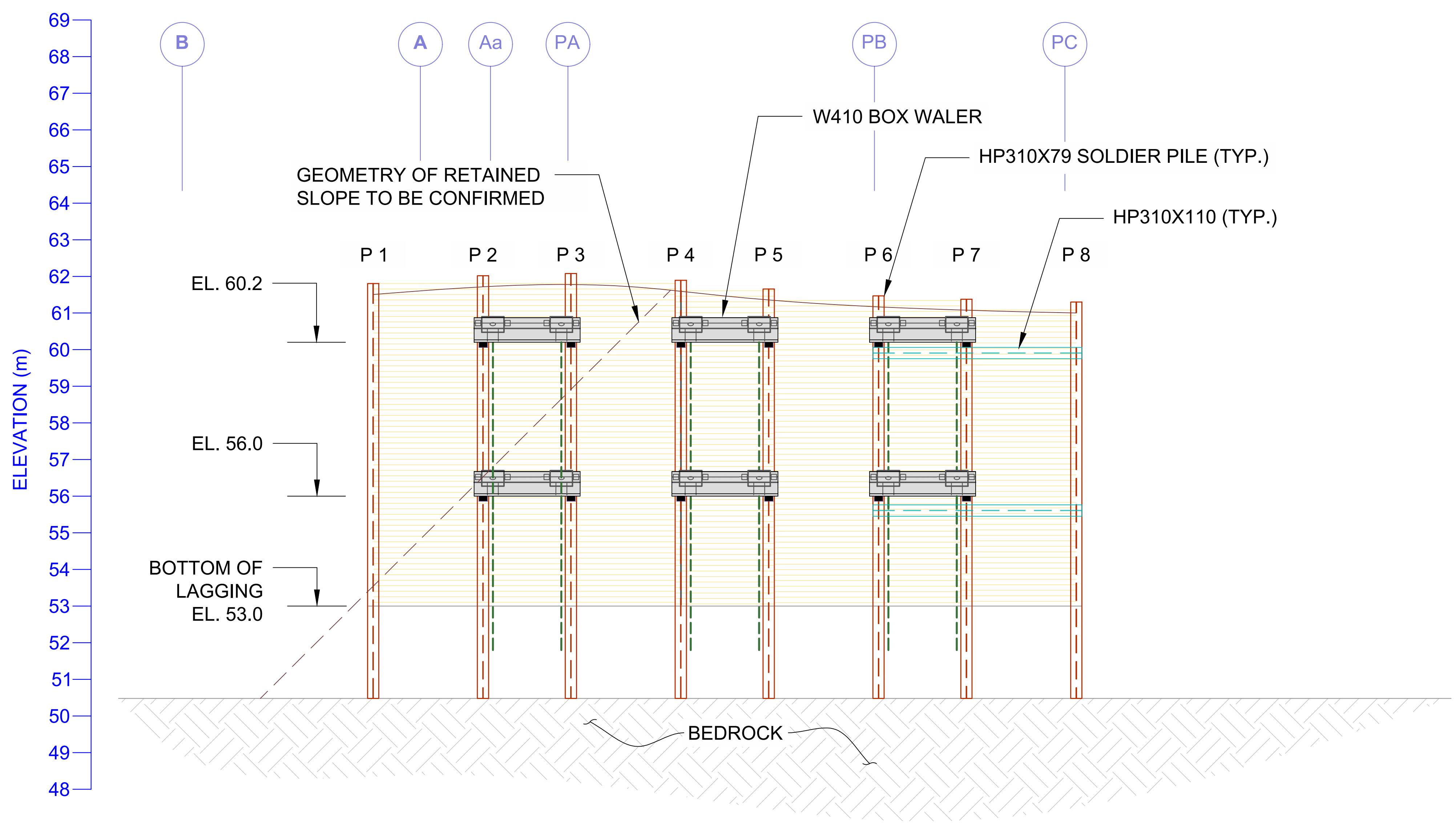
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU9
CHECKED BY MIC	



1 MU10 ELEVATION
SCALE: 1:150

No.	REVISION	DATE
1	ISSUED FOR REVIEW/PERMIT	2022.12.16

MARATHON

Marathon Underground Constructors Corporation
6847 Hiram Drive, Greely, ON K4P 1A2
Tel: (613) 821-4800
Fax: (613) 821-3182
www.marathonunderground.com

PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

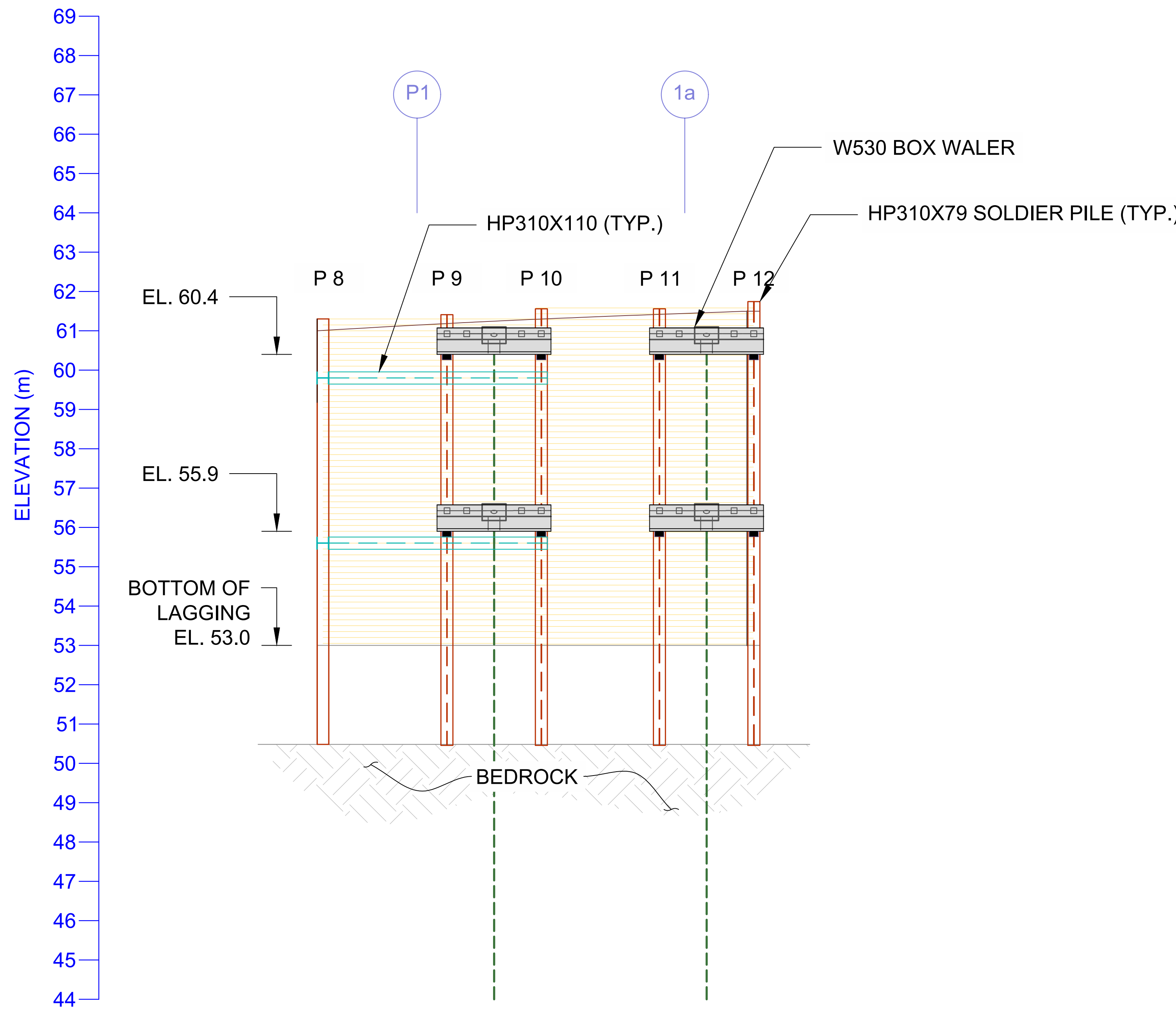
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU10
CHECKED BY MIC	

2022-12-16 3:38:24 PM



1 / MU11 **ELEVATION**

SCALE: 1:150

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

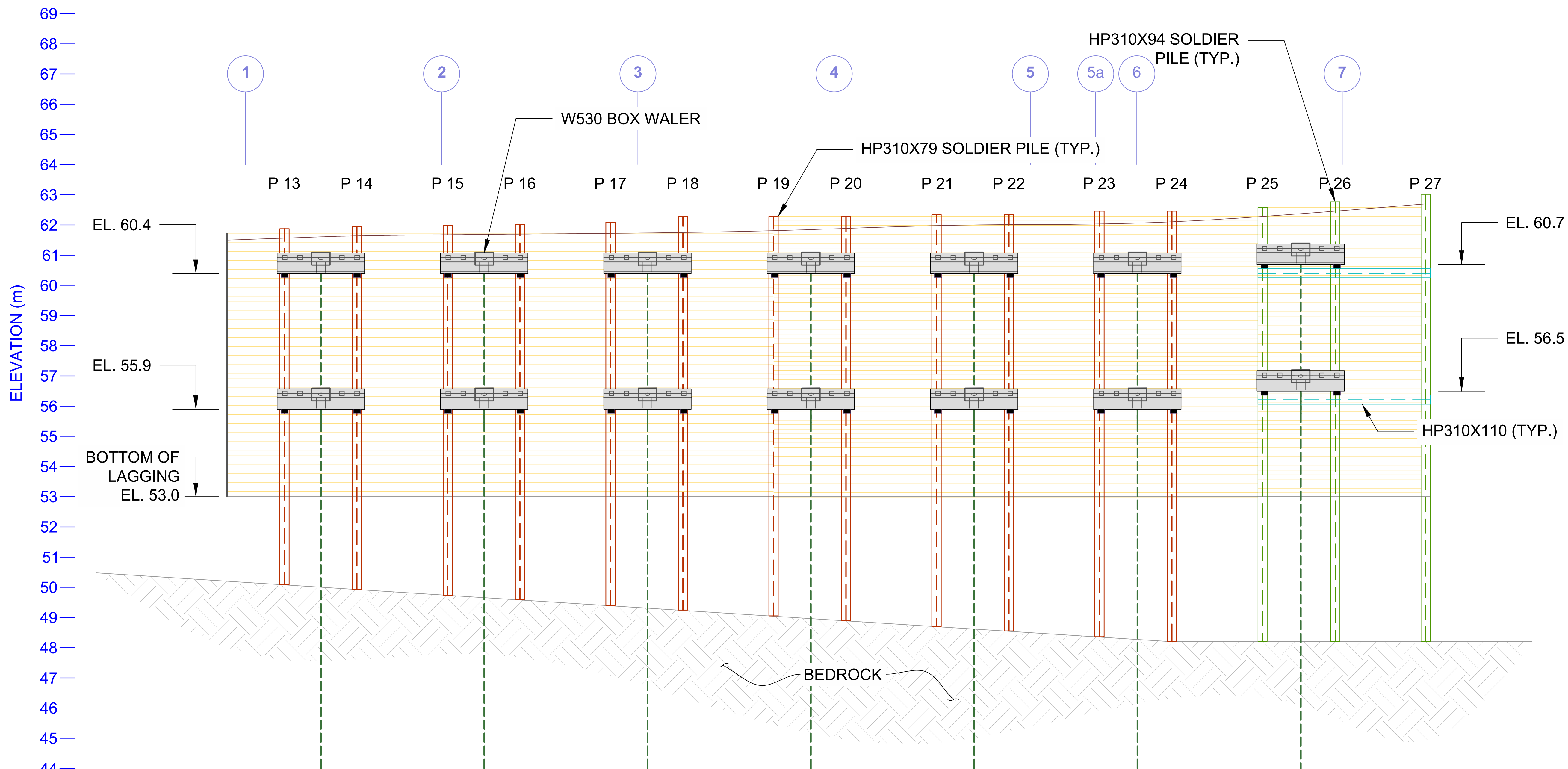
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU11
CHECKED BY MIC	

2022-12-16 3:37:24 PM



1
MU11A
ELEVATION
SCALE: 1:150

No.	REVISION	DATE
1	ISSUED FOR REVIEW/PERMIT	2022.12.16

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PROJECT
LEBRETON LIBRARY PARCEL EXCAVATION SHORING

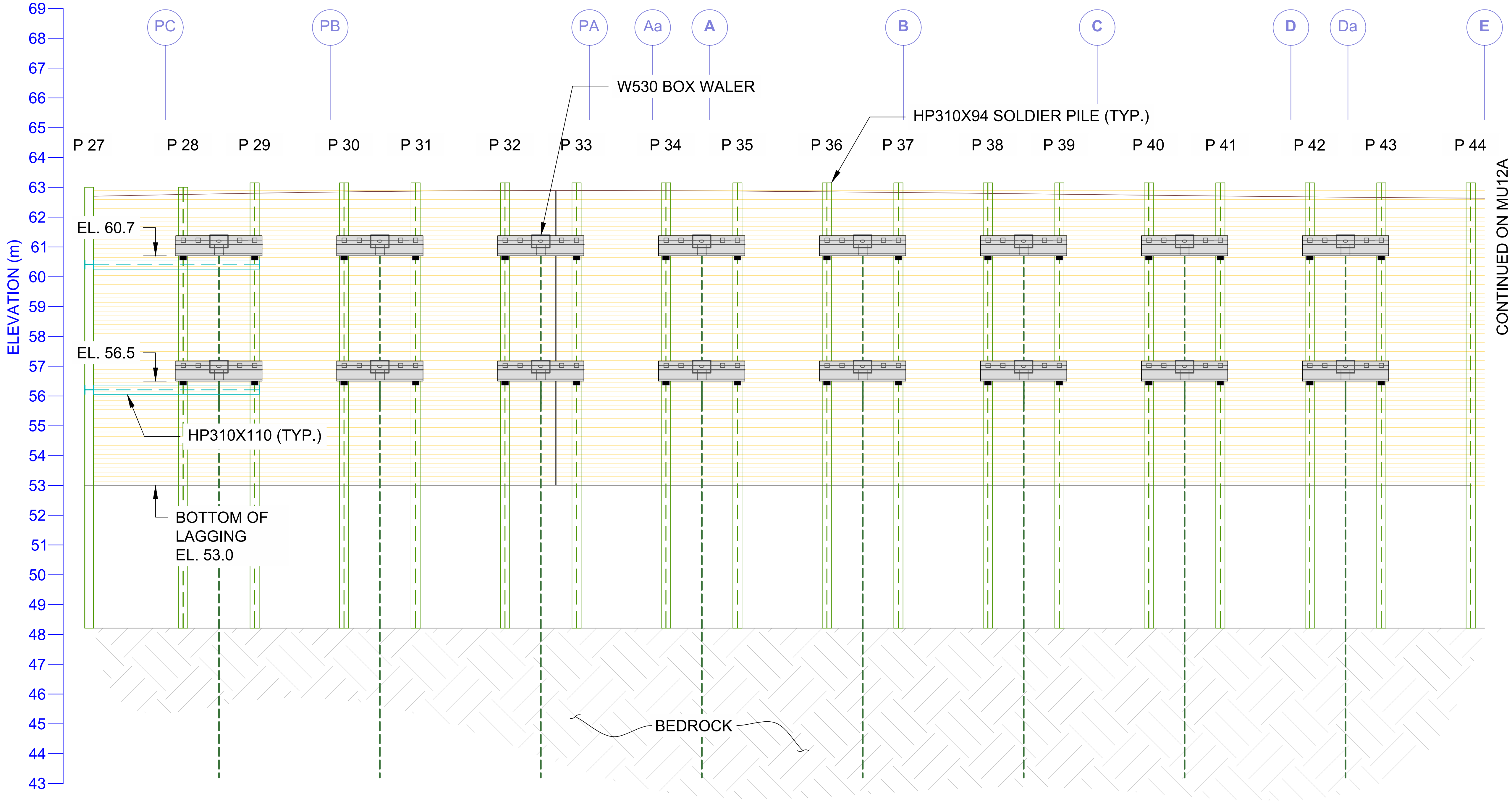
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU11A
CHECKED BY MIC	

2022-12-16 3:37:39 PM



1 MU12 ELEVATION
SCALE: 1:250

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

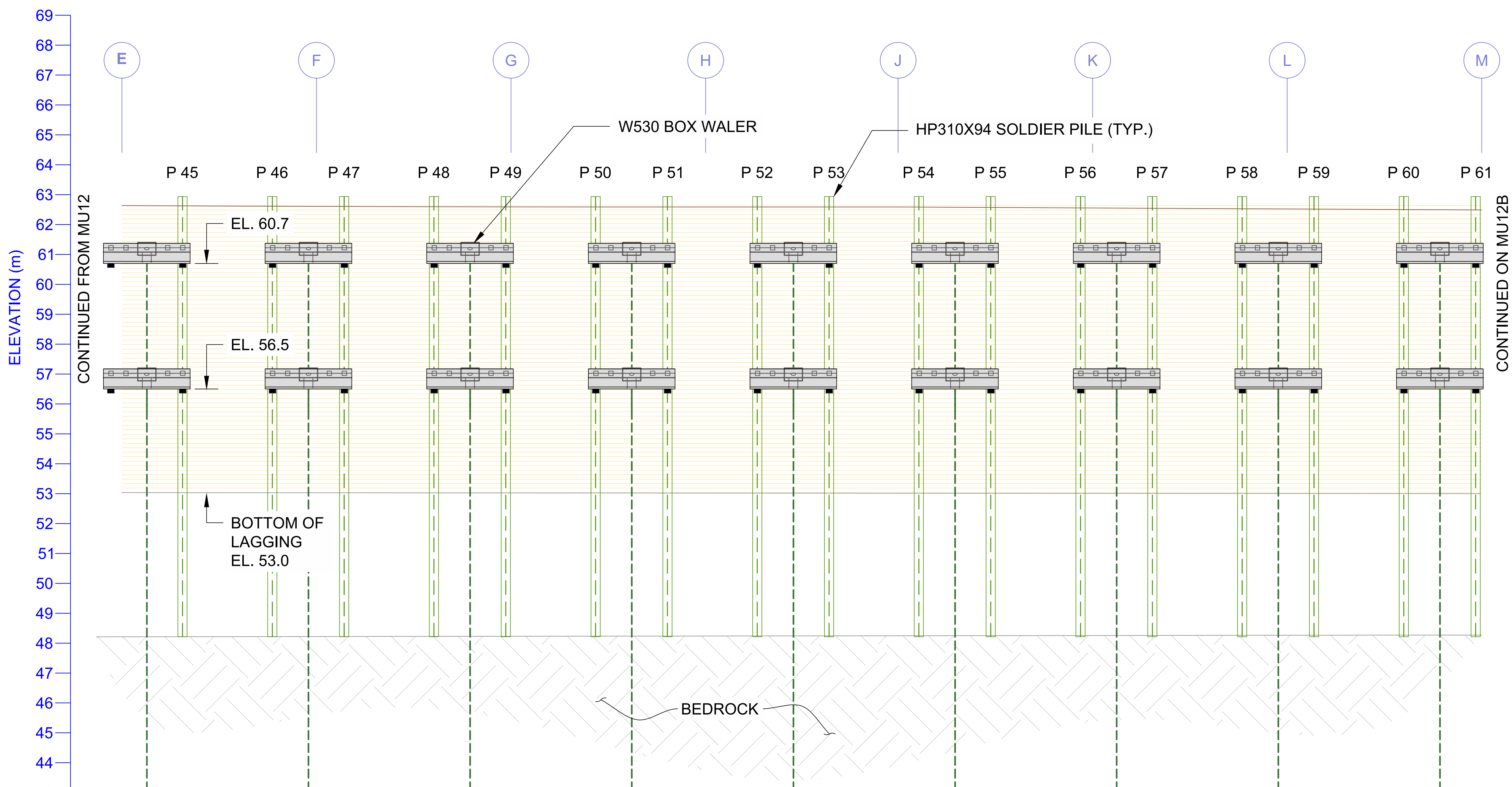
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY	AC	SCALE	AS NOTED
DESIGNED BY	HB	DRAWING No.	MU12
CHECKED BY	MIC		

2022-12-16 3:36:51 PM



1
MU12A

ELEVATION

SCALE: 1:250

No.	REVISION	DATE
1	ISSUED FOR REVIEW/PERMIT	2022.12.16

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU12A
CHECKED BY MIC	

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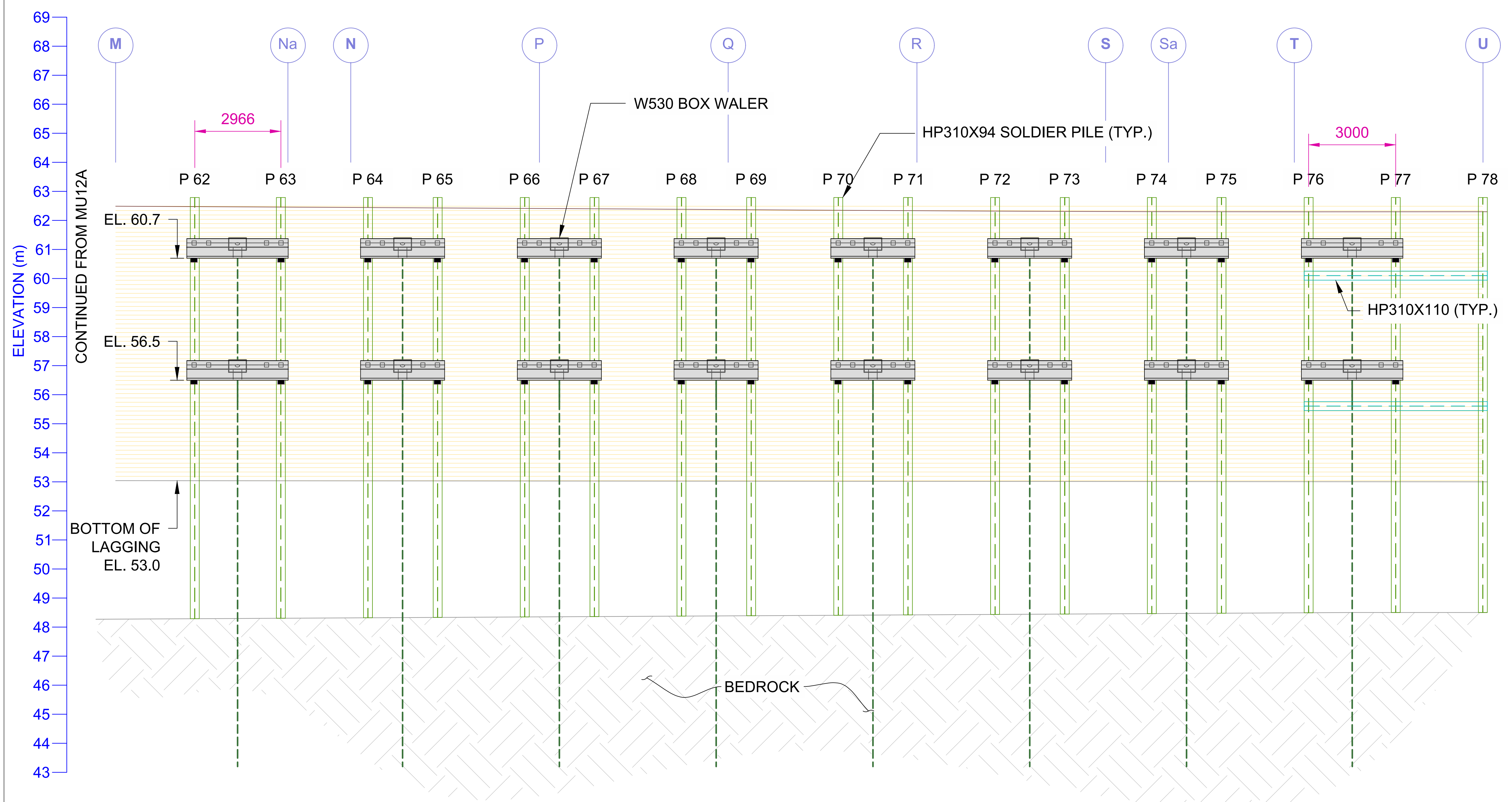

1 MU12B **ELEVATION**
SCALE: 1:250

No.	REVISION	DATE
1	ISSUED FOR REVIEW/PERMIT	2022.12.16

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU12B
CHECKED BY MIC	

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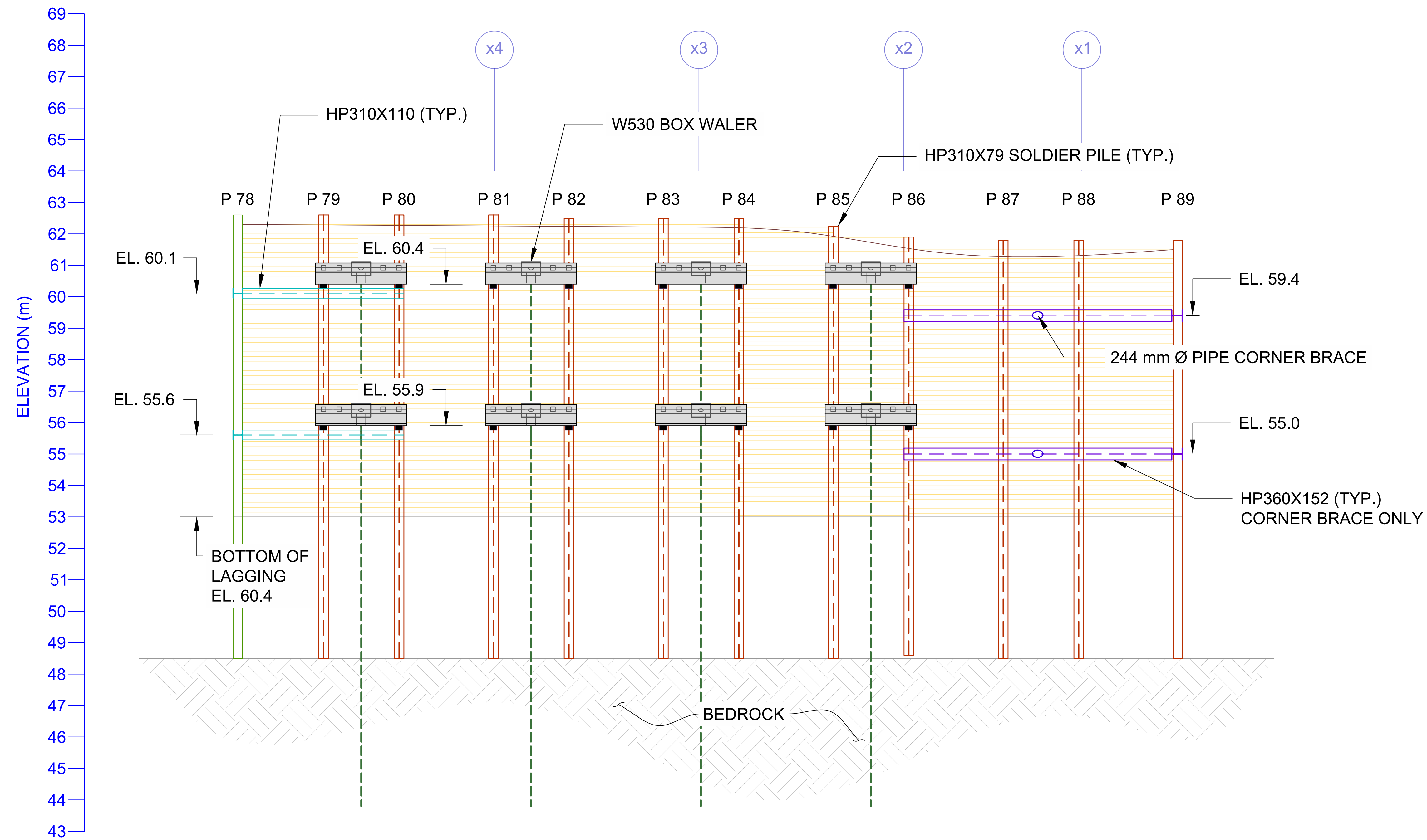

1 MU13 ELEVATION
SCALE: 1:150

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M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

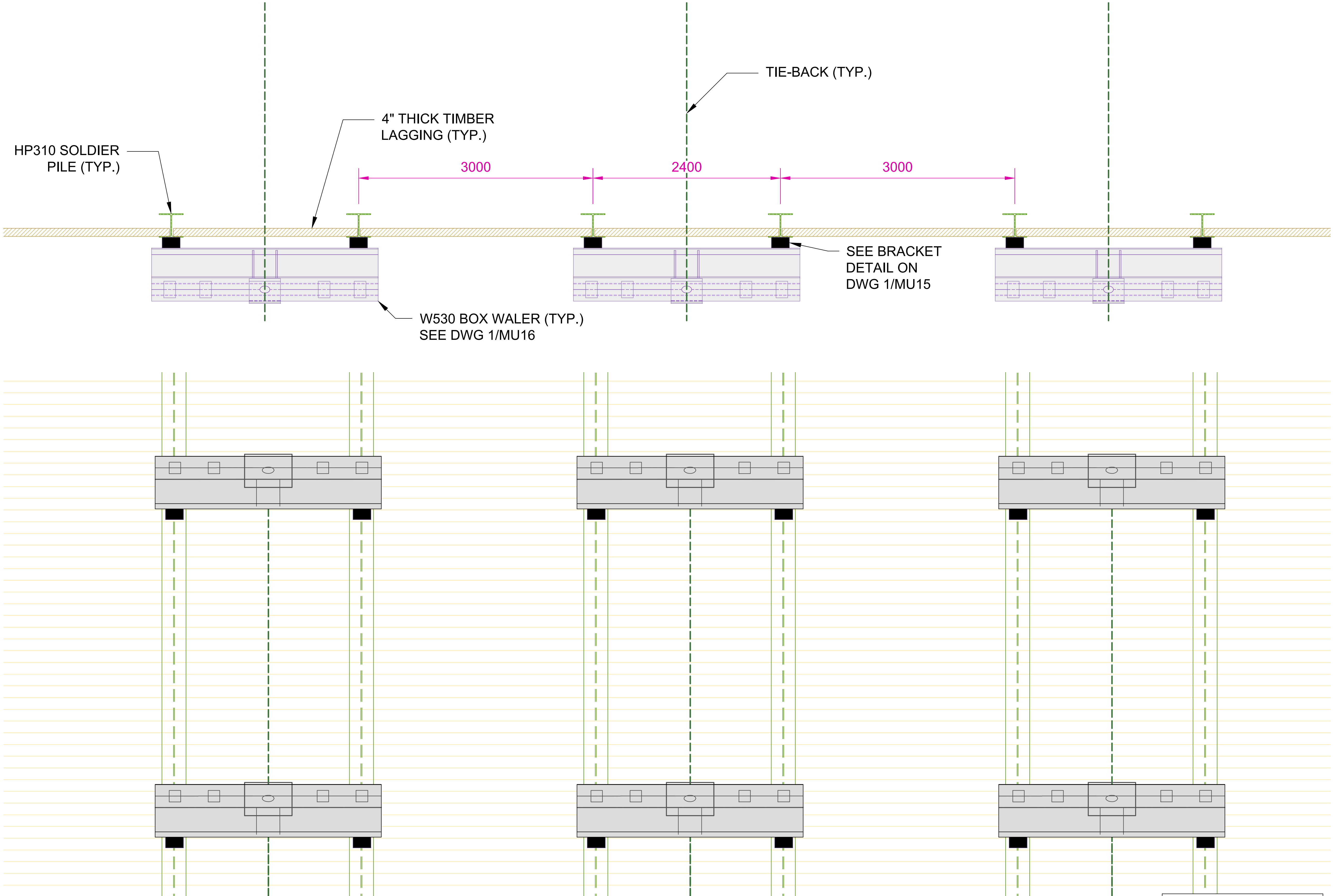
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
DRAWING No. MU13
CHECKED BY MIC

2022-12-16 3:38:41 PM



1 MU14 TYPICAL WALER ASSEMBLY
SCALE: 1:50

NOTE: SEE SECTION AND ELEVATION VIEWS FOR TIE-BACK LEVELS.

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
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PROJECT
LEBRETON LIBRARY PARCEL EXCAVATION SHORING

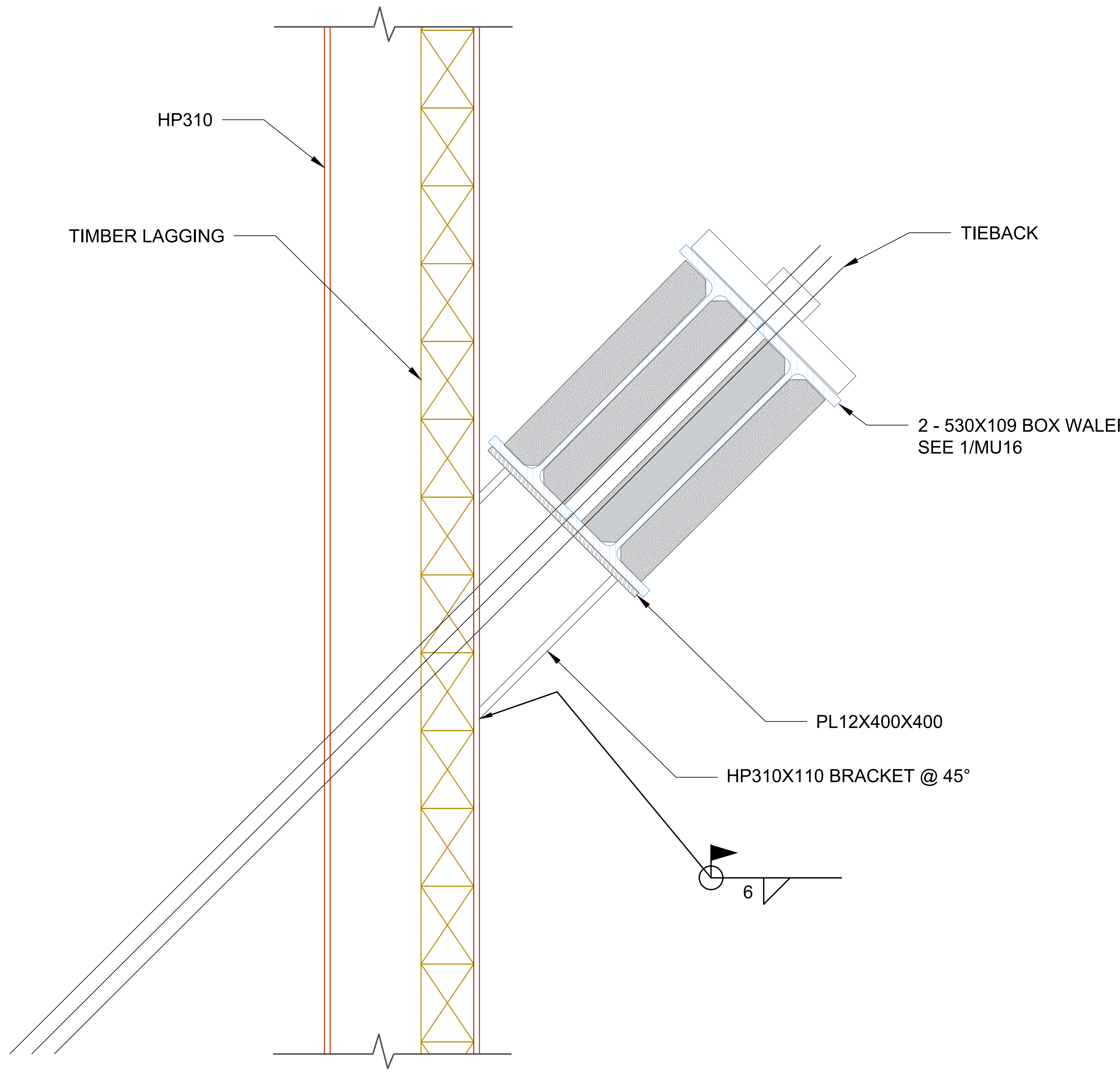
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
TYPICAL WALER ASSEMBLY

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
DRAWING No. MU14
CHECKED BY MIC

2022-12-16 3:36:35 PM



1
MU15
BRACKET DETAIL
SCALE: 1:10

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
ELEVATION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU15
CHECKED BY MIC	

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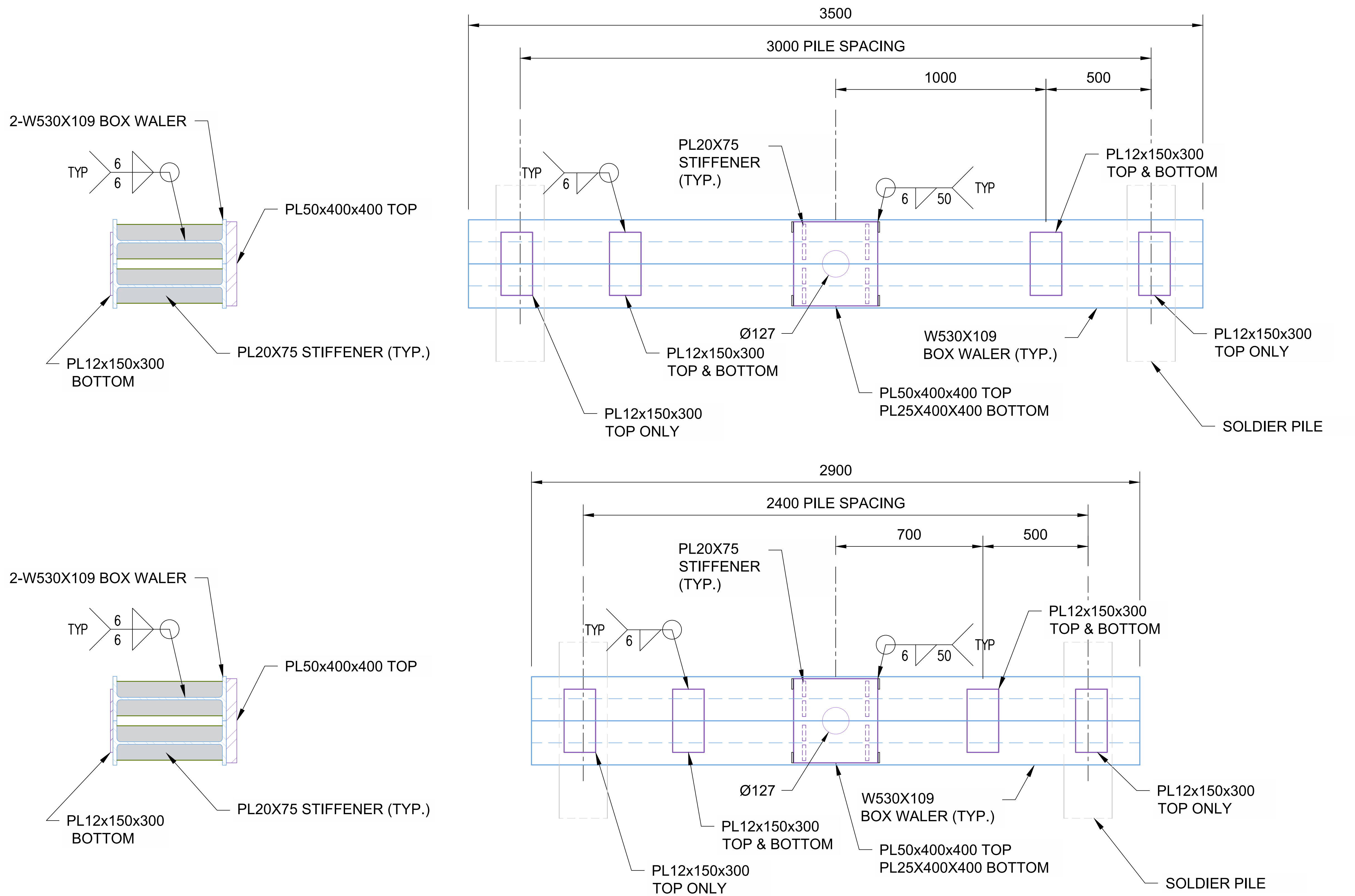

1
MU16
W530 BOX WALER DETAIL
SCALE: 1:20

NOTE: SELECT WALER
BASED ON PILE SPACING
(TYP. 2.4m)

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

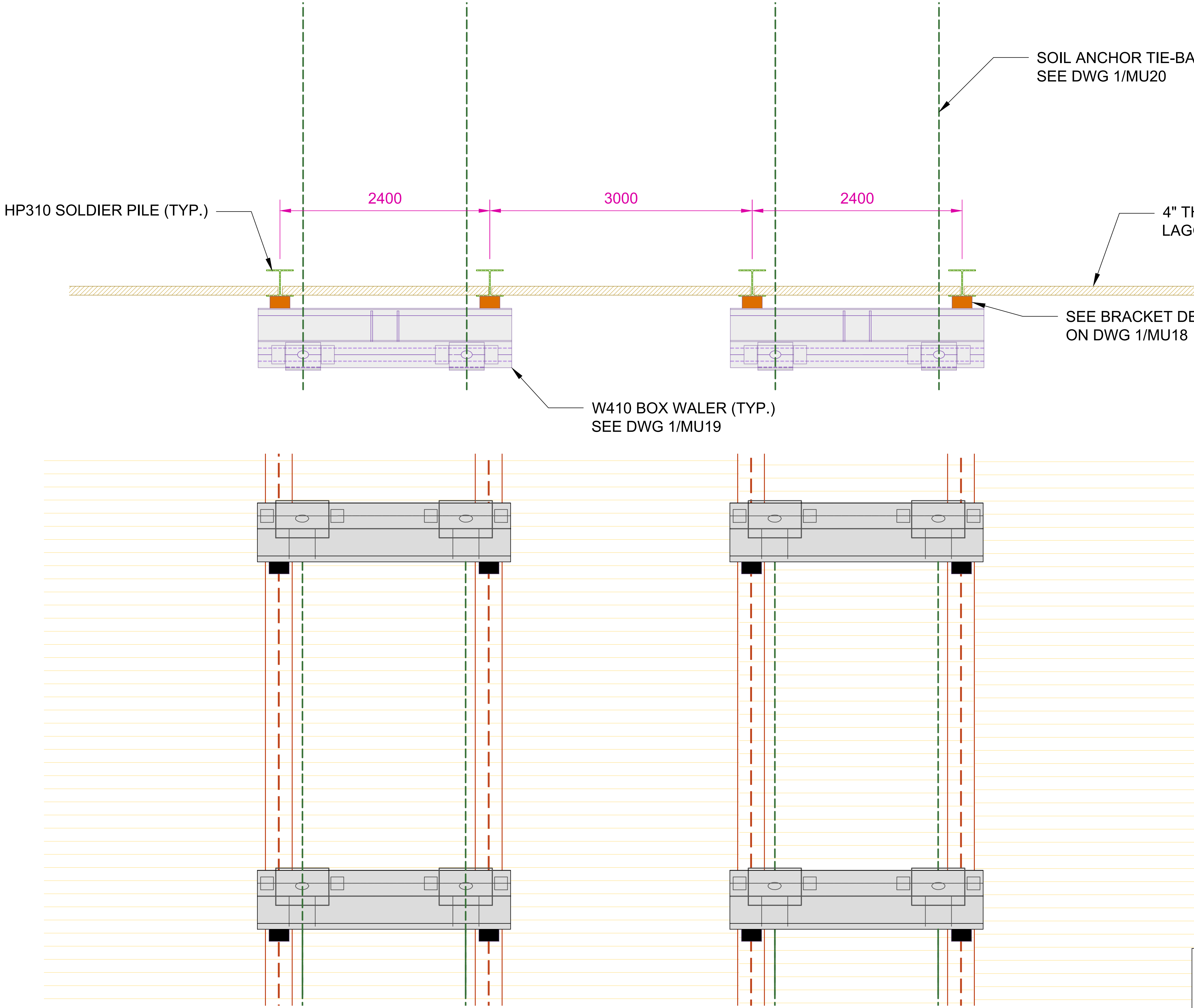
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
BOX WALER DETAIL

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU16
CHECKED BY MIC	

2022-12-16 3:39:13 PM



NOTE: SEE SECTION AND ELEVATION VIEWS FOR TIE-BACK LEVELS.

1
MU17
TYPICAL WALER ASSEMBLY - NORTHEAST SHORING WALL ONLY
SCALE: 1:10

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

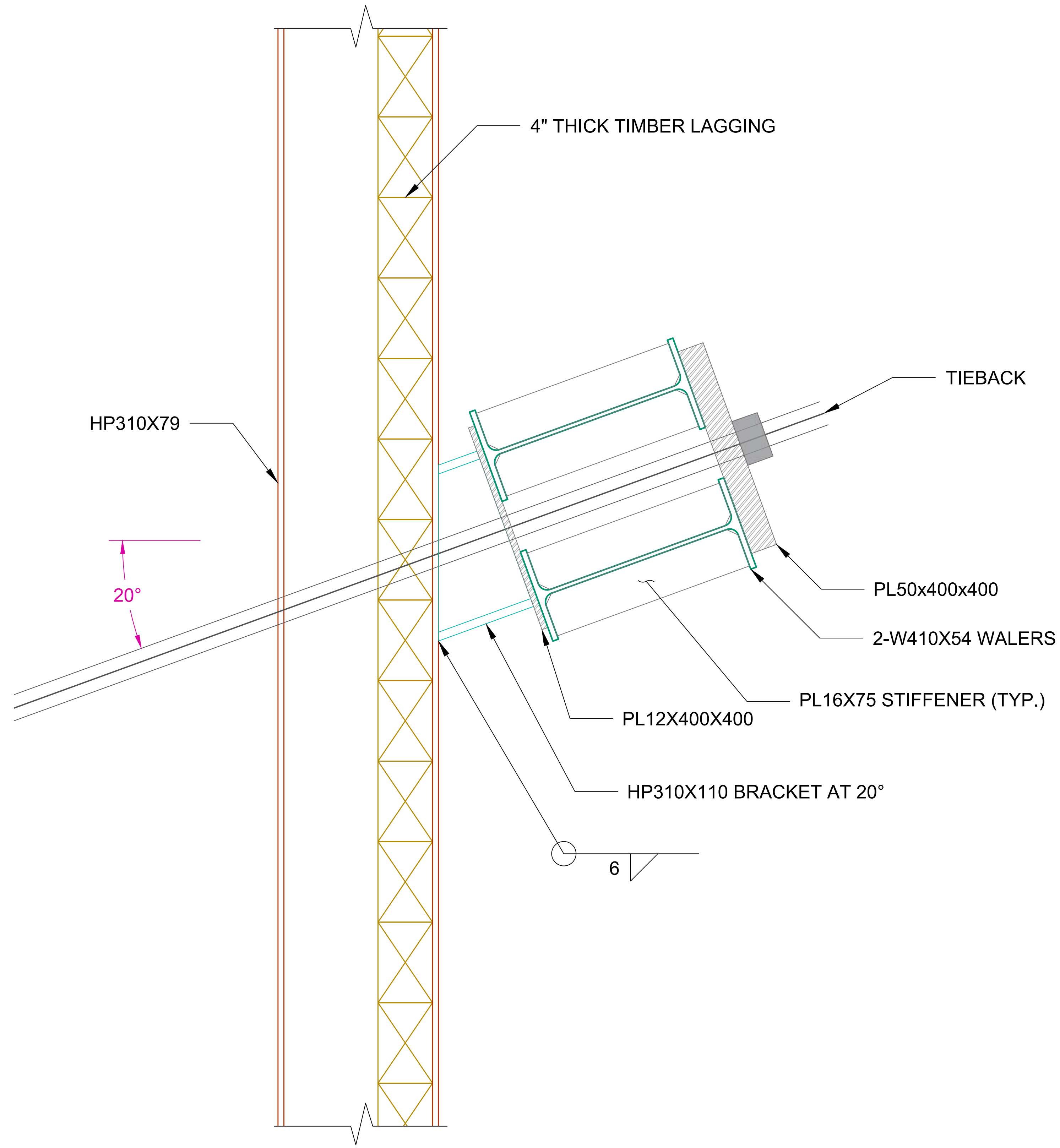
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
TYPICAL WALER ASSEMBLY

DRAWN BY AC
SCALE AS NOTED
DESIGNED BY HB
DRAWING No. MU17
CHECKED BY MIC

2022-12-16 3:38:10 PM



1
MU18
BRACKET DETAIL
SCALE: 1:10

No.	REVISION	DATE
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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

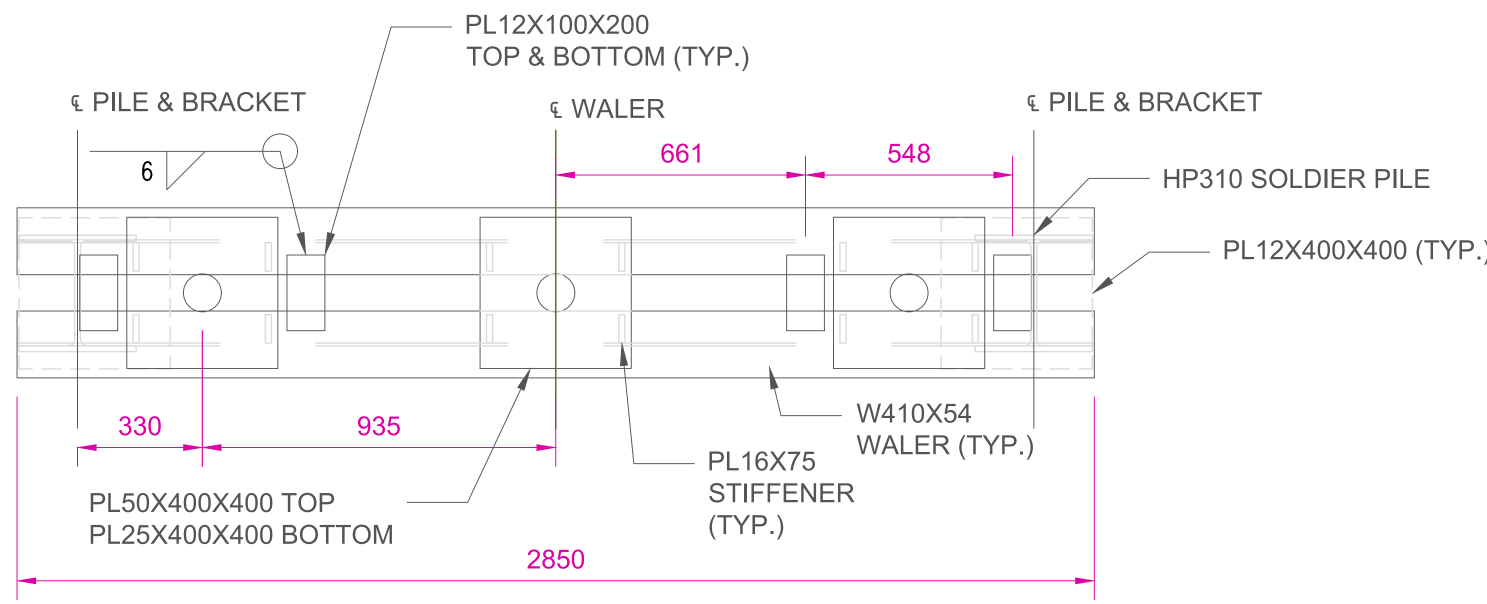
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
BRACKET DETAIL

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU18
CHECKED BY MIC	

2022-12-16 3:36:44 PM



1
MU19

W410 BOX WALER DETAIL

SCALE: 1:20

LICENSED PROFESSIONAL ENGINEER
M. I. CUNNINGHAM
DEC 16/22
PROVINCE OF ONTARIO

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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

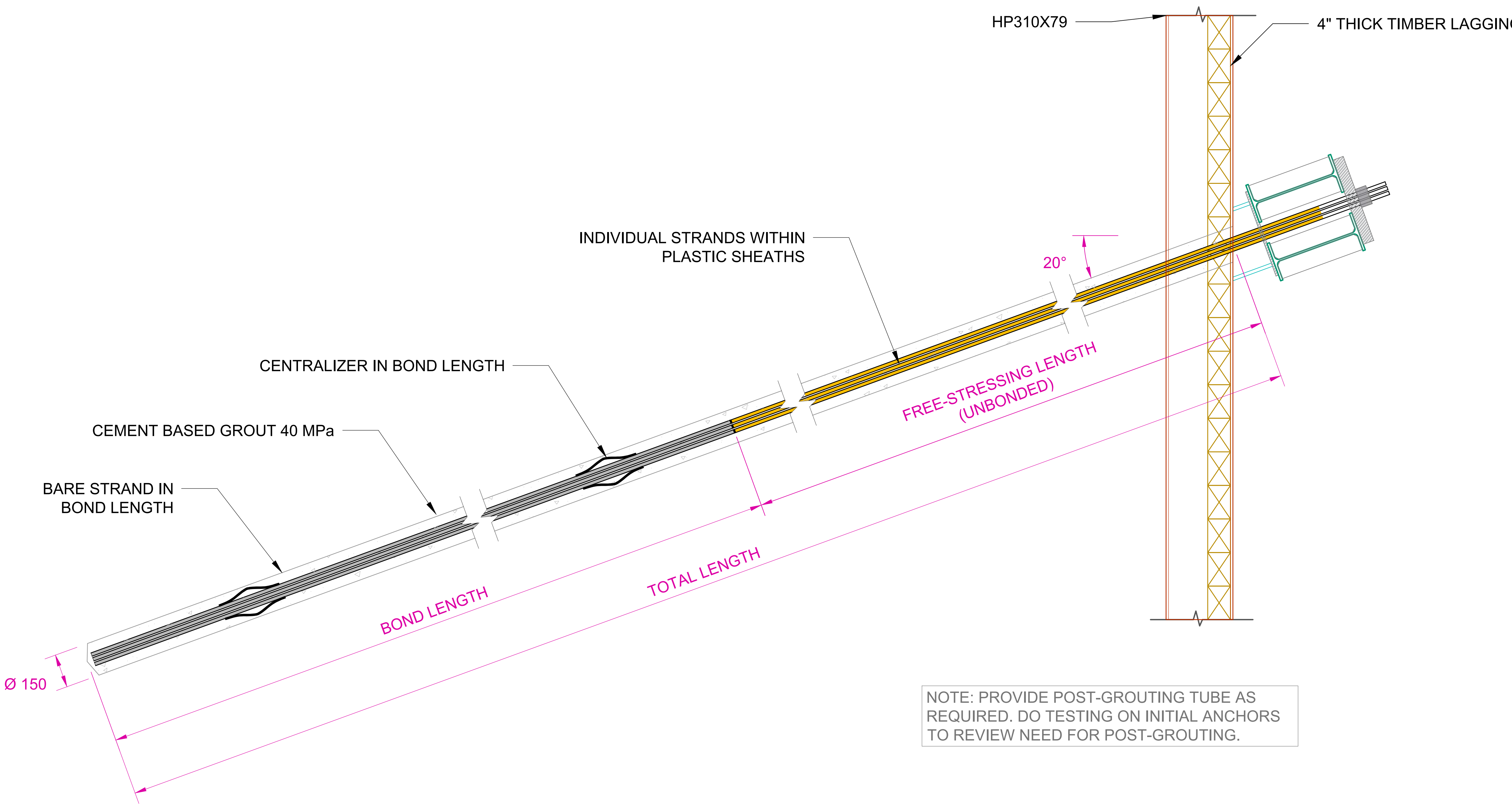
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
BOX WALER DETAIL

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU19
CHECKED BY MIC	

2022-12-16 3:38:17 PM



NOTE: PROVIDE POST-GROUTING TUBE AS REQUIRED. DO TESTING ON INITIAL ANCHORS TO REVIEW NEED FOR POST-GROUTING.

1 / MU20 **SOIL ANCHOR DETAIL**
SCALE: 1:20

LICENSED PROFESSIONAL ENGINEER M. I. CUNNINGHAM DEC 16/22 PROVINCE OF ONTARIO

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PROJECT: LEBRETON LIBRARY PARCEL EXCAVATION SHORING

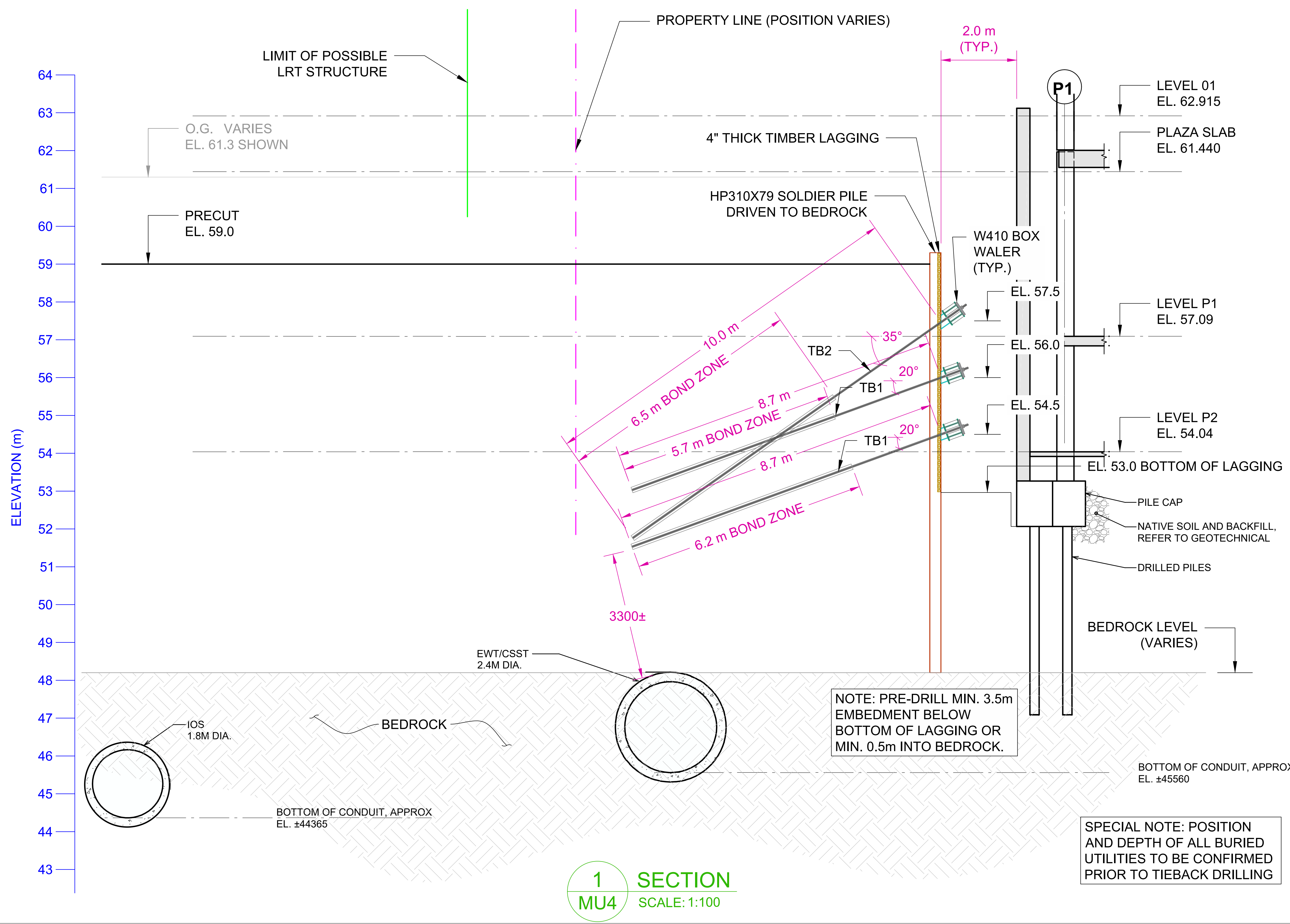
LOCATION: 665 ALBERT STREET OTTAWA, ONTARIO

JOB No. 22409

DESCRIPTION: SOIL ANCHOR DETAIL

DRAWN BY: AC	SCALE: AS NOTED
DESIGNED BY: HB	DRAWING No. MU20
CHECKED BY: MIC	

2022-12-16 3:38:03 PM



No.	REVISION	DATE
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PROJECT
LEBRETON LIBRARY PARCEL
EXCAVATION SHORING

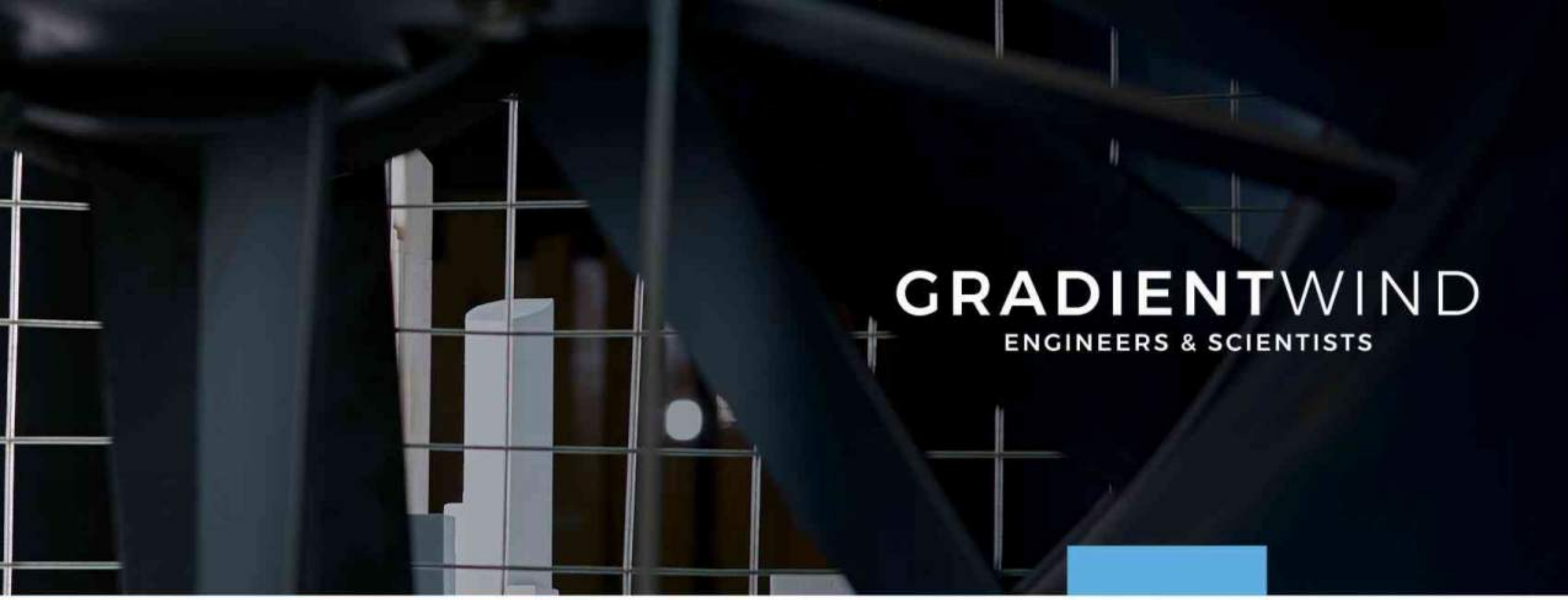
LOCATION
665 ALBERT STREET
OTTAWA, ONTARIO

JOB No.
22409

DESCRIPTION
SECTION

DRAWN BY AC	SCALE AS NOTED
DESIGNED BY HB	DRAWING No. MU4
CHECKED BY MIC	

APPENDIX G: Noise and Vibration Study



TRANSPORTATION NOISE AND VIBRATION STUDY

LeBreton Library Parcel
665 Albert Street
Ottawa, Ontario

Report: 22-064-Transportation Noise and Vibration

April 21, 2022

PREPARED FOR
Dream
30 Adelaide Street East, Suite 301
Toronto, Ontario M5C 3H1

PREPARED BY
Caleb Alexander, B.Eng., Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a transportation noise and vibration assessment performed for a proposed mixed-use development located at 665 Albert Street in Ottawa, Ontario. The proposed development comprises two nominally rectangular buildings rising 31 and 36 storeys to the east and west, respectively, above a five-storey podium. The major sources of roadway noise are Albert Street, Slater Street, and Booth Street. The light rail transit (LRT) noise source is the O-Train Confederation Line that is north of the proposed development. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP); (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications and Pimisi Station arrival/departure information; and (iv) architectural drawings prepared by KPMB and Perkins & Will, in March 2022.

The results of the current analysis indicate that noise levels will range between 57 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e., 68 dBA) occurs along the south façade of the west podium, which is nearest and most exposed to Albert Street.

The noise levels predicted due to roadway and LRT traffic exceed the criteria listed in Section 4.2 for building components, therefore, building components which achieve the minimum STC rating as outlined in Section 5.2 will be required to control indoor sound levels. Noise levels at the outdoor living areas (OLA) exceed 60 dBA in some cases, therefore, mitigation is required in the form of an acoustic barrier as specified in Section 5.2.1. Warning Clauses will also be required depending on the barrier combination selected. The acoustic barrier should be built with solid elements having a minimum surface mass of 20 kg/m² and contain no gaps. The following information will be required by the City for review prior to installation of the barrier:

1. Shop drawings, signed and sealed by a qualified Professional Engineer licenced by the Professional Engineers of Ontario, showing the details of the acoustic barrier systems components, including material specifications.

2. Structural drawing(s), signed by a qualified Professional Engineer licenced by the Professional Engineers of Ontario, showing foundation details and specifying design criteria, climatic design loads, as well as applicable geotechnical data used in the design.
3. Layout plan, and wall elevations, showing proposed colours and patterns.

Results of the calculations also indicate that the east and west tower will require central air conditioning, or a similar ventilation system, which will allow occupants to keep windows closed and maintain a comfortable living environment at the occupant's discretion. Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements.

Vibrations generated by the O-Train Confederation Line LRT (See Appendix B Figure B1) were calculated between the building foundation and the track, shown in Figure 1. Vibration levels due to the nearest track were found to be 0.04 mm/s RMS (64 dBV) based on the FTA protocol and a conservative offset distance of 19 m to track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at building foundation, vibration mitigation will not be required.

Off-site stationary noise impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. It is recommended a stationary noise study be conducted once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits.

The surroundings comprise residential buildings which coincides with insignificant stationary noise emissions.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Dream to undertake a transportation noise and vibration study to satisfy concurrent Official Plan Amendment, Zoning By-law Amendment, and Site Plan Control application requirements for the proposed mixed-use residential development located at 665 Albert Street in Ottawa, Ontario (hereinafter referred to as "subject site" or "proposed development"). This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local transportation.

The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on site plan drawings prepared by KPMB and Perkins & Will, in March 2022.

2. TERMS OF REFERENCE

The subject site is located at 665 Albert Street in Ottawa; situated at the northeast intersection of Albert Street and Booth Street. The proposed development comprises two nominally rectangular buildings rising 31 and 36 storeys to the east and west, respectively, above a five-storey podium. Throughout this report the buildings are referred to as the "East Tower" and the "West Tower". Each building includes a mechanical penthouse (MPH) level and a high-roof parapet sloping downwards to the west. Landscaped gathering spaces and walkways surround the buildings with the parkette (referred to as "Central Parkette"), between the East Tower and West Tower, and a park (referred to as "Wedge Park") to the north of the West Tower.

East Tower

Above two shared below-grade parking levels, the ground floor of the East Tower includes a residential main entrance and an office at the southeast corner, retail space to the south, a community bike shop and public long term and residential bike storage spaces at the northwest corner, childcare entrance to the east, and central loading space and elevator core. Access to below-grade parking is provided by a ramp

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016

[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

at the northeast corner of the East Tower via Empress Avenue Lane from Albert Street. The mezzanine is reserved for lockers and residential bike storage. Level 2 of the east building includes three residential units at the southeast corner, a central shared laundry room, and childcare spaces throughout the remainder of the level. This level is also served by a green roof to the north and a childcare outdoor play area to the southwest. Level 3 includes central lockers and a kids lounge, garden support and indoor amenity at the northwest corner, and residential units throughout the remainder of the level. Level 4 houses a central fitness room, lockers, garden support and indoor amenity, and residential units throughout the remainder of the level. Levels 3 and 4 are served by a community garden to the northwest and a green roof to the southwest. Level 5 includes a lounge, party room, and community kitchen. This level is also served by a community garden to the west, and an outdoor dining and lounge area to the east and southeast. Levels 5-36 comprise a nominally rectangular planform and Levels 6-36 are reserved for residential use.

West Tower

Above two shared below-grade parking levels, the ground floor of the West Tower includes a residential main entrance at the southeast corner, a public long-term bike storage to the south, retail space to the west, a community hub at the northeast corner, and a central elevator core. The mezzanine is reserved for lockers. Level 2 includes a central games room, lockers at the northeast corner, and residential units throughout the remainder of the level. This level is also served by an outdoor amenity terrace at the northeast corner. Level 3 includes central lockers, a kids lounge to the north, and residential units throughout the remainder of the level. An outdoor amenity terrace is situated to the north and a green roof is at the southeast corner of this level. Level 4 includes central lockers, co-working space to the north, and a fitness room to the south. This level is also served by an outdoor amenity terrace to the south and a green roof to the north. Level 5 includes a lounge, party room, and community kitchen. An outdoor dining and lounge area is situated to the northwest and a community garden is to the southwest. Levels 5-31 comprise a nominally rectangular planform and Levels 6-31 are reserved for residential use.

Surrounding Context

The major sources of roadway noise are Albert Street, Slater Street, and Booth Street. The LRT noise source is the O-Train Confederation Line that is north of the proposed development. Collector and arterial roadways located more than 100 m from the site are considered to be insignificant sources of roadway traffic noise as per ENCG. The site is surrounded by low rise residential buildings to the south and high-rise residential buildings to the north beyond the LRT. Figure 1 illustrates the site location with surrounding context.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by local roadway traffic, and (ii) determine whether exterior noise levels exceed the allowable limits specified by the MECP Noise Control Guidelines – NPC-300 as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Transportation Noise

4.2.1 Criteria for Transportation Traffic Noise

For vehicular traffic, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The NPC-300 guidelines specify that the recommended indoor noise limit ranges (that are relevant to this study) are 50, 45 and 40 dBA for retail space, living rooms, and sleeping quarters, respectively, as listed in Table 1. However, to account for deficiencies in building construction and to control peak noise, these levels should be targeted toward 47, 42, and 37 dBA.

TABLE 1: INDOOR SOUND LEVEL CRITERIA

Type of Space	Time Period	L_{eq} (dBA)
General offices, reception areas, **retail** stores, etc.	07:00 – 23:00	50
Living/dining/den areas of **residences**, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[3]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[4]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which normally triggers the need for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, building components will require higher levels of sound attenuation[5].

The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. When noise levels at the OLA exceed 60 dBA, mitigation must be provided.

[3] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[4] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[5] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.2 Theoretical Transportation Noise Predictions

The impact of roadway traffic noise sources on the development was determined by computer modelling. Traffic noise source modelling is based on the software program *Predictor-Lima* which utilizes the United States Federal Highway Administration's Traffic Noise Model (TNM) to represent the roadway line sources. The TNM analysis model as been recognised by the Ministry of Transportation Ontario (MTO) as the recommend noise model for transportation projects (ref. Environmental Guide for Noise, dated August 2021[6]). The Ministry of Environment, Conservation and Parks has also adopted the TMN model as per their "Draft Guideline Noise Pollution Control Publications 306 (NPC-306)[7] This computer program can represent three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. A set of comparative calculations were performed in the free field environment for comparisons to the current Ontario traffic noise prediction model STAMSON. The STAMSON model is however older and requires each receptor to be calculated separately. STAMSON also does not accurately account for building reflections and multiple screening elements, and curved road geometry. Noise levels were found to be within an imperceptible level of 0-3 dBA of those predicted in Predictor, as seen in Table 4.

Roadway traffic noise calculations were performed by treating each roadway segment as a separate line source of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard ground (pavement).
- Topography was assumed to be flat/gentle slope.
- Noise receptors were strategically placed at 26 locations around the study area (see Figure 1).

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[6] Ministry of Transportation Ontario, "*Environmental Guide for Noise*", August 2021, pg. 16
[7] Ministry of Environment, Conservation and Parks, Ontario, "Methods to determine Sound Levels Due to Road and Rail Traffic", Draft February 12, 2020

4.2.3 Roadway and LRT Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, roadway traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[8] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification.

The LRT traffic volumes were obtained by analyzing the arrival/departure information for nearby Pimisi station and projection the traffic volumes into the future assuming a growth rate of 2.5% over 10 years. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY AND LRT TRAFFIC DATA

Segment	Traffic Data	Speed Limit (km/h)	Traffic Volumes
Booth Street (North of Albert)	4-Lane Urban Arterial-Divided (4-UAD)	50	**35,000**
Booth Street (South of Albert)	2-Lane Major Collector (2-UMCU)	40	**12,000**
Slater Street	2-Lane Urban Arterial (2-UAU)	50	**15,000**
Albert Street	4-Lane Urban Arterial-Undivided (4-UAU)	50	**30,000**
Albert Street (East of Slater/Albert split)	3-Lane Urban Arterial-Undivided (3-UAU)	50	**22,500**
O-Train Confederation Line	LRT	70	**485/76***

*Daytime/Nighttime traffic volumes

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior

[8] City of Ottawa Transportation Master Plan, November 2013

cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels (from road and rail sources) at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[9] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

Based on published research[10], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

4.4 Ground Vibration & Ground-borne Noise

Rail systems and heavy vehicles on roadways can produce perceptible levels of ground vibrations, especially when they are in close proximity to residential neighbourhoods or vibration-sensitive buildings. Similar to sound waves in air, vibrations in solids are generated at a source, propagated through a medium, and intercepted by a receiver. In the case of ground vibrations, the medium can be uniform, or more

[9] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

[10] CMHC, Road & Rail Noise: Effects on Housing

often, a complex layering of soils and rock strata. Also, similar to sound waves in air, ground vibrations produce perceptible motions and regenerated noise known as 'ground-borne noise' when the vibrations encounter a hollow structure such as a building. Ground-borne noise and vibrations are generated when there is excitation of the ground, such as from a train or subway. Repetitive motion of the wheels on the track or rubber tires passing over an uneven surface causes vibration to propagate through the soil. When they encounter a building, vibrations pass along the structure of the building beginning at the foundation and propagating to all floors. Air inside the building excited by the vibrating walls and floors represents regenerated airborne noise. Characteristics of the soil and the building are imparted to the noise, thereby creating a unique noise signature.

Human response to ground vibrations is dependent on the magnitude of the vibrations, which is measured by the root mean square (RMS) of the movement of a particle on a surface. Typical units of ground vibration measures are millimeters per second (mm/s), or inch per second (in/s). Since vibrations can vary over a wide range, it is also convenient to represent them in decibel units, or dBV. In North America, it is common practice to use the reference value of one micro-inch per second (μin/s) to represent vibration levels for this purpose. The threshold level of human perception to vibrations is about 0.10 mm/s RMS or about 72 dBV. Although somewhat variable, the threshold of annoyance for continuous vibrations is 0.5 mm/s RMS (or 85 dBV), five times higher than the perception threshold, whereas the threshold for significant structural damage is 10 mm/s RMS (or 112 dBV), at least one hundred times higher than the perception threshold level.

4.4.1 Ground Vibration Criteria

In the United States, the Federal Transportation Authority (FTA) has set vibration criteria for sensitive land uses next to transit corridors. Similar standards have been developed by the MECP. These standards indicate that the appropriate criteria for residences is 0.10 mm/s RMS for vibrations. For main line railways, a document titled *Guidelines for New Development in Proximity to Railway Operations*[11], indicates that vibration conditions should not exceed 0.14 mm/s RMS averaged over a one second time-period at the first floor and above of the proposed building. The Federal Transportation Authority (FTA) criterion was adopted as the appropriate standard for this study. As the main vibration source is due to

[11] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013

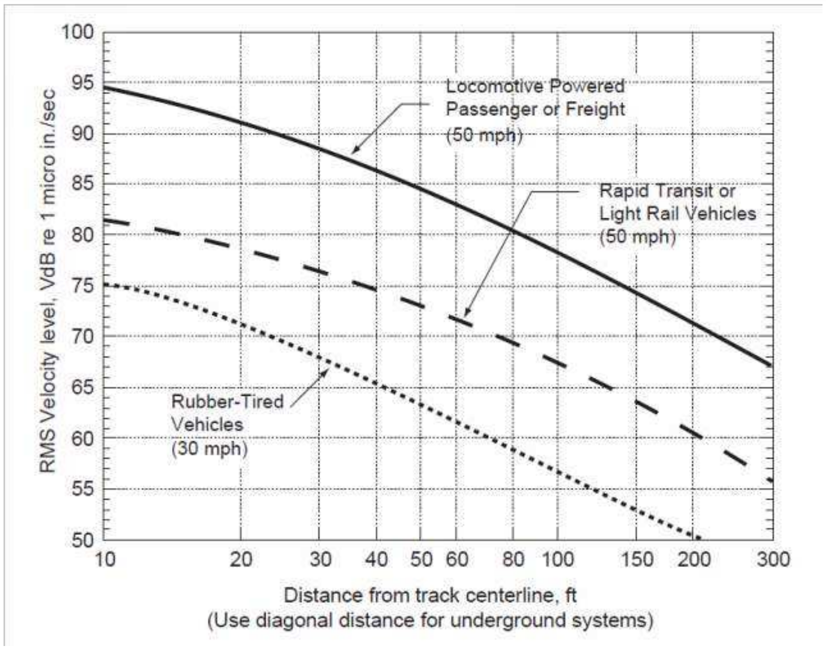
an LRT railway which has frequent events, the 0.14 mm/s RMS (75 dBV) vibration criteria and 40 dBA ground borne noise criteria were adopted for this study.

4.4.2 Theoretical Ground Vibration Prediction Procedure

Potential vibration impacts of the trains were predicted using the Federal Transit Authority's (FTA) Transit Noise and Vibration Impact Assessment[12] protocol. The FTA general vibration assessment is based on an upper bound generic set of curves that show vibration level attenuation with distance. These curves, illustrated in the figure on the following page, are based on ground vibration measurements at various transit systems throughout North America. Vibration levels at points of reception are adjusted by various factors to incorporate known characteristics of the system being analyzed, such as operating speed of vehicle, conditions of the track, construction of the track and geology, as well as the structural type of the impacted building structures. The vibration impact on the building was determined using a set of curves for Locomotive Powered Passenger of Freight at a speed of 50 mph. Adjustment factors were considered based on the following information:

- The maximum operating speed of the trains is 70 km/h (44 mph)
- The distance between the development and the closest track is 19 m
- The vehicles are assumed to have soft primary suspensions
- Tracks are welded
- Soil conditions do not efficiently propagate vibrations
- The building's foundation is large masonry on piles

[12] C. E. Hanson; D. A. Towers; and L. D. Meister, Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006



FTA GENERALIZED CURVES OF VIBRATION LEVELS VERSUS DISTANCE (ADOPTED FROM FIGURE 10-1, FTA TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT)

5. TRANSPORTATION NOISE RESULTS

5.1 Transportation Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Receptor Number	Receptor Height Above Grade/ Roof (m)	Receptor Location	Transportation Noise Level (dBA)	
			Day	Night
R1	40	POW – West Tower – West Façade	65	58
R2	40	POW – West Tower – North Façade	61	54
R3	40	POW – West Tower – East Façade	62	54
R4	40	POW – West Tower – South Façade	66	59
R5	16.3	POW – West Podium – West Façade	68	60
R6	16.3	POW – West Podium – North Façade	66	58
R7	11.9	POW – West Podium – East Façade	64	56
R8	16.3	POW – West Podium – South Façade	68	61
R9	19.3	OLA – West Podium –5th Level	58	N/A*
R10	15.5	OLA – West Podium – 4th Level	59	N/A*
R11	11.9	OLA – West Podium – 3rd Level	62	N/A*
R12	8.2	OLA – West Podium – 2nd Level	61	N/A*
R13	40	POW – West Tower – East Façade	60	53
R14	40	POW – West Tower – South Façade	64	57
R15	40	POW – West Tower – West Façade	61	53
R16	40	POW – West Tower – North Façade	59	53
R17	16.3	POW – West Podium – East Façade	63	56
R18	16.3	POW – West Podium – Southeast Façade	67	59
R19	5.3	POW – West Podium – South Façade	65	58
R20	8.9	POW – West Podium –West Façade	61	54
R21	5.4	POW – West Podium – North Façade	62	57
R22	11.9	OLA – West Podium –3rd Level	59	N/A*
R23	15.5	OLA – West Podium – 4th Level	58	N/A*
R24	19.3	OLA – West Podium – 5th Level	57	N/A*
R25	8.2	OLA – West Podium – 2nd Level	59	N/A*
R26	19.3	OLA – West Podium – 5th Level	59	N/A*

The results of the current analysis indicate that noise levels will range between 57 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e., 68 dBA) occurs along the south façade of the west podium, which is nearest and most exposed to Albert Street. A results comparison between the Predictor and Stamson calculations are shown in Table 4. The difference between calculation methods was within 0-3 dBA which is imperceptible to the human ear.

TABLE 4: RESULT CORRELATION WITH STAMSON

Receptor Number	Receptor Location	Receptor Height (m)	STAMSON 5.04 Noise Level (dBA)		PREDICTOR-LIMA Noise Level (dBA)	
			Day	Night	Day	Night
R8	POW – West Podium – South Façade	16.3	71	64	68	61
R18	POW – West Podium – Southeast Façade	16.3	70	63	67	59
R21	POW – West Podium – North Façade	5.4	62	57	62	57

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). Detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 3), façades not listed do not require upgraded building components:

Bedroom Windows

(i) Bedroom windows on the east and south façades of the west podium, south façade of the west tower, and the south and north façades of the east podium will require a minimum STC of 31.

(ii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2020) requirements.

Living Room Windows

(i) Living room windows on the east and south façades of the west podium, south façade of the west tower, and the south and north façades of the east podium will require a minimum STC of 26.

(ii) All other Living room windows are to satisfy Ontario Building Code (OBC 2020) requirements.

Retail Windows

(i) Retail windows on the east and south façades of the west podium, south façade of the west tower, and the south and north façades of the east podium will require a minimum STC of 21.

(ii) All other retail windows are to satisfy Ontario Building Code (OBC 2020) requirements.

Exterior Walls

(i) Exterior wall components on the north, south, and west façades will require a minimum STC of 45, which will be achieved with brick or precast cladding or an acoustical equivalent according to NRC test data[13].

The window STC requirements apply to windows, doors, spandrel panels, curtainwall, and window wall elements. If exterior wall components, such as stud walls, on these façades are used, it is recommended they have a minimum STC of 45, where a punch window and wall system is used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. Several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

The results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

[13] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

5.2.1 Barrier Investigation

Noise levels at certain OLA's exceed 60 dBA during the daytime period. This exceeds ENCG criteria and noise mitigation measures will be required to bring noise levels to equal to or below 55 dBA. It was found that an acoustic barrier will be required at the perimeter of the OLA's represented by receptors 11 and 12. A barrier with a minimum height of 1.8 m will result in noise levels that meet the criteria. A 1.1 m barrier can also be provided to these OLA's in which case noise levels will not be reduced to equal to or below 55 dBA, triggering the need for a Type B Warning Clause on all Lease, Purchase, and Sale Agreements. Where noise levels exceed 55 dBA mitigation is required where it is economically, administratively, and technically feasible. An acoustic barrier with a minimum height of 1.8 m is recommended at OLA's represented by receptor 22, and an acoustic barrier with a minimum height of 1.1 m at the perimeter of the OLA's represented by receptor 9, 10, 23, 24, 25, 26 will result in noise levels that meet the criteria. Should mitigation not be provided for these areas, a Type A Warning Clause will be required on all Lease, Purchase, and Sale Agreements. Details of the barrier investigation are shown in Figure 4 and presented in Table 5.

TABLE 5: RESULTS OF NOISE BARRIER INVESTIGATION

Receptor Reference	Height (m)	Location	Daytime Leq Noise Levels (dBA)		
			Without Barrier	1.1 m Barrier	1.8 m Barrier
R9	19.3	OLA – West Podium –5th Level	58	**55**	N/A
R10	15.5	OLA – West Podium – 4th Level	59	**54**	N/A
R11	11.9	OLA – West Podium – 3rd Level	62	58	**55**
R12	8.2	OLA – West Podium – 2nd Level	61	58	**54**
R22	11.9	OLA – East Podium –3rd Level	59	56	**54**
R23	15.5	OLA – East Podium – 4th Level	58	**55**	N/A
R24	19.3	OLA – East Podium – 5th Level	57	**53**	N/A
R25	8.2	OLA – East Podium – 2nd Level	59	**52**	N/A
R26	19.3	OLA – East Podium – 5th Level	59	**55**	N/A

The barrier should be of solid construction, contain no gaps and have a minimum surface density of 20kg/m^2. This surface density is commonly achieved with a concrete wall or glass panels with a minimum thickness of 8 mm. Noise levels at the OLA's can also be reduced by increasing the setback distance of the useable area from the building façade.

5.3 Ground Vibrations & Ground-Borne Noise Levels

Vibration caused by the O-Train Confederation Line LRT (See Appendix B Figure B1) were calculated between the building foundation and the track, shown in Figure 1. Vibration levels due to the nearest track were found to be 0.04 mm/s RMS (64 dBV) based on the FTA protocol and a conservative offset distance of 19 m to track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at building foundation, vibration mitigation will not be required.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 57 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e., 68 dBA) occurs along the south façade of the west podium, which is nearest and most exposed to Albert Street. The noise levels predicted due to roadway and LRT traffic exceed the criteria listed in Section 4.2 for building components, therefore, building components which achieve a minimum of the STC ratings outlined in Section 5.2 will be required to control indoor sound levels, as seen in Figure 3. Due to the net-zero target for the development, it is expected that wall and window elements will achieve sufficient STC ratings.

Noise levels at certain OLA's exceed 60 dBA during the daytime period. This exceeds ENCG criteria and noise mitigation measures will be required to bring noise levels to equal to or below 55 dBA. It was found that an acoustic barrier will be required at the perimeter of the OLA's represented by receptors 11 and 12. A barrier with a minimum height of 1.8 m will result in noise levels that meet the criteria. A 1.1 m barrier can also be provided to these OLA's in which case noise levels will not be reduced to equal to or below 55 dBA, triggering the need for a Type B Warning Clause on all Lease, Purchase, and Sale Agreements. Where noise levels exceed 55 dBA mitigation is required where it is economically, administratively, and technically feasible. An acoustic barrier with a minimum height of 1.8 m is recommended at OLA's represented by receptor 22, and an acoustic barrier with a minimum height of 1.1 m at the perimeter of the OLA's represented by receptor 9, 10, 23, 24, 25, 26 will result in noise levels that meet the criteria. Should mitigation not be provided for these areas, a Type A Warning Clause will be required on all Lease, Purchase, and Sale Agreements. The barrier should be of solid construction, contain no gaps and have a minimum surface density of 20kg/m^2. The following information will be required by the City for review prior to installation of the barrier:

1. Shop drawings, signed and sealed by a qualified Professional Engineer licenced by the Professional Engineers of Ontario, showing the details of the acoustic barrier systems components, including material specifications.
2. Structural drawing(s), signed by a qualified Professional Engineer licenced by the Professional Engineers of Ontario, showing foundation details and specifying design criteria, climatic design loads, as well as applicable geotechnical data used in the design.
3. Layout plan, and wall elevations, showing proposed colours and patterns.

The following Warning Clauses may be required depending on the barrier combination selected:

Type A

> *"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*

Type B

> *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*

Results of the calculations also indicate that the east and west tower will require central air conditioning, or a similar ventilation system, which will allow occupants to keep windows closed and maintain a comfortable living environment at the occupant’s discretion. The following Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized below:

Type D

> *"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*

In addition, the Rail Construction Program Office recommends that the warning clause identified below to be included in all agreements of Purchase and Sale and Lease Agreements for the proposed development including those prepared prior to the registration of the Site Plan Agreement:

> *"The Owner hereby acknowledges and agrees:*

i) The proximity of the proposed development of the lands described in Schedule "A" hereto (the "Lands") to the City's existing and future transit operations, may result in noise, vibration, electromagnetic interferences, stray current transmissions, smoke and particulate matter (collectively referred to as "Interferences") to the development;

ii) It has been advised by the City to apply reasonable attenuation measures with respect to the level of the Interferences on and within the Lands and the proposed development; and

iii) The Owner acknowledges and agrees all agreements of purchase and sale and lease agreements, and all information on all plans and documents used for marketing purposes, for the whole or any part of the subject lands, shall contain the following clauses which shall also be incorporated in all transfer/deeds and leases from the Owner so that the clauses shall be covenants running with the lands for the benefit of the owner of the adjacent road:

'The Transferee/Lessee for himself, his heirs, executors, administrators, successors and assigns acknowledges being advised that a public transit light-rail rapid transit system (LRT) is proposed to be located in proximity to the subject lands, and the construction, operation and maintenance of the LRT may result in environmental impacts including,

but not limited to noise, vibration, electromagnetic interferences, stray current transmissions, smoke and particulate matter (collectively referred to as the Interferences) to the subject lands. The Transferee/Lessee acknowledges and agrees that despite the inclusion of noise control features within the subject lands, Interferences may continue to be of concern, occasionally interfering with some activities of the occupants on the subject lands.

The Transferee covenants with the Transferor and the Lessee covenants with the Lessor that the above clauses verbatim shall be included in all subsequent lease agreements, agreements of purchase and sale and deeds conveying the lands described herein, which covenants shall run with the lands and are for the benefit of the owner of the adjacent road.'"

Vibration caused by the O-Train Confederation Line LRT (See Appendix B Figure B1) were calculated between the building foundation and the track, shown in Figure 1. Vibration levels due to the nearest track were found to be 0.04 mm/s RMS (64 dBV) based on the FTA protocol and a conservative offset distance of 19 m to track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at building foundation, vibration mitigation will not be required.

Off-site stationary noise impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. It is recommended a stationary noise study be conducted once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits.

The surroundings include a mix of residential and retail buildings which coincides with insignificant stationary noise emissions.

This concludes our transportation noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

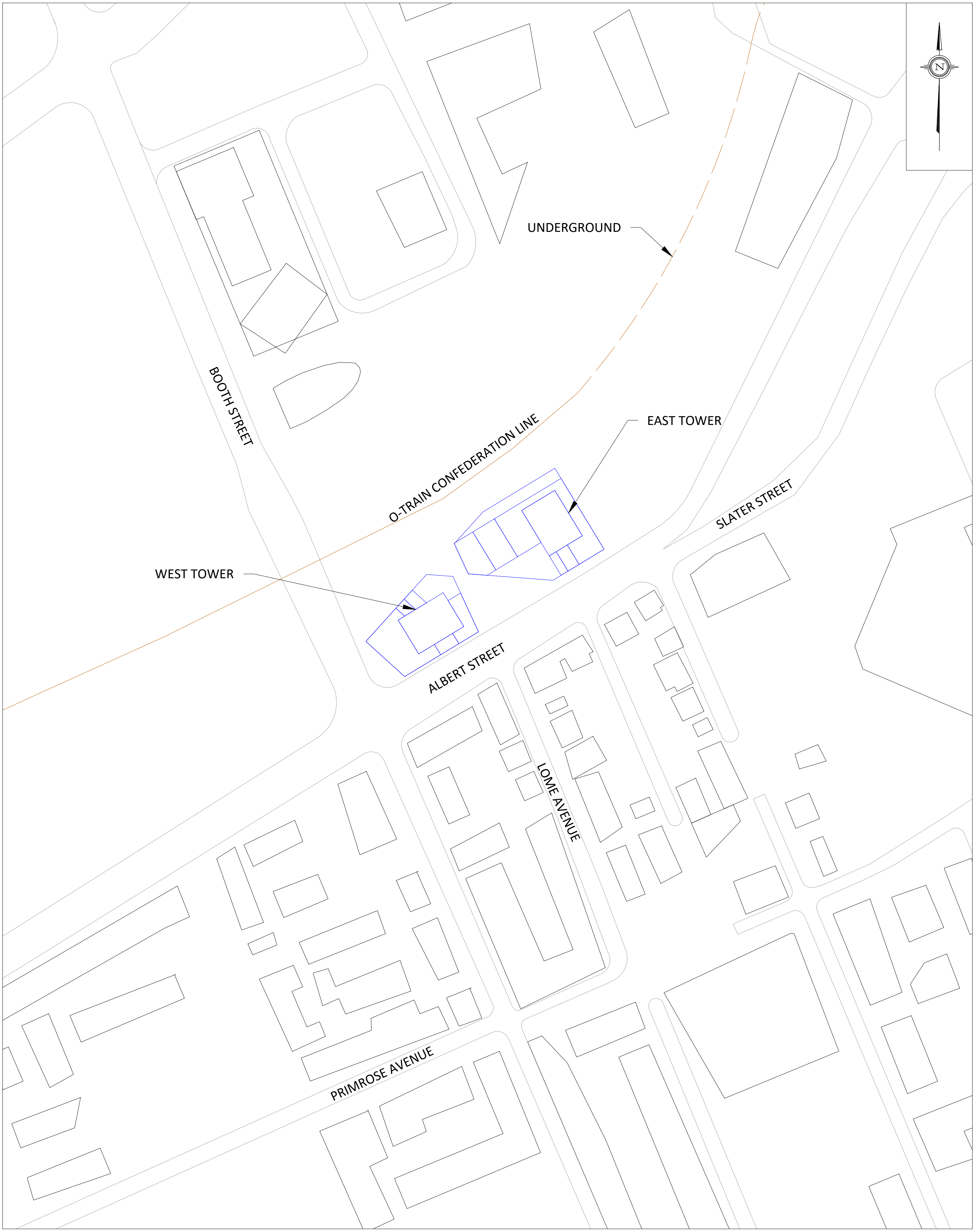
Sincerely,

Gradient Wind Engineering Inc.

Caleb Alexander, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File 22-064-Transportation Noise & Vibration



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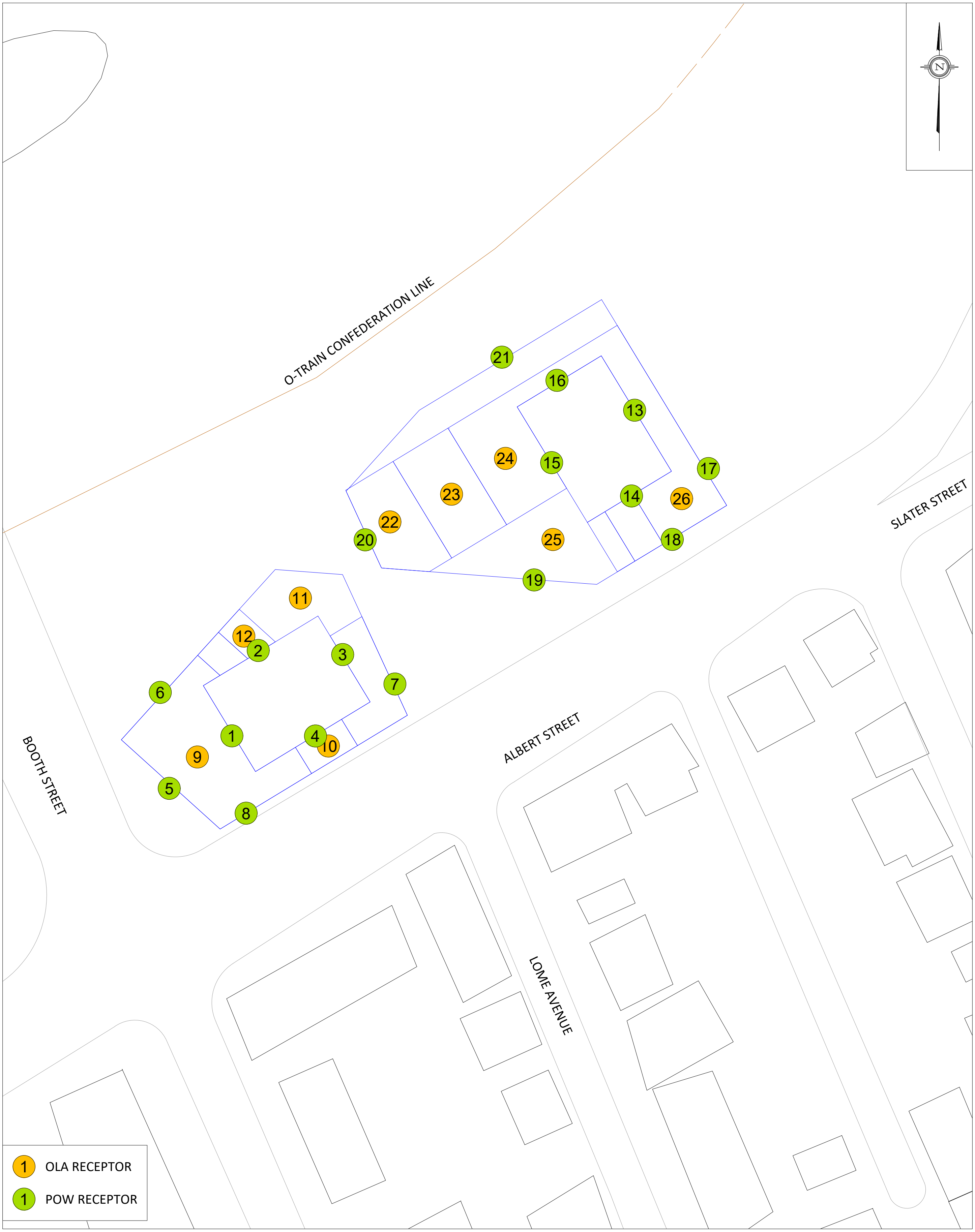
PROJECT	665 ALBERT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:3000 (APPROX.)	DRAWING NO.	GW22-064-1
DATE	MAY 6, 2022	DRAWN BY	C.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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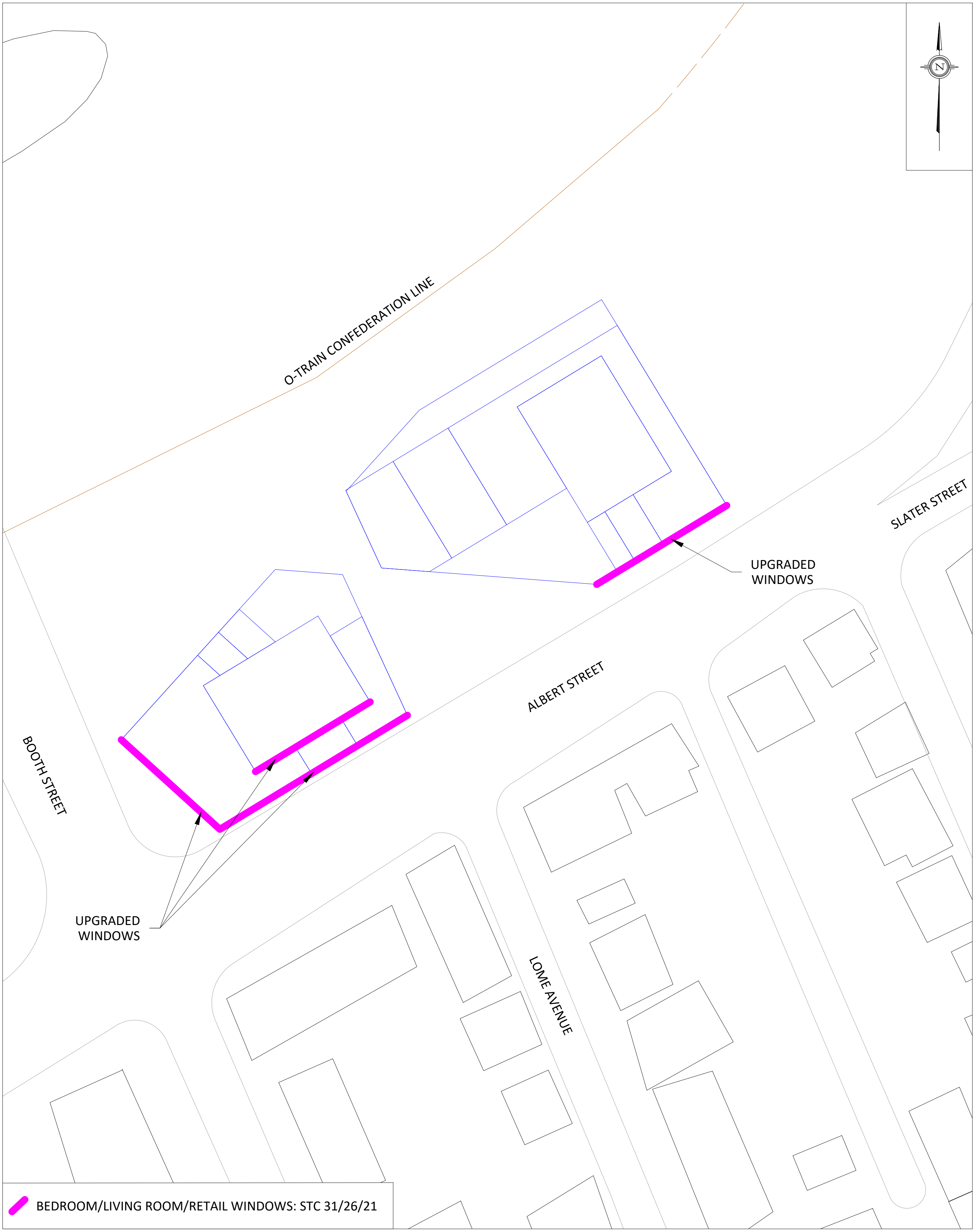
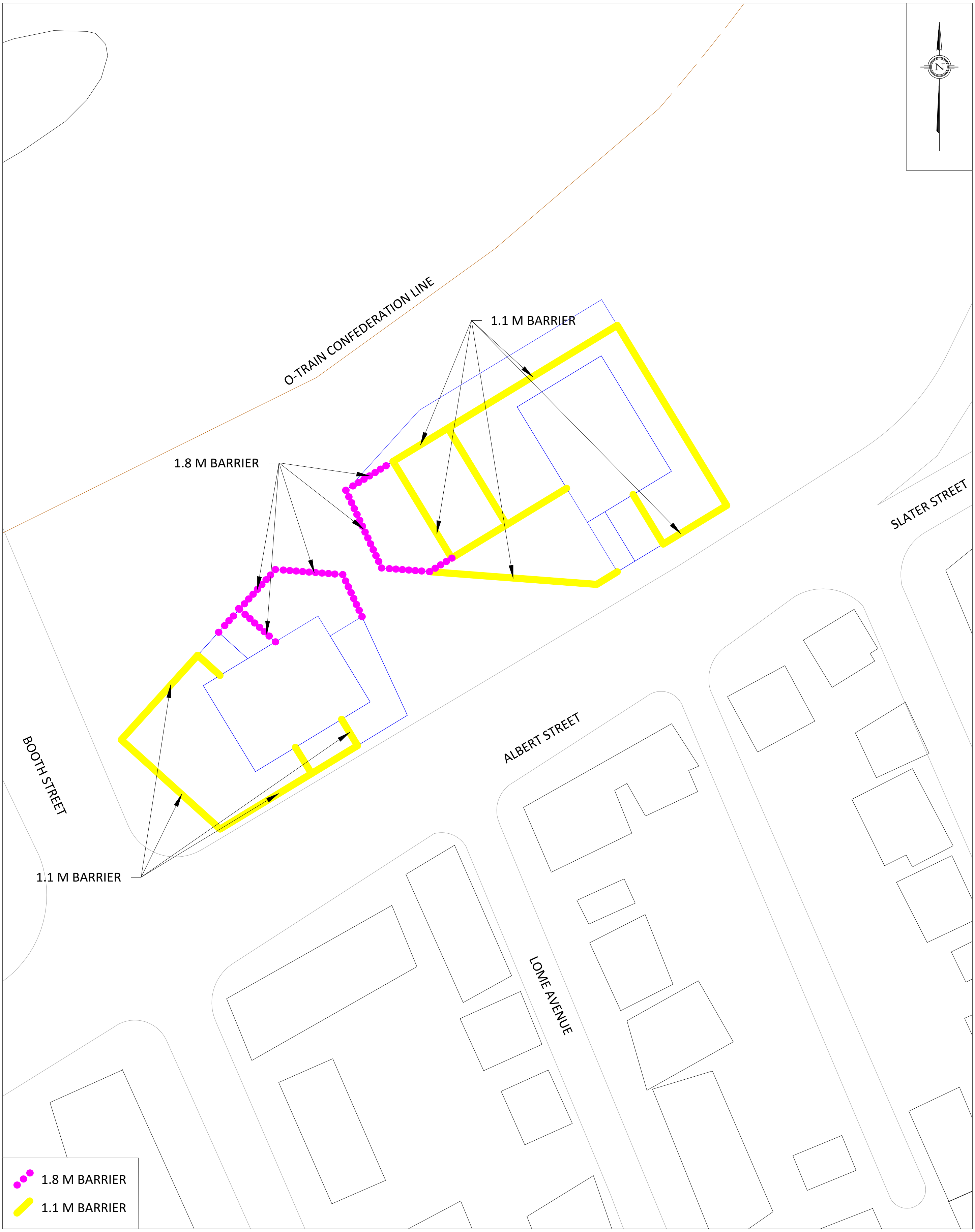
PROJECT	665 ALBERT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION FIGURE 2: RECEPTOR LOCATION
SCALE	1:3000 (APPROX.)	DRAWING NO. GW22-064-2	
DATE	MAY 6, 2022	DRAWN BY C.A.	



GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD , OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT: 665 ALBERT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION: FIGURE 3: UPGRADED BUILDING COMPONENTS
	SCALE: 1:3000 (APPROX.)	DRAWING NO.: GW22-064-3	
	DATE: MAY 6, 2022	DRAWN BY: C.A.	



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PROJECT: 665 ALBERT STREET, OTTAWA
ROADWAY TRAFFIC NOISE ASSESSMENT

SCALE: 1:3000 (APPROX.)

DRAWING NO.: GW22-064-4

DATE: MAY 6, 2022

DRAWN BY: C.A.

DESCRIPTION: FIGURE 4:
NOISE BARRIERS

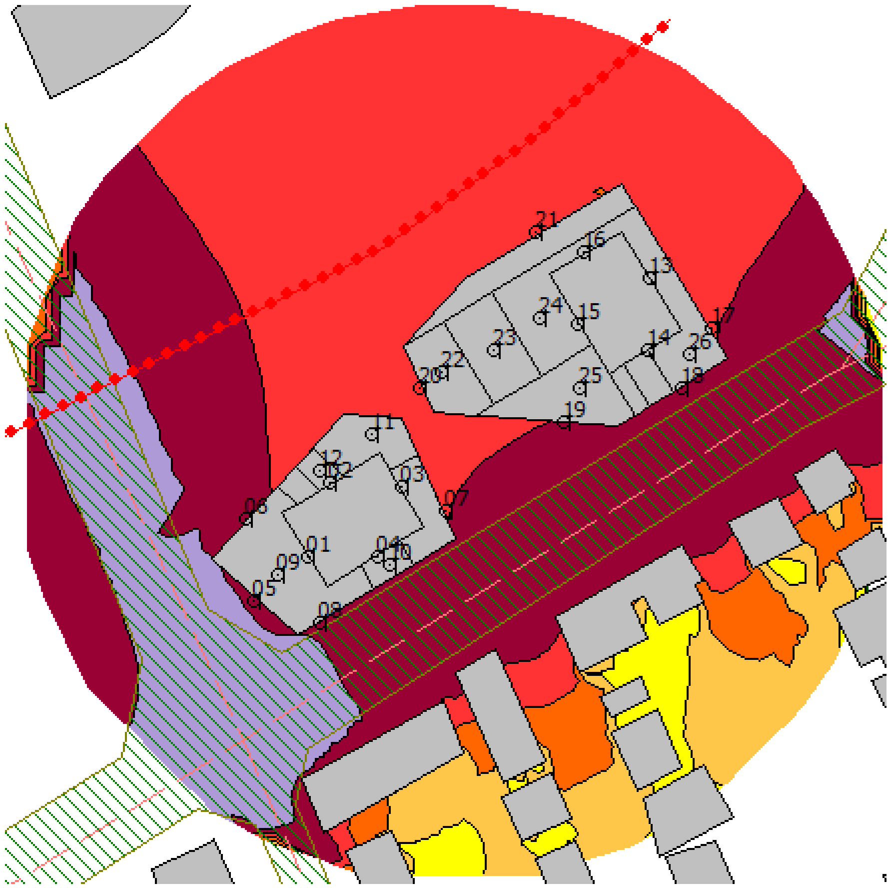
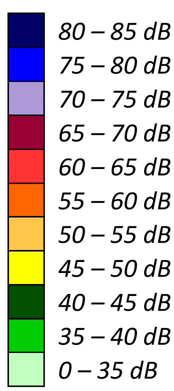


FIGURE 5: DAYTIME ROADWAY TRAFFIC NOISE LEVELS (30 METERS ABOVE GRADE)



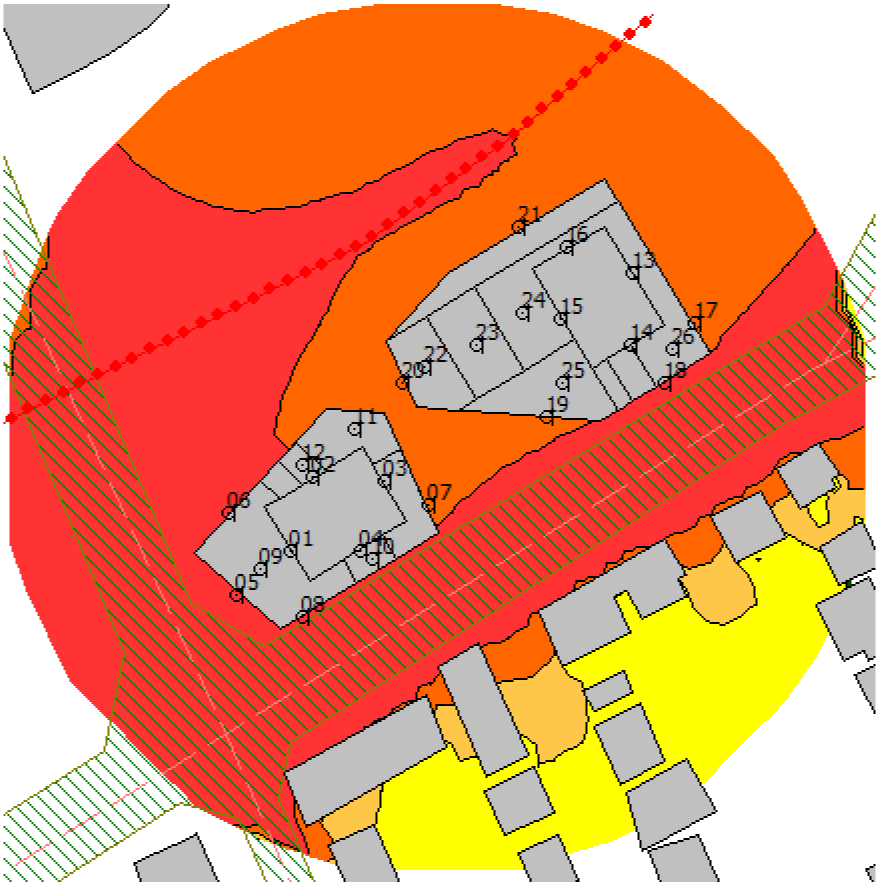
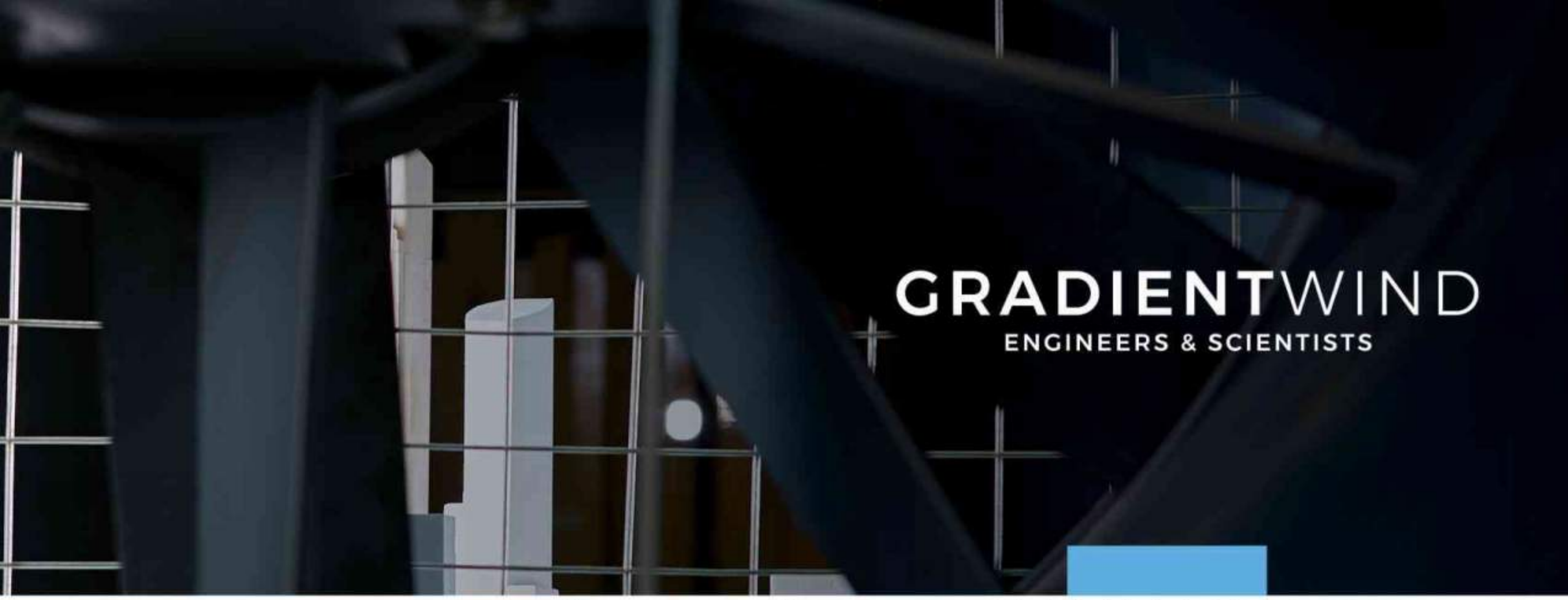


FIGURE 6: NIGHTTIME ROADWAY TRAFFIC NOISE LEVELS (30 METERS ABOVE GRADE)

- *80 – 85 dB*
- *75 – 80 dB*
- *70 – 75 dB*
- *65 – 70 dB*
- *60 – 65 dB*
- *55 – 60 dB*
- *50 – 55 dB*
- *45 – 50 dB*
- *40 – 45 dB*
- *35 – 40 dB*
- *0 – 35 dB*



APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

```
STAMSON 5.0        NORMAL REPORT        Date: 07-04-2022 17:38:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8.te               Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Albert (day/night)
------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Albert (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :  16.30 / 17.30  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Booth N (day/night)
-------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Booth N (day/night)
-----------------------------------------
Angle1   Angle2           :   7.00 deg   33.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  31.00 / 31.00  m
Receiver height           :  16.30 / 17.30  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Booth S (day/night)
-------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Booth S (day/night)
-----------------------------------------
Angle1   Angle2           :  33.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  31.00 / 31.00  m
Receiver height           :  16.30 / 16.30  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  59.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.00 m
Barrier receiver distance :  21.00 / 21.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Albert (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 70.95 + 0.00) = 70.95 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  71.49   0.00  -0.54   0.00   0.00   0.00   0.00  70.95
----------------------------------------------------------------------------

Segment Leq : 70.95 dBA


Results segment # 2: Booth N (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.60 + 0.00) = 60.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
     7     33   0.00  72.16   0.00  -3.15  -8.40   0.00   0.00   0.00  60.60
----------------------------------------------------------------------------

Segment Leq : 60.60 dBA


Results segment # 3: Booth S (day)
----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+---------------
       1.50 !       16.30 !        6.27 !         6.27

ROAD (55.96 + 48.49 + 0.00) = 56.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
    33     59   0.00  67.51   0.00  -3.15  -8.40   0.00   0.00   0.00  55.96
----------------------------------------------------------------------------
    59     90   0.00  67.51   0.00  -3.15  -7.64   0.00   0.00  -8.23  48.49
----------------------------------------------------------------------------

Segment Leq : 56.67 dBA

Total Leq All Segments: 71.48 dBA
```

```
Results segment # 1: Albert (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.35 + 0.00) = 63.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  63.89   0.00  -0.54   0.00   0.00   0.00   0.00  63.35
----------------------------------------------------------------------------

Segment Leq : 63.35 dBA


Results segment # 2: Booth N (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.01 + 0.00) = 53.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
     7     33   0.00  64.56   0.00  -3.15  -8.40   0.00   0.00   0.00  53.01
----------------------------------------------------------------------------

Segment Leq : 53.01 dBA
```

```
Results segment # 3: Booth S (night)
------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source       ! Receiver     ! Barrier      ! Elevation of
Height   (m) ! Height   (m) ! Height   (m) ! Barrier Top  (m)
-------------+--------------+--------------+---------------
       1.50 !        16.30 !         6.27 !          6.27

ROAD (48.36 + 40.89 + 0.00) = 49.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
    33     59   0.00  59.91   0.00  -3.15  -8.40   0.00   0.00   0.00  48.36
----------------------------------------------------------------------------
    59     90   0.00  59.91   0.00  -3.15  -7.64   0.00   0.00  -8.23  40.89
----------------------------------------------------------------------------

Segment Leq : 49.07 dBA

Total Leq All Segments: 63.88 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 71.48
                         (NIGHT): 63.88
```

```
STAMSON 5.0         NORMAL REPORT        Date: 07-04-2022 17:39:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r21.te               Time Period: Day/Night 16/8 hours
Description:


RT/Custom data, segment # 1: LRT (day/night)
--------------------------------------------
1 - 4-car SRT:
Traffic volume    :   485/76    veh/TimePeriod
Speed             :    70 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :   7.40 / 5.40   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: LRT (day)
------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 61.72 + 0.00) = 61.72 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     90   0.00  62.97  -1.25   0.00   0.00   0.00   0.00  61.72
----------------------------------------------------------------------

Segment Leq : 61.72 dBA

Total Leq All Segments: 61.72 dBA


Results segment # 1: LRT (night)
--------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 56.68 + 0.00) = 56.68 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     90   0.00  57.93  -1.25   0.00   0.00   0.00   0.00  56.68
----------------------------------------------------------------------

Segment Leq : 56.68 dBA

Total Leq All Segments: 56.68 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 61.72
                         (NIGHT): 56.68
```

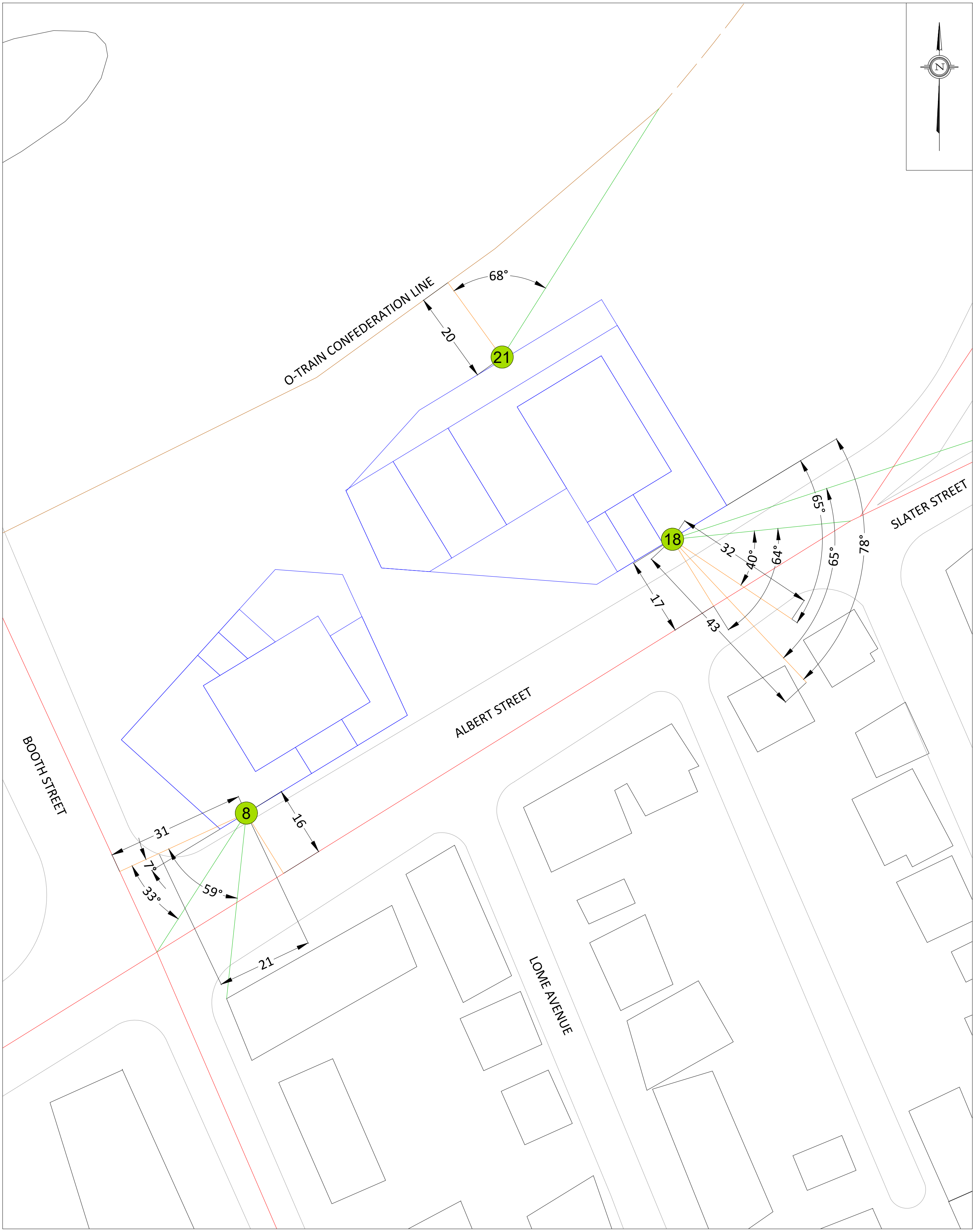
```
STAMSON 5.0        NORMAL REPORT        Date: 07-04-2022 17:39:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r18.te               Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Albert (day/night)
------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Albert (day/night)
----------------------------------------
Angle1   Angle2           : -88.00 deg   64.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :  16.30 / 17.30  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Albert 3 (day/night)
--------------------------------------------
Car traffic volume  : 18216/1584  veh/TimePeriod  *
Medium truck volume :  1449/126   veh/TimePeriod  *
Heavy truck volume  :  1035/90    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  22500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Albert 3 (day/night)
------------------------------------------
Angle1   Angle2            :  41.00 deg   65.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0 / 0
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  32.00 / 32.00  m
Receiver height            :  17.30 / 17.30  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

```
Road data, segment # 3: Slater (day/night)
------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Slater (day/night)
----------------------------------------
Angle1   Angle2            :  65.00 deg   78.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0 / 0
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  43.00 / 43.00  m
Receiver height            :  17.30 / 17.30  m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00
```

```
Results segment # 1: Albert (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 70.21 + 0.00) = 70.21 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -88     64   0.00  71.49   0.00  -0.54  -0.73   0.00   0.00   0.00  70.21
----------------------------------------------------------------------------

Segment Leq : 70.21 dBA


Results segment # 2: Albert 3 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.20 + 0.00) = 58.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
    41     65   0.00  70.24   0.00  -3.29  -8.75   0.00   0.00   0.00  58.20
----------------------------------------------------------------------------

Segment Leq : 58.20 dBA


Results segment # 3: Slater (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 52.49 + 0.00) = 52.49 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
    65     78   0.00  68.48   0.00  -4.57 -11.41   0.00   0.00   0.00  52.49
----------------------------------------------------------------------------

Segment Leq : 52.49 dBA

Total Leq All Segments: 70.54 dBA
```

```
Results segment # 1: Albert (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.62 + 0.00) = 62.62 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -88     64   0.00  63.89   0.00  -0.54  -0.73   0.00   0.00   0.00  62.62
----------------------------------------------------------------------------

Segment Leq : 62.62 dBA


Results segment # 2: Albert 3 (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.60 + 0.00) = 50.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
    41     65   0.00  62.64   0.00  -3.29  -8.75   0.00   0.00   0.00  50.60
----------------------------------------------------------------------------

Segment Leq : 50.60 dBA


Results segment # 3: Slater (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.90 + 0.00) = 44.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
    65     78   0.00  60.88   0.00  -4.57 -11.41   0.00   0.00   0.00  44.90
----------------------------------------------------------------------------

Segment Leq : 44.90 dBA

Total Leq All Segments: 62.95 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 70.54
                         (NIGHT): 62.95
```



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PROJECT	665 ALBERT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:3000 (APPROX.)	DRAWING NO.	GW22-064-A1
DATE	APRIL 5, 2022	DRAWN BY	C.A.

DESCRIPTION

FIGURE A1:
STAMSON INPUT PARAMETERS

APPENDIX B

FTA VIBRATION CALCULATIONS

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

GW22-064 08-Apr-22

Possible Vibration Impacts
Predicted using FTA General Assesment

Train Speed 70 km/h 44 mph

	Distance from C/L	
	(m)	(ft)
Subway	19.0	62.3

Vibration

From FTA Manual Fig 10-1

Vibration Levels at distance from track	72	dBV re 1 micro in/sec

Adjustment Factors FTA Table 10-1

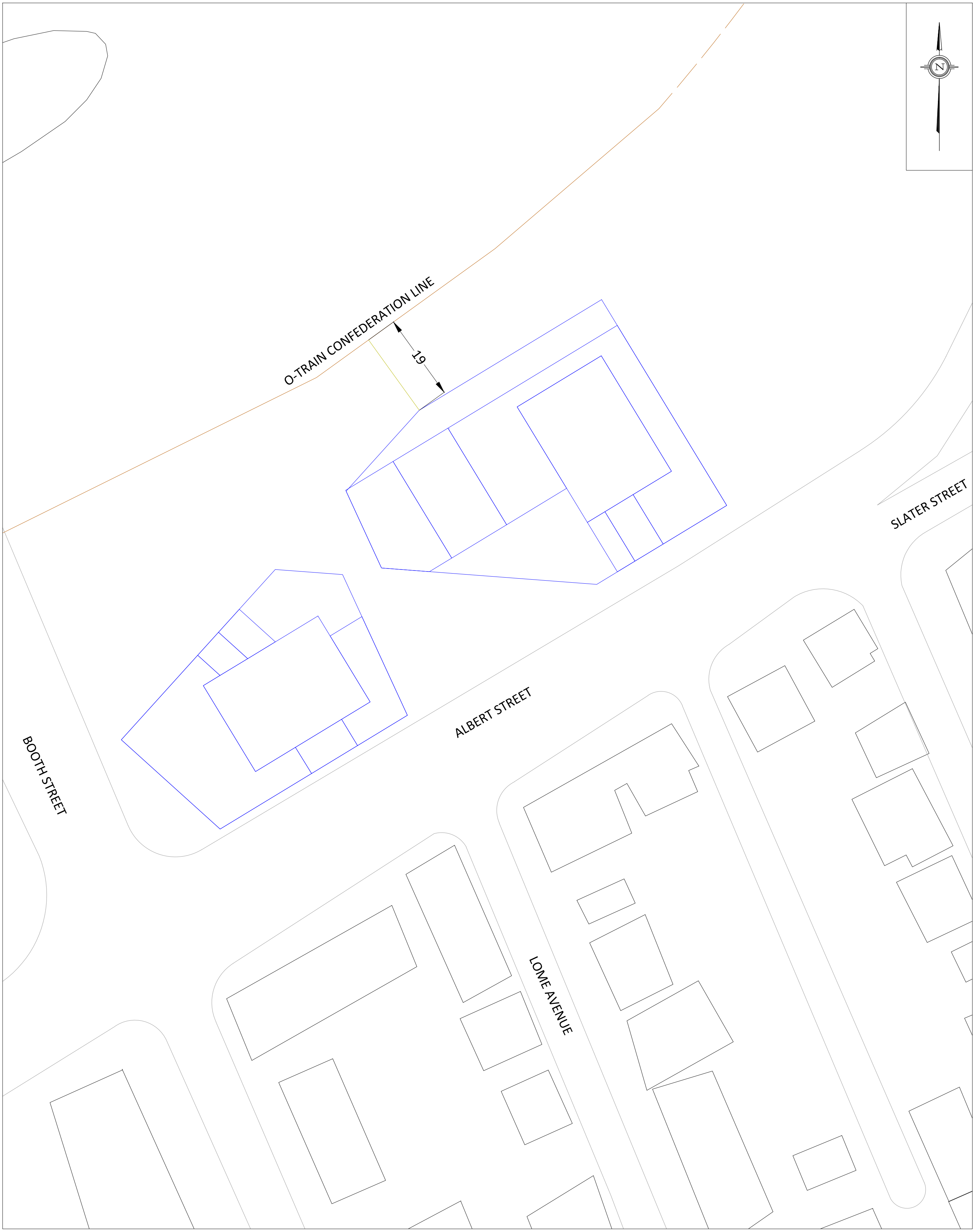
Speed reference 50 mph	-1	Speed Limit of 70 km/h (44 mph)
Vehicle Parameters	0	Assume Soft primary suspension, Wheels run true
Track Condition	0	None
Track Treatments	0	None
Type of Transit Structure	-3	cut and cover
Efficient vibration Propagation	0	Propagation through rock
Vibration Levels at Fdn	68	
Coupling to Building Foundation	-10	Large masonry on piles
Floor to Floor Attenuation	0.0	Ground Floor Occupied
Amplification of Floor and Walls	6	
Total Vibration Level	64	dBV or 0.040 mm/s
Noise Level in dBA	29	dBA

Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise

Factors Affecting Vibration Source				
Source Factor	**Adjustment to Propagation Curve**			**Comment**
		Reference Speed		
Speed	Vehicle Speed	50 mph	30 mph	Vibration level is approximately proportional to 20*log(speed/speed$_{ref}$). Sometimes the variation with speed has been observed to be as low as 10 to 15 log(speed/speed$_{ref}$).
	60 mph	+1.6 dB	+6.0 dB	
	50 mph	0.0 dB	+4.4 dB	
	40 mph	-1.9 dB	+2.5 dB	
	30 mph	-4.4 dB	0.0 dB	
	20 mph	-8.0 dB	-3.5 dB	
Vehicle Parameters (not additive, apply greatest value only)				
Vehicle with stiff primary suspension	+8 dB			Transit vehicles with stiff primary suspensions have been shown to create high vibration levels. Include this adjustment when the primary suspension has a vertical resonance frequency greater than 15 Hz.
Resilient Wheels	0 dB			Resilient wheels do not generally affect ground-borne vibration except at frequencies greater than about 80 Hz.
Worn Wheels or Wheels with Flats	+10 dB			Wheel flats or wheels that are unevenly worn can cause high vibration levels. This can be prevented with wheel truing and slip-slide detectors to prevent the wheels from sliding on the track.
Track Conditions (not additive, apply greatest value only)				
Worn or Corrugated Track	+10 dB			If both the wheels and the track are worn, only one adjustment should be used. Corrugated track is a common problem. Mill scale on new rail can cause higher vibration levels until the rail has been in use for some time.
Special Trackwork	+10 dB			Wheel impacts at special trackwork will significantly increase vibration levels. The increase will be less at greater distances from the track.
Jointed Track or Uneven Road Surfaces	+5 dB			Jointed track can cause higher vibration levels than welded track. Rough roads or expansion joints are sources of increased vibration for rubber-tire transit.
Track Treatments (not additive, apply greatest value only)				
Floating Slab Trackbed	-15 dB			The reduction achieved with a floating slab trackbed is strongly dependent on the frequency characteristics of the vibration.
Ballast Mats	-10 dB			Actual reduction is strongly dependent on frequency of vibration.
High-Resilience Fasteners	-5 dB			Slab track with track fasteners that are very compliant in the vertical direction can reduce vibration at frequencies greater than 40 Hz.

Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise (Continued)

Factors Affecting Vibration Path		
Path Factor	**Adjustment to Propagation Curve**	**Comment**
Resiliently Supported Ties	-10 dB	Resiliently supported tie systems have been found to provide very effective control of low-frequency vibration.
Track Configuration (not additive, apply greatest value only)		
Type of Transit Structure	Relative to at-grade tie & ballast: Elevated structure -10 dB Open cut 0 dB	The general rule is the heavier the structure, the lower the vibration levels. Putting the track in cut may reduce the vibration levels slightly. Rock-based subways generate higher-frequency vibration.
	Relative to bored subway tunnel in soil: Station -5 dB Cut and cover -3 dB Rock-based - 15 dB	
Ground-borne Propagation Effects		
Geologic conditions that promote efficient vibration propagation	Efficient propagation in soil +10 dB	Refer to the text for guidance on identifying areas where efficient propagation is possible.
	Propagation in rock layer — **Dist.** / **Adjust.**: 50 ft +2 dB 100 ft +4 dB 150 ft +6 dB 200 ft +9 dB	The positive adjustment accounts for the lower attenuation of vibration in rock compared to soil. It is generally more difficult to excite vibrations in rock than in soil at the source.
Coupling to building foundation	Wood Frame Houses -5 dB 1-2 Story Masonry -7 dB 3-4 Story Masonry -10 dB Large Masonry on Piles -10 dB Large Masonry on Spread Footings -13 dB Foundation in Rock 0 dB	The general rule is the heavier the building construction, the greater the coupling loss.
Factors Affecting Vibration Receiver		
Receiver Factor	**Adjustment to Propagation Curve**	**Comment**
Floor-to-floor attenuation	1 to 5 floors above grade: -2 dB/floor 5 to 10 floors above grade: -1 dB/floor	This factor accounts for dispersion and attenuation of the vibration energy as it propagates through a building.
Amplification due to resonances of floors, walls, and ceilings	+6 dB	The actual amplification will vary greatly depending on the type of construction. The amplification is lower near the wall/floor and wall/ceiling intersections.
Conversion to Ground-borne Noise		
Noise Level in dBA	Peak frequency of ground vibration: Low frequency (<30 Hz): -50 dB Typical (peak 30 to 60 Hz): -35 dB High frequency (>60 Hz): -20 dB	Use these adjustments to estimate the A-weighted sound level given the average vibration velocity level of the room surfaces. See text for guidelines for selecting low, typical or high frequency characteristics. Use the high-frequency adjustment for subway tunnels in rock or if the dominant frequencies of the vibration spectrum are known to be 60 Hz or greater.



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PROJECT	665 ALBERT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:3000 (APPROX.)	DRAWING NO.	GW22-064-B1
DATE	APRIL 5, 2022	DRAWN BY	C.A.

DESCRIPTION

FIGURE B1:
FTA VIBRATION PARAMETERS

APPENDIX H: Architectural Drawings

Perkins&Will KPMB

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2022 - 12 - 16

G SERIES SHEET LIST SHORING AND EXCAVATION PERMIT

SHEET NUMBER	SHEET NAME	ISSUED FOR OPA/ZBA/SPA | 2022-04-22	ISSUED FOR 66% SD | 2022-05-27	ISSUED FOR 100% SD | 2022-06-10	ISSUED FOR 66% DD | 2022-08-19	ISSUED FOR 100% DD | 2022-09-30	ISSUED FOR FOUNDATION REVIEW	ISSUED FOR SHORING PERMIT | 2022-12-16
G00-00A	COVER SHEET & SHEET LIST	X	X	X	X	X	X	X
G00-01	STANDARD ABBREVIATIONS, SYMBOLS, NOTES			X	X	X	X	X
G01-01	SITE PLAN & STATISTICS	X	X	X	X	X	X	X

3

A SERIES SHEET LIST SHORING AND EXCAVATION PERMIT

revs	SHEET NAME	ISSUED FOR OPA/ZBA/SPA | 2022-04-22	ISSUED FOR 66% SD | 2022-05-27	ISSUED FOR 100% SD | 2022-06-10	ISSUED FOR 66% DD | 2022-08-19	ISSUED FOR 100% DD | 2022-09-30	ISSUED FOR FOUNDATION REVIEW	ISSUED FOR SHORING & EXCAVATION PERMIT | 2022-12-16
A00-11	EXTERIOR WALL ASSEMBLIES			X	X	X	X	X
A00-12	FLOOR, SOFFIT & ROOF ASSEMBLIES			X	X	X	X	X
A10-00A	LEVEL P2 FLOOR PLAN	X	X	X	X	X	X	X
A10-00B	LEVEL P1 FLOOR PLAN	X	X	X	X	X	X	X
A11-0AE	LEVEL P2 FLOOR PLAN, EAST				X	X	X	X
A11-0AW	LEVEL P2 FLOOR PLAN, WEST				X	X	X	X
A11-0BE	LEVEL P1 FLOOR PLAN, EAST				X	X	X	X
A11-0BW	LEVEL P1 FLOOR PLAN, WEST				X	X	X	X
A18-00	P2 SUB-FLOOR & PERIMETER DRAINAGE						X	X
A18-0AE	LEVEL P2 SLAB EDGE PLAN, EAST						X	X
A18-0AW	LEVEL P2 SLAB EDGE PLAN, WEST						X	X
A18-0BE	LEVEL P1 SLAB EDGE PLAN, EAST						X	X
A18-0BW	LEVEL P1 SLAB EDGE PLAN, WEST						X	X
A31-E01	EXTERIOR WALL SECTIONS, EAST				X	X	X	X
A31-E02	EXTERIOR WALL SECTIONS, EAST				X	X	X	X
A31-W11	EXTERIOR WALL SECTIONS, WEST				X	X	X	X
A31-W12	EXTERIOR WALL SECTIONS, WEST				X	X	X	X

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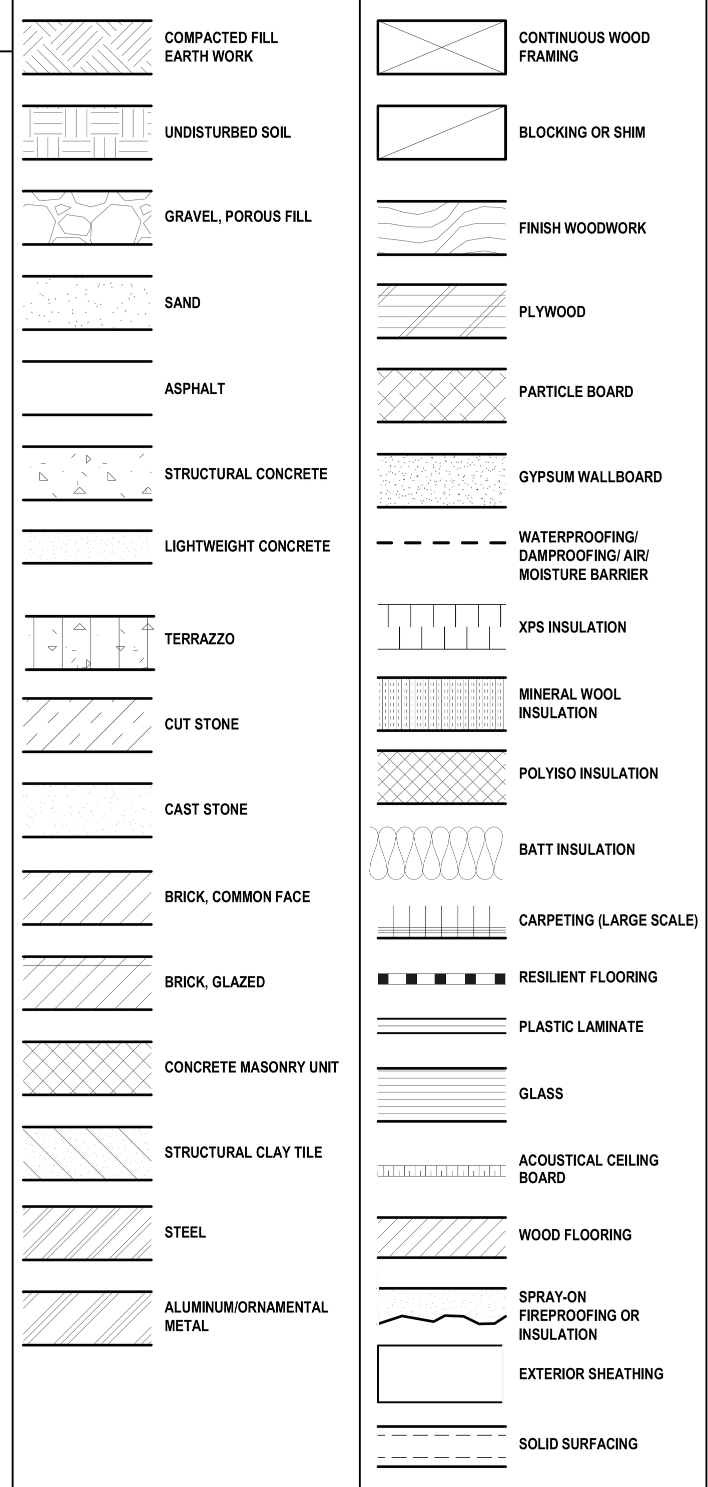
ABBREVIATIONS LEGEND

NOTE 1: ABBREVIATIONS WHEN USED IN COMPOSITION MAY INCLUDE PERIODS FOR CLARIFICATION
NOTE 2: ABBREVIATIONS MAY BE DIFFERENT WHEN A PART OF A LEGEND

A/C	AIR CONDITION(ING)(ED)
ACC	ACCESSIBLE
ACM	ALUMINUM COMPOSITE MATERIAL
ACMU	ARCHITECTURAL CONCRETE MASONRY UNIT
ACP	LARGE SCALE ACOUSTIC CEILING PANEL
ACST	ACOUSTIC(AL)
ACT	ACOUSTICAL PANEL CEILING SYSTEM
AD	AREA DRAIN
ADJ	ADJUSTABLE/ ADJACENT
AFC	ABOVE FINISHED COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AG	ALUMINUM GUARD
AGGR	AGGREGATE
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
ALUM	PREFINISHED ALUMINUM
ANOD	ANODIZE(D)
APPROX	APPROXIMATE
AR	AREA RUG
ARCH	ARCHITECT(URAL), ARCHITECT
ARGB	ABUSE-RESISTANT GYPSUM BOARD
AS	ALUMINUM STOREFRONT SCREENS
ASPH	ASPHALT
AUTO	AUTOMATIC
AVB	AIR/VAPOUR BARRIER
AWCP	ACOUSTIC WOOD CEILING PANEL
AWP	LARGE SCALE ACOUSTIC WALL PANEL
AWT	ACOUSTICAL WALL TREATMENT
AWWP	ACOUSTIC WOOD WALL PANEL
B/B	BACK TO BACK
BB	BLACK BOARD
BC	BACK OF CURB
BD	BOARD
BIPV	BUILDING INTEGRATED PHOTOVOLTAICS
BITUM	BITUMINOUS
BLDG	BUILDING
BM	BEAM/ BENCHMARK
BOT/	BOTTOM OF
BPG	BACK-PAINTED GLASS
BSMT	BASEMENT
BUR	BUILT-UP ROOFING
C/W	COMPLETED WITH
CAB	CABINET
CB	CATCH BASIN
CCTV	CLOSED CIRCUIT TELEVISION
CEM	CEMENT
CF/CI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CF/OI	CONTRACTOR FURNISHED, OWNER INSTALLED
CFM	CUBIC FEET PER MINUTE
CFMF	COLD-FORMED METAL FRAMING
CG	CORNER GUARD
CGS	COMPOSITE GLASS SURFACING FABRICATION
CH	CHANNEL
CHK	COAT HOOKS
CI	CAST IRON, CURB INLET
CIP	CAST-IN-PLACE
CJ	CONTROL JOINT
CL	CENTER LINE
CLF	CLEAR FINISH
CLG	CEILING
CLO	CLOSET
CLR	CLEAR
CM	CENTIMETER
CMT	CERAMIC MOSAIC TILE
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONF	CONFERENCE
CONT	CONTINUOUS
COORD	COORDINATE
COR MTL	CORRUGATED METAL
CORR	CORRIDOR
CP	CARPET
CPT	CARPET TILES
CQS	COMPOSITE QUARTZ SURFACING FABRICATION
CRL	CRASH RAIL
CT	CERAMIC TILE
CTR	CENTER/CONTOUR
CU	CUBIC
CW	COLD WATER PIPING/CHEMICAL WASTELINE
CWP	CEMENTITIOUS WOOD FIBER PANELS
CWS	CURTAIN WALL SYSTEM
D	DEEP, DEPTH, PENNY (NAIL)
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLISH, DEMOLITION
DEPT	DEPARTMENT
DF	DRINKING FOUNTAIN
DIA	DIAMETER (EXTERIOR)
DIAG	DIAGONAL
DIFF	DIFFUSER/ DIFFERENCE
DIM	DIMENSION
DISP	DISPENSER
DIV	DIVISION
DJ	DRY JOINT
DL	DEAD LOAD
DR	DOOR/ DRAIN
DS	DOWNSPOUT
DW	DISHWASHER
DWG	DRAWING
DWS-1	STAINLESS STEEL DOME TACTILE WARNING SYSTEM
DWS-2	TACTILE WARNING TILING
DWS-3	VISUAL WARNING TAPE
E	EAST
EA	EACH
ECT	ELECTRO CONDUCTIVE TILE
EHD	ELECTRIC HAND DRYER
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELAST	ELASTOMERIC
ELEC	ELECTRIC(AL)
ELEV	ELEVATOR
EMER	EMERGENCY
EMER SHR	EMERGENCY SHOWER
EMR	ELEVATOR MACHINE ROOM
ENGR	ENGINEER
ENTR	ENTRANCE
EO	ELECTRIC OUTLET
EOS	EDGE OF SLAB
EP	ELECTRICAL PANEL
EPFC	EPOXY FLOOR COATING
EQ	EQUAL
EQUIP	EQUIPMENT
ETC	ET CETERA
ETZ	EPOXY TERRAZZO FLOORING
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR, EXTERNAL
F/F	FACE TO FACE
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FAB	FABRIC
FAB-BB	BLACK OUT SHADE FABRIC
FAB-S	SHADE FABRIC
FCO	FLOOR CLEANOUT
FCT-A	ADULT FOLDING CHANGE TABLE
FCT-I	INFANT FOLDING CHANGE TABLE
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FDTN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FINISH FACE
FFAP	FABRIC FACED ACOUSTIC PANELS
FFE	FINISHED FLOOR ELEVATION
FG	ENTRANCE FLOOR GRILLES
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FILM	GLAZING FILM
FIN	FINISH(ED)
FLR	FLOOR
FLR-MT	ENTRANCE FLOOR MAT
FLT	FELT WALL COVERING
FLUOR	FLUORESCENT
FO	FINISHED OPENING
FOC	FACE OF CURB
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF SLAB/ FACE OF STUD
FP	FIRE PROTECTION/FIREPROOF
FRG	FIRE RESISTIVE GLASS
FRMG	FRAMING
FRTW	FIRE RETARDANT TREATED WOOD
FSS	FOLDING SHOWER SEATS
FT	FOOT (FEET)/ FIRE TREATED
FTG	FOOTING
FURG	FURRING
FURN	FURNISH, FURNITURE
FUT	FUTURE
FV	FIELD VERIFY
GA	GAGE
GALV	GALVANIZED
GB	GRAB BAR
GBS	GYPSUM BOARD - SHAFT LINER
GBX	FIRE RATED GYPSUM BOARD TYPE X
GEN	GENERAL
GFRC	GLASS FIBER REINFORCED CONCRETE
GFRG	GLASS FIBER REINFORCED GYPSUM
GG-1	STRUCTURAL GLASS WINDSCREEN WITH BASE SHOE ATTACHMENT
GG-2	FRAMED GLASS PRIVACY SCREEN
GL	GLASS
GL BLK	GLASS BLOCK
GL-LK	GLASS LOCKERS
GLU LAM	GLUED LAMINATED WOOD
GR LN	GRADE LINE
GRFL	GROUND FLOOR
GT	GREASE TRAP
GWB	STANDARD GYPSUM BOARD
GWT	GLASS WALL TILES
GYP	GYPSUM
H	HIGH
HB	HOSE BIBB
HC	HOLLOW CORE
HDL	HIGH DENSITY COMPOSITE PANEL
HDW	HARDWARE
HDWD	HARDWOOD
HM	HOLLOW METAL
HMS	HOLLOW METAL DOORS AND FRAMES
HORIZ	HORIZONTAL
HPL	HIGH PRESSURE LAMINATE
HPT	HIGH POINT
HS	HEAT STRENGTHENED GLASS
HSKPG	HOUSEKEEPING
HSLG	HEAT STRENGTHENED LAMINATED SAFETY GLASS
HSTG	HEAT SOAKED TEMPERED GLASS
HT	HEIGHT
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HW	HOT WATER
HWC	HIGH IMPACT WALL PROTECTION
ID	INSIDE DIAMETER
IFRM	INTUMESCENT MASTIC FIRE-RESISTIVE COATING
IGU	INSULATED GLASS UNIT
INCAND	INCANDESCENT
INSUL	INSULATION
INT	INTERIOR
INV	INVERT
JAN CLO	JANITOR'S CLOSET
KIT	KITCHEN
L	LONG, LENGTH
LAM	LAMINATE(D)
LAV	LAVATORY
LH	LEFT HAND
LIB	LIBRARY
LIN	LINOLEUM FLOORING
LK	LOCKER
LL	LIVE LOAD
LOC	LOCATION
LONG	LONGITUDINAL
LPT	LOW POINT
LQR	LACQUER FINISH
LT	LIGHT
LTPG	LAMINATED TEMPERED SAFETY GLASS
LVR	LOUVER
LVT	LUXURY VINYL TILE
M	METER
M1	UNFRAMED MIRRORS
M2	TILTED MIRRORS
MACH	MACHINE
MAINT	MAINTENANCE
MATL	MATERIAL
MAX	MAXIMUM
MB	MARKER BOARD
MBWC	MARKER BOARD WALL COVERING
MCP	METAL CEILING PANEL
MDF	MEDIUM DENSITY FIBREBOARD
MECH	MECHANICAL
MEL	MELAMINE
MEMB	MEMBRANE
MEP	MECHANICAL, ELECTRICAL, PLUMBING, FIRE PROTECTION
MEZZ	MEZZANINE
MFR	MANUFACTURER
MG	GLASS MARKER BOARD
MGL	MAGNETIC GLASS MARKER BOARD
MH	MANHOLE
MHO	MAGNETIC HOLD OPEN
MIN	MINIMUM
MISC	MISCELLANEOUS
MM	MILLIMETER
MO	MASONRY OPENING
MOH	MOP HOLDER
MTL	METAL
MTL-LK	METAL LOCKERS
MTL-TP	METAL TOILET PARTITIONS AND URINAL SCREENS
MTLG	METAL GRILLE PANEL
MWP	METAL WALL PANEL
N	NORTH
NA	NOT AVAILABLE
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
O/O	OUT TO OUT
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF/CI	OWNER FURNISHED, CONTRACTOR INSTALLED
OF/OI	OWNER FURNISHED, OWNER INSTALLED
OFF	OFFICE
OPH	OPPOSITE HAND
OPNG	OPENING
OPP	OPPOSITE
ORD	OVERFLOW ROOF DRAIN
PA	PUBLIC ADDRESS
PAR	PARAPET, PARALLEL
PCC	PRE-CAST CONCRETE
PCT	PROCELAIN TILE
PCTZ	PRECAST EPOXY TERRAZZO FLOORING
PDO	POWER DOOR OPERATOR
PERF	PERFORATED
PERP	PERPENDICULAR
PH-LK	PHENOLIC LOCKERS
PH-TP	PHENOLIC TOILET PARTITIONS AND URINAL SCREENS
PLAM	PLASTIC LAMINATE
PLAM-LK	PLASTIC LAMINATE LOCKERS
PLAM-TP	PLASTIC LAMINATE TOILET PARTITIONS AND URINAL SCREENS
PLAS	PLASTER
PLBG	PLUMBING
PLYWD	PLYWOOD
POL	POLISHED
PREFAB	PREFABRICATE(D)
PROJ	PROJECT
PROP	PROPERTY
PSD	PIT SCUPPER DRAIN
PSH	PURSE SHELF
PSS	POLYMER BASED SOLID SURFACE
PT	PAINT(ING)
PTD	PAPER TOWEL DISPENSER
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVG	PAVING
PWCT	POWDER COAT FINISH
QT	QUARRY TILE
QTY	QUANTITY
R	THERMAL RESISTANCE, RADIUS, RISER
RB	RUBBER BASE
RBSF	RUBBER SPORTS FLOORING
RC	REINFORCED CONCRETE
RCP	REFLECTED CEILING PLAN
RCPTN	RECEPTION
RD	ROOF DRAIN
REC	RECESSED
REF	REFERENCE, REFRIGERATOR
REINF	REINFORCE, REINFORCING
REQ(D)	REQUIRE, REQUIRED
RES	RESINOUS FLOORING
RESIL	RESILIENT
REV	REVISION
RF	ROOF
RFT	RUBBER TREADS, RISERS AND LANDINGS
RH	RIGHT HAND
RM	ROOM
RO	ROUGH OPENING
ROW	RIGHT OF WAY
RSF	RESILIENT SHEET FLOORING
RSSF	RESILIENT SAFETY SHEET FLOORING
RTF	RUBBER TILE FLOOR
RVL	REVEAL
RWBB	DUAL ROLLER WINDOW SHADES AND BLACKOUT BLINDS, MANUAL OPERATED
RWBB-M	DUAL ROLLER WINDOW SHADES AND BLACKOUT BLINDS, MOTORIZED
RWF	RESILIENT WOOD FLOOR
RWS	ROLLER WINDOW SHADE, MANUAL OPERATED
RWS-M	ROLLER WINDOW SHADE, MOTORIZED
S	SOUTH
SAN	SANITARY
SB	SMOKE BAFFLE
SC	SOLID CORE
SCHED	SCHEDULE
SCR	SHOWER CURTAIN AND ROD
SD	SOAP DISPENSER
SDT	STATIC DISSIPATIVE TILE
SECT	SECTION
SF	SOFFIT
SFRM	SPRAY APPLIED CEMENTITOUS FIRE RESISTIVE MATERIAL
SG	SECURITY GRILLE
SGB	GLASS MAT GYPSUM BOARD, EXTERIOR GYPSUM SHEATHING
SGL	SINGLE
SHR	SHOWER
SHT	SHEET
SIM	SIMILAR
SJ	SCORED JOINT, SILICONE JOINT, SLIP JOINT
SLD	SEALED
SND	SANITARY NAPKIN DISPOSAL
SNV	SANITARY NAPKIN VENDOR
SOF	SOFFIT
SPD	SOAP DISH
SPEC	SPECIFICATION
SPG	SWITCHABLE PRIVACY GLASS
SPKR	SPEAKER
SQ	SQUARE
SQ.FT.	SQUARE FOOT(FEET)
SSG	STRUCTURAL SILICONE GLAZED CURTAIN WALL
SST	STAINLESS STEEL
STA	STATION
STC	SOUND TRANSMISSION CLASS
STD	STANDARD
STL	STEEL
STN	STONE
STOR	STORAGE
STRUCT	STRUCTURAL
STS	INTERIOR ALL-GLASS SCREENS
STS-WD	WOOD ALL GLASS SCREENS
SUSP	SUSPENDED
SV	SHEET VINYL
SVF	CHEMICAL RESISTANT RESILIENT FLOORING
SYMM	SYMMETRICAL
T	TREAD
T&B	TOP & BOTTOM
T&G	TONGUE & GROOVE
T/	TOP OF
TA	TOILET ACCESSORY
TBC	TO BE CONFIRMED
TC	TRAFFIC COATING
TEL	TELEPHONE
TEMP	TEMPORARY
TER	TERRAZZO
TH	TOWEL HOOKS
THK	THICK
TI	TENANT IMPROVEMENT
TKBD	TACKBOARD
TOPO	TOPOGRAPHY, TOPOGRAPHIC
TPG	TEMPERED GLASS
TRTD	TREATED
TS	TUBE STEEL
TTD	TOILET TISSUE DISPENSER
TV	TELEVISION
TYP	TYPICAL
U	HEAT TRANSFER COEFFICIENT
U/S	UNDERSIDE
UH	UNIT HEATER
UL	UNDERWRITER'S LABORATORIES
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
UTIL	UTILITY
VB	VINYL BASE
VCT	VINYL COMPOSITION TILE
VENT	VENTILATION
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VNR	VENEER
VOL	VOLUME
VS	VISION STRIPS
VWC	VINYL WALL COVERING
W	WEST
W/	WITH
W/O	WITHOUT
WCSS	SOLID SURFACE WALL COVERING
WCV	WALL COVERING
WD	NATURAL WOOD AND VENEER FINISH
WD-LK	WOOD VENEER LOCKERS
WD-TP	WOOD VENEER TOILET PARTITIONS AND URINAL SCREENS
WG	WALL GUARD
WH	WATER HEATER
WI	WROUGHT IRON
WMP	WIRE MESH PARTITION
WPG	WIRED GLASS
WPM	MEMBRANE WATERPROOFING
WR	WASTE RECEPTACLE
WSCT	WAINSCOT
WT	WEIGHT
WW	WINDOW WALL
WWF	WELDED WIRE FABRIC
WWM	WELDED WIRE MESH
WWS	WINDOW WALL SYSTEM
X	BY
YD	YARD
YR	YEAR
ZN	ZINC

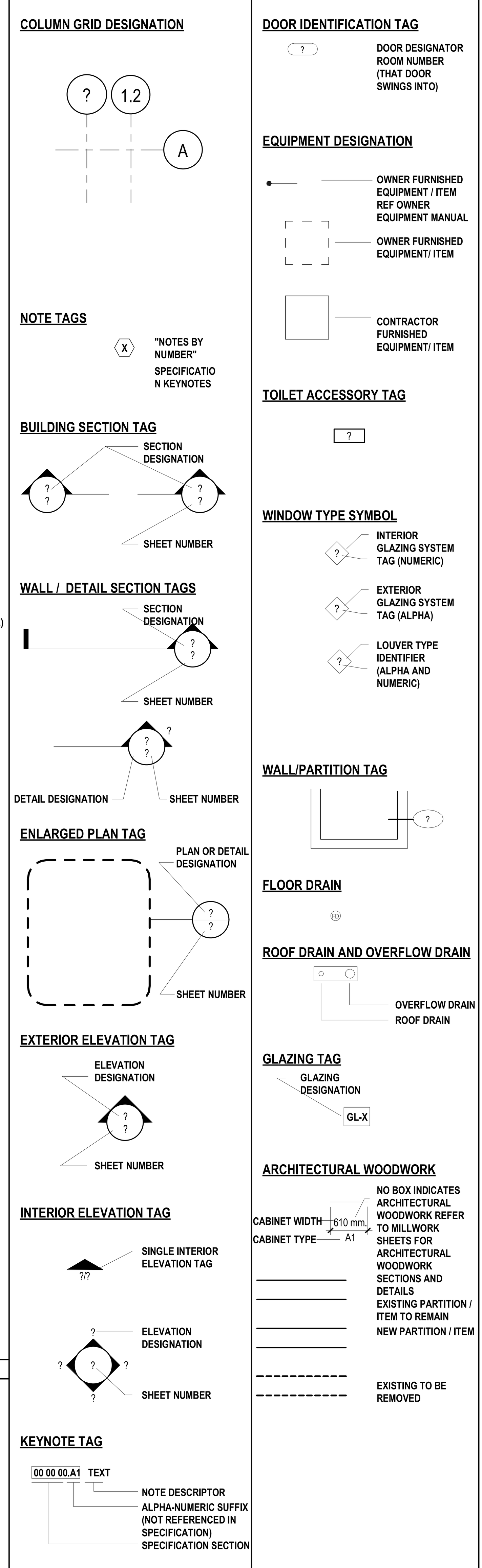
MATERIALS



SYMBOLS

&	AND
X	BY (LOWERCASE)
CL	CENTER LINE
°	DEGREE
±	PLUS OR MINUS
SF	SQUARE FEET

SYMBOLS LEGEND



GENERAL PROJECT NOTES

1. ALL KEYNOTES TO BE READ IN CONJUNCTION WITH SPECIFICATIONS. NOTES APPEAR ON VARIOUS DRAWINGS FOR DIFFERENT SYSTEMS AND MATERIALS. REVIEW ALL SHEETS AND APPLY NOTES TO RELATED BUILDING COMPONENTS. REFER TO COMPLETE SET OF ISSUED CONTRACT DOCUMENTS FOR APPLICABLE NOTES, ABBREVIATIONS, AND SYMBOLS.
2. DO NOT SCALE THE DRAWING. IF DIMENSIONS ARE IN QUESTION, OBTAIN CLARIFICATION FROM THE ARCHITECT BEFORE CONTINUING.
3. DIMENSIONS SHOWN ON THE FLOOR PLANS FOR NEW CONSTRUCTION ARE TO THE FACE OF FINISH OF INTERIOR WALLS, TO CENTER LINE OF COLUMNS AND TO FACE OF CONCRETE OR MASONRY WALLS, UNLESS OTHERWISE INDICATED. DIMENSIONS IN RENOVATED AREAS ARE FROM FINISH FACE OF EXISTING WALLS AND TO FINISH FACE OF NEW STUD WALLS, UNLESS OTHERWISE INDICATED.
4. FIELD MEASURE AND CONFIRM DIMENSIONS FOR OWNER PROVIDED EQUIPMENT AND FURNISHINGS. COORDINATE WITH THE OWNER ON DELIVERY AND INSTALLATION OF OFFICE EQUIPMENT. MINIMUM REQUIRED OPENINGS AND ACCESSIBLE ROUTES TO THE INSTALLATION AREA SHALL BE COORDINATED WITH THE SUPPLIER.
5. FINISH FLOOR ELEVATIONS ARE TO TOP OF CONCRETE SLAB UNLESS OTHERWISE NOTED.
6. COORDINATE EXACT SIZE AND PLACEMENT OF EQUIPMENT BASE AND HOUSEKEEPING PADS WITH EQUIPMENT TO BE PROVIDED.
7. WHERE NEW GYPSUM BOARD PARTITIONS ARE A CONTINUATION OF AN EXISTING PARTITION OR COLUMN ENCASEMENT, THE FACE OF THE NEW GYPSUM BOARD SHALL BE ALIGNED WITH THE FACE OF THE EXISTING SURFACE. WHERE A ONE HOUR PARTITION IS SHOWN AS A CONTINUATION OF A TWO-HOUR PARTITION OR COLUMN ENCASEMENT, THE FACE OF THE GYPSUM BOARD SHALL BE OFFSET AS REQUIRED TO PROVIDE FACE ALIGNMENT OF GYPSUM BOARD ON BOTH SIDES.
8. LEVEL FLOORS SO THAT THEY DO NOT EXCEED A ¼" VARIANCE IN A 10'-0" RADIUS.
9. PIPING LOCATED ABOVE GRADE AND INSIDE THE BUILDING SHALL BE CONCEALED IN FURRED SPACES WITH THE EXCEPTION OF PIPING IN STAIRWAYS, EQUIPMENT ROOMS AND POWERHOUSE. COORDINATE WITH OTHER TRADES TO PROVIDE FURRING FOR PIPING INSTALLED IN FINISHED AREAS.
10. ALL EXTERIOR STEEL HANDRAILS, GUARDRAILS, AND BOLLARDS SHALL BE GALVANIZED AND PAINTED UNLESS OTHERWISE NOTED.
11. PARTITION TYPES AND FIRE RESISTIVE RATINGS INDICATED ON A WALL ARE TO BE CONTINUOUS FOR THE LENGTH AND HEIGHT OF A PARTITION.
12. OPENINGS IN A RATED WALL, FLOOR, CEILING, AND/OR ROOF ASSEMBLIES SHALL BE SEALED WITH A FIRE RATED CAULKING, OR PROTECTED WITH A FIRE RATED ENCLOSURE APPROVED BY THE AUTHORITY HAVING JURISDICTION, OF EQUAL OR GREATER FIRE RESISTANCE RATING THAN THE ASSEMBLY.
13. MAINTAIN THE FIRE RATING OF CONSTRUCTION AROUND CABINETS, PANELS, AND BOXES RECESSED IN FIRE RATED WALL, FLOOR, AND CEILING ASSEMBLIES.
14. MAINTAIN THE FIRE RATING OF CONSTRUCTION AROUND NON-RATED FIXTURES INSTALLED IN FIRE RATED WALL ASSEMBLIES BY PROVIDING A RATED 5 SIDED BOX AROUND THE FIXTURE.
15. PROVIDE STIFFENERS, BRACING, BACKING PLATES AND BLOCKING REQUIRED FOR SECURE INSTALLATION OF ALL WALL/CEILING MOUNTED EQUIPMENT, FIXTURES & FURNISHINGS, TOILET PARTITIONS, DOORS AND DOOR HARDWARE, INCLUDING WALL-MOUNTED DOOR STOPS, HANDRAILS, WALL-MOUNTED SHELVES, OPERABLE PARTITIONS AND SUSPENDED MECHANICAL, ELECTRICAL & A.V. EQUIPMENT. REFER ALSO TO INTERIOR ELEVATIONS & CEILING PLANS.
16. LOCATE ACCESS PANELS AS INDICATED ON DRAWINGS. FOR ACCESS PANELS NOT SHOWN BUT REQUIRED BY PROVISIONS OF THE CONTRACT DOCUMENTS, LOCATE IN ACCORDANCE WITH APPLICABLE CODES, COORDINATE AND GROUP SERVICES TO MINIMIZE NUMBER OF REQUIRED ACCESS PANELS AND SUBMIT PROPOSED LOCATIONS TO THE ARCHITECT FOR REVIEW AND ACCEPTANCE PRIOR TO INSTALLATION.
17. IN OCCUPIABLE SPACES, ALL SERVICES ARE TO BE INSTALLED ABOVE FINISHED CEILINGS, OR ABOVE CODE REQUIRED MINIMUM HEIGHTS WHERE CEILING IS NOT PROVIDED, UNLESS NOTED OTHERWISE. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONFIRM ALL WALL PENETRATIONS / ROUTING OF SERVICES ARE POSITIONED TO ACHIEVE THIS OBJECTIVE.
18. APPROVE FLOOR OUTLET LOCATIONS WITH ARCHITECT AND BUILDING OWNER PRIOR TO CORE DRILLING.
19. OPENINGS IN A RATED WALL, FLOOR, CEILING AND ROOF ASSEMBLIES SHALL BE SEALED WITH A FIRE RESISTANT JOINT SYSTEMS OR PROTECTED WITH A FIRE RATED CHASE.
20. EXIT SIGNS AND SMOKE DETECTORS LOCATED IN CEILINGS SHALL BE POSITIONED AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION.
21. WHERE MATERIALS ARE APPLIED TO, OR ARE IN DIRECT CONTACT WITH WORK INSTALLED BY ANOTHER SUBCONTRACTOR, COMMENCEMENT OF WORK IMPLIES ACCEPTANCE OF THE SUBSTRATE AS SUITABLE FOR THE APPLICATION INTENDED.
22. ISOLATE DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.
23. INTERIOR AND EXTERIOR SEALANTS EXPOSED TO VIEW SHALL BE CUSTOM COLOR AS SELECTED BY THE ARCHITECT.
24. COORDINATE LOCATION OF SEALANT AND COMPATIBILITY OF SEALANTS WITH ADJACENT WORK, INCLUDING MATERIALS AND OTHER ONTIGUOUS SEALANTS.
25. APPLY SEALANT AT THE JUNCTURE OF INTERIOR FACES OF DOOR FRAMES, INTERIOR WINDOW FRAMES, EXTERIOR WINDOW FRAMES, CABINET WORK AND CASEWEORK WITH ADJACENT MATERIALS.
26. APPLY SEALANT AT BOTH SIDES OF ALL FLOOR, WALL AND CEILING TRACKS ON SOUND RATED STUD ASSEMBLIES W/ ACOUSTIC SEALANT.
27. SEAL FLOOR AND WALL OUTLET AND JUNCTION BOXES WITH AN ACOUSTIC SEALANT.
28. PROVIDE CONTINUOUS FREE SAFING BETWEEN FLOORS AND EXTERIOR WALL ASSEMBLIES WHERE THE EXTERIOR WALL ASSEMBLY BI-PASSES THE SLAB EDGE. FIRE RATING OF SAFING SHALL MATCH OR EXCEED THE FIRE RATING OF THE FLOOR CONSTRUCTION.
29. ACCESSORIES SUCH AS GRAB BARS, TOWEL BARS, PAPER DISPENSERS AND SOAP DISHES INSTALLED WITHIN 610MM OF A URINAL, WATER CLOSET, SINK OR LAVATORY SHALL BE MOISTURE SEALED.
30. DO NOT HANG (SUPPORT) ANY ITEMS FROM METAL ROOF DECK. IT IS ACCEPTABLE TO ATTACH, I.E. CEILING SYSTEM WIRE HANGERS FROM JOISTS AND/ OR BEAMS. IF NO JOIST OR BEAM, PROVIDE A STEEL STRIP.
31. WALL OUTLETS SHALL BE INSTALLED AT 460mm (1'-6") AFF UNLESS NOTED OTHERWISE. INSTALL SWITCH PLATES AT 1070mm (3'-6") AFF UNLESS NOTED OTHERWISE. DO NOT INSTALL OUTLET OR JUNCTION BOXES BACK-TO-BACK ON OPPOSITE SIDES OF A WALL. BOXES MUST BE SEPARATED BY A SINGULAR STUD AT MINIMUM.
32. ESCUTCHEON PLATES TO BE INSTALLED OVER ALL PLUMBING/ELECTRICAL PENETRATIONS INSIDE CABINET BACKS AND SIDE WALLS.
33. FIELD MEASURE AND CONFIRM DIMENSIONS FOR OWNER PROVIDED EQUIPMENT AND FURNISHINGS. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER ON DELIVERY AND INSTALLATION OF EQUIPMENT. MINIMUM REQUIRED OPENINGS AND ACCESSIBLE ROUTES TO THE INSTALLATION AREA SHALL BE COORDINATED WITH THE SUPPLIER.
34. CONSTRUCTION LAYOUT LINES, MARKINGS AND STAININGS TO BE REMOVED FROM ALL EXPOSED AND SEMI-EXPOSED SURFACES.
35. ALL GLASS THAT EXTEND BELOW 915mm (3'-0") ABOVE FINISHED TO BE TEMPERED SAFETY GLASS UNLESS NOTED OTHERWISE.
36. ARCHITECTURAL BUILDING ELEMENTS HAVE BEEN LOCATED / DIMENSIONED TO SPECIFICIED REFERENCE LINES / GRID LINES AS NECESSARY TO POSITION ALL ELEMENTS ON THE DRAWINGS. IT IS THE CONTRACTORS RESPONSIBILITY TO PROVIDE LAYOUT DRAWINGS SHOULD THE CONTRACTOR PREFER THE SAME ELEMENTS BE DIMENSIONED FROM THEIR SPECIFIED LOCATIONS TO OTHER GRID LINES OR SURFACES TO FACILITATE SET-OUT REQUIREMENTS ON SITE.
37. CONTRACTORS TO PROVIDE AND INSTALL ALL CODE RELATED BUILDING SIGNAGE, INCLUDING FIRE EXIT PLANS AT ALL EXITS.

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KEYPLAN

TRUE NORTH

ISSUE CHART

MARK	ISSUE	DATE
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9	ISSUED FOR SHORING & EXCAVATION PERMIT	2022-12-16

Job Number 442200

TITLE

STANDARD ABBREVIATIONS, SYMBOLS, NOTES

SHEET NUMBER

G00-01

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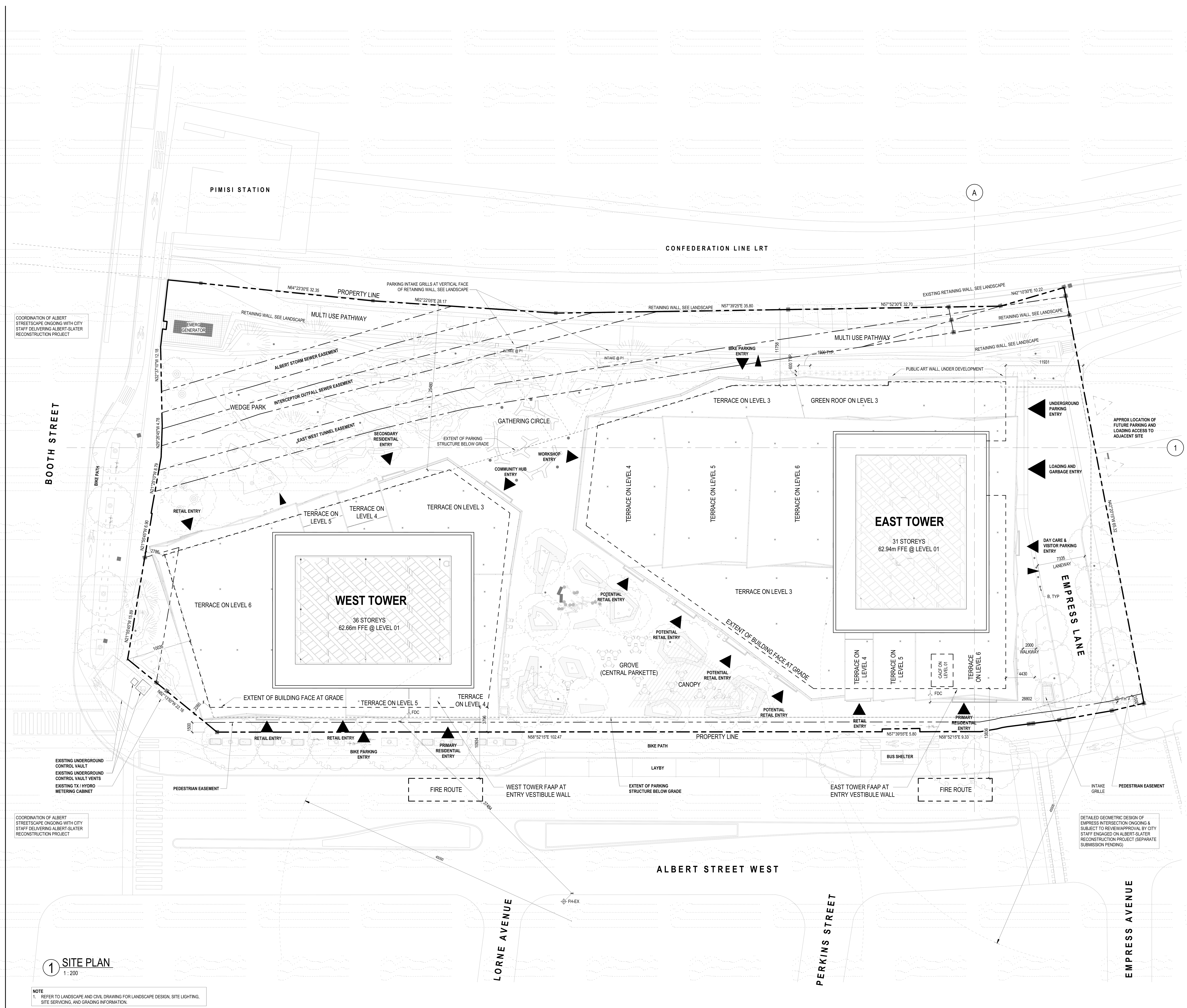

1 SITE PLAN
1 : 200

NOTE
1. REFER TO LANDSCAPE AND CIVIL DRAWING FOR LANDSCAPE DESIGN, SITE LIGHTING, SITE SERVICING, AND GRADING INFORMATION.

NOTES

SITE PLAN BASED ON TOPOGRAPHIC SURVEY BY:	STANTEC GEOMATICS LTD. 300-1331 CLYDE AVENUE, OTTAWA, ON, K2C 0A9 C/O R. G. BENNETT
DATE:	APRIL 7, 2022

SITE / ZONING DATA

	REQUIRED	PROVIDED
TOTAL LOT AREA		9,629 m^2
GROSS FLOOR AREA		38,275.26 m^2
FLOOR SPACE INDEX		3.97
LOT FRONTAGE ON ALBERT STREET		144.0 m
LOT FRONTAGE ON BOOTH STREET		77.9 m
LOT FRONTAGE ON LRT		138.6 m
LOT FRONTAGE ON EAST PROPERTY LINE		63.8 m
PROPOSED BUILDING LENGTH AT GRADE ON ALBERT STREET		
EAST TOWER (PARALLEL)		29.5 m
EAST TOWER (ANGLED)		43.3 m
WEST TOWER (PARALLEL)		42.7 m
WEST TOWER (ANGLED)		30.2 m
PROPOSED BUILDING LENGTH AT GRADE ON BOOTH STREET		
WEST TOWER		24.7 m
PROPOSED BUILDING LENGTH AT GRADE ON LRT		
EAST TOWER (PARALLEL)		42.7 m
EAST TOWER (ANGLED)		21.2 m
EAST TOWER (ANGLED)		15.2 m
WEST TOWER (PARALLEL)		46.2 m
WEST TOWER (ANGLED)		11.4 m
PROPOSED BUILDING LENGTH AT GRADE ON EAST PROPERTY LINE		
EAST TOWER		46.8 m
SETBACK DATA		
FRONT YARD (ALBERT STREET)	NO MIN	1.8 m-4.9 m
CORNER SIDE YARD SETBACK	NO MIN	0.0 m-9.9 m
EASTERLY INTERIOR SIE YARD SETBACK	9.0 m	9.8 m
REAR YARD SETBACK (LRT)	NO MIN	10 m
TOWER SETBACK FROM EASTERLY SIDE YARD	14.5 m	15.7 m
TOWER DATA		
TOWER SEPARATION	23.0 m	55.3 m
TOWER FLOORPLATE AREA	750 m^2 MAX	708 m^2
BUILDING HEIGHT		
EAST TOWER AVERAGE GRADE		62.91 m
MIDPOINT OF EAST TOWER ROOF		167.52 m
EAST TOWER BUILDING HEIGHT	110 m	104.61 m
WEST TOWER AVERAGE GRADE		62.58 m
MIDPOINT OF WEST TOWER ROOF		183.37m
WEST TOWER BUILDING HEIGHT	127 m	120.79 m

AMENITY AREA

AMENITY LOCATION	AMENITY FUNCTION	AREA
INDOOR AMENITY	COMMUNAL AMENITY	1753.91 m^2
OUTDOOR AMENITY	COMMUNAL AMENITY	2474.50 m^2
OUTDOOR AMENITY	PRIVATE AMENITY	986.16 m^2
TOTAL AMENITY SPACE		5214.57 m^2

PARKING SPACES

TYPE	REQUIRED	REQUIRED	PROPOSED
RESIDENT	N/A, MAX 1.5per	0 MIN, 910 MAX	124
RESIDENT BARRIER-FREE	N/A	0	8
TOTAL RESIDENTIAL			132
RES VISITOR	0.1/unit	61	58 (+3 B-F)
RES VISITOR BARRIER-FREE	20-99 = 1	1 of 61	3
RETAIL	N/A, MAX 10	0	8
DAY CARE	N/A	0	6
RETAIL/DAY CARE BARRIER-FREE	N/A	0	1
TOTAL VISITOR			76
GRAND TOTAL		61 MIN	208

NOTES
REFER TO A10-008 FOR FURTHER INFORMATION ON VEHICULAR PARKING SPACE SIZES AND WASTE STATISTICS.

LOADING SPACES

TYPE	REQUIRED	PROPOSED
RETAIL	0	SHARED
OTHER (DAY CARE)	1	1
RESIDENTIAL	0	SHARED
TOTAL TYP LOADING SPACES	1	1

1 TYPE G LOADING SPACE IS PROVIDED FOR WASTE COLLECTION

1 ADDITIONAL LSU LOADING SPACE IS LOCATED IN P1 FOR WEST TOWER LOADING CONVENIENCE

BICYCLE PARKING SPACES

TYPE	PROVISION	REQUIRED	PROPOSED
REQUIRED SPACES			
RESIDENTIAL	0.5/unit	304	
RETAIL	1/250 m^2	6	
DAY CARE	1/250 m^2	5	
TOTAL REQUIRED		315	
PROVIDED SPACES			
INTERIOR SECURE SPACES	MIN 25%	79	640
EXTERIOR SPACES	MAX 50%	N/A	132
TOTAL PROVIDED			772
NUMBER OF SPACES ABOVE AT GROUND LEVEL HORIZONTAL	50% of REQD	158	
INTERIOR			26
EXTERIOR			132
TOTAL			158

STORAGE LOCKERS

TOTAL: 350

SITE PLAN LEGEND

AD	AREA DRAIN
APS	ACCESSSIBLE PARKING SIGNAGE
AW	AREA WELL (GRATE POROSITY LESS THAN 20mm x 20mm)
B	BOLLARD
B-F	BARRIER-FREE
BR	BIKE RACK (SEE LANDSCAPE)
CB	CATCH BASIN
CW	CONCRETE WALKWAY
DC	DEPRESSED CURB
EX-CW	EXISTING CONCRETE WALKWAY
EX-LS	EXISTING LIGHT STANDARD
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FH-EX	FIRE HYDRANT - EXISTING
FR	FIRE ROUTE SIGNAGE
HB	HOSE BIB (SEE MECHANICAL)
MH	MAN HOLE
NIC	NOT IN CONTRACT
TD	TRENCH DRAIN

PRIMARY ENTRY/EXIT

EXIT

PROPERTY AND EASEMENT LINES

FIRE ROUTE

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Job Number 442200

TITLE

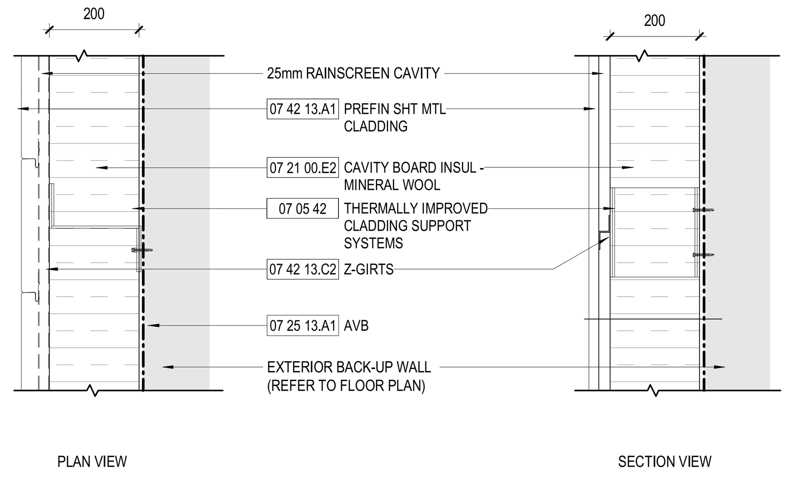
SITE PLAN & STATISTICS

SHEET NUMBER

G01-01

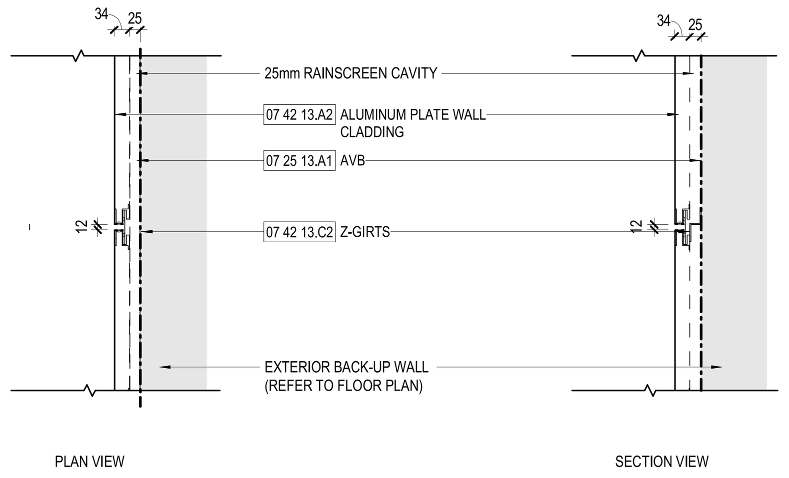
Site Plan Control Application File Nos.: D01-01-22-0005, D02-02-22-0041 & D07-12-22-0069

EW8 - VERTICAL PREFINISHED METAL SIDING



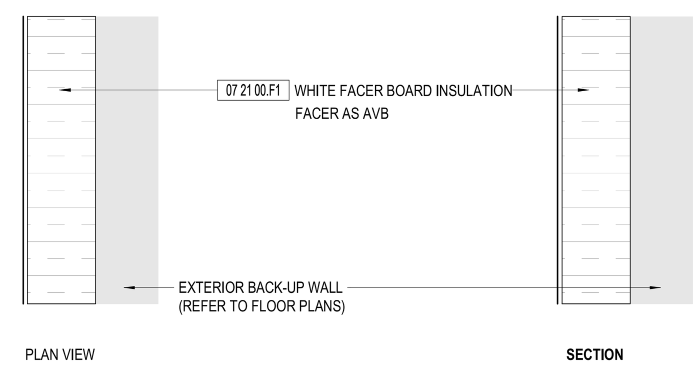
WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
EW8.1	REFER TO ELEVATION	M-07		R-34/RSI-5.9	

EW4 - ALUMINUM PLATE CLADDING - UNINSULATED



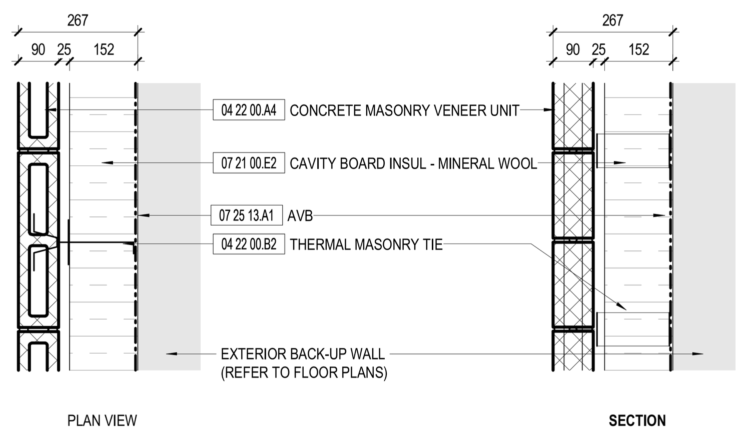
WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
EW4.1	REFER TO ELEVATION	M-06		N/A	

EW7 - BOARD INSULATION WITH FACER (INTERIOR INSULATED)



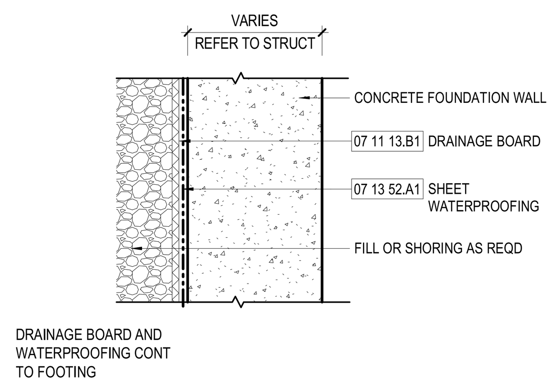
WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
EW7.1	N/A	WHITE		152mm/R25	ENSURE CONTINUITY OF AVB BETWEEN ADJACENT HORIZONTAL AND VERTICAL ASSEMBLIES

EW3 - CONCRETE MASONARY VENEER UNIT



WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
EW3.1	267	PT FINISH		152mm/R25	
EW3.2					REPLACE CMU W/ CEMENT BOARD

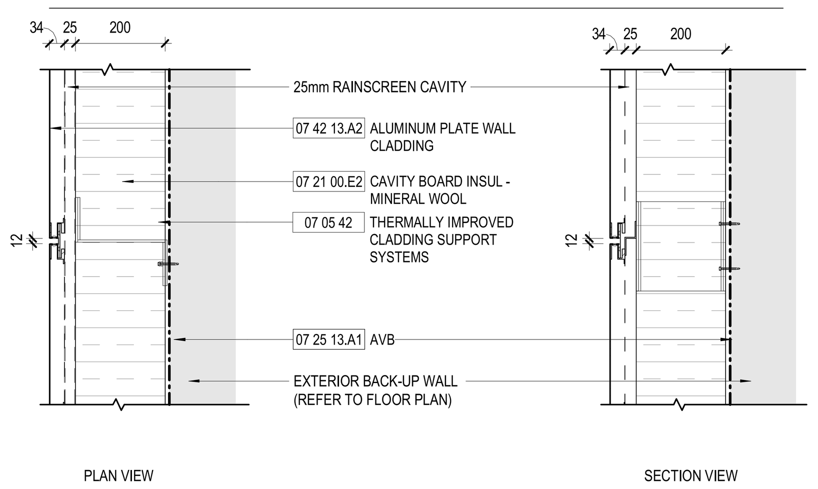
EW6 FOUNDATION WALL - UNINSULATED



NOTE: SEE SHORING PACKAGE FOR SHORING INFORMATION. SEE DRAWING A18-00 FOR FOUNDATION DRAINAGE SYSTEM

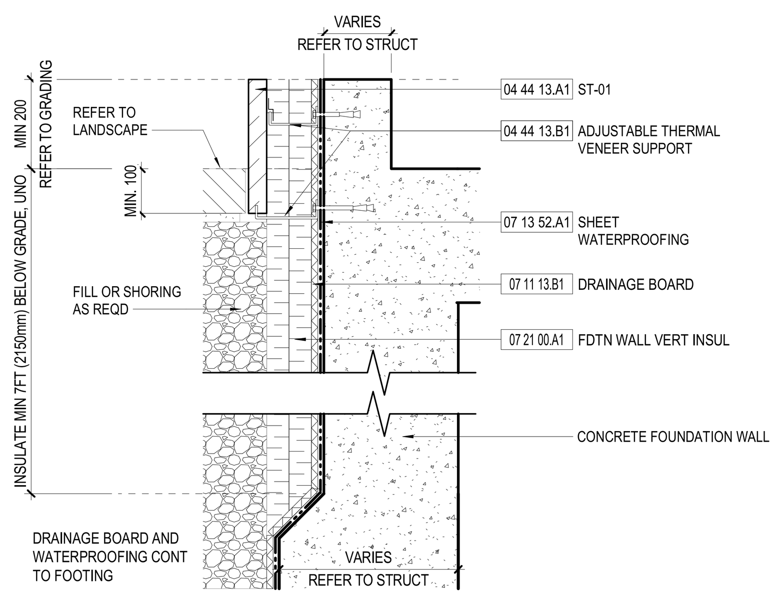
WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
EW6.1				N/A	

EW1/EW2 - ALUMINUM PLATE WALL CLADDING



WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
EW1.1	REFER TO ELEVATION	M-01-M-05		R-34/RSI-5.9	TOWER CLADDING
EW2.1	REFER TO ELEVATION	M-06		R-34/RSI-5.9	PODIUM CLADDING

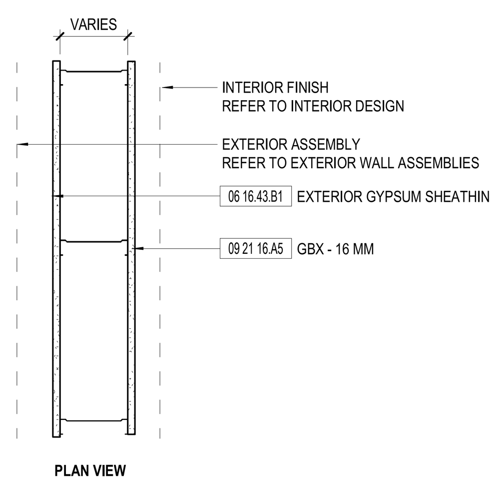
EW5 - FOUNDATION WALL - BLINDSIDE



NOTE: SEE SHORING PACKAGE FOR SHORING INFORMATION. SEE DRAWING A18-00 FOR FOUNDATION DRAINAGE SYSTEM

WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
EW5.1				100mm/R-20	INSULATE AS NOTED ABOVE
EW5.2				100mm/R-20	INSULATE FULL HEIGHT OF WALL

B3 - STEEL STUD BACK-UP WALL



PLAN VIEW

WALL TYPE	SIZE	COLOUR	FIRE RATING	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
B3.1	92mm				ENGRD MTL STUD FRMG SIZE TO BE CONFIRMED BY ENGRD MTL STUD FRMG ENGINEER
B3.2	152mm				
B3.3	203mm				
B3.4	254mm				

ASSEMBLIES GENERAL NOTES

1. FOR GENERAL NOTES, SYMBOLS, AND ARCHITECTURAL ABBREVIATIONS REFER TO SHEET A00-01
2. ALL WALL/ROOF/FLOOR/FOUNDATION/PARAPET/SOFFIT ASSEMBLIES TO BE READ IN CONJUNCTION WITH PLANS, SECTIONS AND DETAILS.
3. REFER TO FINISH SCHEDULE AND INTERIOR DESIGN DOCUMENTS FOR ALL FINISHES.
4. SUBSTITUTE EQUAL THICKNESS WATER RESISTANT TILE BACKER BOARD FOR GYPSUM WALL BOARD BEHIND ALL TILED SURFACES IN INTERNAL WASHROOMS
5. SUBSTITUTE EQUAL THICKNESS TYPE X FIRE RATED WATER-RESISTANT TILE BACKER BOARD FOR TYPE X GYPSUM WALL BOARD BEHIND TILED SURFACES AT ALL RATED PARTITIONS IN INTERNAL WASRHOOMS.
6. WHERE 2 LAYERS OF GYPSUM WALLBOARD IS SPECIFICED, HORIZONTAL AND VERTICAL JOINTS ARE TO BE STAGGERED BY A MINIMUM OF 400mm (16")
7. USE WATER RESISTANT GWB AT ALL WASHROOM CEILINGS
8. INSTALL 19mm (3/4") FIRE RATED PLYWOOD OVER GYPSUM WALL BOARD PARTITIONS, FROM 100mm (4") TO 2400 (8'-0") A.F.F., IN ALL TELEVISION, TELECOM & DATA ROOMS.
9. CONTRACTOR TO COORDINATE ALL ARCHITECTURAL WALL TYPES WITH MECHANICAL AND ELECTRICAL SERVICES AND NOTIFY ARCHITECT OF LOCATIONS WHERE SPECIFIED STUD WIDTH NEEDS TO BE INCREASED TO ACCOMODATE SAID SERVICES
10. CONTRACTOR TO ENSURE THAT REQUIREMENTS FOR THE ANCHORAGE AND SEISMIC RESTRAINT OF ALL NON –LOAD BEARING PARTITIONS CONFORM TO THE LATEST EDITION OF THE PROJECT'S JURISDICTION BYLAW. ALLOW FOR ALL COSTS OF THIS WORK INCLUDING ANY REQUIRED PROFESSIONAL ENGINEERING.
11. NO AIR CAVITY TO EXCEED 25mm (1") IN ALL WALLS WHERE FOAMED IN PLACE INSULATION IS USED.
12. TRANSITION MEMBRANES TO BE INSTALLED AT ALL CHANGES IN SUBSTRATE BEHIND FOAMED IN PLACE INSULATION. PROVIDE MINIMUM 100mm (4") MEMBRANE LAP ONTO EACH SUBSTRATE.
13. ALL ARCHITECTURAL CONCRETE TO BE CAST WITH UNCHAMFERED CORNERS UNLESS NOTED OTHERWISE.

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TITLE

EXTERIOR WALL ASSEMBLIES

SHEET NUMBER

A00-11

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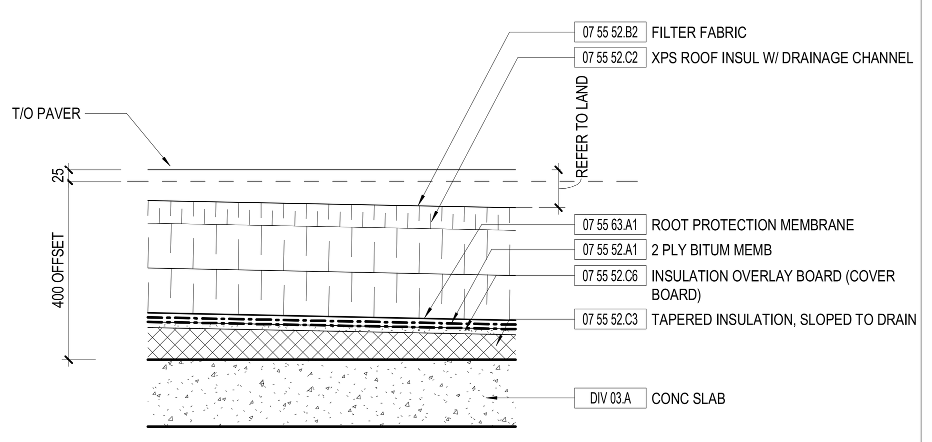
ROOFS

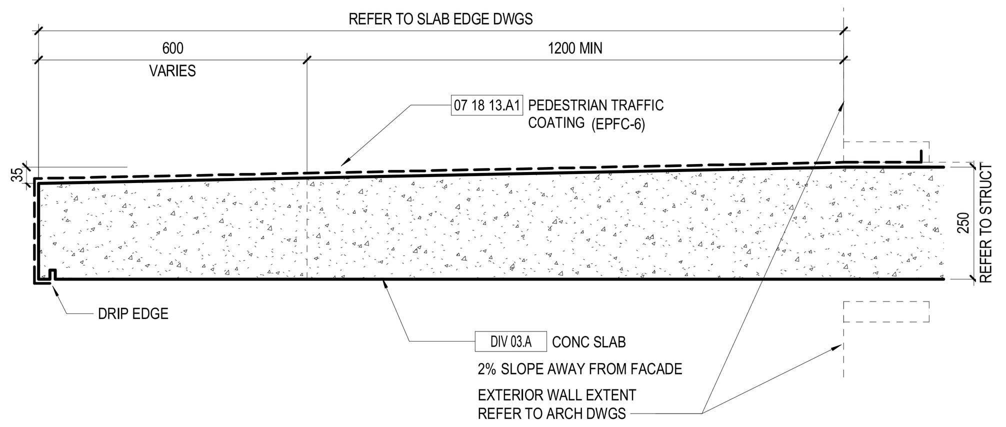
RF2 - TERRACE ROOF PODIUM

NOTE
REFER TO LANSCAPE FOR BUILD UP ABOVE FILTER FABRIC



TYPE	FIRE RATING/ TEST NO	INSULATION THICKNESS	ADDITIONAL COMMENTS
RF2	N/A	250mm + TAPER / R-60	

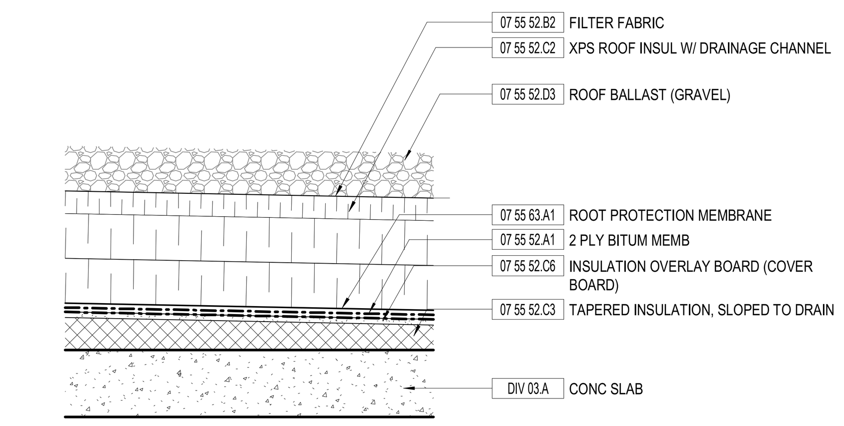
RF4 - UNINSULATED BALCONY



TYPE	FIRE RATING/ TEST NO	INSULATION THICKNESS	ADDITIONAL COMMENTS
RF4	-		

RF1 - PROTECTED MEMBRANE ROOF WITH BALLAST

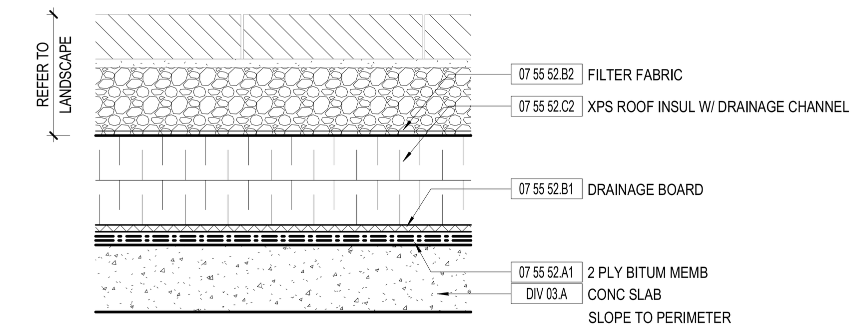
NOTE
REFER TO LANSCAPE FOR BUILD UP ABOVE FILTER FABRIC



TYPE	FIRE RATING/ TEST NO	INSULATION THICKNESS	ADDITIONAL COMMENTS
RF1	N/A	250mm + TAPER / R-60	

RF3B - INVERTED PLAZA ROOF - PRECAST UNIT PAVERS AND PLANTINGS

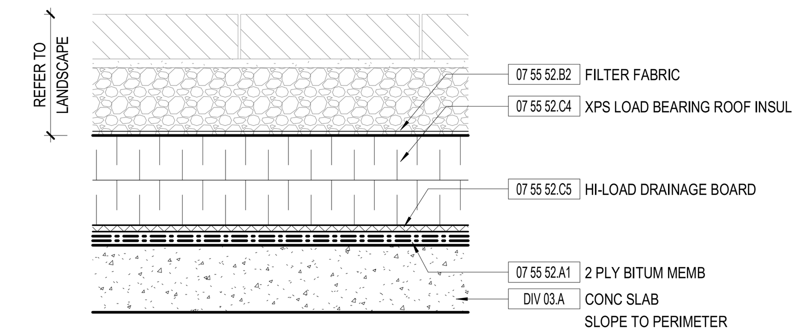
NOTE
REFER TO LANSCAPE FOR BUILD UP ABOVE FILTER FABRIC



TYPE	FIRE RATING/ TEST NO	INSULATION THICKNESS	ADDITIONAL COMMENTS
RF3B	N/A	203mm	

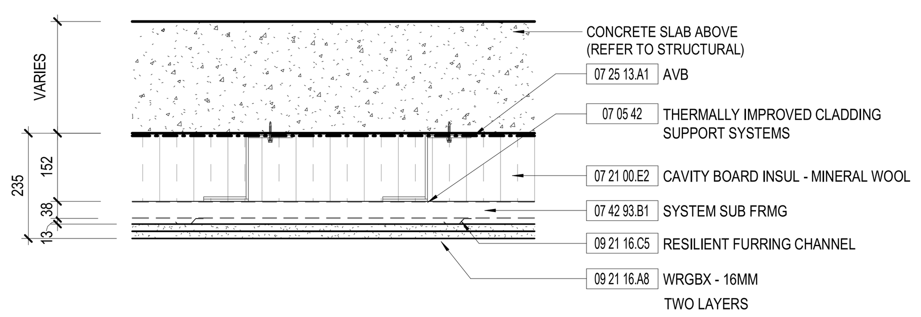
RF3A - INVERTED PLAZA ROOF - PRECAST UNIT PAVERS AND PLANTING @ DRIVEWAY

NOTE
REFER TO LANSCAPE FOR BUILD UP ABOVE FILTER FABRIC



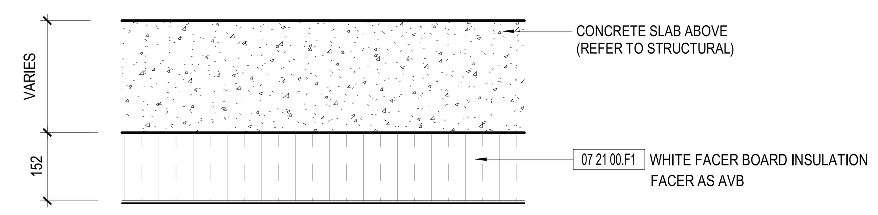
TYPE	FIRE RATING/ TEST NO	INSULATION THICKNESS	ADDITIONAL COMMENTS
RF3A	N/A	203mm	

SF6 INSULATED ACOUSTIC GYPSUM BOARD SOFFIT



SOFFIT TYPE	DEPTH	COLOUR	FRR	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
SF5.1	235mm	PT FINISH	N/A	152mm/R-25	

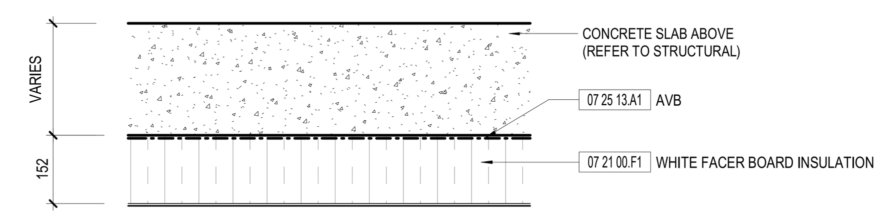
SF5 BOARD INSULATION WITH FACER (INTERIOR INSULATED)



SOFFIT TYPE	DEPTH	COLOUR	FRR	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
SF5.1		WHITE	N/A	152mm/R-25	
			N/A	N/A	

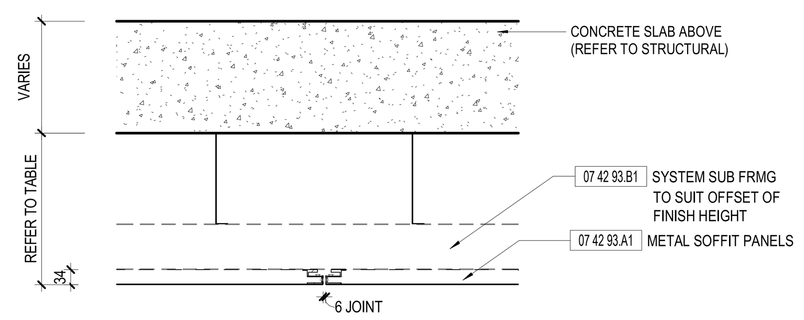
SOFFITS

SF4 BOARD INSULATION WITH FACER



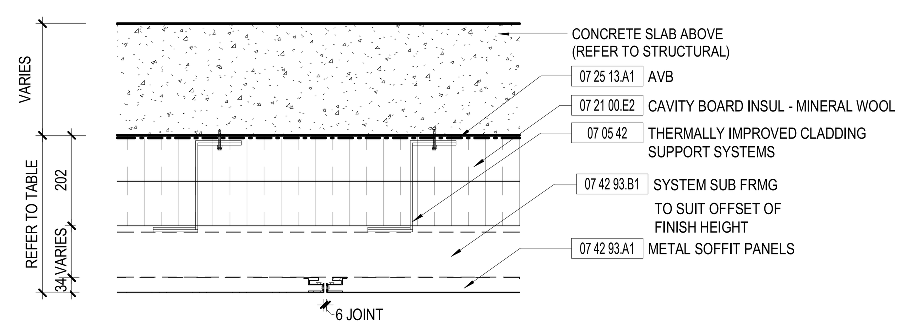
SOFFIT TYPE	DEPTH	COLOUR	FRR	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
SF4.1		WHITE	N/A	152mm/R-25	

SF3 UNINSULATED ALUMINIUM PLATE COLD SOFFIT



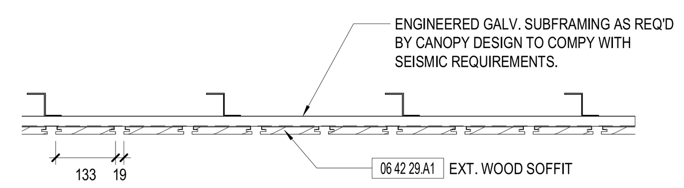
SOFFIT TYPE	DEPTH	COLOUR	FRR	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
SF3.1	895mm	TO MATCH ADJACENT GUARD	N/A	N/A	LEVEL 3, 4 AND 5
SF3.2	2005mm	TO MATCH ADJACENT GUARD	N/A	N/A	LEVEL 2,3 AND 4

SF2 INSULATED ALUMINIUM PLATE COLD SOFFIT



SOFFIT TYPE	DEPTH	COLOUR	FRR	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
SF2.1	345mm	TO MATCH GUARD	N/A	204mm/R-40	LEVEL 3, 4 AND 5
SF2.2	1455mm	AG-1.1	N/A	204mm/R-40	LEVEL 2
SF2.3		M-07	N/A	204mm/R-40	LEVEL 6 TOWER

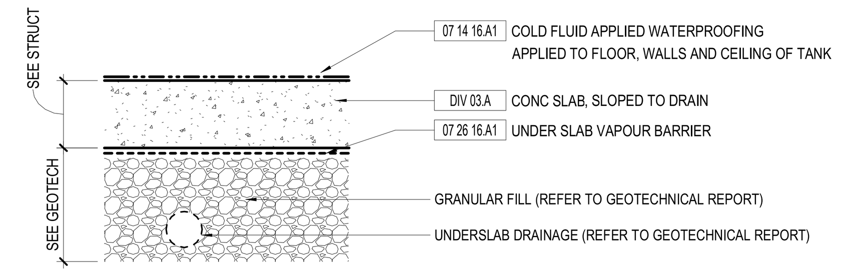
SF1 - EXTERIOR WOOD TONGUE AND GROOVE SOFFIT (UNINSULATED)



SOFFIT TYPE	DEPTH	COLOUR	FRR	INSULATION/ R-VALUE	ADDITIONAL COMMENTS
SF1.1		TEAK STAIN			

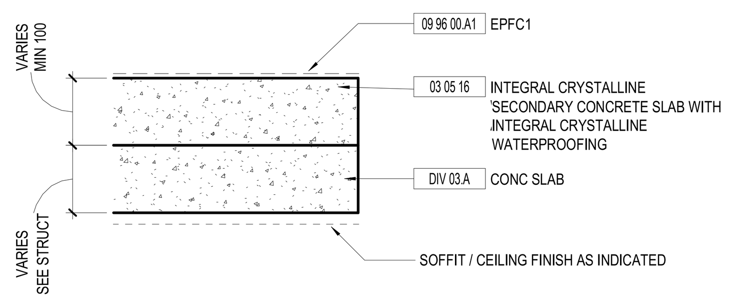
FLOORS

FL6 - CONCRETE SLAB @ CISTERN



TYPE	FIRE RATING/ TEST NO	ACOUSTIC PROPERTIES		ADDITIONAL COMMENTS
		STC	INSUL THK	
FL6	-	-		-

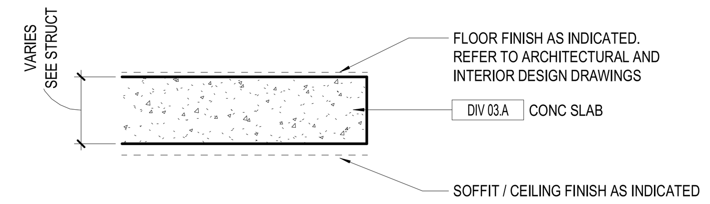
WEARING SLAB OVER CONCRETE SUSPENDED SLAB - LOADING BAY



TYPE	FIRE RATING/ TEST NO	ACOUSTIC PROPERTIES		ADDITIONAL COMMENTS
		STC	INSUL THK	
FL4	2HR / SEE STRUCT	-		-

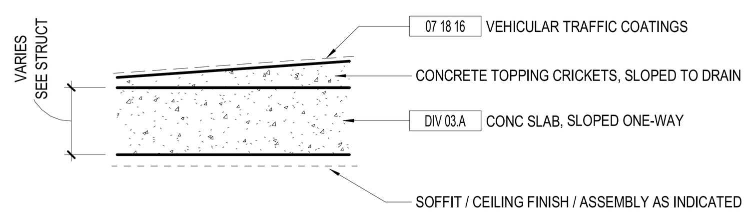
FL3 - CONCRETE SUSPENDED SLAB - BUILDING

NOTE
REFER TO SLAB EDGE DRAWINGS FOR DEPRESSIONS



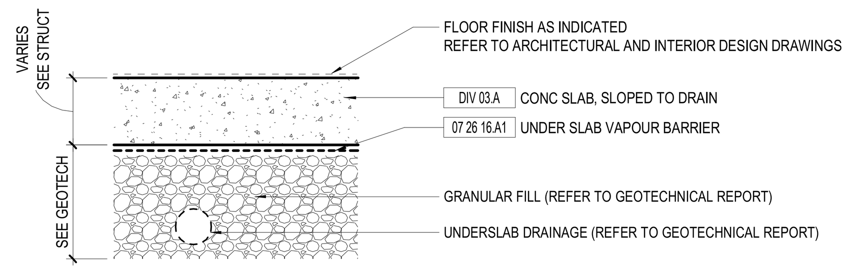
TYPE	FIRE RATING/ TEST NO	ACOUSTIC PROPERTIES		ADDITIONAL COMMENTS
		STC	INSUL THK	
FL3	2HR / SEE STRUCT	-		-

FL2 - CONCRETE SUSPENDED SLAB - PARKADE



TYPE	FIRE RATING/ TEST NO	ACOUSTIC PROPERTIES		ADDITIONAL COMMENTS
		STC	INSUL THK	
FL2	2HR / SEE STRUCT	-		-

FL1 - CONCRETE SLAB ON GRADE



TYPE	FIRE RATING/ TEST NO	ACOUSTIC PROPERTIES		ADDITIONAL COMMENTS
		STC	INSUL THK	
FL1	-	-		-

ASSEMBLIES GENERAL NOTES

1. FOR GENERAL NOTES, SYMBOLS, AND ARCHITECTURAL ABBREVIATIONS REFER TO SHEET A00-01
2. ALL WALL/ROOF/FLOOR/FOUNDATION/PARAPET/SOFFIT ASSEMBLIES TO BE READ IN CONJUNCTION WITH PLANS, SECTIONS AND DETAILS.
3. REFER TO FINISH SCHEDULE AND INTERIOR DESIGN DOCUMENTS FOR ALL FINISHES.
4. SUBSTITUTE EQUAL THICKNESS WATER RESISTANT TILE BACKER BOARD FOR GYPSUM WALL BOARD BEHIND ALL TILED SURFACES IN INTERNAL WASHROOMS
5. SUBSTITUTE EQUAL THICKNESS TYPE X FIRE RATED WATER-RESISTANT TILE BACKER BOARD FOR TYPE X GYPSUM WALL BOARD BEHIND TILED SURFACES AT ALL RATED PARTITIONS IN INTERNAL WASRHOOMS.
6. WHERE 2 LAYERS OF GYPSUM WALLBOARD IS SPECIFICED, HORIZONTAL AND VERTICAL JOINTS ARE TO BE STAGGERED BY A MINIMUM OF 400mm (16")
7. USE WATER RESISTANT GWB AT ALL WASHROOM CEILINGS
8. INSTALL 19mm (3/4") FIRE RATED PLYWOOD OVER GYPSUM WALL BOARD PARTITIONS, FROM 100mm (4") TO 2400 (8'-0") A.F.F., IN ALL TELEVISION, TELECOM & DATA ROOMS.
9. CONTRACTOR TO COORDINATE ALL ARCHITECTURAL WALL TYPES WITH MECHANICAL AND ELECTRICAL SERVICES AND NOTIFY ARCHITECT OF LOCATIONS WHERE SPECIFIED STUD WIDTH NEEDS TO BE INCREASED TO ACCOMODATE SAID SERVICES
10. CONTRACTOR TO ENSURE THAT REQUIREMENTS FOR THE ANCHORAGE AND SEISMIC RESTRAINT OF ALL NON –LOAD BEARING PARTITIONS CONFORM TO THE LATEST EDITION OF THE PROJECT'S JURISDICTION BYLAW. ALLOW FOR ALL COSTS OF THIS WORK INCLUDING ANY REQUIRED PROFESSIONAL ENGINEERING.
11. NO AIR CAVITY TO EXCEED 25mm (1") IN ALL WALLS WHERE FOAMED IN PLACE INSULATION IS USED.
12. TRANSITION MEMBRANES TO BE INSTALLED AT ALL CHANGES IN SUBSTRATE BEHIND FOAMED IN PLACE INSULATION. PROVIDE MINIMUM 100mm (4") MEMBRANE LAP ONTO EACH SUBSTRATE.
13. ALL ARCHITECTURAL CONCRETE TO BE CAST WITH UNCHAMFERED CORNERS UNLESS NOTED OTHERWISE.

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KEYPLAN

TRUE NORTH

ISSUE CHART

MARK	ISSUE	DATE
3	ISSUED FOR 100% SD	2022-06-10
4	ISSUED FOR 66% DD	2022-08-19
5	ISSUED FOR 100% DD	2022-09-30
8	ISSUED FOR FOUNDATION REVIEW	2022-12-09
9	ISSUED FOR SHORING & EXCAVATION PERMIT	2022-12-16

Job Number 442200

TITLE

FLOOR, SOFFIT & ROOF ASSEMBLIES

SHEET NUMBER

A00-12

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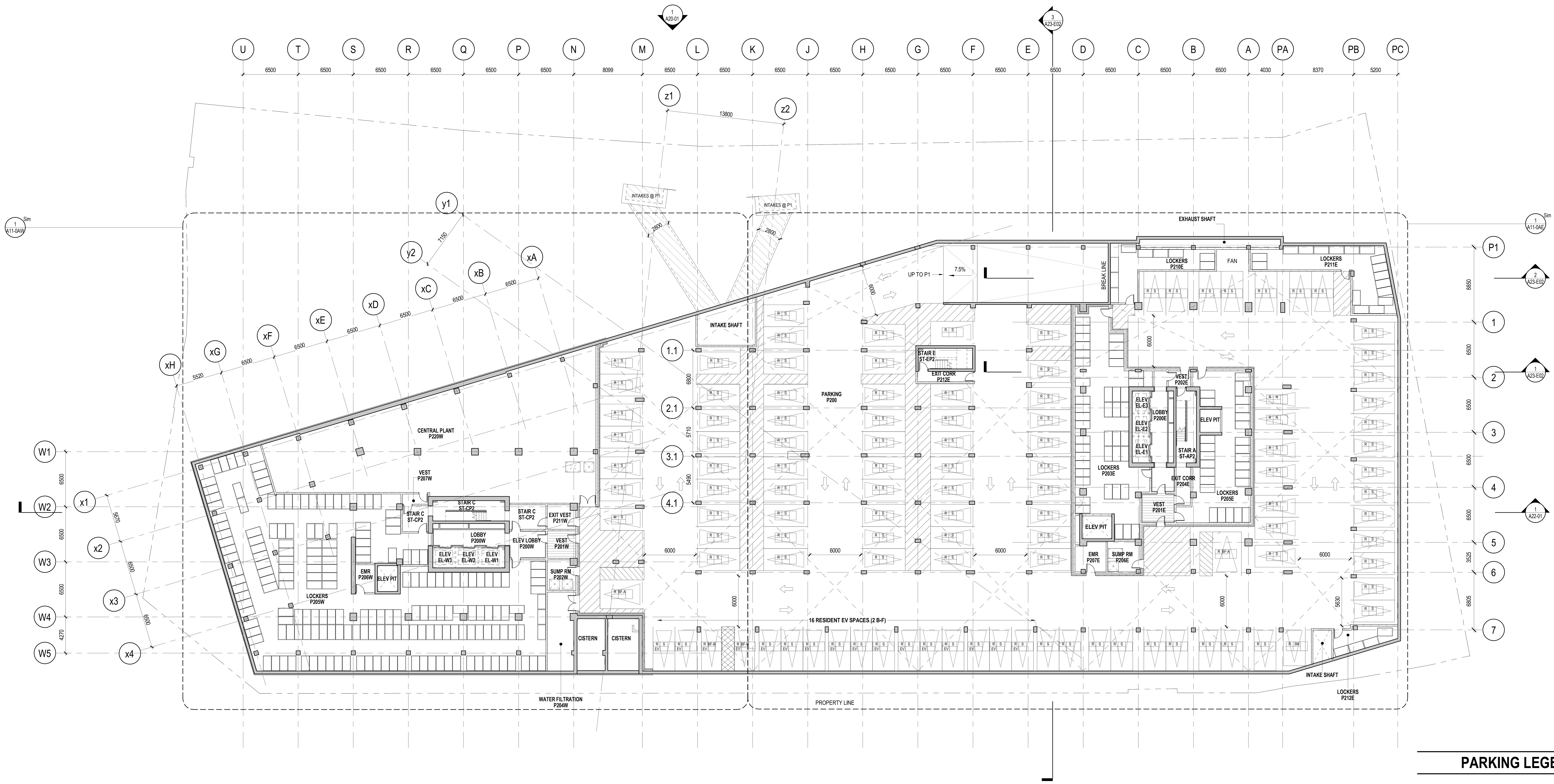

1 OVERALL FLOOR PLAN - LEVEL P2
1 : 200

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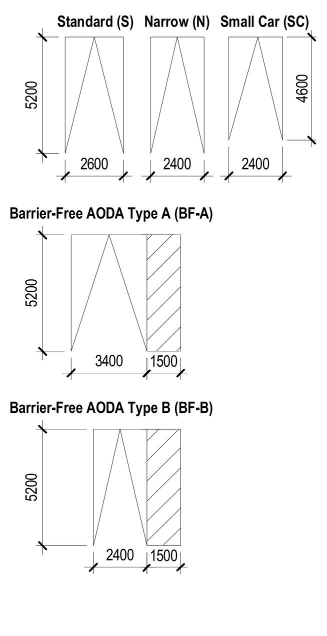
PARKING LEGEND



Parking Space Types:

**Standard (S) - Space abutting columns/walls
5.2m (D) x 2.6m (W)**

**Narrow (N)- Space with no obstructions
5.2m (D) x 2.4m (W)**

**Small Car (SM)- Space abutting columns/walls with reduced length.
4.6m (D) x 2.4m (W)**

**"V" denotes visitor parking
"R" denotes residents parking
"C" denotes retail/daycare parking
"EV" denotes spaces with electric vehicle charging stations, refer to electrical**

Parking space types determined per City of Ottawa By-Law 2008-250.

Barrier-Free space types determined by AODA

Job Number 442200

TITLE

LEVEL P2 FLOOR PLAN

SHEET NUMBER

A10-00A

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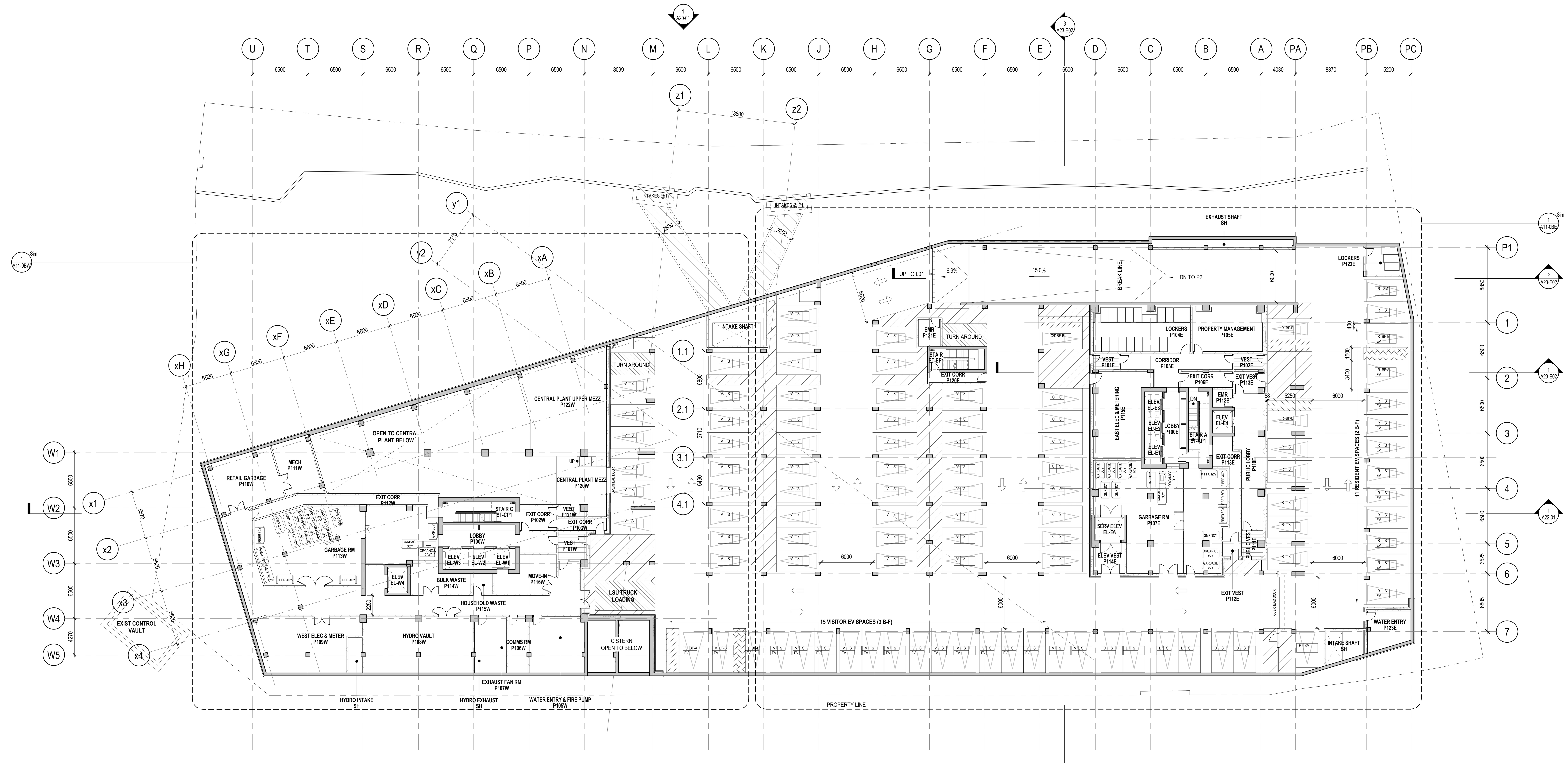
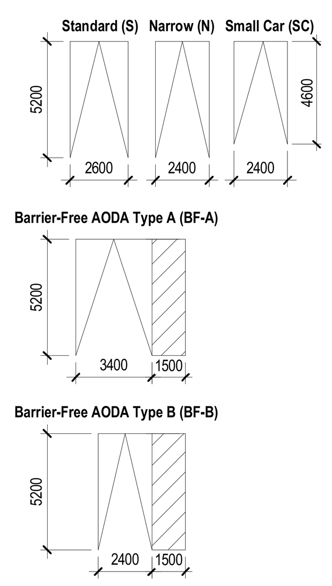


1 OVERALL FLOOR PLAN - LEVEL P1

1 : 200

PARKING LEGEND



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"V" denotes visitor parking
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"EV" denotes spaces with electric vehicle charging stations, refer to electrical

Parking space types determined per City of Ottawa By-Law 2008-250.

Barrier-Free space types determined by AODA

PARKING CALCULATIONS

Visitor Parking
0.1 x 608 units = 61 spaces required

Barrier-Free Parking
Public Parking Spaces = Spaces to be Reserved for Persons with Disabilities
20-99 = 1 visitor parking space is required to be barrier-free

Rates and quantities determined per City of Ottawa By-Law 2008-250

Barrier-Free Parking AODA
Public Parking Spaces = Spaces to be Reserved for Persons with Disabilities
12-100 = 4%
61 = 3 visitor parking spaces are required to be barrier-free
(1 Type A, 2 Type B)

EV Parking
Minimum 20% of parking spaces to be provided with EV charging facilities
206 x 20% = 42 spaces

EV Parking Count:
P1 26 spaces
P2 16 spaces
Total: 42 spaces

PARKING SCHEDULE

Level	Type	Count
LEVEL P1	Barrier Free Commercial (AODA Type B)	1
LEVEL P1	Barrier Free Resident (AODA Type A)	1
LEVEL P1	Barrier Free Resident (AODA Type B)	3
LEVEL P1	Barrier Free Visitor (AODA Type A)	1
LEVEL P1	Barrier Free Visitor (AODA Type B)	2
LEVEL P1	Comm (2.6m)	8
LEVEL P1	Daycare (2.6m)	6
LEVEL P1	Residents (2.6m)	15
LEVEL P1	Residents Small Car (2.6mX4.6M)	2
LEVEL P1	Visitor (2.6m)	58
97		
LEVEL P2	Barrier Free Resident (AODA Type A)	2
LEVEL P2	Barrier Free Resident (AODA Type B)	2
LEVEL P2	Residents (2.4m)	2
LEVEL P2	Residents (2.6m)	104
LEVEL P2	Residents Small Car (2.6mX4.6M)	1
111		

GRAND TOTAL: 208

WASTE CALCULATIONS

RESIDENTIAL WASTE COLLECTION:

WEST TOWER

GARBAGE
335 units x 0.053 yards
= 17.8 yards/3CY = 6 bins

FIBER
335 units x 0.038 yards
= 12.7 yards/3CY = 5 bins

GMP
335 units x 0.018 yards
= 6.1 yards/3CY = 3 bins

ORGANICS
335 units / 50
= 7 x 240L bins

EAST TOWER

GARBAGE
273 units x 0.053 yards
= 14.5 yards/3CY = 5 bins

FIBER
273 units x 0.038 yards
= 10.4 yards/3CY = 4 bins

GMP
273 units x 0.018 yards
= 4.9 yards/3CY = 2 bins

ORGANICS
273 units / 50
= 6 x 240L bins

LOCKER SCHEDULE

Level	Count
LEVEL 04	2
LEVEL 02	37
LEVEL P1	22
LEVEL P2	291

GRAND TOTAL: 352

OVERALL PLAN NOTES

1. ALL AREA MEASUREMENTS ARE SHOWING GROSS FLOOR AREA AND ARE CALCULATED AS PER GROSS FLOOR AREA DEFINITION IN THE CITY OF OTTAWA'S ZONING BY-LAW NO.2008-250

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9	ISSUED FOR SHORING & EXCAVATION PERMIT	2022-12-16

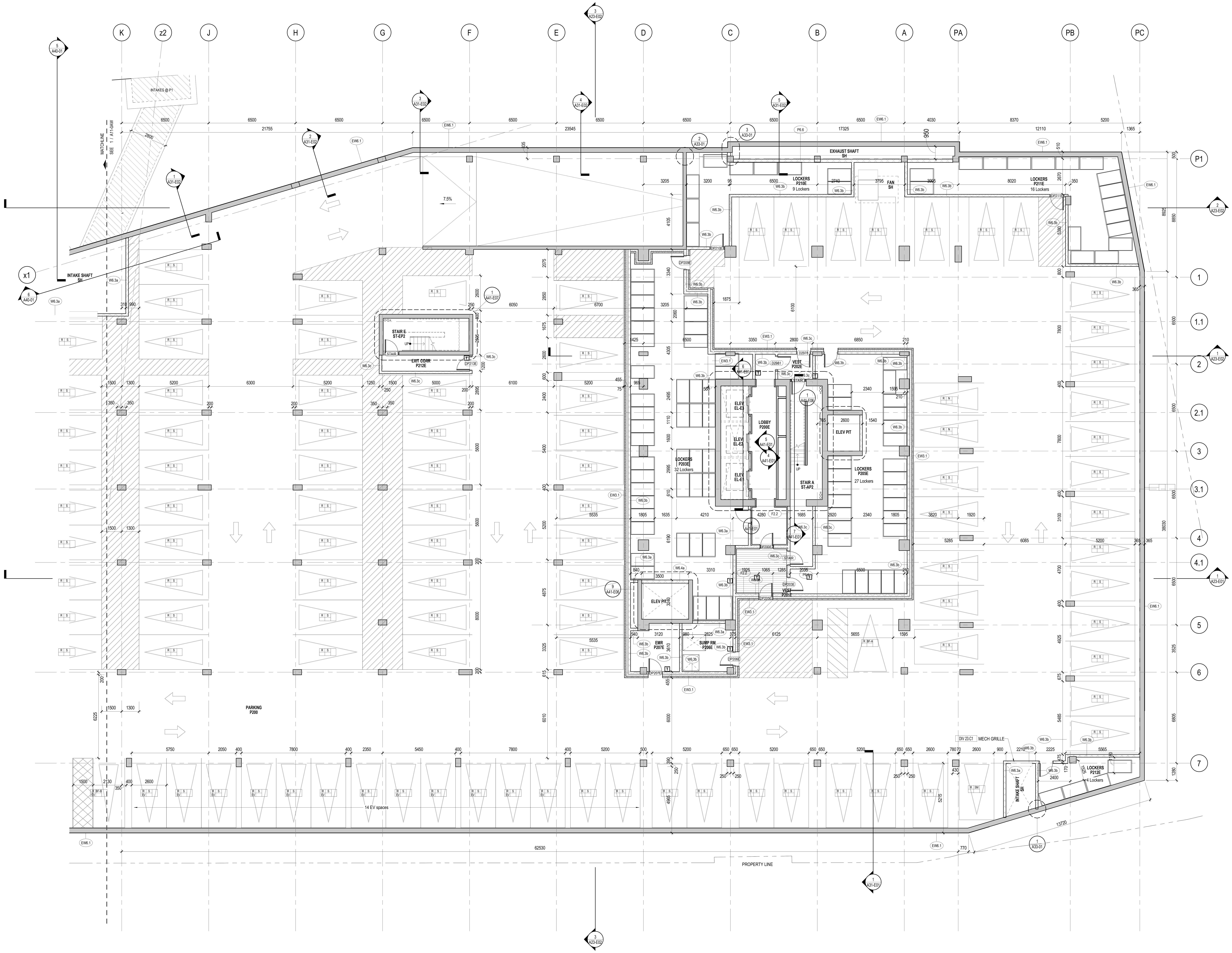
Job Number 442200

TITLE

LEVEL P1 FLOOR PLAN

SHEET NUMBER

A10-00B



1 LEVEL P2, EAST
1 : 100

PARKING GENERAL NOTES

1. FOR GENERAL NOTES, SYMBOLS, AND ARCHITECTURAL ABBREVIATIONS REFER TO SHEET A00-01
2. 2300mm (7'-6 ½") CLEAR HEIGHT SHALL BE MAINTAINED FROM THE ENTRANCE TO THE CAR PARK, THROUGH THE MANOUEVERING AISLE AND INTO EACH ACCESSIBLE PARKING STALL. ELSEWHERE A 2100mm (6'-11") CLEAR HEIGHT SHALL BE MAINTAINED THROUGHTOUT THE CAR PARK TO THE U/S OF STRUCTURE, DUCTS, PIPES AND CONDUITS, UNLESS NOTED OTHERWISE.
3. MECHANICAL AND ELECTICAL DRAWINGS INDICATE THE GENERAL LOCATION AND ROUTE TO BE FOLLOWED FOR PIPES, DUCTS, CONDUITS, ETC. INSTALLATION OF SERVICES IS TO CONSERVE HEADROOM AND INTERFERE AS LITTLE AS POSSIBLE WITH THE FREE USE OF THE SPACE THROUGH WHICH THEY PASS. KEEP ALL DUCTS, PIPES, ETC. AT THE CEILING AS TIGHT AS POSSIBLE TO THE UNDERSIDE OF SLAB, BEAM OR OTHER LIMITING MEMBERS. RELOCATE AS NECESSARY TO MAINTAIN MINIMUM 2300mm (7'-6 ½") CLEAR FOR H.C. PARKING AND MANOUEVERING AISLES AND 2100mm (6'-11") CLEAR ELSEWHERE. NOTIFY THE ARCHITECT OF REVISIONS BEFRORE PROCEEDING WITH FABRICATION AND/OR INSTALLATION.
4. PROVIDE 9mm (3/8") WELDED METAL PLATE GUARDS AROUND ALL SINGLE VERTICAL PIPES AND CONDUITS AGAINST WALLS OR COLUMNS FROM 200mm (8") TO 1220mm (4'-0") ABOVE THE FLOOR. GUARD TO BE PAINTED YELLOW. CLEAN-OUTS TURNED PARALLEL WALL / COLUMN.
5. PROVIDE 5mm X 50mm (3/16" X 2") DIAMETER PAINTED PIPE GUARD AROUND ALL GANGED SERVICES OR EQUIPMENT FROM 300mm (1'-0") TO 915mm (3'-0") ABOVE THE FLOOR. GUARDS TO BE PAINTED YELLOW AND DESIGNED TO PERMIT FOR DOORS / PANELS TO BE FULLY OPENED.
6. PROVIDE 50mm X 100mm X 6mm (2" X 4" X ¼") ANGLES EITHER SIDE OF THE PANIC ALARM STATIONS. HEIGHT OF ANGLES TO MATCH PANIC ALARM HEIGHT, EDGES GROUND SMOOTH AND ANGLES TO BE PAINTED RED.
7. PROVIDE A 100mm (4") CHAMFERED CORNER COMPLETE WITH A CONTINUOUS 100mm (4") WIDE BLACK/YELLOW REFLECTIVE TAPE TO THE CHAMFERED CORNER OF ALL STRUCTURE / SERVICES BELOW 2000mm (6'-7") ABOVE PARKING STALLS. EXTENT OF STRUCTURE / SERVICES SHALL NOT PROJECT GREATER THEN 1220mm (4'-0") FROM THE BACK WALL OR LOWER THAN 1200mm (4'-0") ABOVE THE PARKING STALL. 100mm (4") HIGH BLACK LETTERS ON YELLOW BACKGROUND READING "CAUTION LOW CLEARANCE" TO BE INSTALLED ON THE VERTICAL FACE ABOVE OF THE STRUCTURE / SERVICE, ONE EVERY TWO STALLS.
8. ALL PARKADE WALLS, COLUMNS & NON-INSULATED CEILINGS TO BE PAINTED, REFER TO FINISH SCHEDULE
9. PARKING DEMARCATION SHALL BE 100mm (4") WIDE PAINTED YELLOW LINES, EXTENDING UP 1220mm (4'-0") FROM FLOOR AT WALLS.
10. FLOOR AREA DEMARCATION SHALL BE SOLID PAINTED YELLOW FIELDS AS SHOWN ON DRAWINGS.
11. ALL COLUMNS TO BE PAINTED YELLOW FROM 100mm (4") TO 1220mm (4'-0") ABOVE FLOOR.
12. PARKING STALL NUMBERS SHALL BE PAINTED USING 150mm (6") HIGH NUMERALS, YELLOW IN COLOUR, PERPENDICULAR TO THE DRIVE AISLE.
13. ACCESSIBLE PARKING STALL SYMBOLS SHALL BE PAINTED ON EVERY ACCESSIBLE STALL.
14. SMALL CAR STALLS SHALL BE LABELED 'SMALL CAR' WITH PAINTED 150mm (6") HIGH LETTERS, YELLOW IN COLOUR, PERPENDICULAR TO THE DRIVE AISLE.
15. TRAFFIC COATING AT PARKING AREAS, DRIVEWAYS, TURNING AREAS & RAMPS TO TURN 100mm VERTICALLY AT ALL WALLS, CURBS AND COLUMNS
16. ALL CONCRETE FLOORS TO BE SEALED UNLESS NOTED OTHERWISE.
17. SEE INTERIOR DRAWINGS FOR ELEVATOR LOBBY FINISHES
18. SEE VERTICAL CIRCULATION DRAWINGS FOR STAIR FINISHES.
19. ALL GUARDS TO BE DESIGNED TO CONFORM TO ONTARIO BUILDING CODE 4.1.5 LIVE LOADS DUE TO USE AND OCCUPANCY
20. PROVIDE CLOSE SPACED SPRINKLERS AT EXIT DOORS AND VISION LIGHTS INTO STAIRS & ELEVATOR LOBBIES (SEE ALSO MECHANICAL)
21. CHAMFER ALL EXPOSED CONCRETE WALL/COLUMN CORNERS 19mm (3/4")
22. ALL CONCRETE MASONRY UNITS WALLS ARE 200mm NOMINAL (2HR RATED BLOCK WALL TYPE UNLESS NOTED OTHERWISE)
23. ALL FIRE RATED WALL CONSTRUCTION WITH ABUTS CONCRETE OR CONCRETE BLOCK WALLS AND SLABS ARE TO HAVE PERIMETER SEALED WITH FIRE RATED CAULKING.

PARKING LEGEND

Standard (S) — 5200 × 2600
Narrow (N) — 5200 × 2400
Barrier-Free — 5200 × 3660
Small Car (SC) — 4600 × 2600

Parking Space Types:

Standard (S) - Space abutting columns/walls
5.2m (D) x 2.6m (W)

Narrow (N)- Space with no obstructions
5.2m (D) x 2.4m (W)

Small Car (SC)- Space abutting columns/walls with reduced length.
4.6m (D) x 2.4m (W)

"V" denotes visitor parking
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Barrier-Free
5.2m (D) x 3.66m (W) + 1.5m access aisle

Parking space types determined per City of Ottawa By-Law 2008-250.

PAINTED FLOOR GRAPHIC

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dream

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KEYPLAN

TRUE NORTH

ISSUE CHART

MARK	ISSUE	DATE
4	ISSUED FOR 66% DD	2022-08-19
5	ISSUED FOR 100% DD	2022-09-30
8	ISSUED FOR FOUNDATION REVIEW	2022-12-09
9	ISSUED FOR SHORING & EXCAVATION PERMIT	2022-12-16

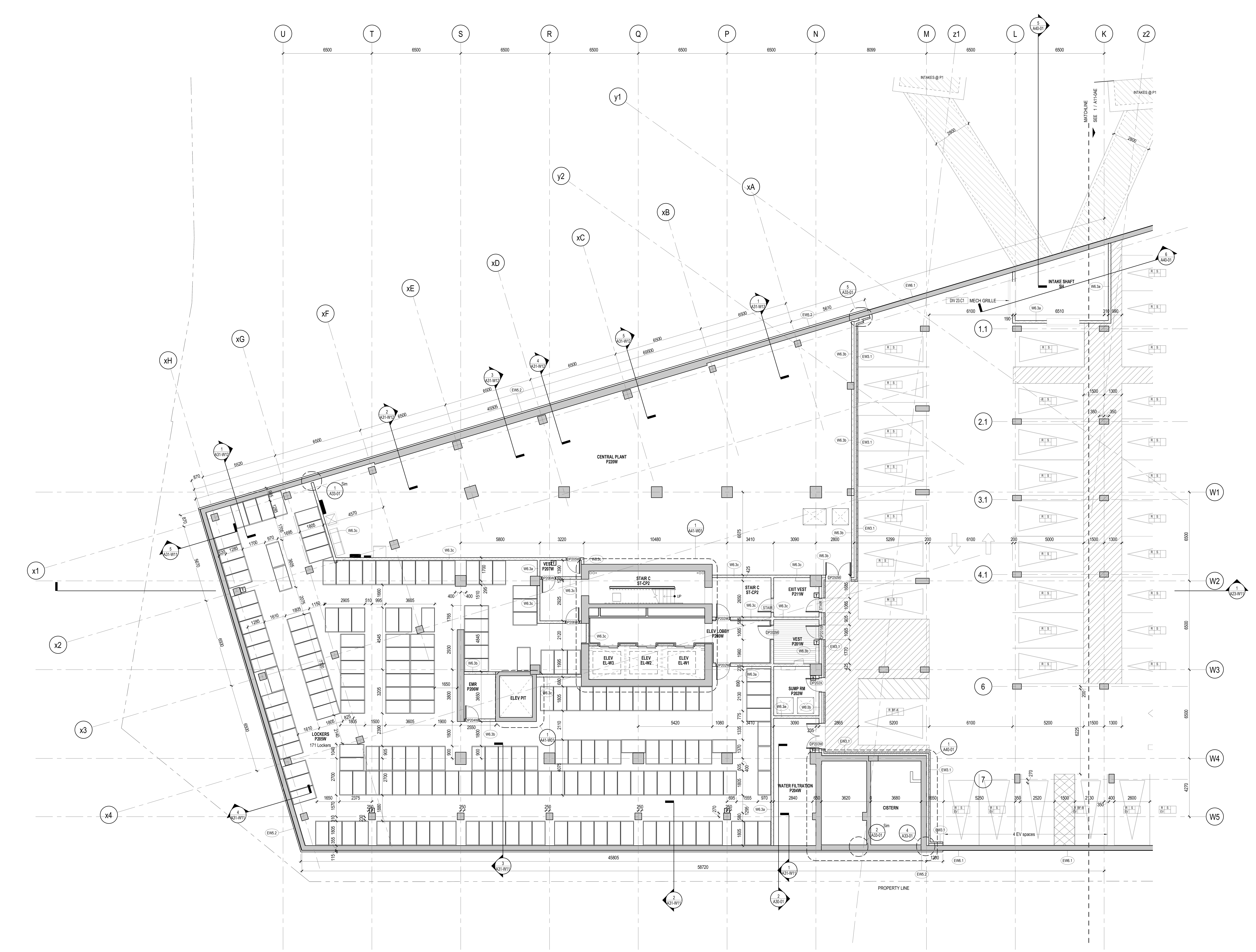
Job Number 442200

TITLE

LEVEL P2 FLOOR PLAN, EAST

SHEET NUMBER

A11-0AE



1 LEVEL P2, WEST
1 : 100

PARKING GENERAL NOTES

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3. MECHANICAL AND ELECTICAL DRAWINGS INDICATE THE GENERAL LOCATION AND ROUTE TO BE FOLLOWED FOR PIPES, DUCTS, CONDUITS, ETC. INSTALLATION OF SERVICES IS TO CONSERVE HEADROOM AND INTERFERE AS LITTLE AS POSSIBLE WITH THE FREE USE OF THE SPACE THROUGH WHICH THEY PASS. KEEP ALL DUCTS, PIPES, ETC. AT THE CEILING AS TIGHT AS POSSIBLE TO THE UNDERSIDE OF SLAB, BEAM OR OTHER LIMITING MEMBERS. RELOCATE AS NECESSARY TO MAINTAIN MINIMUM 2300mm (7'-6 ½") CLEAR FOR H.C. PARKING AND MANOUEVERING AISLES AND 2100mm (6'-11") CLEAR ELSEWHERE. NOTIFY THE ARCHITECT OF REVISIONS BEFRORE PROCEEDING WITH FABRICATION AND/OR INSTALLATION.
4. PROVIDE 9mm (3/8") WELDED METAL PLATE GUARDS AROUND ALL SINGLE VERTICAL PIPES AND CONDUITS AGAINST WALLS OR COLUMNS FROM 200mm (8") TO 1220mm (4'-0") ABOVE THE FLOOR. GUARD TO BE PAINTED YELLOW. CLEAN-OUTS TURNED PARALLEL WALL / COLUMN.
5. PROVIDE 5mm X 50mm (3/16" X 2") DIAMETER PAINTED PIPE GUARD AROUND ALL GANGED SERVICES OR EQUIPMENT FROM 300mm (1'-0") TO 915mm (3'-0") ABOVE THE FLOOR. GUARDS TO BE PAINTED YELLOW AND DESIGNED TO PERMIT FOR DOORS / PANELS TO BE FULLY OPENED.
6. PROVIDE 50mm X 100mm X 6mm (2" X 4" X ¼") ANGLES EITHER SIDE OF THE PANIC ALARM STATIONS. HEIGHT OF ANGLES TO MATCH PANIC ALARM HEIGHT, EDGES GROUND SMOOTH AND ANGLES TO BE PAINTED RED.
7. PROVIDE A 100mm (4") CHAMFERED CORNER COMPLETE WITH A CONTINUOUS 100mm (4") WIDE BLACK/YELLOW REFLECTIVE TAPE TO THE CHAMFERED CORNER OF ALL STRUCTURE / SERVICES BELOW 2000mm (6'-7") ABOVE PARKING STALLS. EXTENT OF STRUCTURE / SERVICES SHALL NOT PROJECT GREATER THEN 1220mm (4'-0") FROM THE BACK WALL OR LOWER THAN 1200mm (4'-0") ABOVE THE PARKING STALL. 100mm (4") HIGH BLACK LETTERS ON YELLOW BACKGROUND READING "CAUTION LOW CLEARANCE" TO BE INSTALLED ON THE VERTICAL FACE ABOVE OF THE STRUCTURE / SERVICE, ONE EVERY TWO STALLS.
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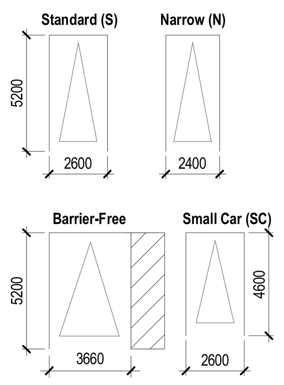

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Job Number 442200

TITLE

LEVEL P2 FLOOR PLAN, WEST

SHEET NUMBER

A11-0AW

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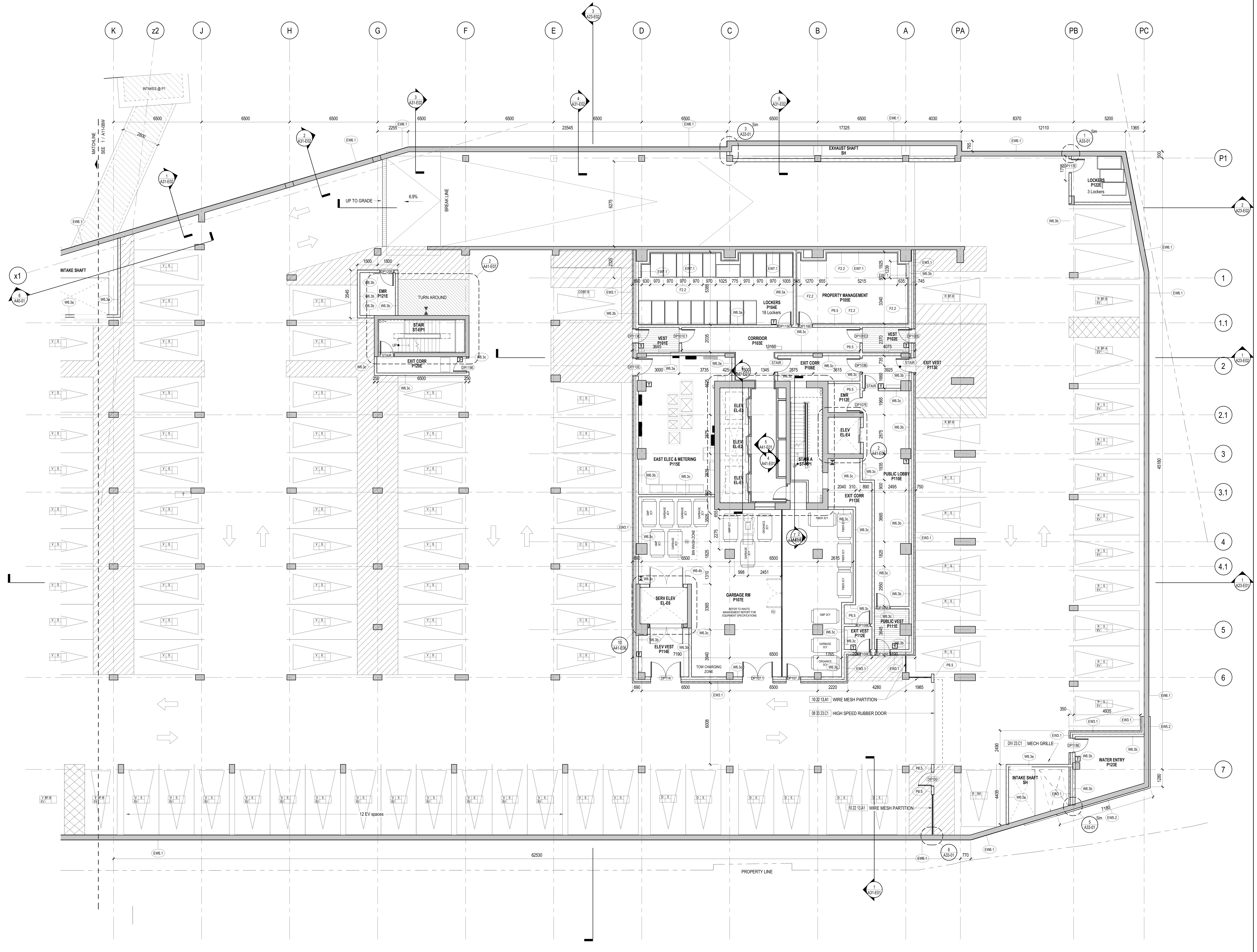

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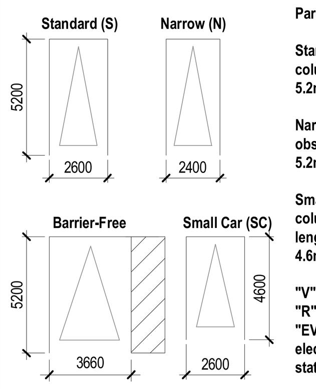

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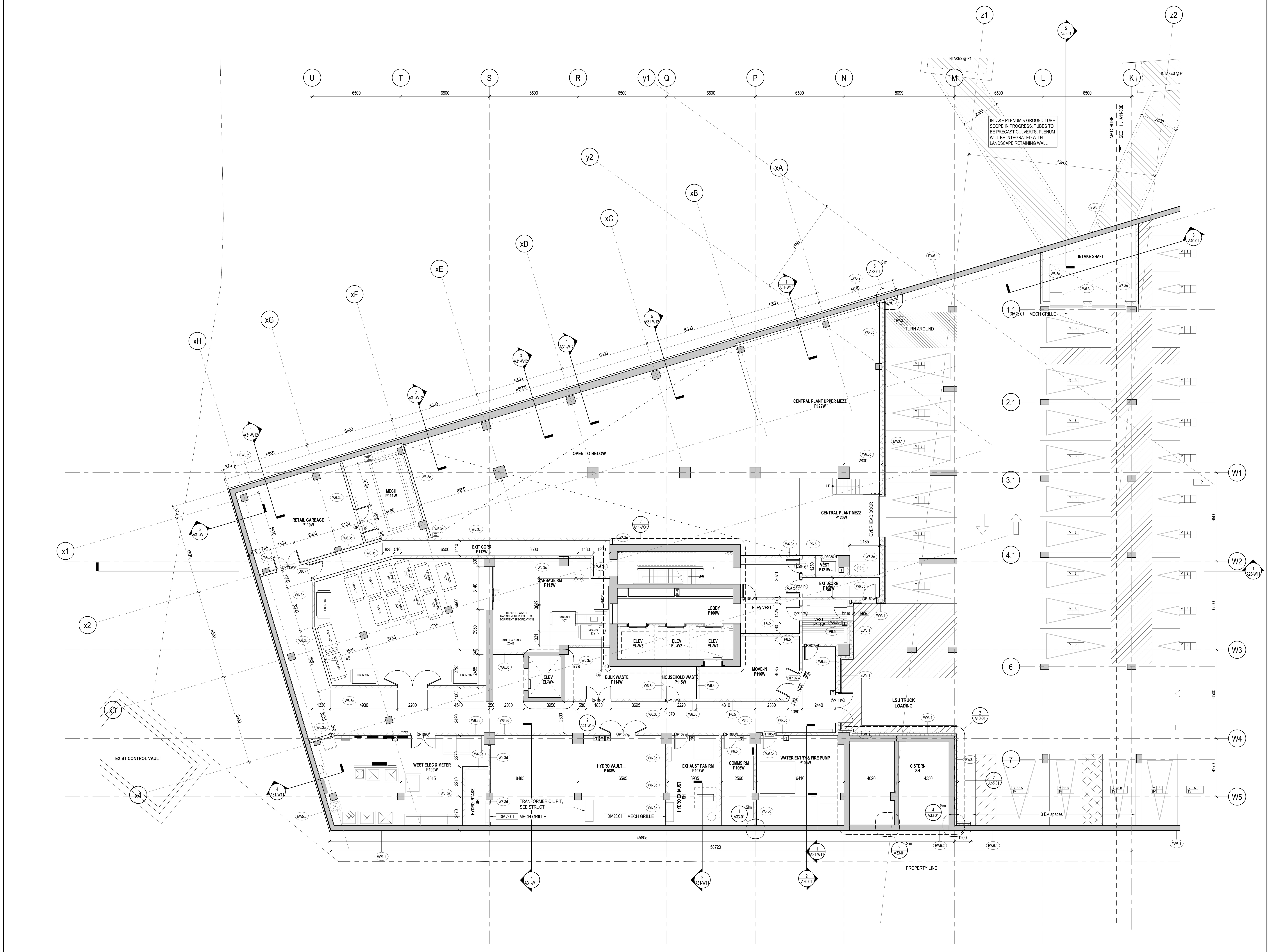
Job Number 442200

TITLE

LEVEL P1 FLOOR PLAN, EAST

SHEET NUMBER

A11-0BE



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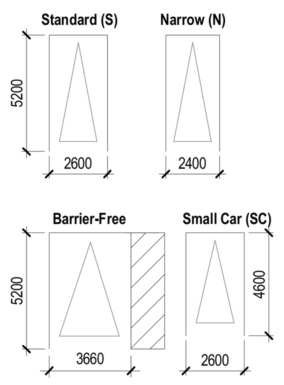

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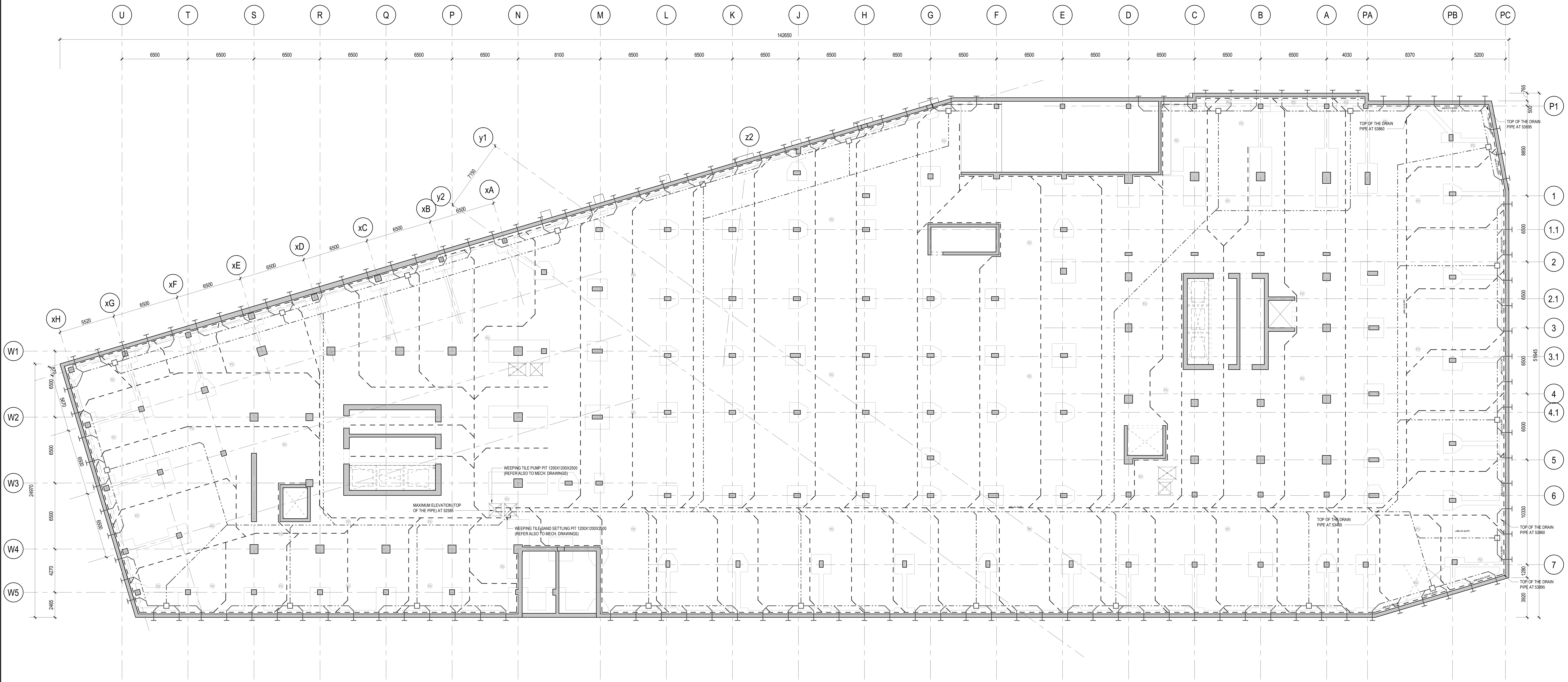
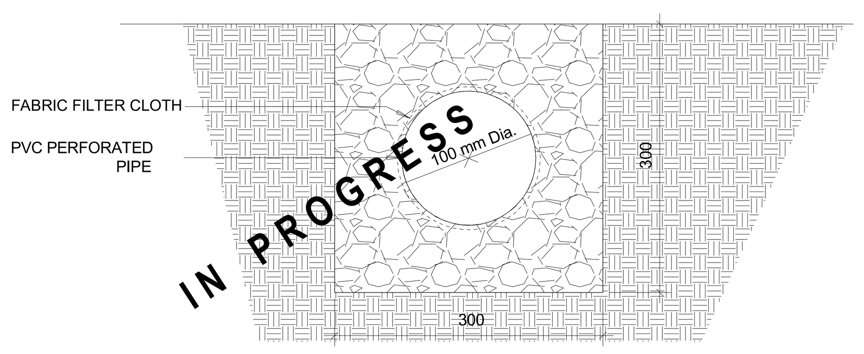


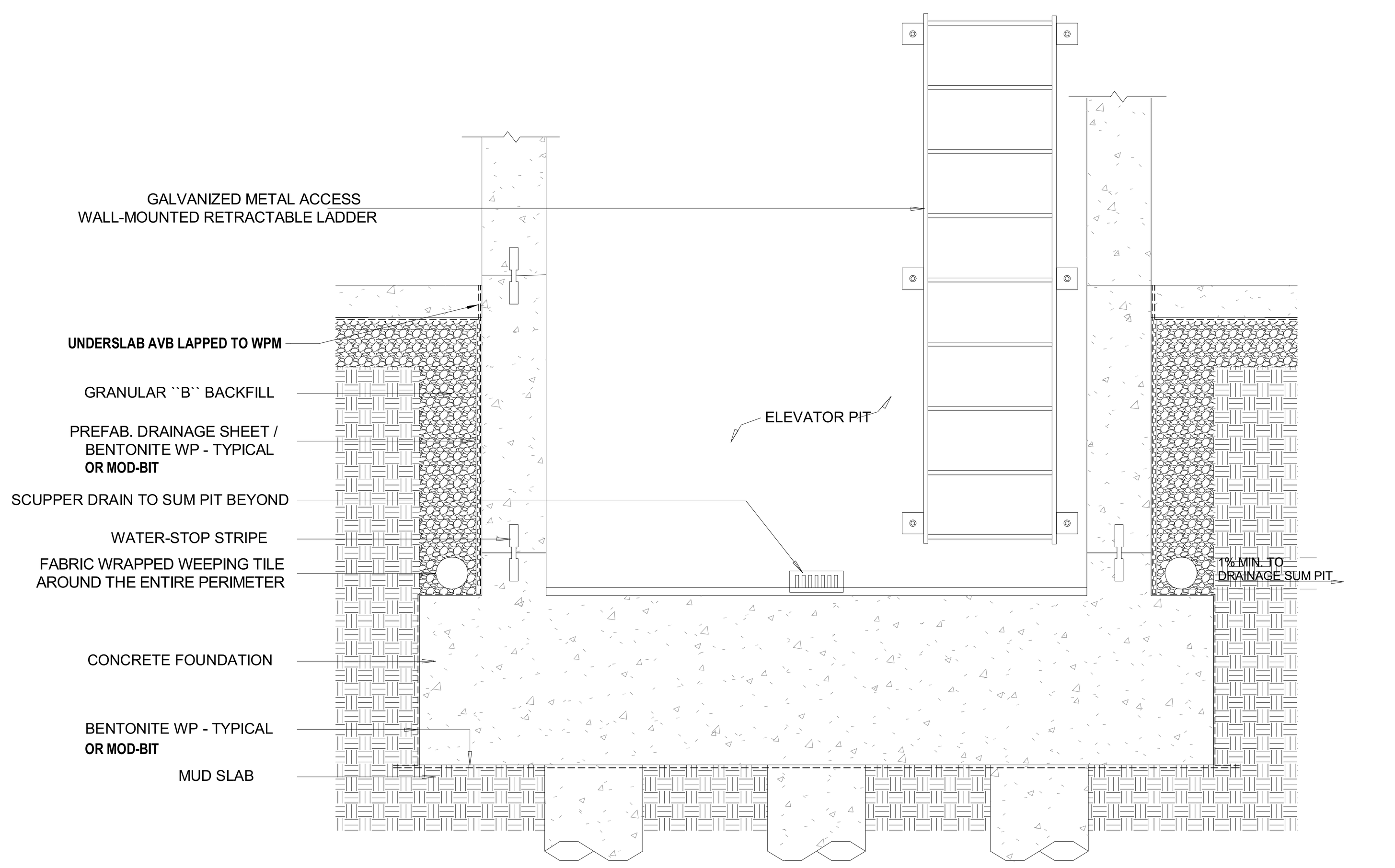
1 LEVEL P2 - SUB-SURFACE DRAINAGE PLAN

1 : 150



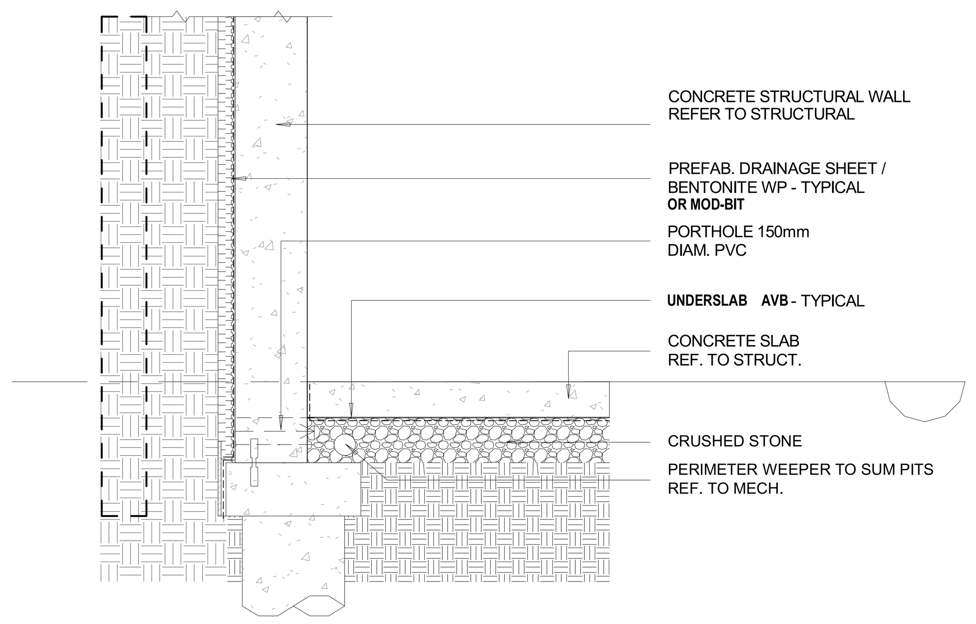
SUB-FLOOR DRAINS SECTION - TYP

SCALE: 1 : 5



ELEVATOR PIT WATERPROOFING - SECTION - TYP.

SCALE: 1 : 20



TYP. DETAIL @ BASE OF RETAINING WALLS

SCALE: 1 : 25

NOTE: SEE SHORING PACKAGE FOR SHORING INFORMATION. SEE DRAWING A18-00 FOR FOUNDATION DRAINAGE SYSTEM

EOS/ROOF DRAIN DWG LEGEND

- P2 SUB-FLOOR DRAIN PIPES (*) (**)
- PERIMETER BLIND-SIDE DRAINAGE (*) (**)
- INTERIOR SLOPE LINE (CONC/INSULATION)
- SLOPED INSULATION RIDGE (*)
- CONCRETE CRICKETS ON TOP OF STRUCTURAL SLAB
- INSULATION CRICKETS (**)
- FLAT CONCRETE TOP FILL

* : SHOWING THE DESIGN INTENT ONLY. REFER TO THE SHOPDRAWINGS FOR THE EXACT LAYOUT & DIMENSIONS

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9	ISSUED FOR SHORING & EXCAVATION PERMIT	2022-12-16

Job Number 442200

TITLE

P2 SUB-FLOOR & PERIMETER DRAINAGE

SHEET NUMBER

A18-00

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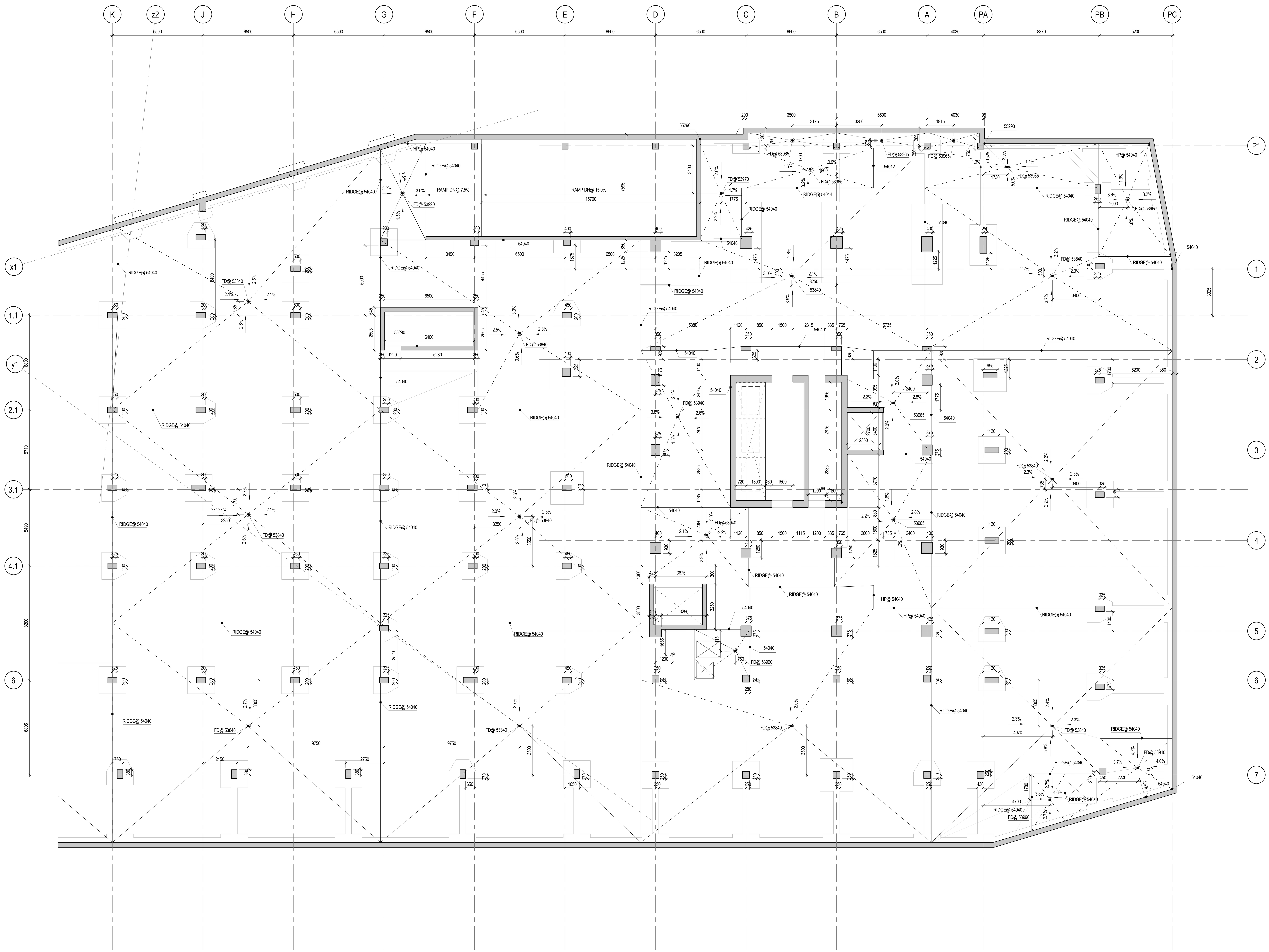

EOS/ROOF DRAIN DWG LEGEND

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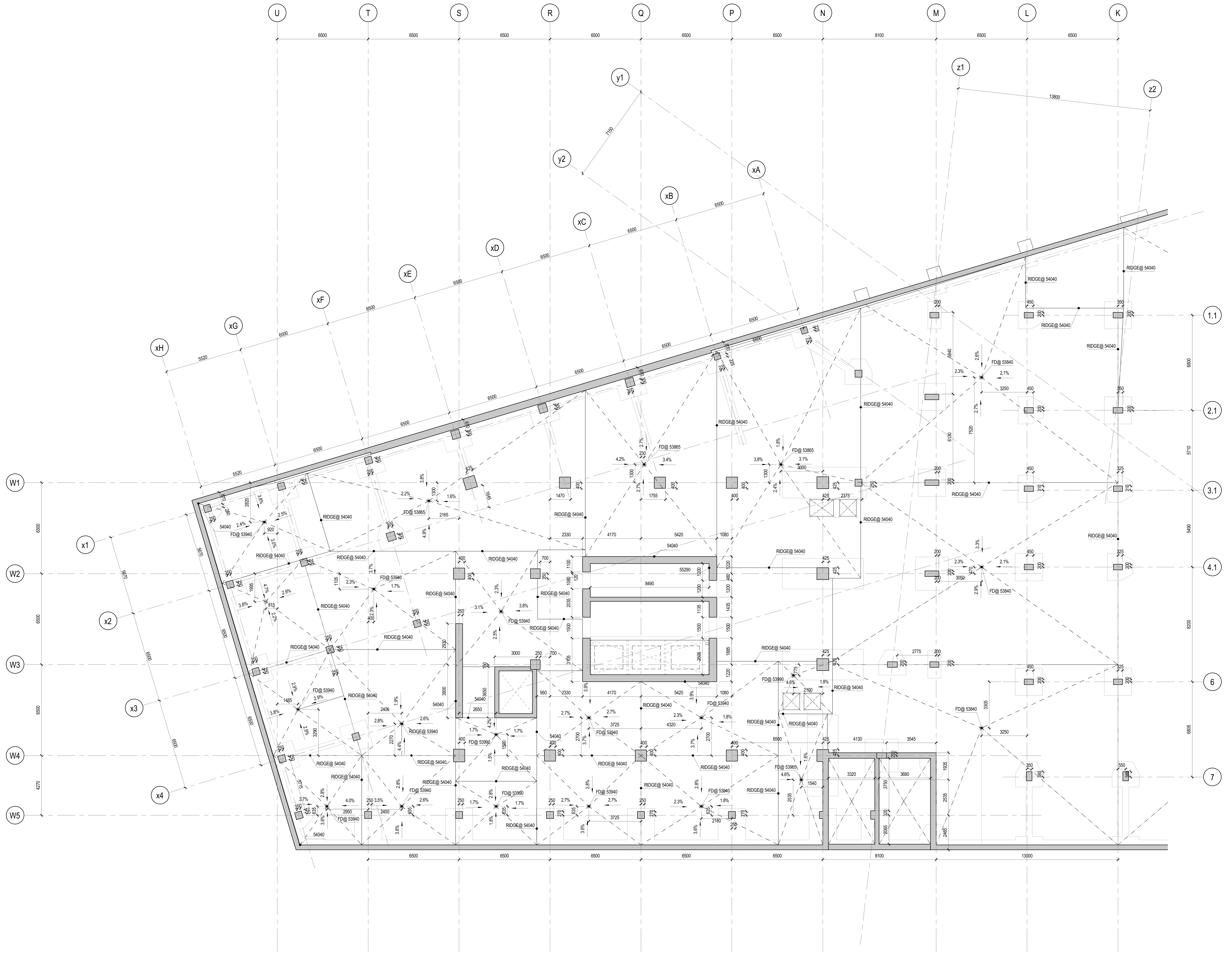
Job Number 442200

TITLE

LEVEL P2 SLAB EDGE PLAN, EAST

SHEET NUMBER

A18-0AE



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- PERIMETER BLIND-SIDE DRAINAGE (*) (**)
- INTERIOR SLOPE LINE (CONC/INSULATION)
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Job Number	442200

TITLE

LEVEL P2 SLAB EDGE PLAN, WEST

SHEET NUMBER

A18-0AW

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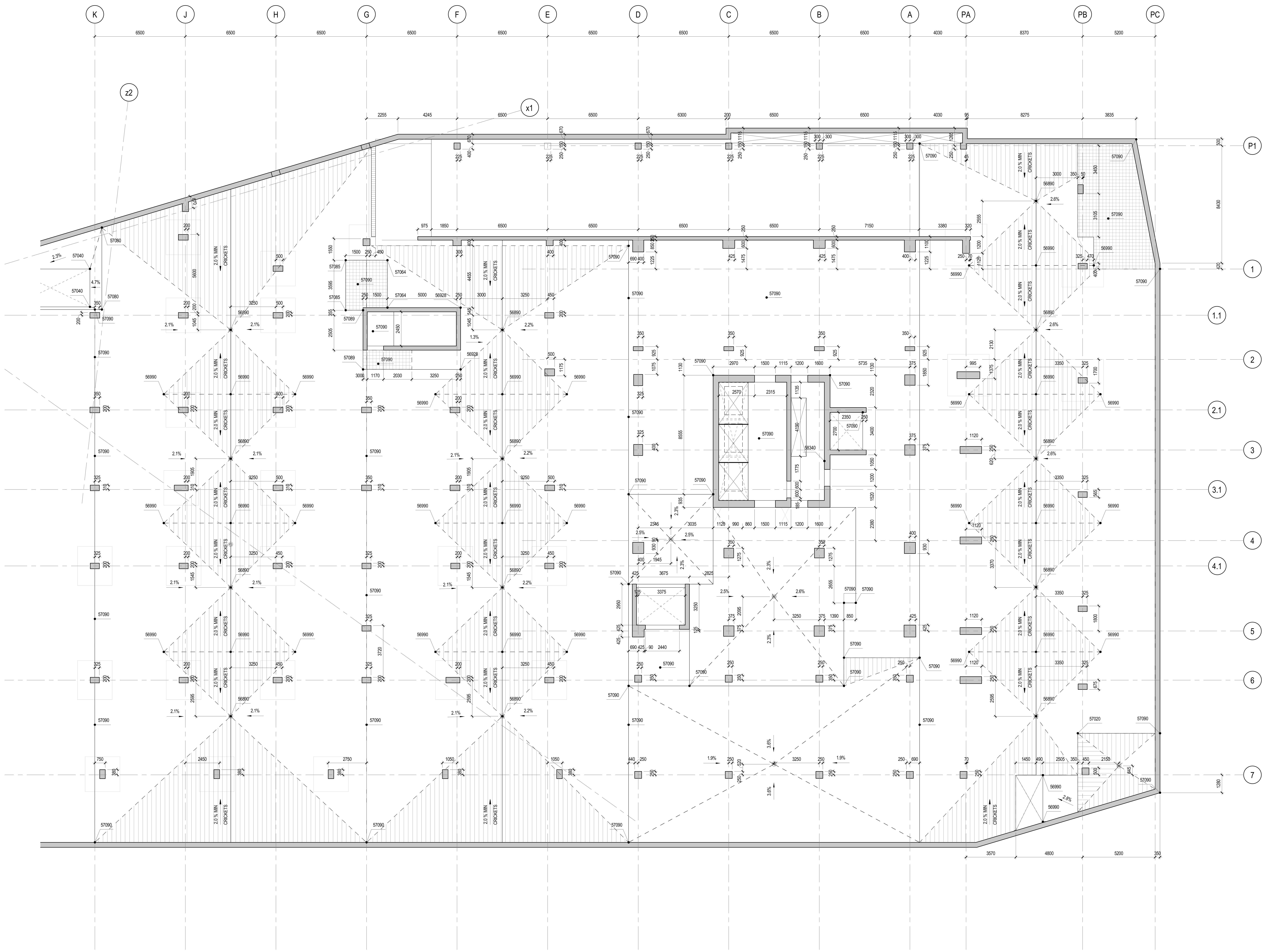

EOS/ROOF DRAIN DWG LEGEND

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TITLE

LEVEL P1 SLAB EDGE PLAN, EAST

SHEET NUMBER

A18-0BE

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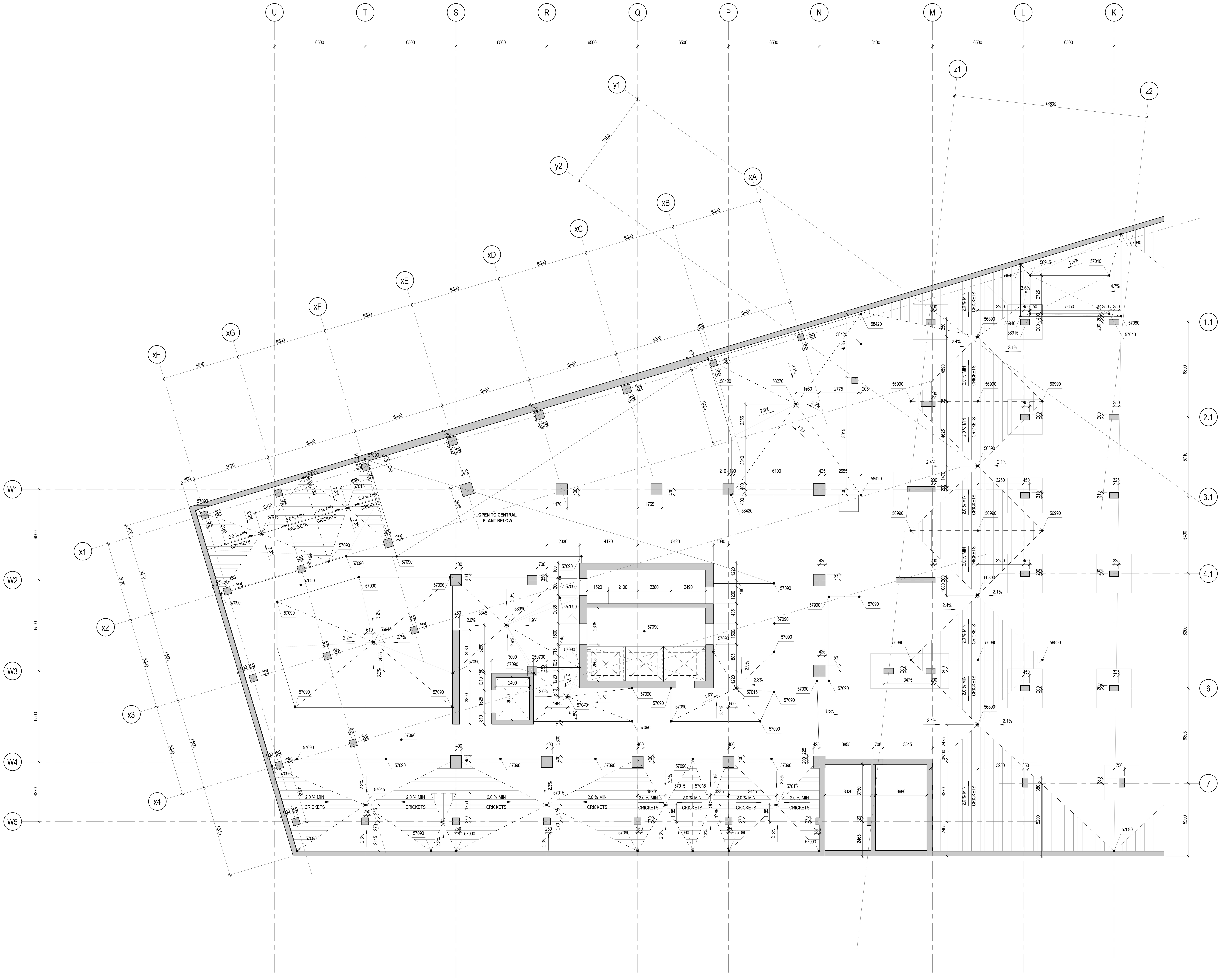

EOS/ROOF DRAIN DWG LEGEND

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TITLE

LEVEL P1 SLAB EDGE PLAN, WEST

SHEET NUMBER

A18-0BW

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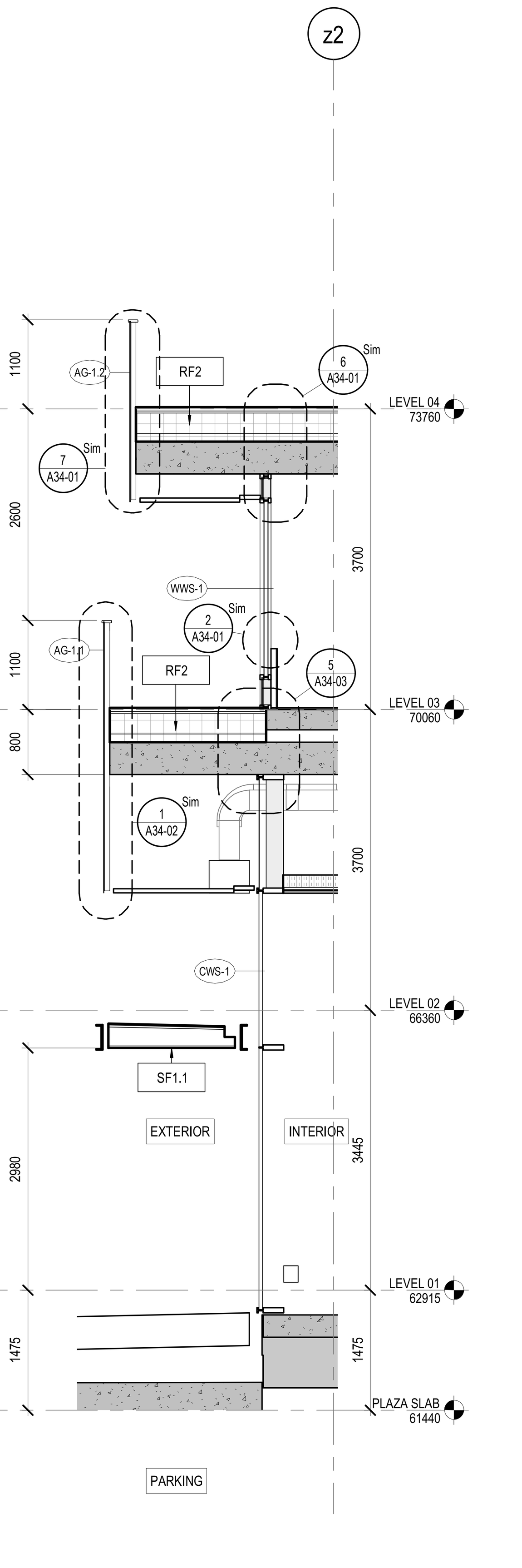

6 EAST PODIUM - WEST WALL SECTION 2
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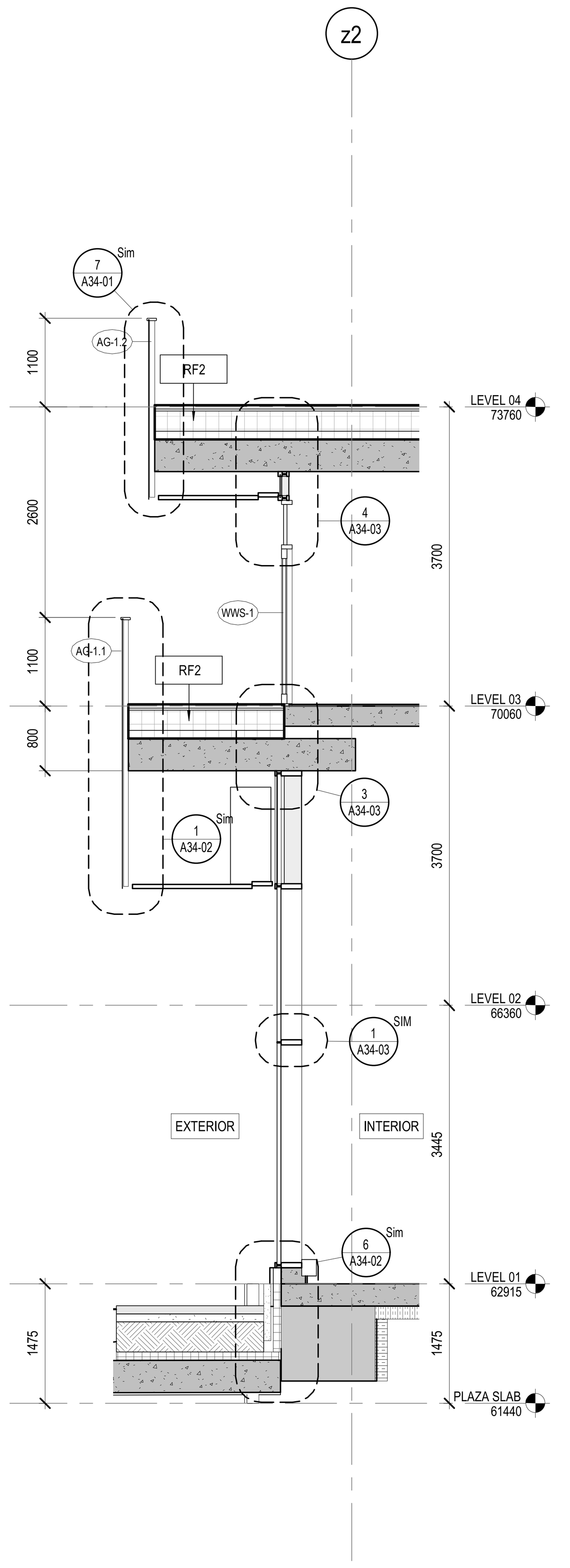
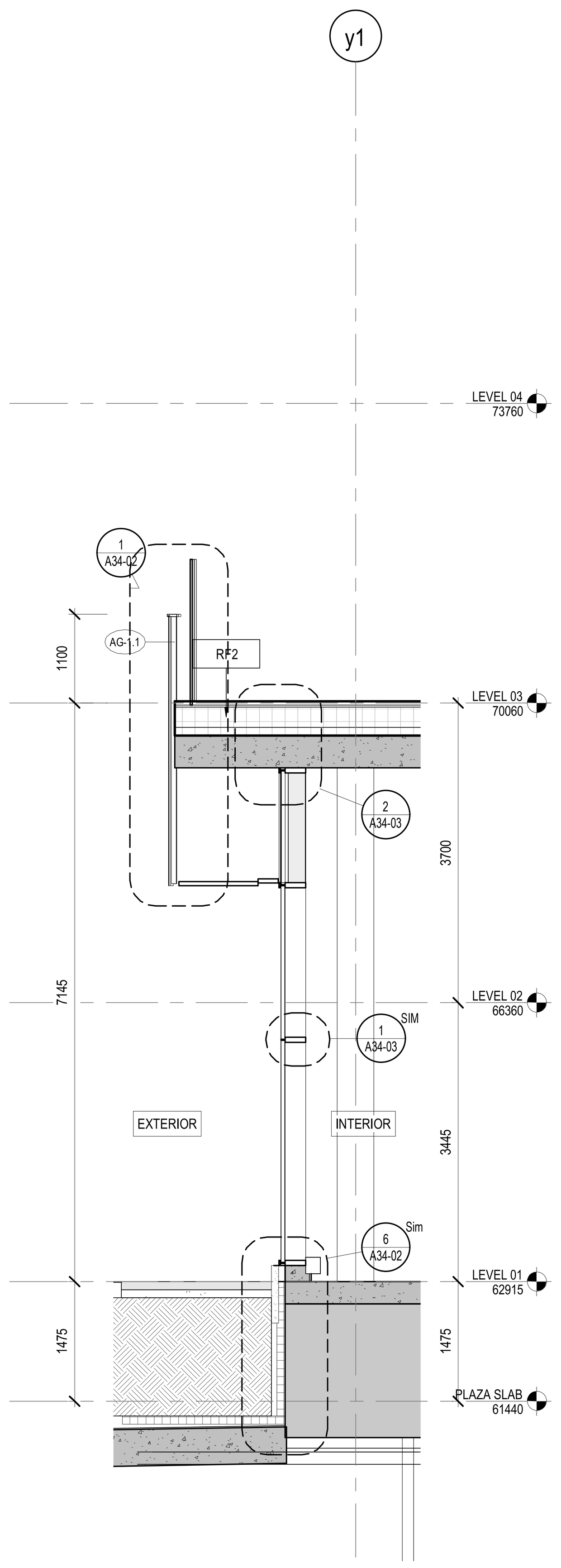


5 EAST PODIUM - WEST WALL SECTION 1
1 : 50



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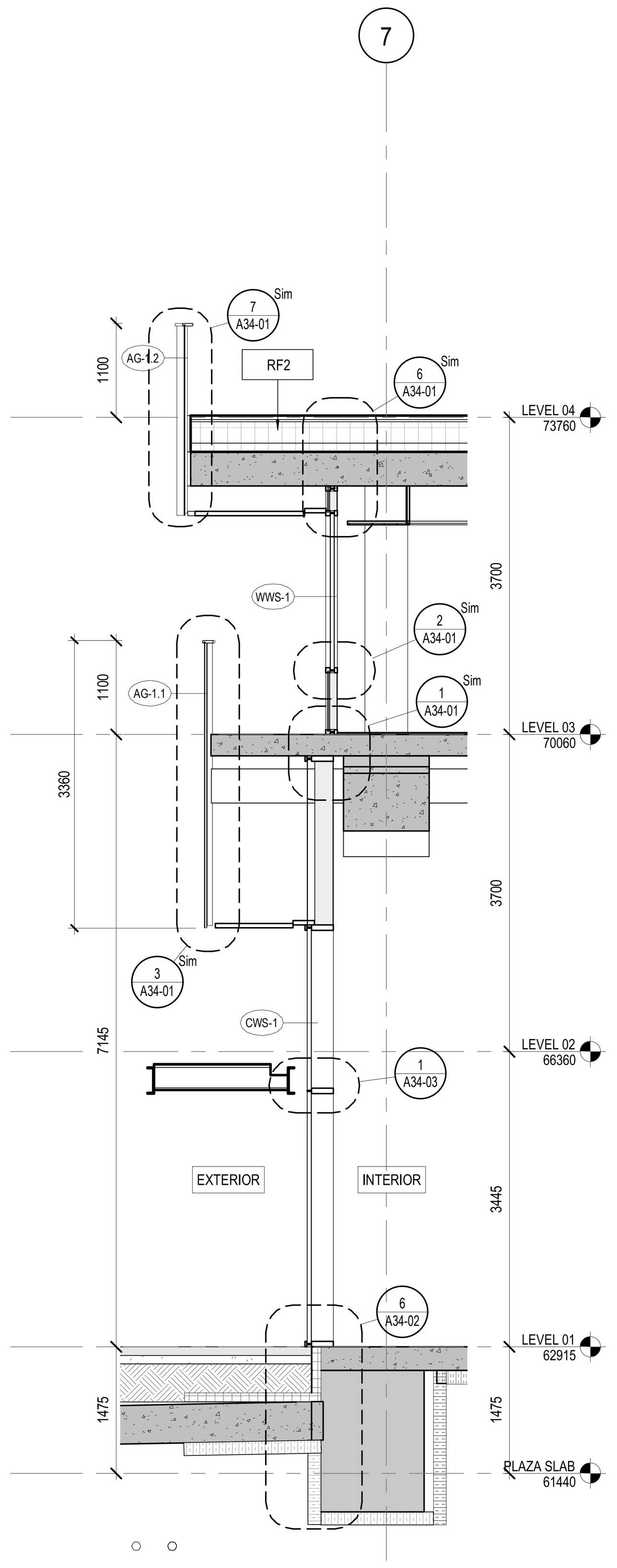
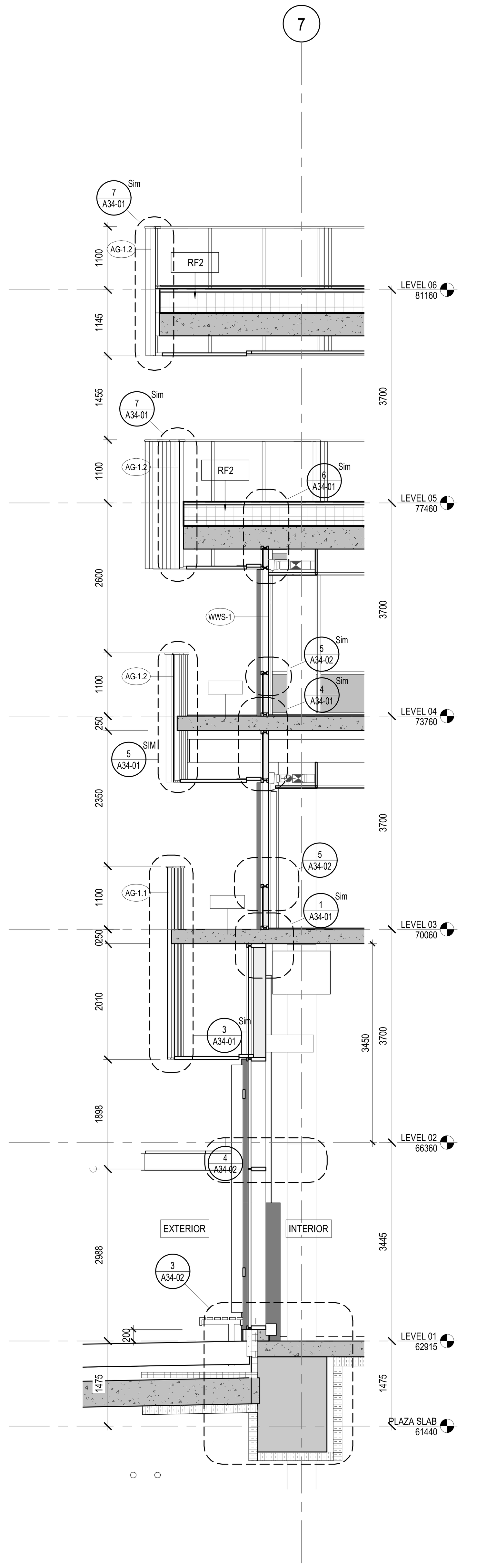
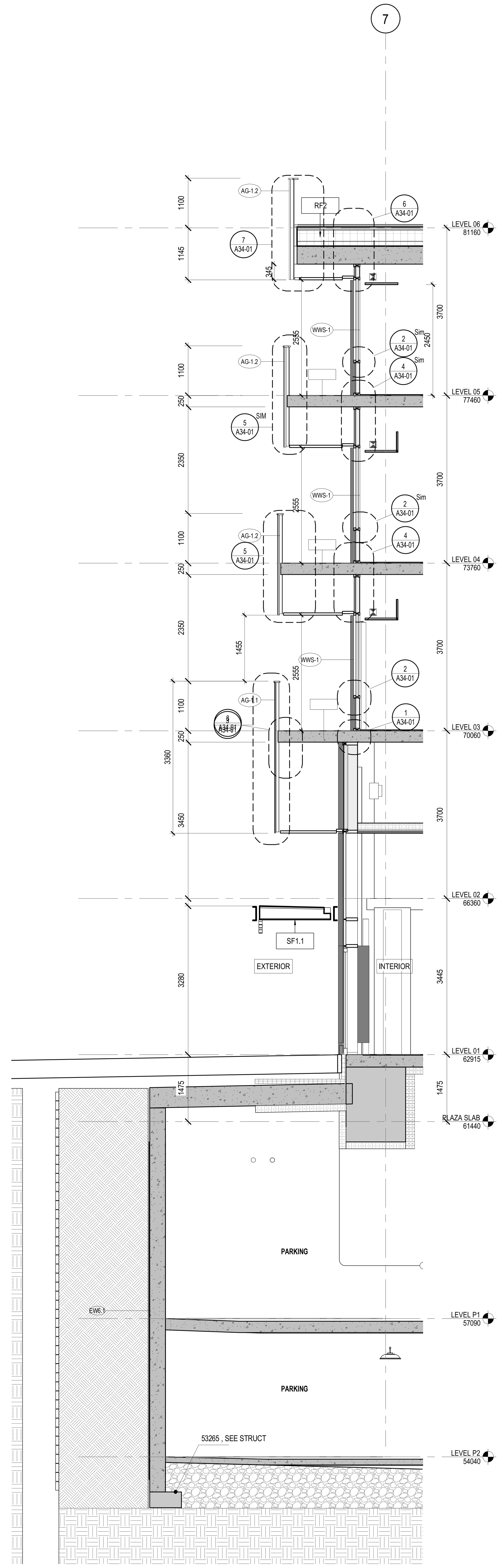


3 EAST PODIUM - SOUTH WALL SECTION 3
1 : 50



2 EAST PODIUM - SOUTH WALL SECTION 2
1 : 50



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1 EAST PODIUM - SOUTH WALL SECTION 1
1 : 50

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TITLE

EXTERIOR WALL SECTIONS, EAST

SHEET NUMBER

A31-E01

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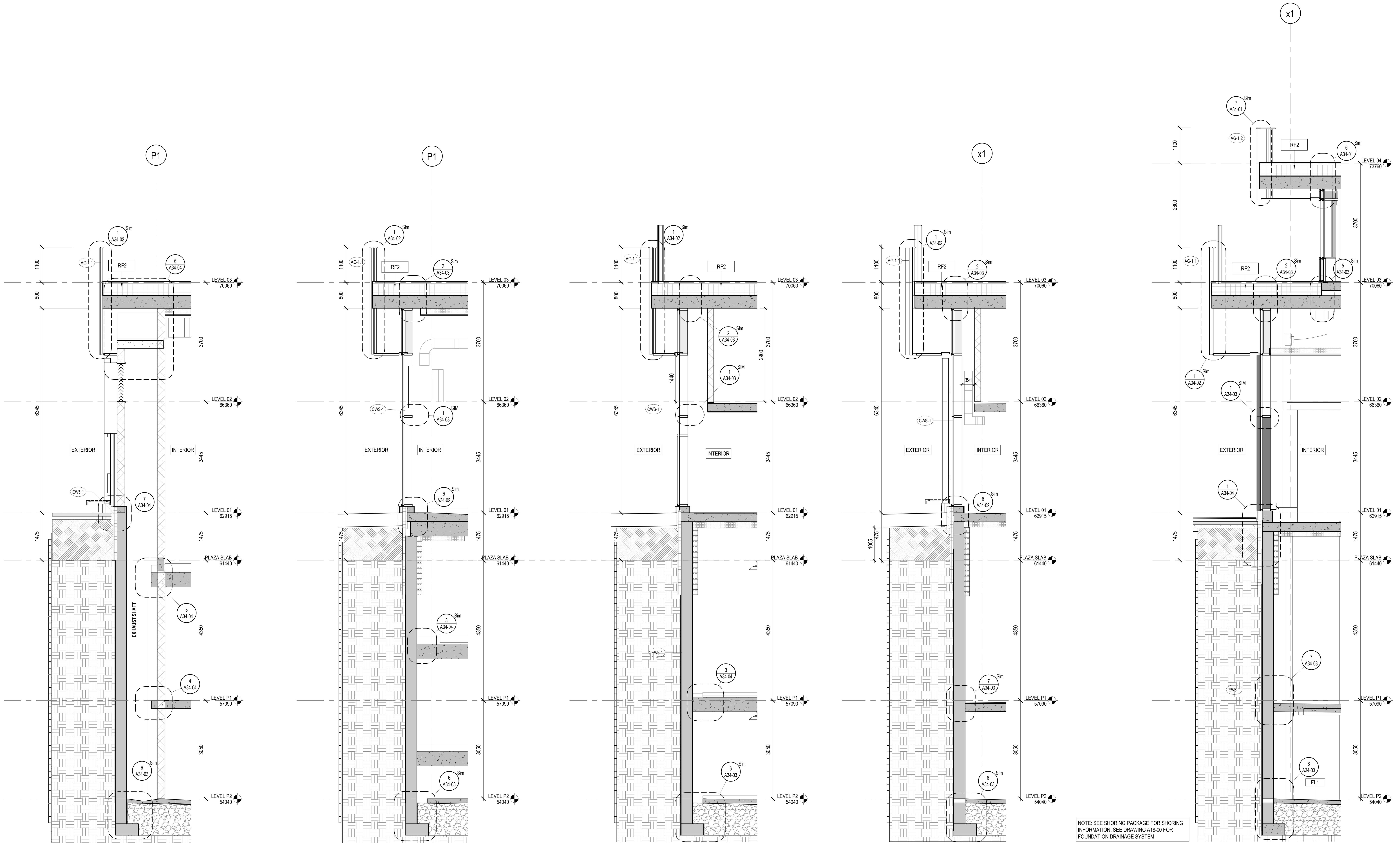

5 EAST PODIUM - NORTH WALL SECTION 3
1 : 50

4 EAST PODIUM - NORTH WALL SECTION 2
1 : 50

3 EAST PODIUM - NORTH WALL SECTION 1
1 : 50

2 EAST PODIUM - NW WALL SECTION 2
1 : 50

1 EAST PODIUM - NW WALL SECTION 1
1 : 50

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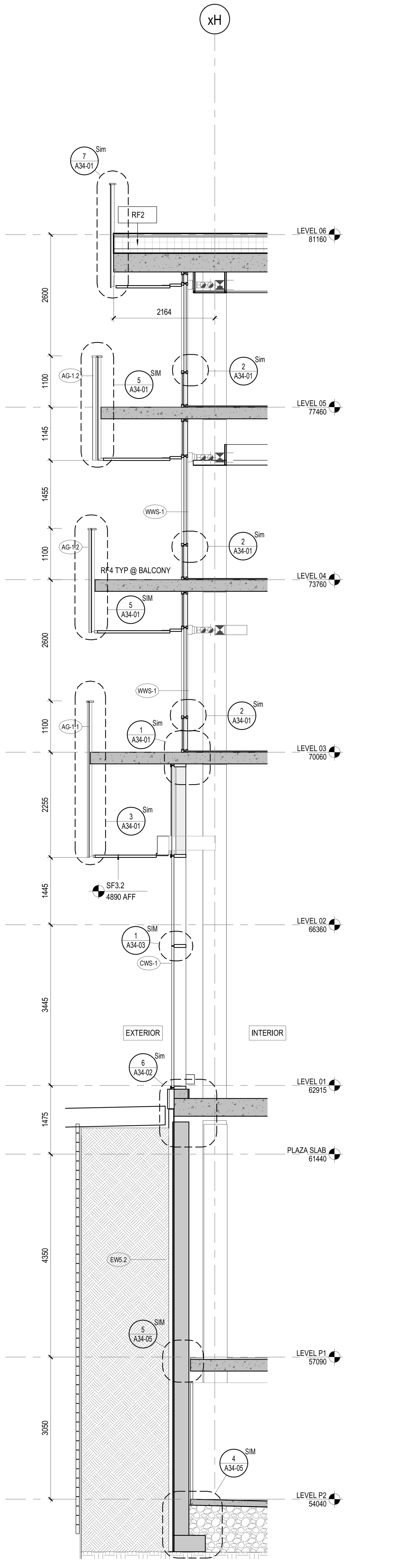
TITLE

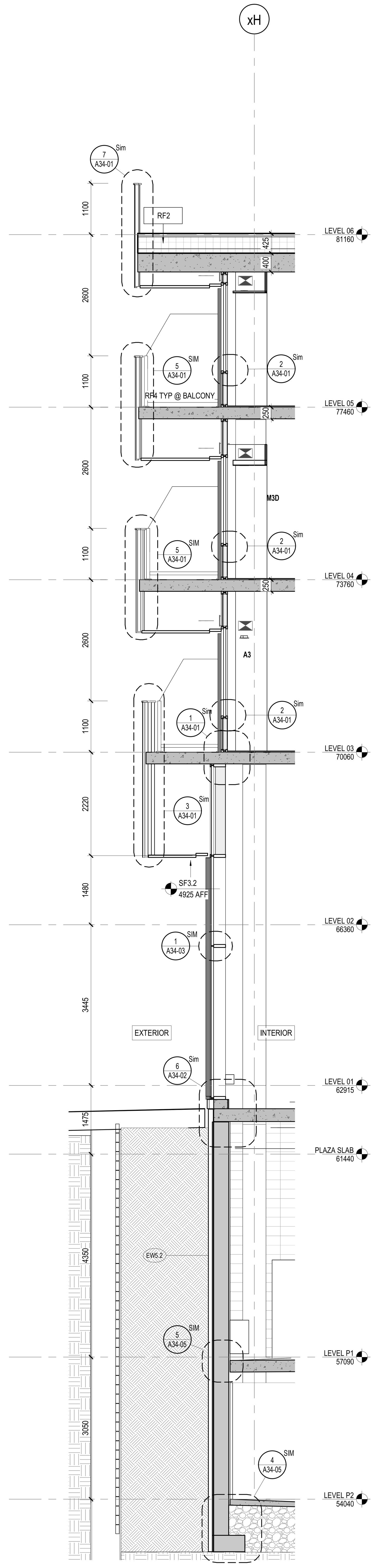
EXTERIOR WALL SECTIONS, EAST

SHEET NUMBER

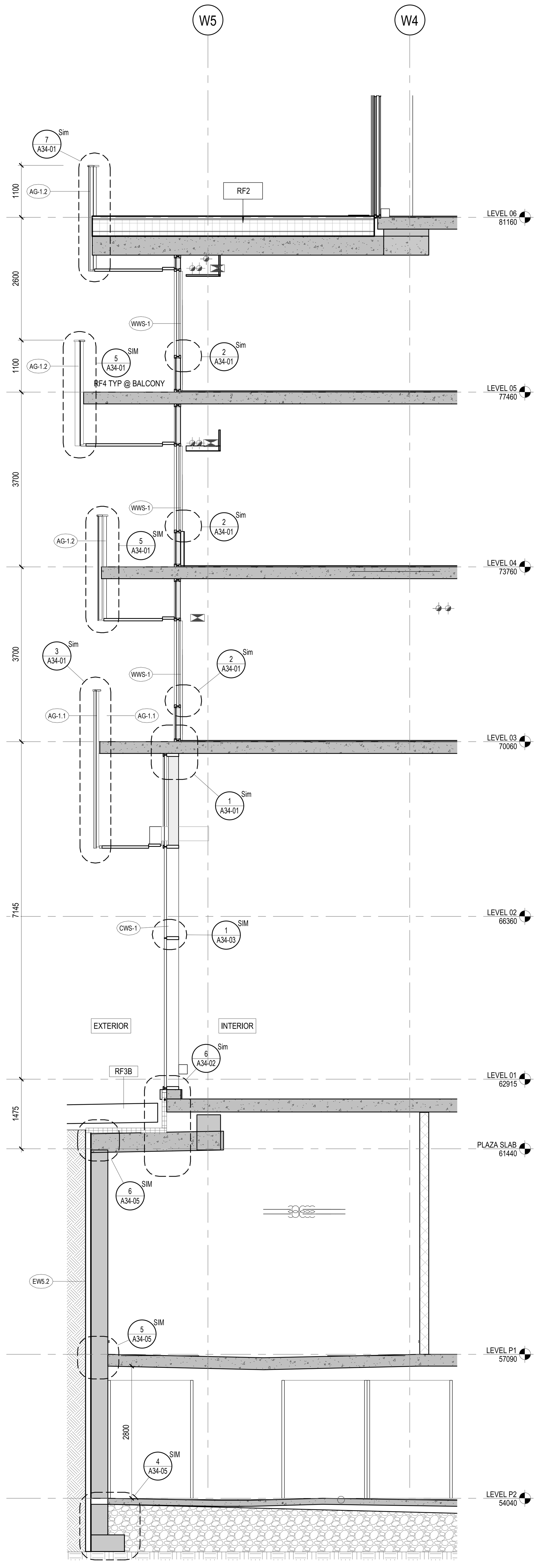
A31-E02



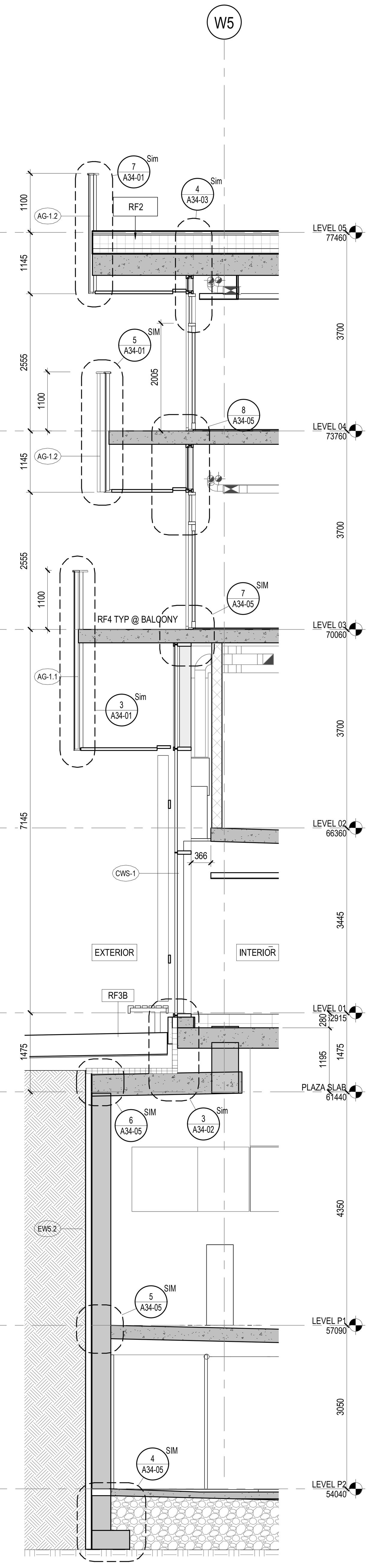
5 WEST PODIUM - WEST WALL SECTION 2
1 : 50



4 WEST PODIUM - WEST WALL SECTION 1
1 : 50



3 WEST PODIUM - SOUTH WALL SECTION 3
1 : 50



2 WEST PODIUM - SOUTH WALL SECTION 2
1 : 50

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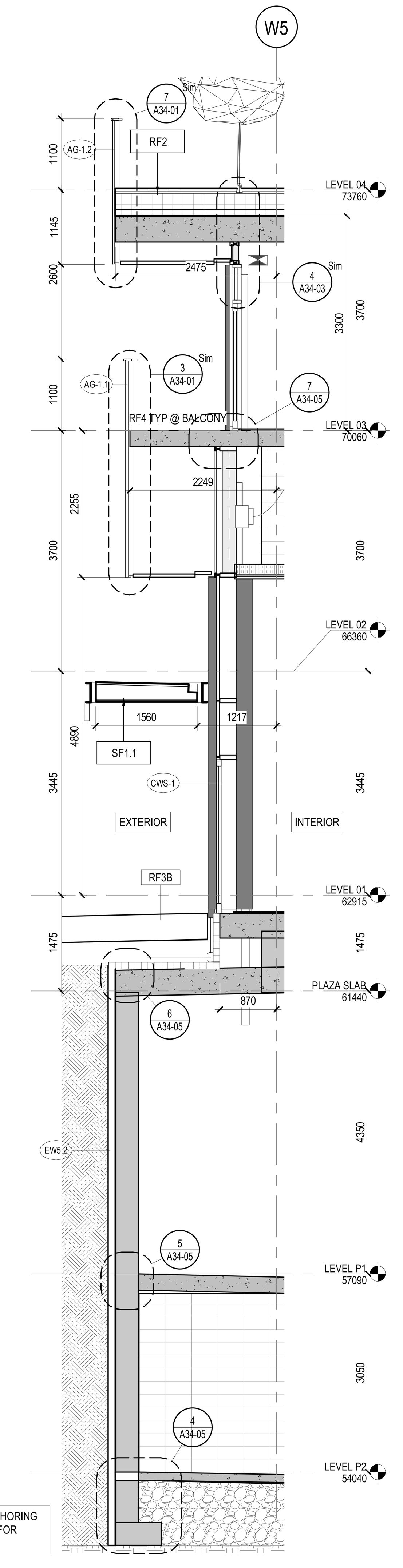

1 WEST PODIUM - SOUTH WALL SECTION 1
1 : 50

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TITLE

EXTERIOR WALL SECTIONS, WEST

SHEET NUMBER

A31-W11

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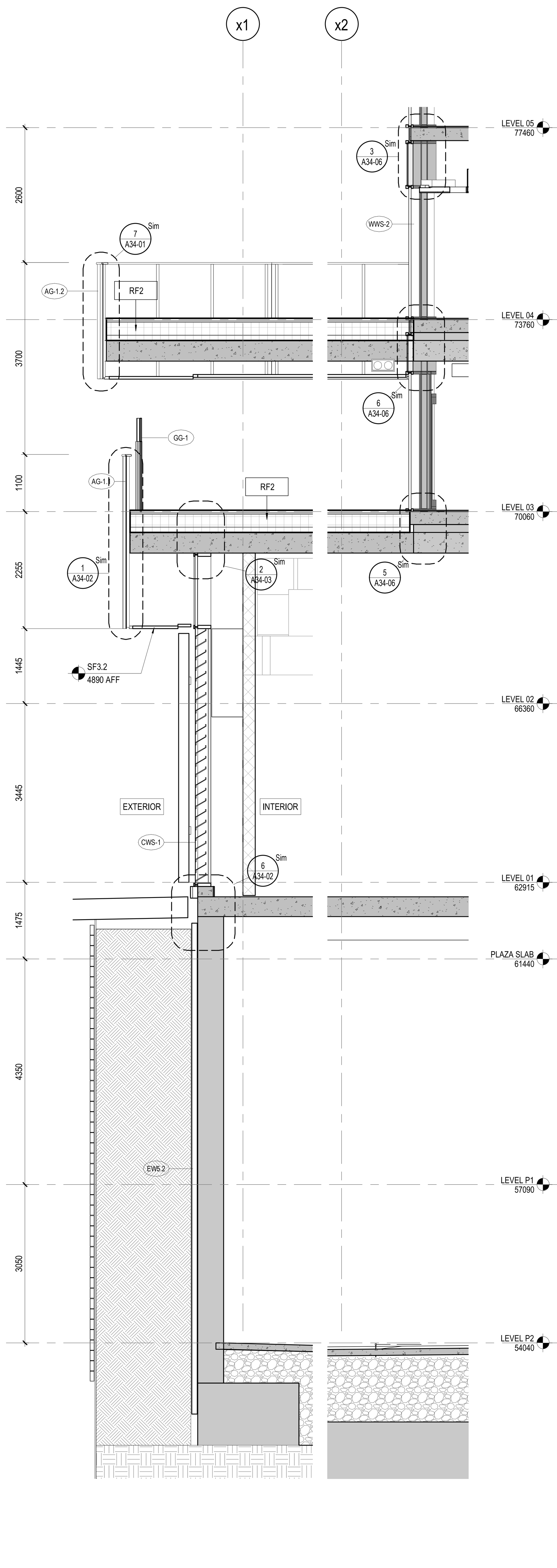
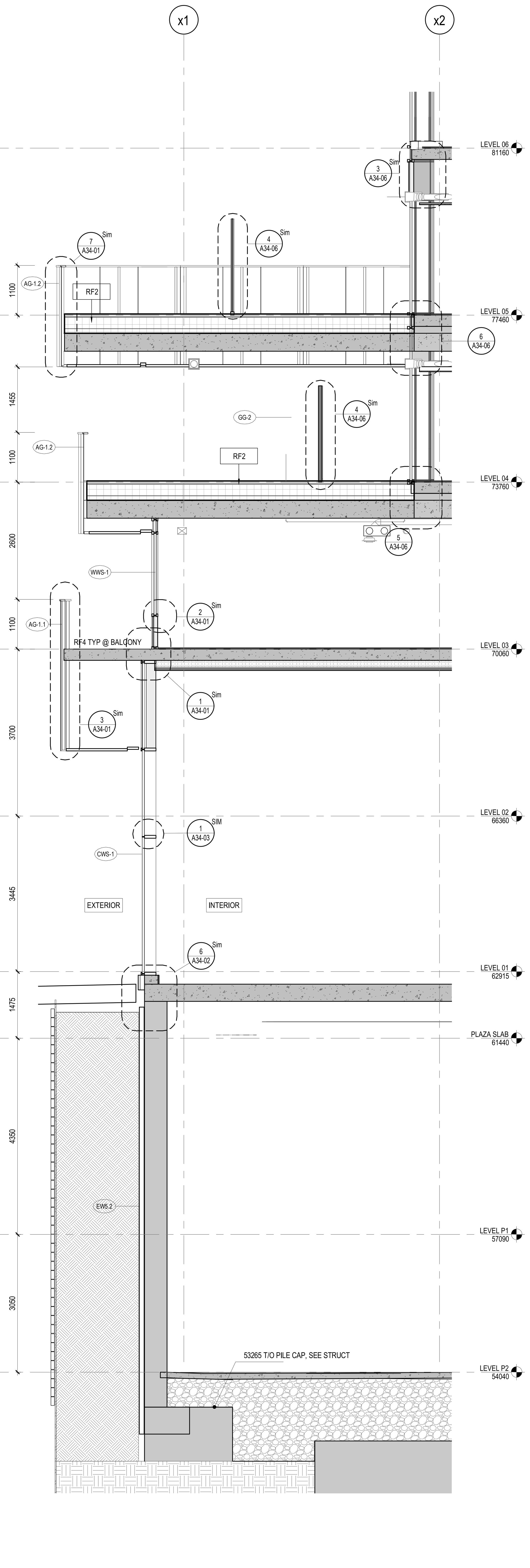
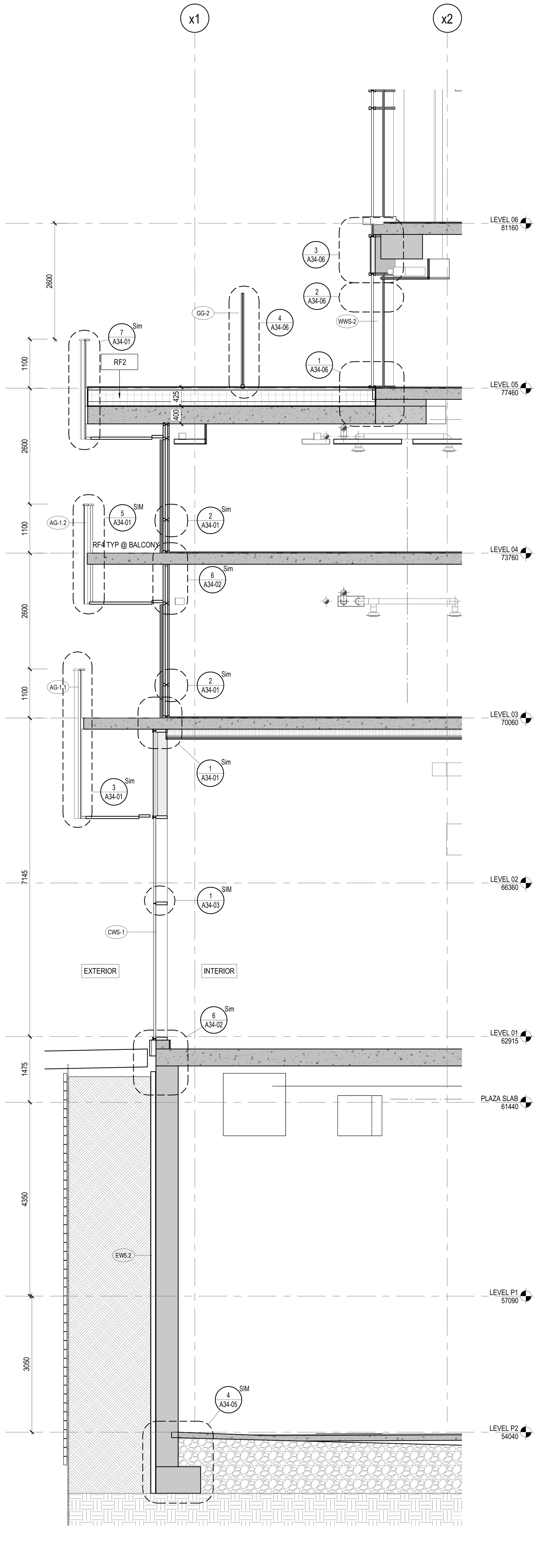


5 WEST PODIUM - NW WALL SECTION 5
1 : 50



4 WEST PODIUM - NW WALL SECTION 4
1 : 50



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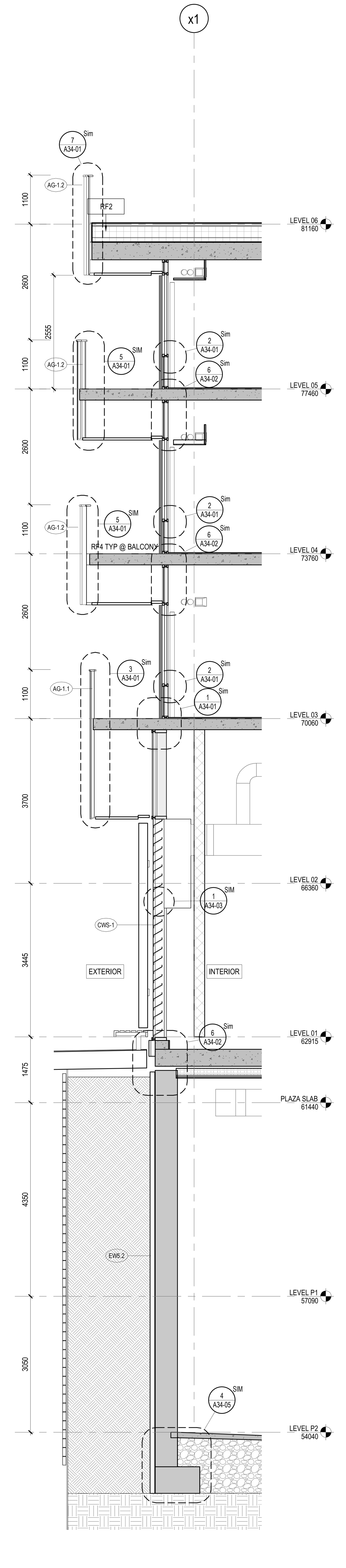
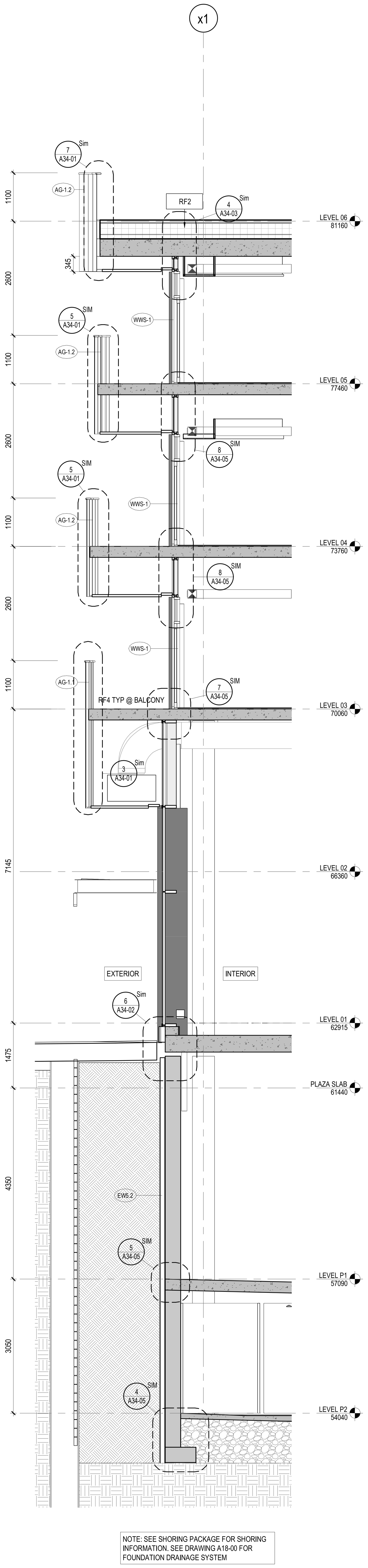
1 : 50



2 WEST PODIUM - NW WALL SECTION 2
1 : 50



NOTE: SEE SHORING PACKAGE FOR SHORING INFORMATION. SEE DRAWING A18-00 FOR FOUNDATION DRAINAGE SYSTEM

1 WEST PODIUM - NW WALL SECTION 1
1 : 50

KPMB
Perkins&Will

351 King Street E, Suite 1200, Toronto, Ontario, Canada, M5A 0L6, t 416.977.5104, kpmb.com

275 Slater Street, Suite 1810, Ottawa, Ontario, Canada, K1P 5H9, t 613.563.2500, f 613.563.7281, perkinswill.com

CONSULTANTS

CIVIL
TMIG
8800 Dufferin St., Suite 200, Vaughan, ON L4K 0C5

STRUCTURAL
RJC Engineers
1545 Carling Ave., Suite 304, Ottawa, ON K1Z 8P9

MEP
Smith+Andersen
1600 Carling Ave., Suite 530, Ottawa, ON K1Z 1G3

LANDSCAPING
PFS Studio
1777 W 3rd Ave., Vancouver, BC V6J 1K7

CONSULTANT
Two Row Architect
1804 6th Line, Ohsweken, ON N0A 1M0

CONTRACTOR
EllisDon
2680 Queensview Dr., Ottawa, ON K2B 8J9

STAMP

ONTARIO ASSOCIATION OF ARCHITECTS
BRUCE KUWABARA
LICENCE 3860

PROJECT

LEBRETON LIBRARY PARCEL
665 Albert St
Ottawa, ON
Canada

dream

DREAM
30 Adelaide St. E., Suite 301,
Toronto, ON M5C 3H1

KEYPLAN

TRUE NORTH

ISSUE CHART

MARK	ISSUE	DATE
5	ISSUED FOR 100% DD	2022-09-30
8	ISSUED FOR FOUNDATION REVIEW	2022-12-09
9	ISSUED FOR SHORING & EXCAVATION PERMIT	2022-12-16

Job Number 442200

TITLE

EXTERIOR WALL SECTIONS, WEST

SHEET NUMBER

A31-W12

Autodesk Docs://Lebreton Flats Library/ARCH_Dream_LeBreton_R22_Podium.rvt
12/16/2022 5:05:18 PM

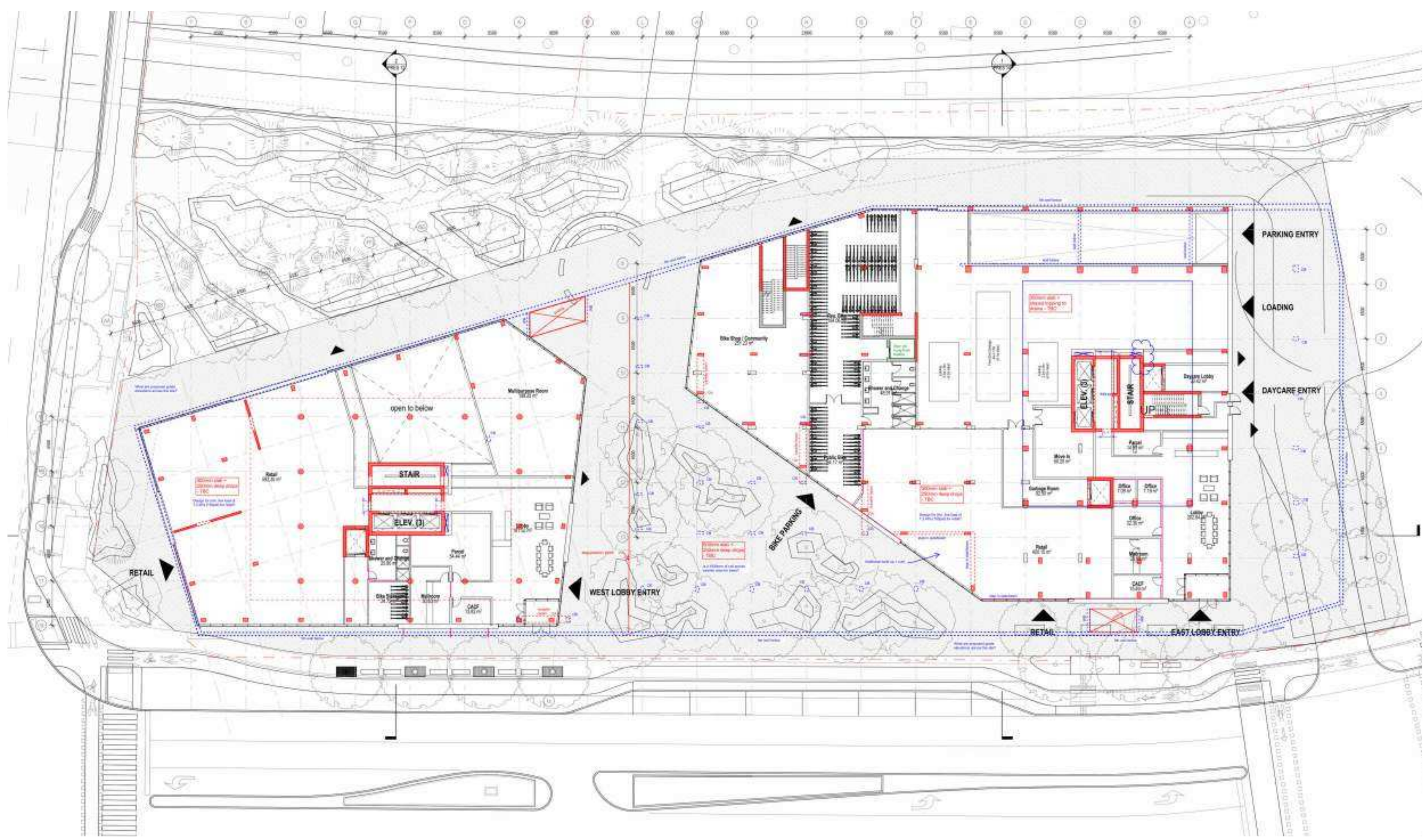
APPENDIX I: Construction Logistics Plans

LEBRETON LIBRARY PARCEL

655 ALBERT ST. OTTAWA. ONTARIO.

LOGISTICS DRAWINGS

ISSUE DATE: NOVEMBER 16, 2022



DRAWINGS LIST

DRAWING #	DRAWING TITLE	ISSUE DATE
LLP-LOG-00	Cover Page	Nov 16 2022
LLP-LOG-01	Mobilization and Site Offices	Nov 16 2022
LLP-LOG-02	Excavation Works	Nov 16 2022
LLP-LOG-03	Substructure - Level P1	Nov 16 2022
LLP-LOG-04	Superstructure - Level 1	Nov 16 2022
LLP-LOG-05	Superstructure - Level 3	Nov 16 2022
LLP-LOG-06	Superstructure - Towers Construction	Nov 16 2022
LLP-LOG-07	Site Safety Plan COVID-19	Nov 16 2022
LLP-LOG-08	South Elevation	Nov 16 2022

PRELIMINARY
ISSUED FOR REVIEW

No.	Date	Description	By

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Construction Sciences
Engineering Department
1004 Middlegate Road, Main Floor
Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Print Date / Time: 11/16/22 2:29:02 PM

Project Name: Lebreton Library Parcel

655 Albert St. Ottawa, Ontario.

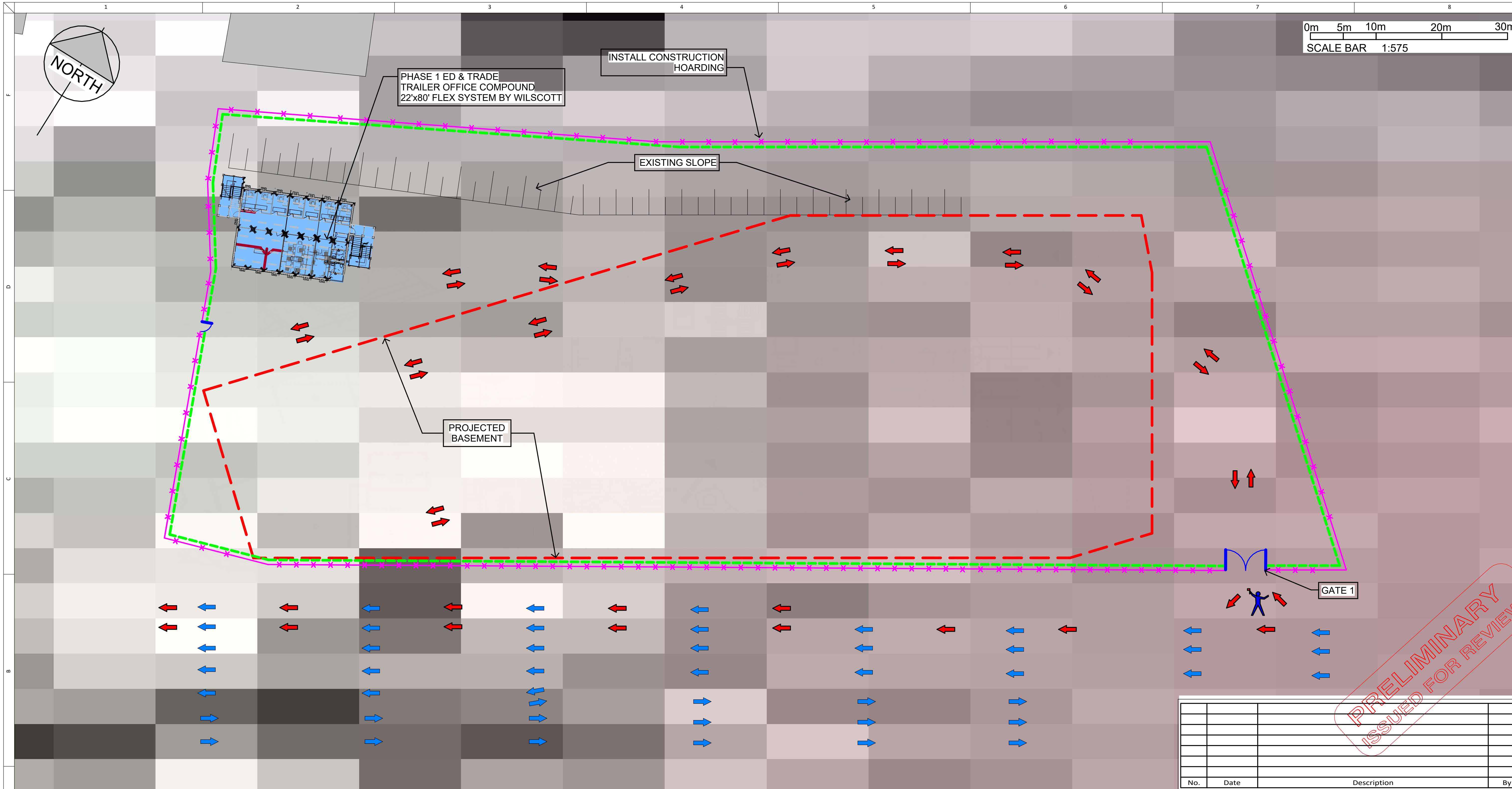
Drawing Title: Site Logistics Cover Page

Date: Nov 16 2022 | Scale: 1 : 40 | Drawn By: MR

Job Number: LLP-LOG-00 | Rev: 0

MR

Filename: N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\
N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\Logistics\Lebreton Library - Logistics Drawings 2022-11-15_R0.rvt



PRELIMINARY ISSUED FOR REVIEW

No.	Date	Description	By

LEGEND:

- EXISTING BUILDING
- LAYDOWN AREA
- EXCAVATION WORKS
- MUD MAT
- PROPERTY LINE
- CONSTRUCTION HOARDING
- SILT FENCE
- PROJECTED STRUCTURES
- FOLDING GATE
- SWING GATE
- CONSTRUCTION TRAFFIC
- PUBLIC TRAFFIC
- FLAGMAN
- TRAILER OFFICE COMPOUND

Print Date / Time: 11/16/22 2:29:03 PM

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Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Project Name: Lebreton Library Parcel

655 Albert St. Ottawa, Ontario.

Drawing Title: Site Logistics
Mobilization and Site Offices

Date: Nov 16 2022 | Scale: As indicated | Drawn By: MR

Job Number: LLP-LOG-01 | Rev:

Author

Filename: N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\
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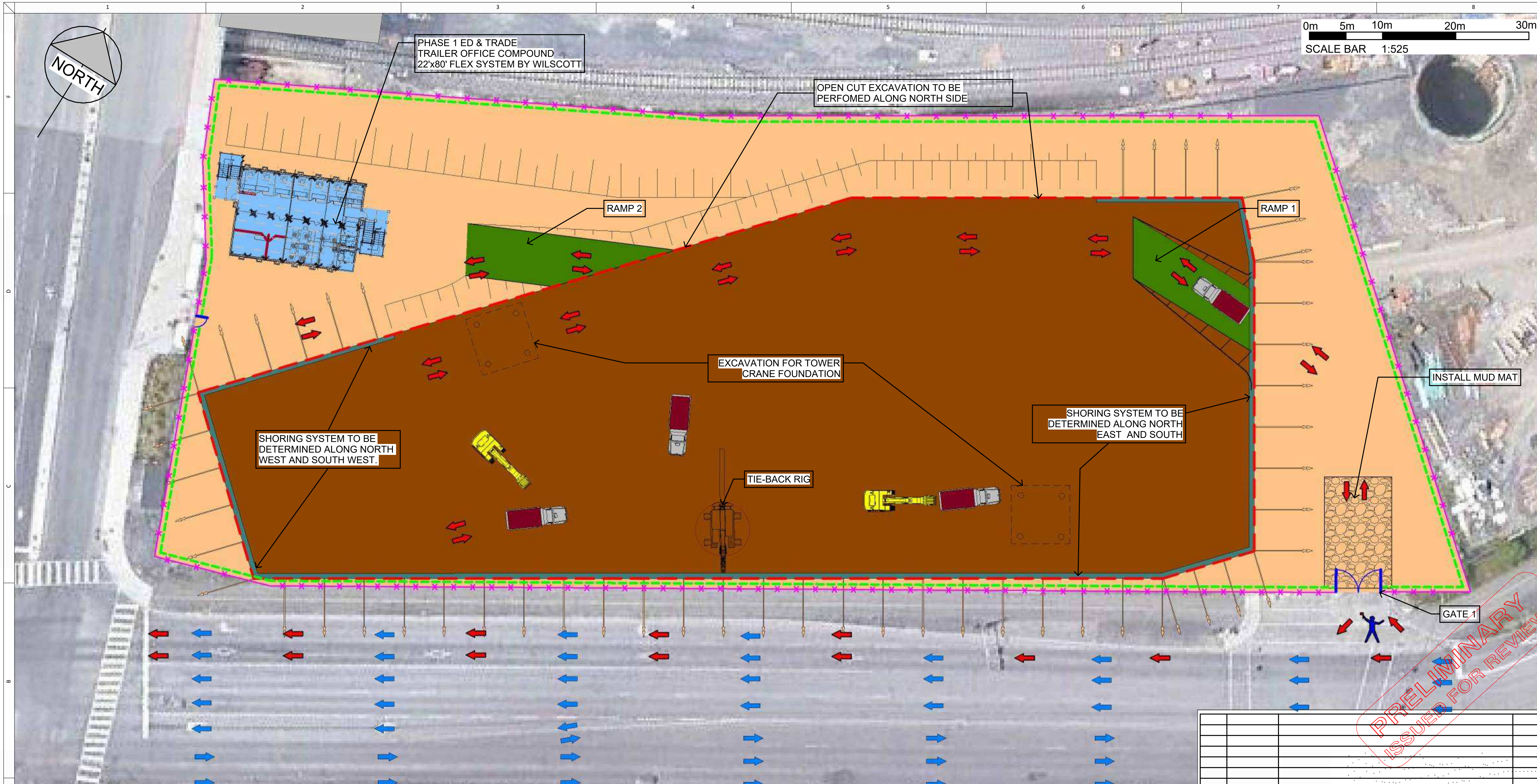

LEGEND:

- EXISTING BUILDING
- LAYDOWN AREA
- EXCAVATION WORKS
- MUD MAT
- PROPERTY LINE
- CONSTRUCTION HOARDING
- SILT FENCE
- PROJECTED STRUCTURES
- FOLDING GATE
- SWING GATE
- CONSTRUCTION TRAFFIC
- PUBLIC TRAFFIC
- FLAGMAN
- TRAILER OFFICE COMPOUND

No.	Date	Description	By

Print Date / Time: 11/16/22 2:29:04 PM

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Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Project Name: Lebreton Library Parcel

655 Albert St. Ottawa, Ontario.

Drawing Title: Site Logistics
Excavation Works

Date: Nov 16 2022 | Scale: As indicated | Drawn By: MR

Job Number: LLP-LOG-02 | Rev:

Author

Filename: N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\
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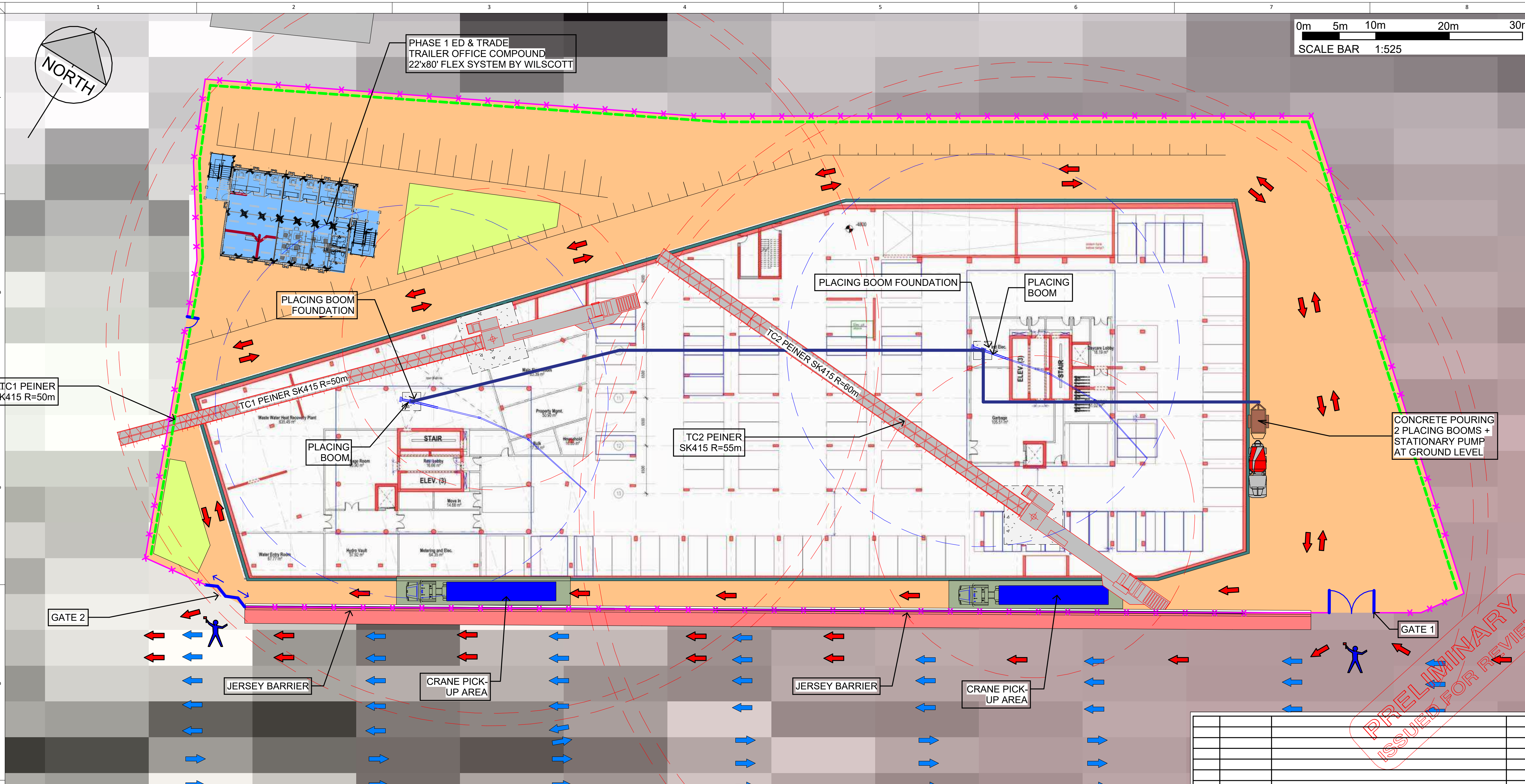

LEGEND:

EXISTING BUILDING	PROPERTY LINE	SWING GATE	JERSEY BARRIER
LAYDOWN AREA	CONSTRUCTION HOARDING	CONSTRUCTION TRAFFIC	TRAILER OFFICE COMPOUND
COVERED HOARDING	SILT FENCE	PUBLIC TRAFFIC	
HIGH COVERED HOARDING	PROJECTED STRUCTURES	FLAGMAN	
	FOLDING GATE		

No.	Date	Description	By

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Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Project Name: Lebreton Library Parcel

655 Albert St. Ottawa, Ontario.

Drawing Title: Site Logistics Substructure - Level P1

Date:	Scale:	Drawn By:
Nov 16 2022	As indicated	MR

Job Number:		Rev:
	LLP-LOG-03	0

Print Date / Time: 11/16/22 2:29:05 PM

Author

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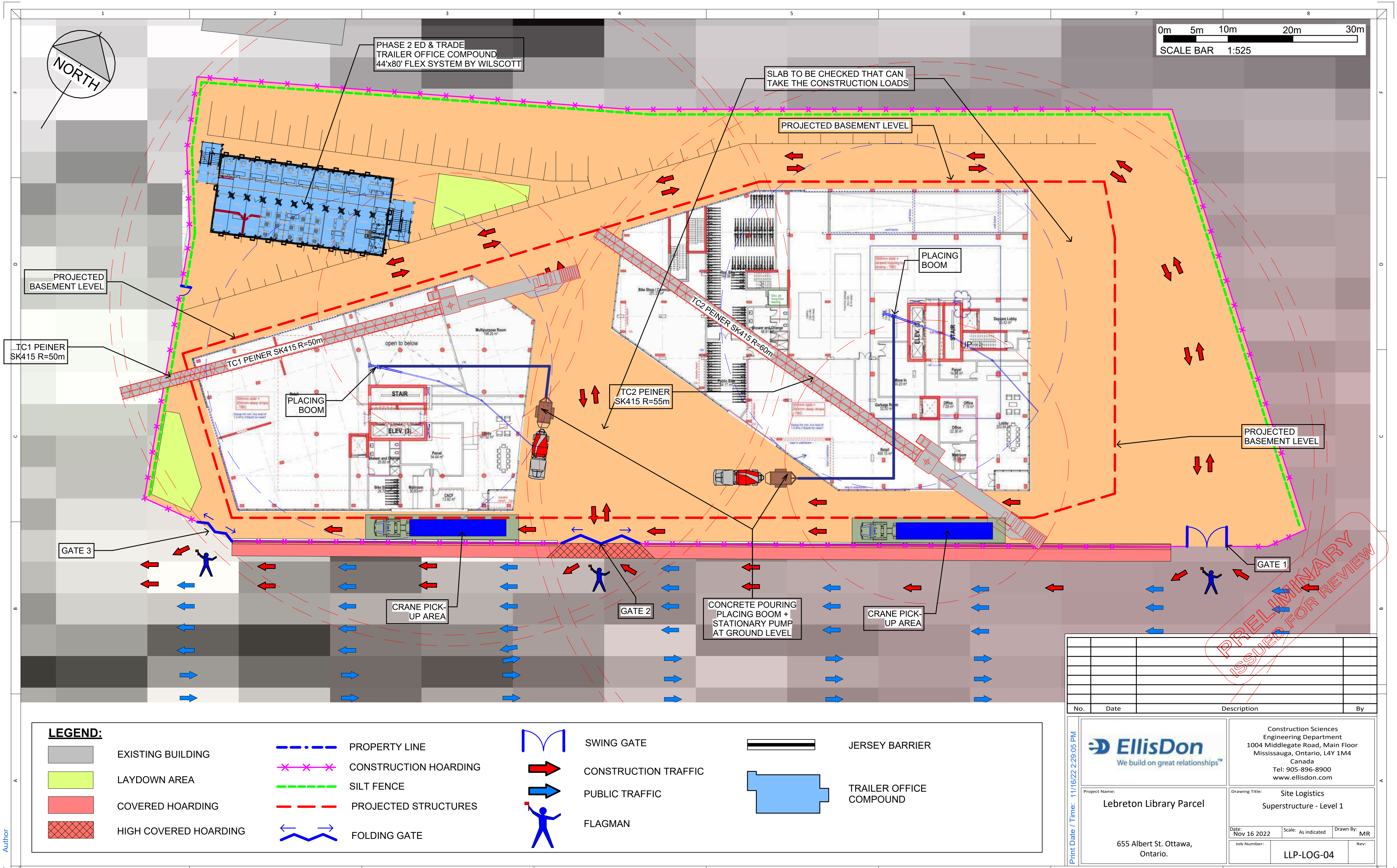

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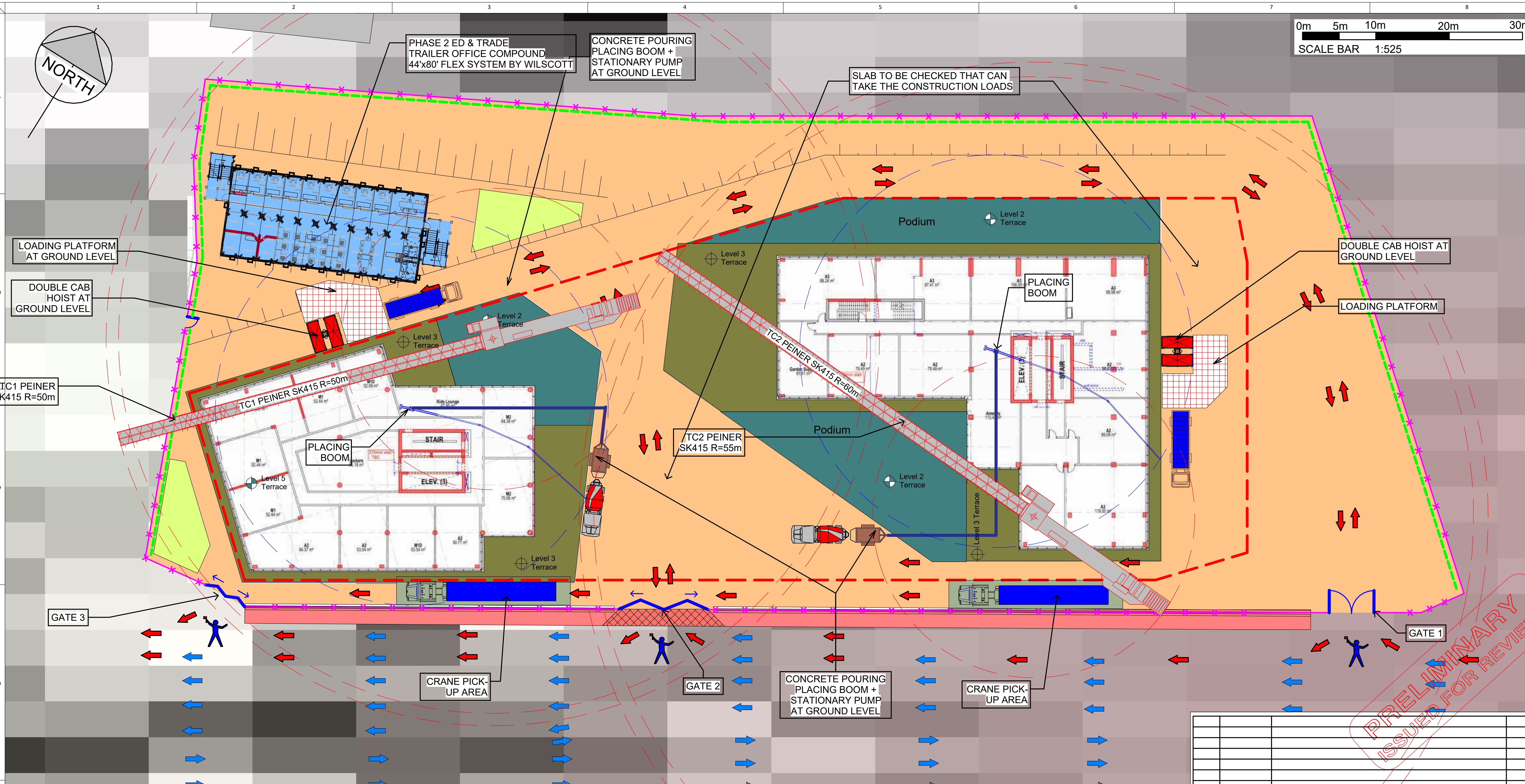

LEGEND:

EXISTING BUILDING	PROPERTY LINE
LAYDOWN AREA	CONSTRUCTION HOARDING
COVERED HOARDING	SILT FENCE
HIGH COVERED HOARDING	PROJECTED STRUCTURES
	FOLDING GATE
SWING GATE	JERSEY BARRIER
CONSTRUCTION TRAFFIC	TRAILER OFFICE COMPOUND
PUBLIC TRAFFIC	
FLAGMAN	

No.	Date	Description	By

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Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Project Name: Lebreton Library Parcel
655 Albert St. Ottawa, Ontario.

Drawing Title: Site Logistics Superstructure - Level 3

Date: Nov 16 2022 | Scale: As indicated | Drawn By: MR

Job Number: LLP-LOG-05 | Rev:

Print Date / Time: 11/16/22 2:29:06 PM

Author

Filename: N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\
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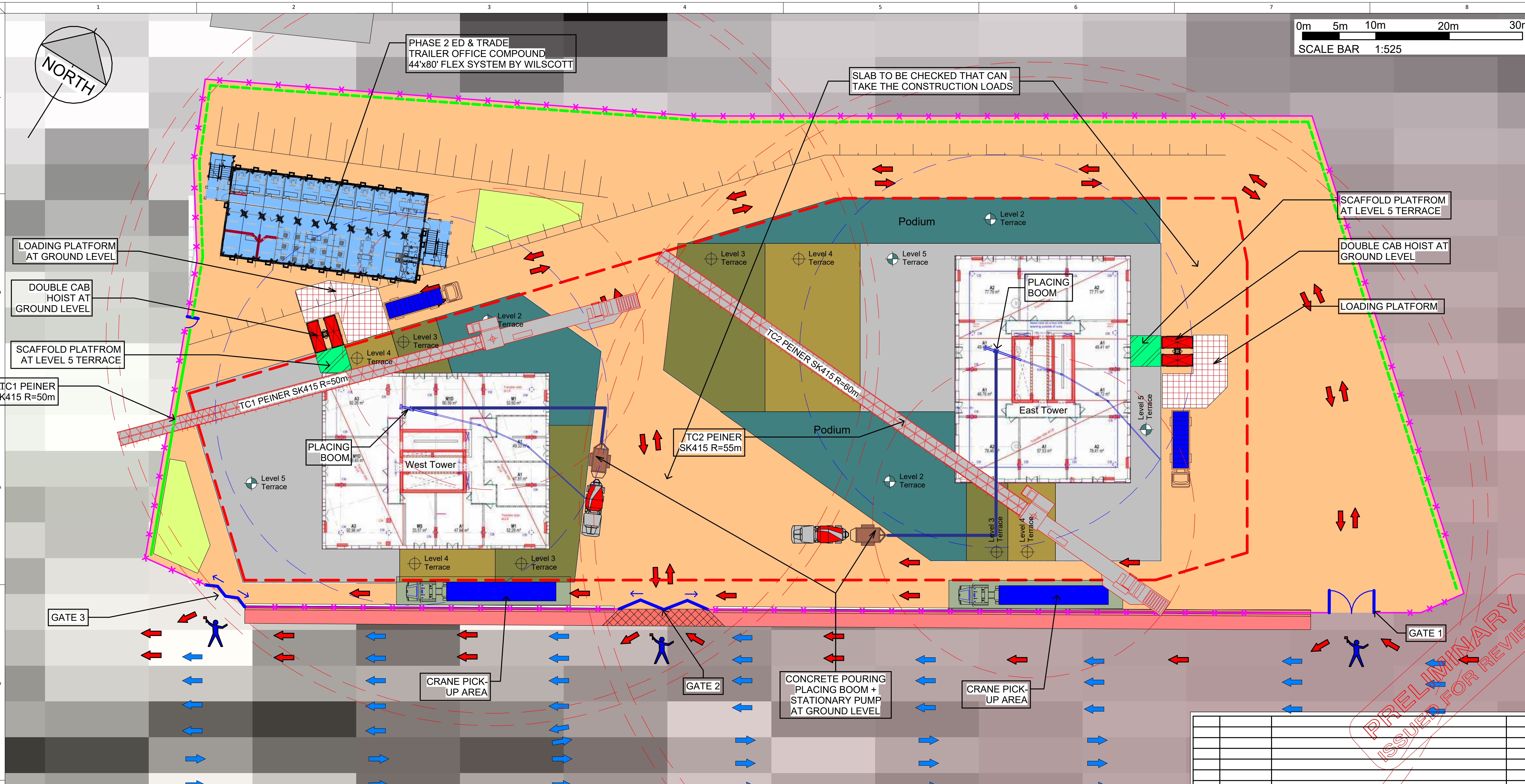

LEGEND:

EXISTING BUILDING	PROPERTY LINE	SWING GATE	JERSEY BARRIER
LAYDOWN AREA	CONSTRUCTION HOARDING	CONSTRUCTION TRAFFIC	TRAILER OFFICE COMPOUND
COVERED HOARDING	SILT FENCE	PUBLIC TRAFFIC	
HIGH COVERED HOARDING	PROJECTED STRUCTURES	FLAGMAN	
	FOLDING GATE		

No.	Date	Description	By

Print Date / Time: 11/16/22 2:29:07 PM

Author

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Engineering Department
1004 Middlegate Road, Main Floor
Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Project Name: Lebreton Library Parcel
655 Albert St. Ottawa, Ontario.

Drawing Title: Site Logistics
Superstructure - Towers Construction

Date: Nov 16 2022 | Scale: As indicated | Drawn By: MR

Job Number: LLP-LOG-06 | Rev:

Filename: N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\
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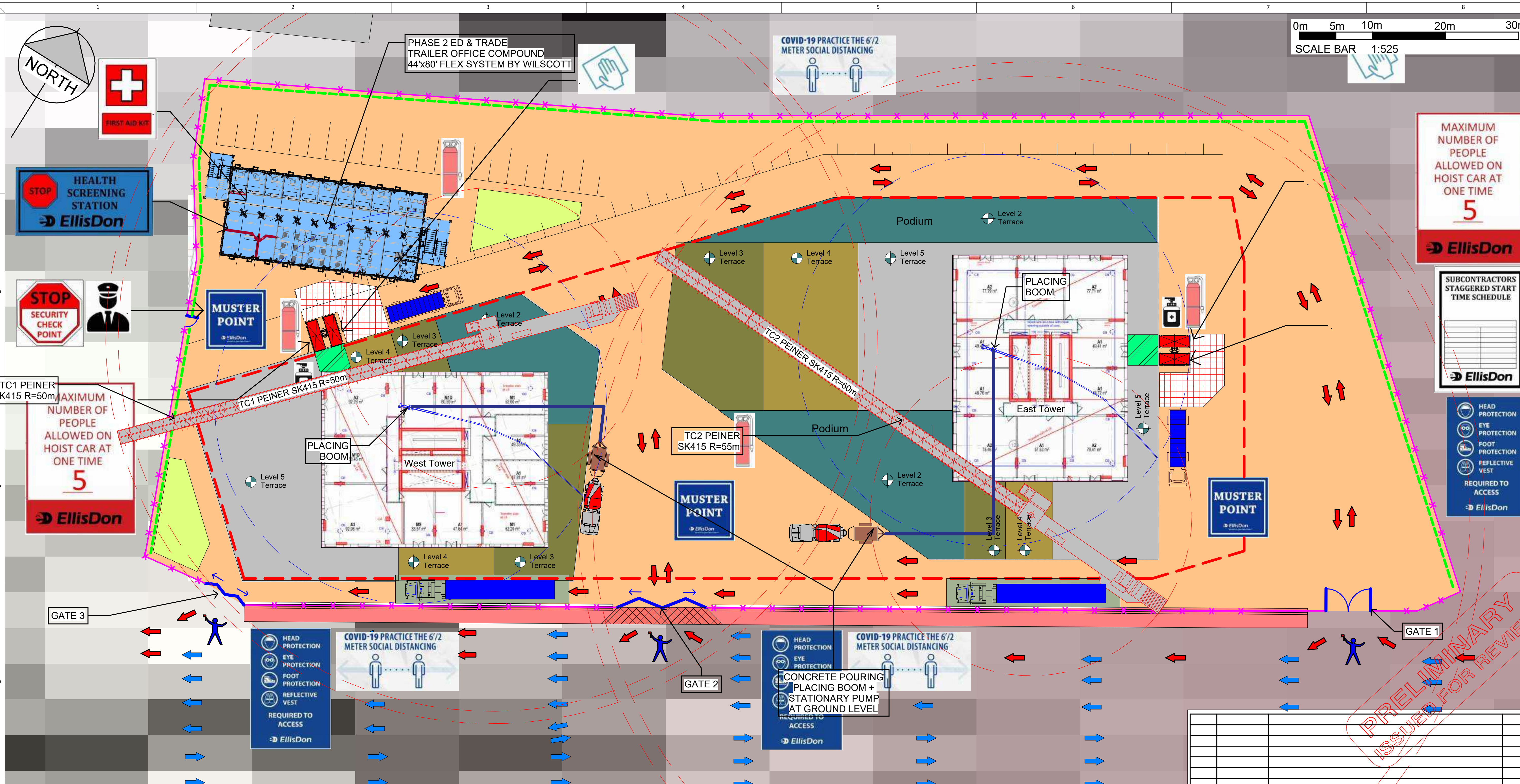

LEGEND:

- CONSTRUCTION AREA
- LAYDOWN AREA
- COVERED HOARDING
- HIGH COVERED HOARDING
- PROPERTY LINE
- CONSTRUCTION HOARDING
- FOLDING GATE
- SWING GATE
- CONSTRUCTION TRAFFIC
- PUBLIC TRAFFIC
- FLAGMAN
- TRAILER OFFICE COMPOUND
- FIRE EXTINGUISHER
- SECURITY GUARD
- HAND SANITIZING BOTTLE
- HAND WASH STATION
- LOW RISK EXPOSURE TO COVID-19 STANDARD PPE REQUIRED
- COMMONLY TOUCHED SURFACES OR AREAS THAT REQUIRE MORE FREQUENT CLEANING/SANITIZING (ELEVATOR/ HOIST CONTROLS / BUTTONS, SITE TRAILERS, DOORS HANDLES, EQUIPMENT, ETC.)

No.	Date	Description	By

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Engineering Department
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Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Project Name: Lebreton Library Parcel

655 Albert St. Ottawa, Ontario.

Drawing Title: Site Logistics
Site Safety Plan COVID-19

Date: Nov 16 2022 | Scale: As indicated | Drawn By: MR

Job Number: | LLP-LOG-07 | Rev:

Print Date / Time: 11/16/22 2:29:08 PM

Author

Filename: N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\
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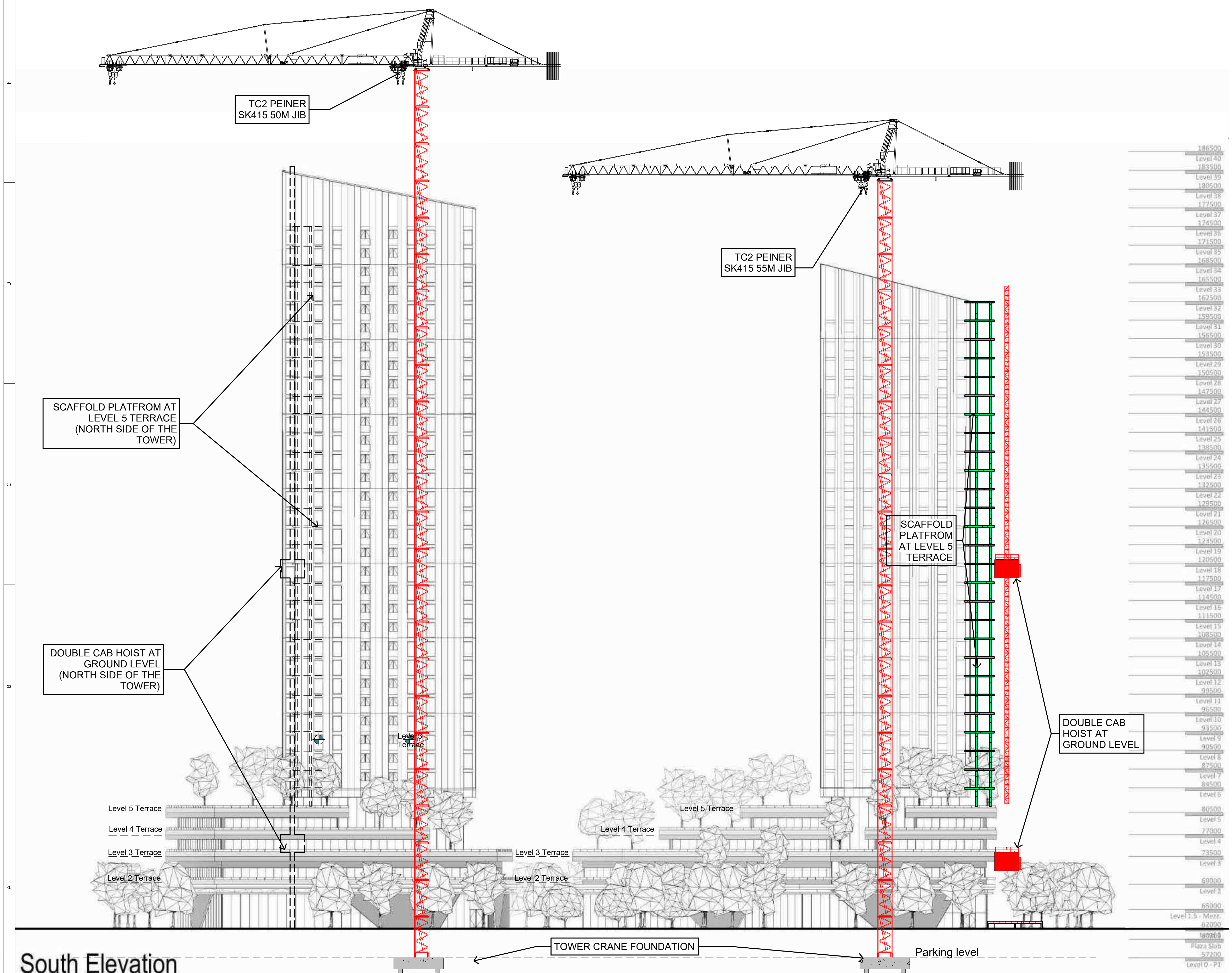

South Elevation

No.	Date	Description	By

PRELIMINARY ISSUED FOR REVIEW

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Engineering Department
1004 Middlegate Road, Main Floor
Mississauga, Ontario, L4Y 1M4
Canada
Tel: 905-896-8900
www.ellisdon.com

Project Name: Lebreton Library Parcel

655 Albert St. Ottawa, Ontario.

Drawing Title: Site Logistics South Elevation

Date: Nov 16 2022 | Scale: 1 : 635 | Drawn By: MR

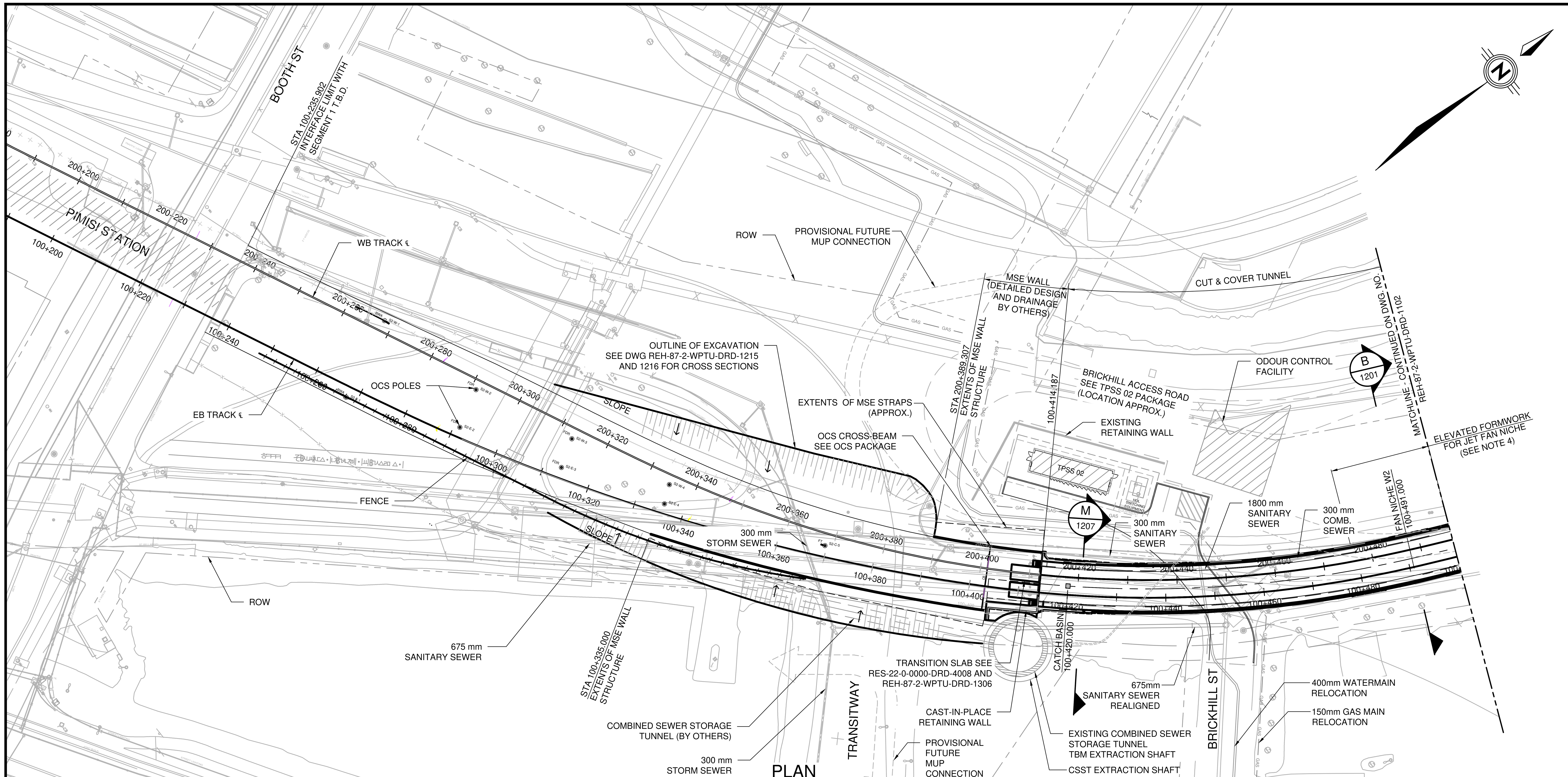
Job Number: LLP-LOG-08 | Rev:

Print Date / Time: 11/16/22 2:29:09 PM

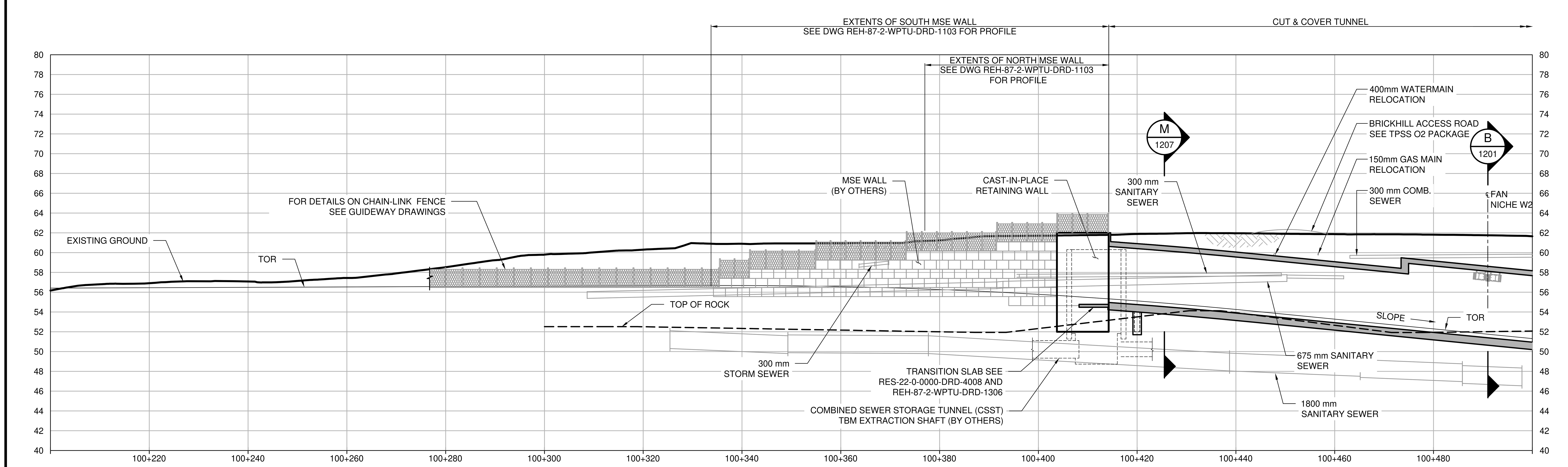
Author

Filename: N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\
N:\AutoCAD\PROPOSAL\Data Centres\XXXX - Lebreton Library Parcel\Logistics\Lebreton Library - Logistics Drawings 2022-11-15_R0.rvt

APPENDIX J: As Built Drawings



PLAN
SCALE 1:500



PROFILE - SOUTH WALLS AND EB TRACKS
SCALE 1:500 H 1:250 V

Confederation Line
Ligne de la Confédération

Ottawa

TUNNEL DESIGN
WEST PORTAL - STRUCTURAL
PLAN AND PROFILE
STA 100+235.902 TO 100+500

CONTRACT No. OILC-11-00-P006
DESIGNED | CHECKED J. ASPIOTIS
DRAWN V. JUSI | SEALED

DRAWING NUMBER REH-87-2-WPTU-DRD-1101

PRIMARY SEAL
REFER TO PREVIOUS REVISION FOR THE ORIGINALLY SEALED VERSION

DESIGN/BUILDER: OLRT CONSTRUCTORS
ENGINEERING JV: RTGE Joint Venture
SECONDARY SEAL (IF REQUIRED)
DESIGN FIRM: HATCH

SCALE: HORIZONTAL 1:500 FULL SIZE, 1:1000 HALF SIZE (0, 5m, 10m, 20m, 40m); VERTICAL 1:250 FULL SIZE, 1:500 HALF SIZE (0, 2.5m, 5m, 10m, 20m)
ASSET No. -
ASSET GROUP -

REV	DESCRIPTION	BY	DATE
0	SI-0737: ISSUED FOR CONSTRUCTION	JA	2016-05-30
1	SI-0983: ISSUED FOR CONSTRUCTION	JA	2016-09-26
2	AS-BUILT	JA	2019-07-05

KEY MAP N.T.S.
WEST PORTAL

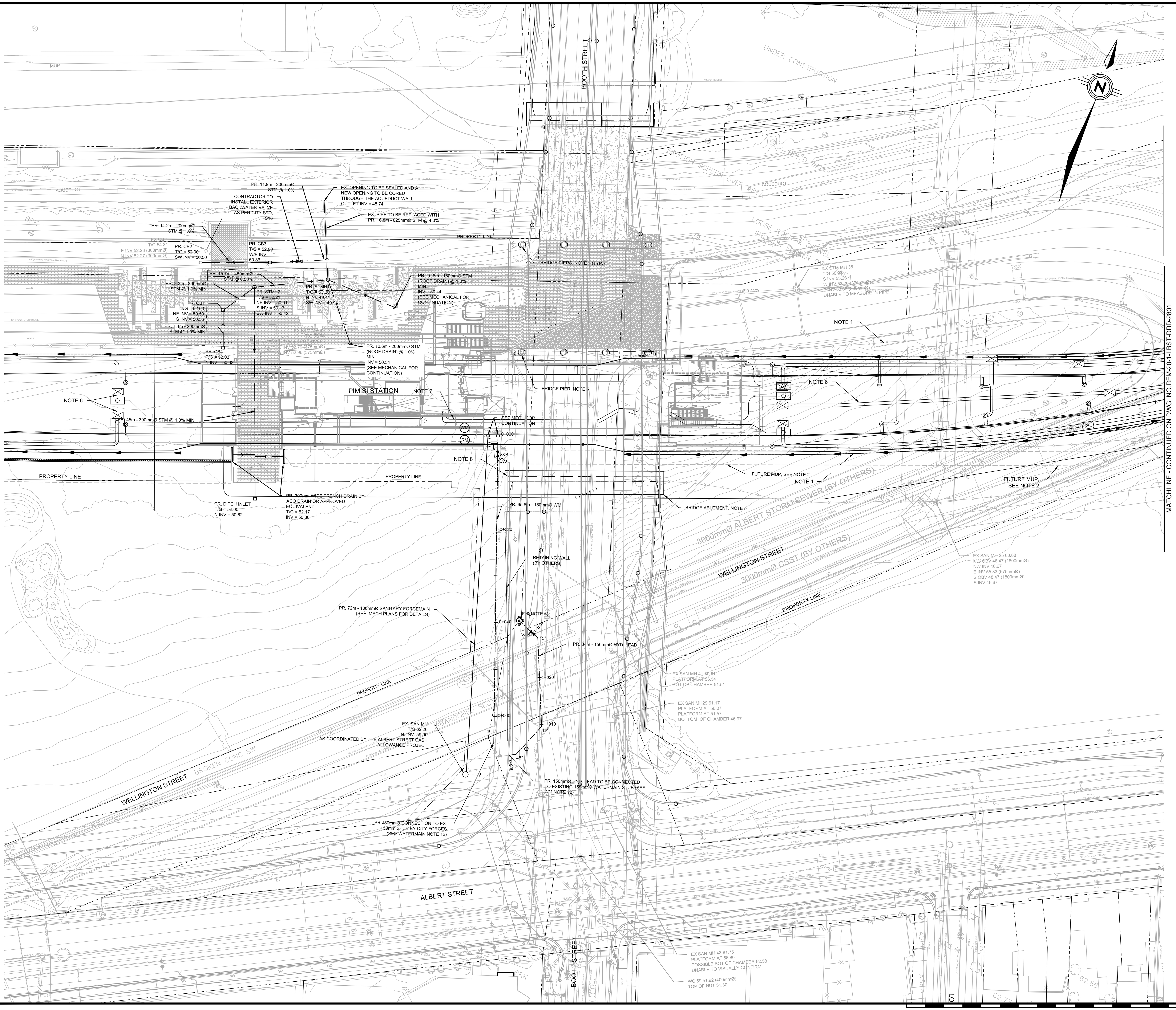
THIS AS-BUILT DOCUMENT HAS BEEN PREPARED BASED UPON INFORMATION FURNISHED BY OLRT CONSTRUCTORS.

NOTES:

1. FOR GENERAL NOTES SEE DRAWING REH-87-2-WPTU-DRD-0030.
2. ONLY MAJOR UTILITIES (300mm AND ABOVE) AND UTILITIES IN THE VICINITY OF THE PORTALS HAVE BEEN SHOWN. FOR ADDITIONAL UTILITY INFORMATION, SEE SEGMENT 1 UTILITIES DRAWINGS.
3. FOR PROPOSED UTILITIES AND UTILITY RELOCATIONS SEE CIVIL DRAWINGS.
4. FOR FAN NICHE PROFILE SEE DRAWING REH-87-2-WPTU-DRD-1202.
5. FOR UTILITY REMOVALS AND RELOCATIONS, SEE REM-30-2-0000-DRD-2731.

BASED ON ALIGNMENT ISSUED 2015-10-19

TITLEBLOCK: 790mm x 534mm RTGE JV 2013
2019-Jul-15 10:37:52 AM P:\OTTAWA\311921\CAD\DWGS\80_Underground_Works\87_Tunnel_Design\SHEET\REH-87-2-WPTU-DRD-1101.dwg



Confederation Line
Ligne de la Confédération

Ottawa

PIMISI STATION
CIVIL
COMPOSITE UTILITY
PLAN

CONTRACT No.	
OILC-11-00-P006	
DESIGNED	CHECKED
-	-
DRAWN	SEALED
REKHA	-

DRAWING NUMBER
REM-20-1-LBST-DRD-2800

PRIMARY SEAL

Refer to Rev 0 for the originally sealed version

DESIGN/BUILDER
OLRT CONSTRUCTORS CONSTRUCTEURS

ENGINEERING JV
RTGE Joint Venture

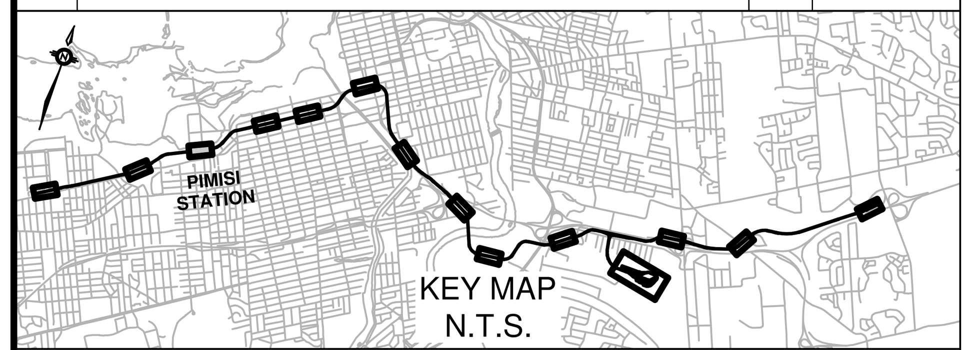
SECONDARY SEAL (IF REQUIRED)

DESIGN FIRM
MMM GROUP

SCALE 0 4 8 16 32
HORIZONTAL 1:800 FULL SIZE 1:400 HALF SIZE

ASSET No. -
ASSET GROUP -

REV	DESCRIPTION	BY	DATE
0	SI-0463: ISSUED FOR CONSTRUCTION	IJ	2015-12-16
1	AS BUILT	RA	2019-06-14



LAYOUT INFORMATION BASED ON 3 DEGREE MTM ZONE NAD 83 (OLRT) COORDINATE SYSTEM, COMBINED SCALE FACTOR 0.99946

This As-Built Document has been prepared based upon information furnished by OLRT Constructors.

NOTES:

1. REFER TO 'CIVIL - GUIDEWAY DESIGN - SEGMENT 1' FOR UTILITIES RELOCATION, REMOVALS AND NEW CONSTRUCTION.
2. REFER TO THE 'LANDSCAPING - PIMISI STATION' FOR SITE FURNISHING, LANDSCAPING FEATURES AND MUP'S.
3. ROW BASED ON PROPERTY REQUEST PLANS (PRP) PROVIDED BY THE CITY.
4. CONTACTOR TO ENSURE THAT THE EXISTING BRIDGE FOOTING IS NOT UNDERMINED, EXPOSED TO FROST OR OTHERWISE ADVERSELY IMPACTED BY EXCAVATION FOR CONSTRUCTION OF FOOTINGS OR SERVICES. PROVIDE EXCAVATION PLAN IN THE VICINITY OF THE BRIDGE FOOTING FOR REVIEW BY THE BRIDGE ENGINEER
5. REFER TO THE 'POWER SUPPLY AND DISTRIBUTION DESIGN' PACKAGE FOR TPSS AND OCS DETAILS.
6. REFER TO THE 'AT-GRADE DUCTBANK' PACKAGE FOR GUIDEWAY DUCTBANK DETAILS.
7. REFER TO 'ELECTRICAL - PIMISI STATION' FOR ELECTRICAL DESIGN.
8. REFER TO 'STRUCTURES - BOOTH STREET BRIDGE' FOR FOUNDATION LAYOUT AND ABUTMENT FOOTING DETAILS.
9. REFER TO '400mm WATERMAIN RELOCATION BRICKHILL - SEGMENT 1' FOR WATERMAIN RELOCATION DESIGN.
10. THE SEAL ABOVE CERTIFY THAT THE VERTICAL CLEARANCES BETWEEN THE THIRD PARTY UTILITIES AND CIVIL UTILITIES HAVE BEEN REASONABLY COORDINATED. THE SEAL IS NOT INTENDED TO WARRANT THAT THE ENTITIES HAVE BEEN DESIGNED IN ACCORDANCE WITH THE CONTRACT REQUIREMENTS. REFER TO INDIVIDUAL UTILITY DRAWINGS FOR SUCH INFORMATION AND WARRANTS.

LEBRETON FLATS DIVERSION CHAMBER

SITE PLAN

NOTES:

1. RETAINING WALL LOCATION, DEPTH AND DETAILS PROVIDED FROM RTG DRAWING "BOOTH STREET PROPOSED_2012-06-05-OVERALL.
2. OLRT TRACK ALIGNMENT IS BASED ON "OLRT AUG 16 2013" DRAWING.
3. BOOTH STREET BRIDGE (FUTURE) LAYOUT PROVIDED FROM DRAWING "BOOTH STREET PROPOSED_2012-06-05-OVERALL.
4. THE CONTRACTOR SHALL NOT DISTURB THE EXISTING SLOPE TO THE AQUEDUCT. EXCAVATIONS SHALL REMAIN SOUTH OF THE EXISTING CHAINLINK FENCE.
5. CONTRACTOR TO COMPLETE PRE-CONSTRUCTION SURVEY OF SITE TO FACILITATE REINSTATEMENT AS PER CITY STD. S.P. No.F-1011.
6. LOCATION OF ALL EXISTING UNDERGROUND SERVICES IS APPROXIMATE ONLY. CONTRACTOR TO LOCATE ALL UNDERGROUND SERVICES PRIOR TO ANY EXCAVATION.
7. PROPERTY LINES FROM "LRT PROPERTY SKETCHES" DWG. No.MS No.14145-P001-REV-7-114.DGN DATED JAN. 2013
8. REFER TO DWG. No. C-07 FOR FLOW MANAGEMENT AND CONSTRUCTION SEQUENCING REQUIREMENTS.
9. CONTRACTOR STAGING AND MATERIAL STORAGE/STOCKPILE AREA SHALL BE AS DIRECTED BY RIO/RTG.

Ottawa

Contract No. **ISD13-2007** | Dwg. No. C-02

Sheet of

Asset No.

Asset Group

W. Newell, P. Eng.
General Manager, Infrastructure Services

R. Dempsey, P. Eng.
Project Manager, Infrastructure Services

Des.	C.G.	Chk'd.	S.D.
Dwn.	E.C.	Chk'd.	C.G.
Utility Circ. No.		Index No.	
Const. Inspector			

Scale: HORIZONTAL 500
0m 5 10 20

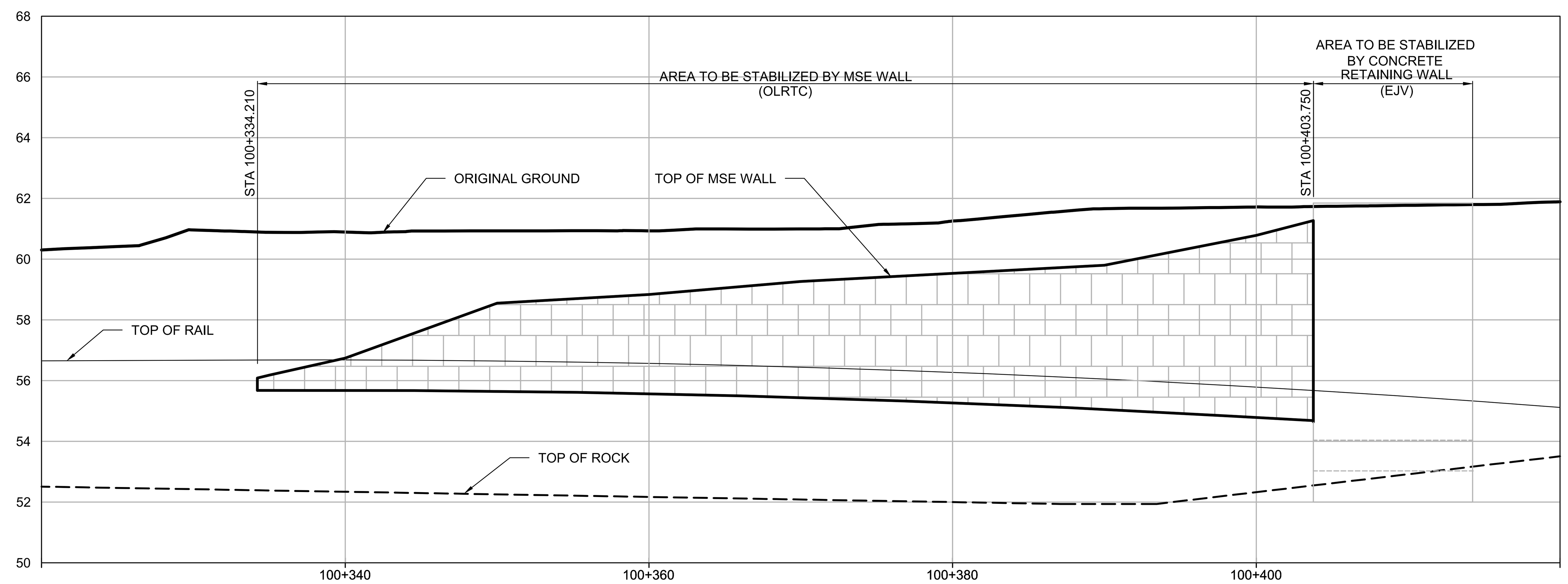
NOTE:
The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Stantec
Stantec Consulting Ltd.
1331 Clyde Ave., Suite 400
Ottawa ON Canada
K2C 3G4
Tel. 613.722.4420
Fax. 613.722.2799
www.stantec.com

REVISIONS

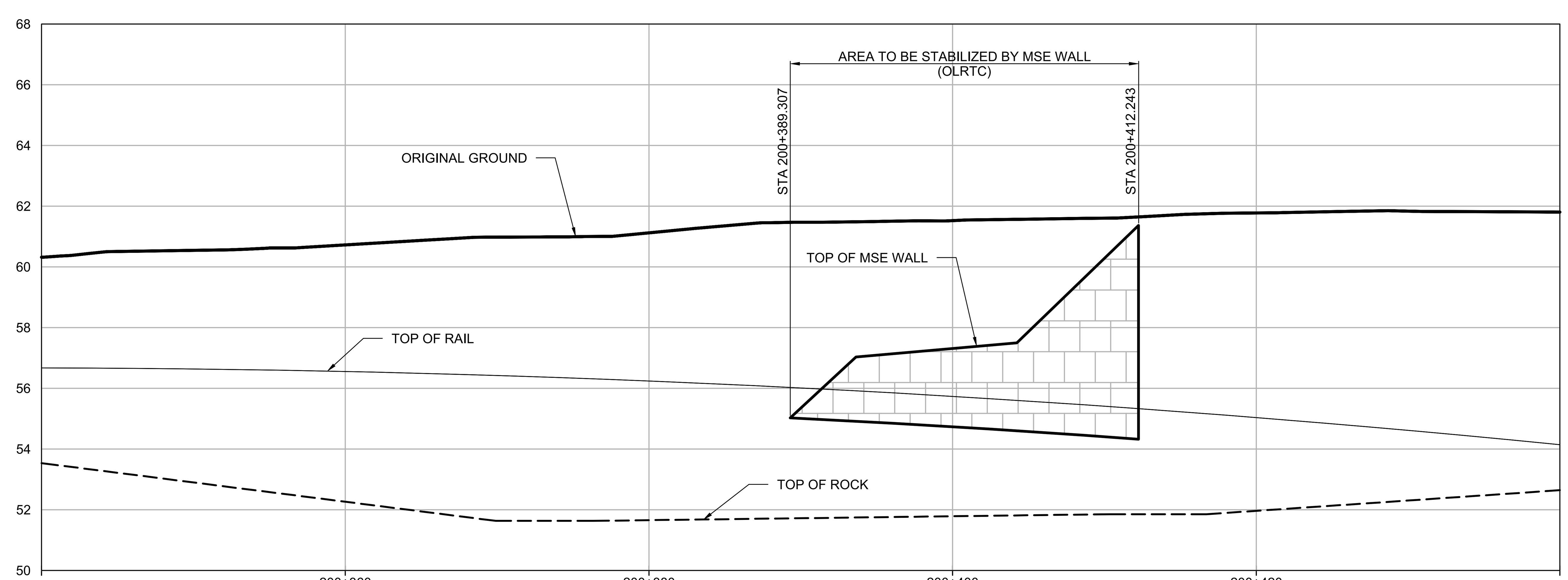
No.	Description	By	Date (dd/mm/yy)
0	ISSUED FOR PRELIMINARY DESIGN	CG/SD	25/10/13
1	ISSUED FOR 90% DESIGN	CG/SD	22/11/13
2	ISSUED FOR TENDER	CG/SD	20/12/13
3	ISSUED FOR CONSTRUCTION	C.G.	23/05/14
4	ISSUED FOR SCM #18	J.R.	04/12/14
5	ISSUED FOR SCM #40	J.R.	04/06/15
6	ISSUED FOR SCM #40R1	J.R.	09/06/15
7	AS BUILT	J.R.	10/19/18

TITLEBLOCK: 790mm x 534mm RTGE JV 2013



PROFILE - SOUTH MSE WALL

SCALE 1:250 H 1:125 V



PROFILE - NORTH MSE WALL

SCALE 1:250 H 1:125 V

Confederation Line
Ligne de la Confédération

Ottawa

TUNNEL DESIGN
WEST PORTAL - STRUCTURAL
MSE WALL PROFILES

CONTRACT No.	OILC-11-00-P006
DESIGNED	
CHECKED	J. ASPIOTIS
DRAWN	V. JUSI
SEALED	

DRAWING NUMBER
REH-87-2-WPTU-DRD-1103

PRIMARY SEAL

REFER TO PREVIOUS REVISION FOR THE ORIGINALLY SEALED VERSION

DESIGN/BUILDER

OLRT CONSTRUCTORS CONSTRUCTEURS

ENGINEERING JV

RTGE Joint Venture

SECONDARY SEAL (IF REQUIRED)

DESIGN FIRM

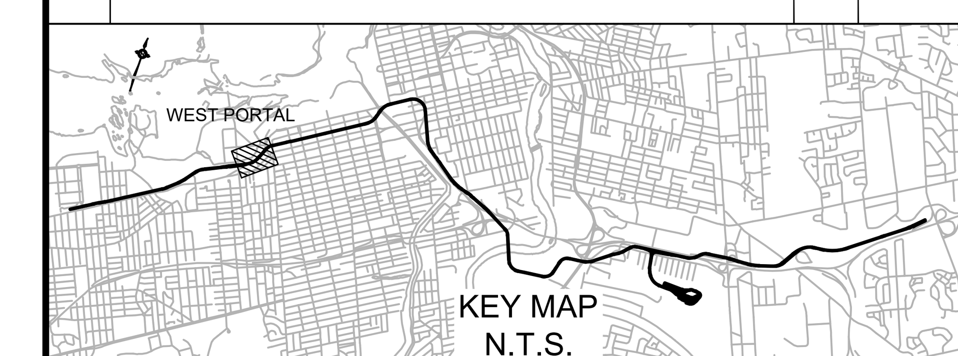
HATCH

SCALE
HORIZONTAL 0 2.5m 5m 10m 20m — 1:250 FULL SIZE, 1:500 HALF SIZE
VERTICAL 0 1.25m 2.5m 5m 10m — 1:250 HALF SIZE, 1:125 FULL SIZE

ASSET No. -

ASSET GROUP -

REV	DESCRIPTION	BY	DATE
0	SI-0737: ISSUED FOR CONSTRUCTION	JA	2016-05-30
1	SI-0983: ISSUED FOR CONSTRUCTION	JA	2016-09-26
2	AS-BUILT	JA	2019-07-05



THIS AS-BUILT DOCUMENT HAS BEEN PREPARED BASED UPON INFORMATION FURNISHED BY OLRT CONSTRUCTORS.

NOTES:

1. FOR GENERAL NOTES SEE DRAWING REH-87-2-WPTU-DRD-0030.

2019-Jul-17 9:33:43 AM P:\OTTAWA\311921\CAD\DWGS\80_Underground_Works\87_Tunnel_Design\SHEET\REH-87-2-WPTU-DRD-1103.dwg

Confederation Line
Ligne de la Confédération

Ottawa

TUNNEL DESIGN
WEST PORTAL - STRUCTURAL
RETAINING SOIL SYSTEM WALL
SECTIONS, SHT 1

CONTRACT No. OILC-11-00-P006

DESIGNED | CHECKED J. ASPIOTIS

DRAWN V. JUSI | SEALED

DRAWING NUMBER REH-87-2-WPTU-DRD-1215

PRIMARY SEAL: REFER TO PREVIOUS REVISION FOR THE ORIGINALLY SEALED VERSION

DESIGN/BUILDER: OLRT CONSTRUCTORS CONSTRUCTEURS

SECONDARY SEAL (IF REQUIRED)

ENGINEERING JV: RTGE Joint Venture

DESIGN FIRM: HATCH

SCALE 1:100 FULL SIZE, 1:200 HALF SIZE (0, 1m, 2m, 4m, 8m)

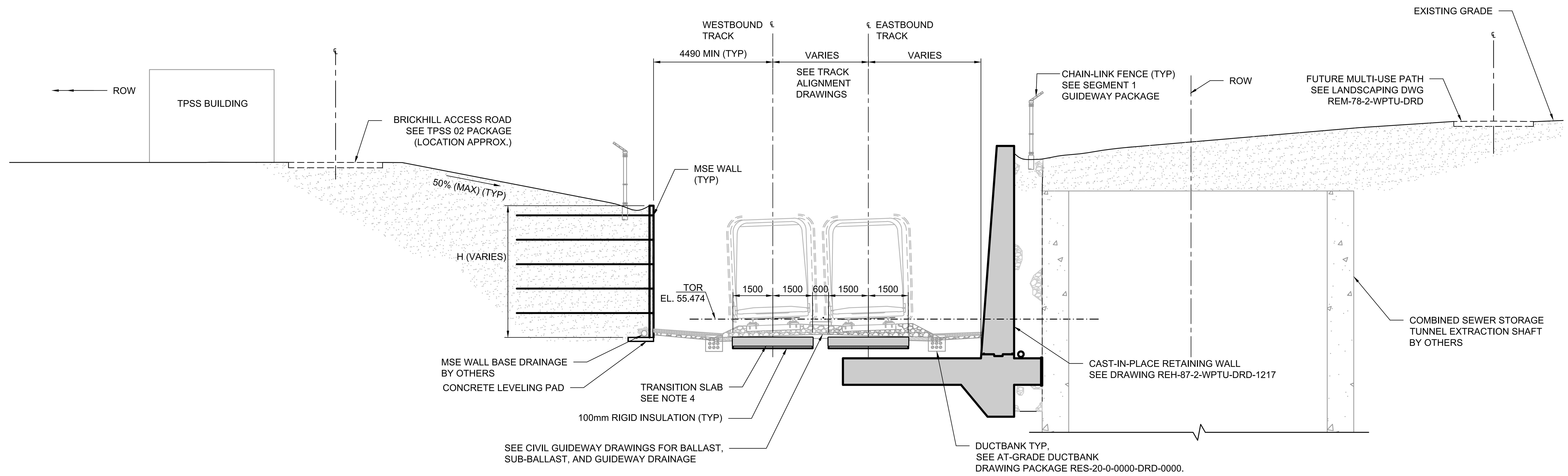
ASSET No. -

ASSET GROUP -

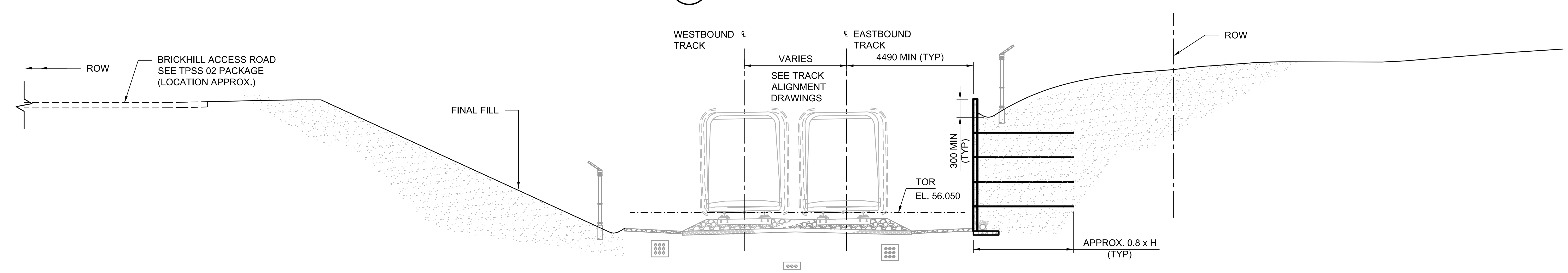
REV	DESCRIPTION	BY	DATE
0	SI-0737: ISSUED FOR CONSTRUCTION	JA	2016-05-30
1	SI-0983: ISSUED FOR CONSTRUCTION	JA	2016-09-26
2	SI-1087: ISSUED FOR CONSTRUCTION	JA	2016-11-11
3	AS-BUILT	JA	2019-07-05

KEY MAP N.T.S. (WEST PORTAL)

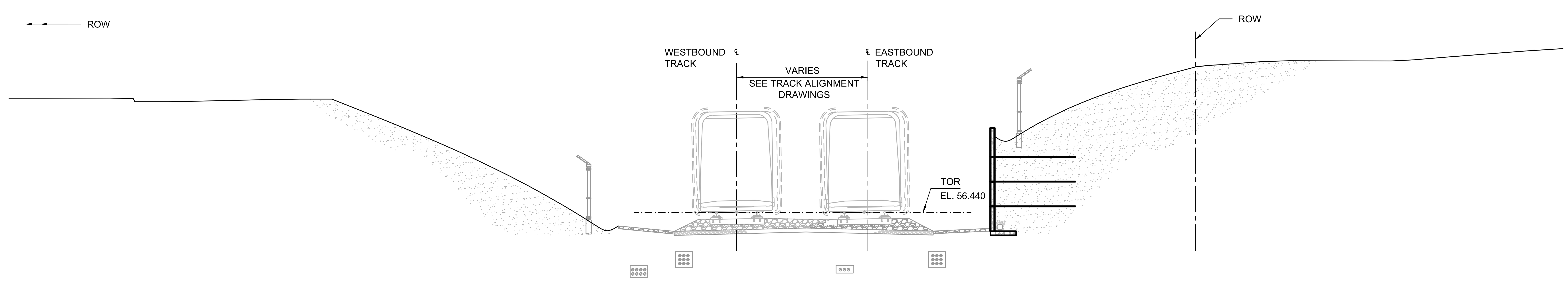
THIS AS-BUILT DOCUMENT HAS BEEN PREPARED BASED UPON INFORMATION FURNISHED BY OLRT CONSTRUCTORS.



A / 1110 SECTION STA. 100+410
SCALE 1:100



B / 1110 SECTION STA. 100+390
SCALE 1:100



C / 1110 SECTION STA. 100+370
SCALE 1:100

NOTES:

1. DURING EXCAVATION, PROVIDE 1m BENCH AS INTERFACE BETWEEN EXISTING FILL AND NATIVE SILTY SAND AS PER THE GEOTECHNICAL REPORT NO: RET-80-2-WPTU-REP-0005. TITLED "GEOTECHNICAL REPORT - WEST PORTAL (FINAL SUBMISSION)".
2. STRUCTURAL DESIGN OF MSE WALL SHALL BE PERFORMED BY THE CONTRACTOR SUBJECT TO THE APPROVAL BY THE ENGINEER OF RECORD.
3. ALL EXISTING GRADE ELEVATIONS AND SURFACE FEATURES BEYOND ROW SHALL BE RESTORED BY THE CONTRACTOR: REFER TO LANDSCAPING PACKAGE FOR GRADING.
4. FOR THE TRANSITION SLAB, REFER TO DRAWINGS RES-22-0-0000-DRD-4008 AND REH-87-2-WPTU-DRD-1306.