Adverse Soils Conditions

Address(&lot): Following the civic Address Only- as note on Gemtec Memo 64153.80, 1500 Thomas Argue, D07-16-18-0007,
Subdivision, Phase, Builder: Soho West, West Capital Carp Airport Phase 2A
Geotechnical Memo (s) & Report (s): Gemtec # 64153.80, July 22, 2019, Grading Plan Review #64153.80, February 19,2021 a
Notes: Above ground pools to be assessed by geotechnical personnel.

Date:

		Permit Approvals - requirements at permit application
Site Class A,B,C,D,E or F		A, B, C, D - Standard Procedure unless dictated by other factors
Bearing Capacity Kpa		75 kPa or greater, part 9 fdtn - Standard Procedure unless dictated by other factors
Maximum Permissable Grade Raise Identified	**Part 4/9**	Part 9 & 4 Foundation Requirements Geotechnical Engineer • Confirmation of part 9/4 foundation • Part 9 only - Lot specific bearing capacity values at the USF as a function of founding elevation, including footing restrictions • Part 4 only - Soil design bearing capacity, SLS and ULS at USF as a function of founding elevation, including footing restrictions • Footing sizes and the effects of long term groundwater lowering accounted for • Existing grade elevation, proposed finished grade elevation, maximum allowable grade raise, actual grade raise, proposed USF elevation • Calculated post construction settlements (include special requirements for foundation construction where calculated settlements are more than 25mm total and 20mm differential)
	Additional for part 4	N/A

Light Weight Fill Required	Part 9&4 Foundation Requirements Geotechnical Engineer • Confirmation of part 9 Foundation (site conditions may dictate part 4 design as determined by geotechnical engineer) • Lot Specific, backfill, engineered fill details • Calculated post construction settlements, (include special requirements for footing and foundation wall construction where calculated settlements are more than 25mm total and 20mm differential).

REVIEWED
By Serge Labonte at 10:25 am, Jul 14, 2021

Adverse Soils Conditions

Address(&lot): Following the civic Address Only- as note on Gemtec Memo 64153.80, 1500 Thomas Argue, D07-16-18-0007,
Subdivision, Phase, Builder: Soho West, West Capital Carp Airport Phase 2A
Geotechnical Memo (s) & Report (s): Gemtec # 64153.80, July 22, 2019, Grading Plan Review #64153.80, February 19,2021 an
Notes: Above ground pools to be assessed by geotechnical personnel.

Date:

		Building Inspection - requirements at key inspection stages
Site Class A,B,C,D,E or F		A, B, C, D - Standard Procedure unless dictated by other factors
Bearing Capacity Kpa		75 kPa or greater, part 9 fdtn - Standard Procedure unless dictated by other factors
Maximum Permissable Grade Raise Identified	**Part 4/9**	Part 9 or 4 fdtn Excavation Inspection - Geotechnical Engineer Confirm bearing capacity at USF meets/exceeds minimum design requirements. Final Inspection - Geotechnical Engineer • Lot specific letter signed under professional seal confirming that the grade raise, is as recommended (reference all geotechnical reports) • Expected post construction settlement limits of 25 mm total and 20 mm differential will not be exceeded.
	Additional for part 4	N/A

Light Weight Fill Required	Part 9 or 4 foundation design Excavation Inspection - Geotechnical Engineer Confirm bearing capacity at USF meets/exceeds minimum design requirements. Framing Inspection - Geotechnical Engineer/Designate Lot specific site review memo confirming light weight fill has been placed in accordance with geotechnical engineers recommendations. Final Inspection - Geotechnical Engineer • Lot specific letter signed under professional seal confirming that the installed backfill, lightweight fill, granular fill are installed as recommended (reference all geotechnical reports) • Expected post construction settlement limits of 25 mm total and 20 mm differential will not be exceeded.

REVIEWED
By Serge Labonte at 10:26 am, Jul 14, 2021

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February 19, 2021

File: 64153.80

REVIEWED
By Serge Labonte at 10:26 am, Jul 14, 2021

Novatech
200-240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

Attention: Alex McAuley, P.Eng.

Re: Grading Plan Review
West Capital Airpark – Phase 2A Residential Development
Diamondview Road at March Road
Ottawa, Ontario

INTRODUCTION

As requested, this letter provides a grading plan review for Phase 2A of the West Capital Airpark residential development located southeast of the intersection of Diamondview Road and March Road in Ottawa, Ontario.

BACKGROUND

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) carried out the geotechnical investigation for Phase 2A of the West Capital Airpark residential development. The results of that investigation are provided in the following reports:

- Report titled “Geotechnical Investigation, West Capital Airpark, Phase 2A Residential, Ottawa, Ontario”, dated July 22, 2019 (Project Number 64153.80); and,
- Report titled “Supplemental Geotechnical Investigation, West Capital Airpark, Phase 2A Residential, Ottawa, Ontario”, dated July 22, 2019 (Project Number 64153.80)

Recently, we were asked to provide lot specific information regarding certain geotechnical aspects of the development. The requested information is provided in Attachment A. The grading plans for Phase 2A of West Capital Airpark were prepared by Novatech and provided in the following drawings:

- Drawing No. 102085-GR-11, titled “Phase 2A Residential Grading Plan” (Project Number 102085-01) Revision Number 11 (dated February 12, 2021); and,
- Drawing No. 102085-GR12, titled “Phase 2A Residential Grading Plan” (Project Number 102085-01) Revision Number 11 (dated February 12, 2021).

DISCUSSION

As indicated above, the requested, lot specific information for Phase 2A of this development is provided in Attachment A. The following sections provide additional comments based on our geotechnical investigation.

It should be noted that original, existing, and proposed grading information in the attached table for lots 52 to 82 and Blocks 83, 84, and 85 were provided by Novatech.

Grade Raise Restrictions

The development is underlain by deposits of sensitive silty clay, which has a limited capacity to support loads imposed by grade raise fill material, pavement structures, and foundations for the houses. The placement of fill material on this site must therefore be carefully planned and controlled so that the stress imposed by the fill material does not result in excessive consolidation of the silty clay deposit. Concrete slabs, granular base materials, overall grade raise and pavement structures are considered grade raise filling. Groundwater lowering also results in a stress increase on the underlying sensitive silty clay deposit.

Based on the results of our subsurface investigations, the maximum thickness of any grade raise filling should be limited to the following within the assessment areas summarized in the table below:

Table 1 – Maximum Permissible Grade Raise

Assessment Area	Maximum Permissible Grade Raise (metres)
A[1]	1.5
A[2]	1.7
B[2]	1.5
C[2]	1.4
D[2]	1.2

Assessment Area	Maximum Permissible Grade Raise (metres)
E[2]	1.0

Note: [1] – Assessment area as defined in Figure 1 from geotechnical investigation dated July 22, 2019
[2] – Assessment area as defined in Figure 1 from supplemental geotechnical investigation dated January 27, 2021

The grade raise restrictions for Phase 2A of the residential development have been calculated in order to limit the total settlement of the ground to about 25 millimetres in the long term. For design purposes, we have made the following assumptions:

- The groundwater lowering due to the development at this site will be at most 1.0 metres below the existing measured groundwater levels at the site;
- The unit weight of the grade raise material used in the vicinity of the structures is not greater than 20.0 kilonewtons per cubic metre; and,
- The grade raise fill material used below the structures, where required, will be composed of compacted granular material having a unit weight of 21.5 kilonewtons per cubic metre.

If heavier grade raise fill material is used, the maximum grade raise will have to be reduced accordingly.

The proposed grades exceed the maximum permissible at Blocks 84 (Lots F to J) and 85 (Lots L to O) and Lots 63 to 69, and 79. As such, light weight fill will be required at the above blocks and lots.

The grade raise exceedances at Block 85 (Lots F to J) and Lots 25, 71, and 76 are within 0.05 metres, or less, of the permissible grade raise. Based on the conservative approach with the maximum permissible grade raise assessment, and the degree of accuracy during the construction of the houses, it is our opinion that the proposed grades at these blocks and lots are acceptable, from a geotechnical perspective.

Foundation Bearing Values

Based on the results of the borehole investigation, spread footing foundations founded on or within undisturbed, native deposits at elevations of about 113 metres, or higher, could be sized based on an allowable bearing value of 75 kilopascals. It is recommended that the underside of footing elevation be kept a minimum of 0.3 metres above the high groundwater level.

Light Weight Fill

Based on our review of the proposed and existing grades, it is anticipated that the use of expanded polystyrene (EPS) blocks will be required at Blocks 84 and 85 and Lots 63 to 69, and 79. The proposed grade raise exceedances at are summarized in the table below:

Table 2 – Grade Raise Exceedances

Block/Lot	Grade Raise Exceedance (metres)	Location
85 L-O	0.08	Front
	0.31	Rear
63	0.23	Front
64	0.36	Front
65	0.61	Front
66	0.77	Front
67	0.75	Front
68	0.24	Front
69	0.06	Front
79	0.37	Front
84 F-J	0.09	Front
	0.20	Rear
	0.20	Side Terrace

The EPS should extend at least 2.4 metres beyond the entire perimeter of the foundations and within the garages and porches, as shown in Figures 1 and 2. The thickness of the EPS should be equal to the thickness of the grade raise exceedance in Table 2, above.

Where two adjacent houses are not planned to be constructed at the same time, and where the spacing between houses is 2.4 metres or less, the EPS should be placed within 1.2 metres of the house to be constructed. The remaining 1.2 metres of EPS should be placed at the time the adjacent house is constructed. Additional information regarding the use of EPS blocks could be provided as the design progresses.

The EPS should meet the designations in ASTM D6817, Standard Specification for Rigid Cellular Polystyrene Geofoam. EPS 12 can be used below landscaped areas while EPS 15 should be used below the driveway and garage floor slab.

Given the thickness of grade raise filling, we suggest that the placement of the grade raise fill material be carried out well in advance of construction (i.e., 6 months or more), where possible, in order to minimize the amount of post construction settlement.

Frost Protection

All exterior footings should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated footings located outside of the building footprint or footings located within unheated areas should be provided with at least 1.8 metres of frost cover. If the required depth of earth cover for foundations is not practicable, a combination of earth cover and extruded polystyrene insulation could be considered.

If the foundation and\or basement floor slab is insulated in a way that reduces heat loss towards the surrounding soil, the required depth of earth cover over the footings should conform to that of an unheated structure (i.e. 1.8 metres).

At the rear of the houses at Lots 65, 66, and 67, the earth cover above the underside of footing ranges from 1.37 to 1.46 metres.

In preparation for the insulation, a levelling mat consisting of 25 millimetres of concrete/mortar sand or 50 millimetres of lean concrete should be placed on the approved bearing surface. Care must be taken to ensure that the insulation is not damaged during construction. Joints should be carefully lap jointed and glued where and if possible. Footings may then be constructed on the surface of the insulation. The type of insulation should be selected such that the bearing pressure on the insulation placed under the footings does not exceed about 35 percent of the insulation's quoted compressive strength. This is due to the time dependant creep characteristics of this material.

Based on the allowable bearing value of 75 kilopascals provided above, DOW SM (or approved equivalent) would be considered acceptable.

Seismic Design

Based on the results of the investigation, it is considered that a Site Class E would be applicable to the design of structures on this site. However, it should be noted that seismic Site Class is not directly applicable to structures designed in accordance with Part 9 of the Ontario Building Code.

Effects of Long Term Groundwater Lowering

Based on the results of the geotechnical investigation, there is a grade raise restriction ranging from 1.0 to 1.7 metres in Phase 2A. We do not anticipate negative impacts from any long term groundwater level lowering.

We do not anticipate any significant groundwater pumping during excavations for the foundations. If encountered, groundwater should be pumped from well filtered sumps from within the base of the excavations.

Post Construction Settlements

The post construction total and differential settlement of footings should be less than 25 and 15 millimetres, respectively, provided that all loose and/or disturbed material is removed from the bearing surfaces and provided that any engineered fill material is compacted to 95 percent of the standard Proctor dry density value.

Closure

We trust this letter provides the necessary information for your purposes. Do not hesitate to contact the undersigned should you require additional information.

Alex Meacoe, P.Eng.
Geotechnical Engineer

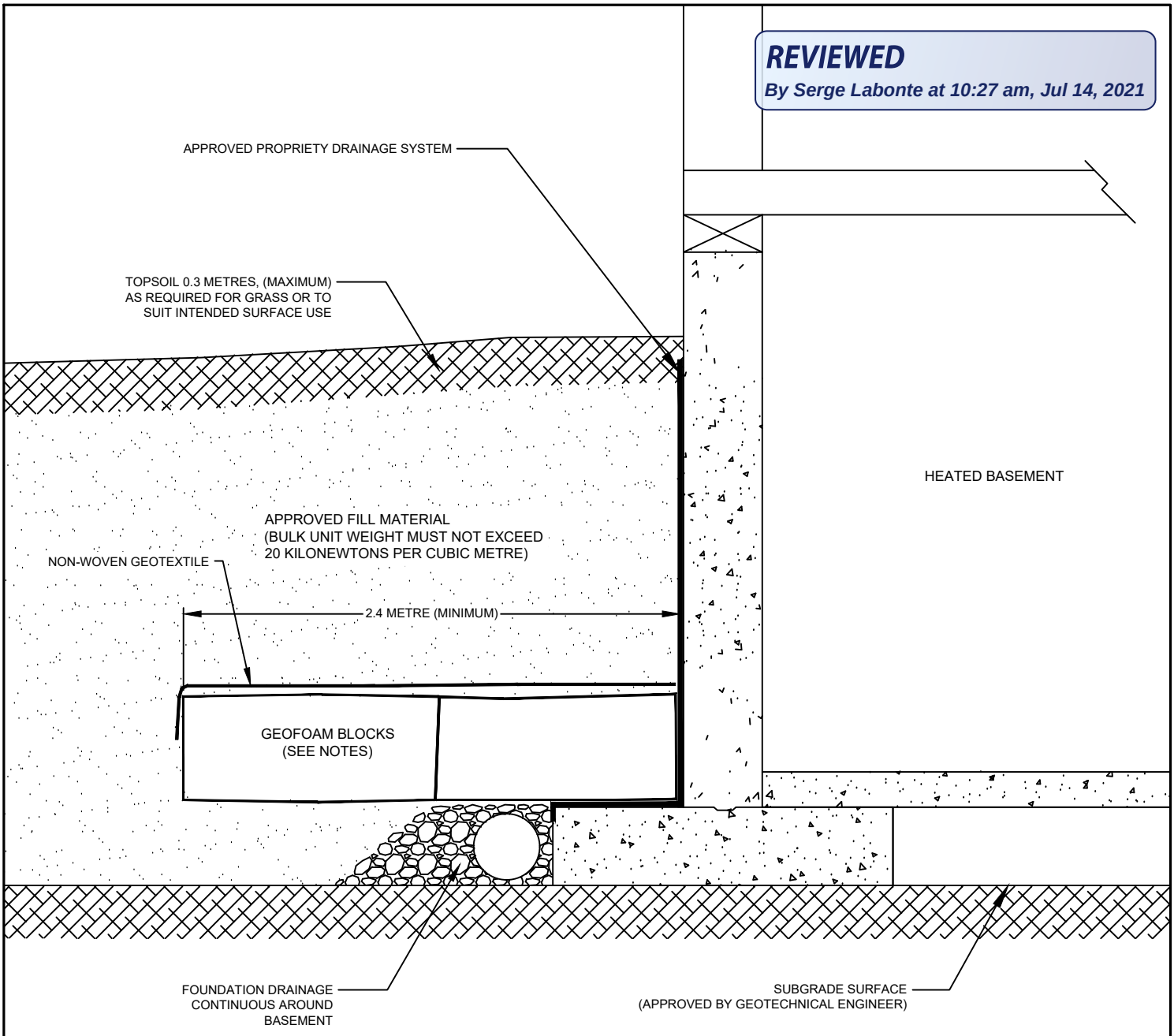
Brent Wiebe, P.Eng.
VP Operations – Ontario

WAM/BW

Enclosures
\\192.168.0.4\Projects\files\64100\64153.80\Phase 2A\Phase 2A - Grading Plan Review\64153.80_LET.01_Grading Review_Rev.02_2021-02-19.docx

ATTACHMENTS

Figure 1 – Exterior Light Weight Fill Detail
Figure 2 – Light Weight Fill for Garages and Porches
Soils Review Chart Carp Airpark – Phase 2A



NOT TO SCALE

NOTES

1) LIGHTWEIGHT FILL TO CONSIST OF GEOFOAM BLOCKS WHICH MEET ASTM D6817 SPECIFICATIONS FOR GEOFOAM MATERIAL. EPS 12 (TYPE I) TO BE USED AROUND FOUNDATIONS IN LANDSCAPED AREAS ONLY. IN AREAS OF HARD SURFACING (GARAGE,DRIVEWAY), EPS 15 TO BE USED.

2) LIGHTWEIGHT FILL CAN BE POSITIONED HIGHER IN THE PROFILE THAN INDICATED.

3) WHERE TWO ADJACENT HOUSES ARE NOT PLANNED TO BE CONSTRUCTED AT THE SAME TIME, AND WHERE THE SPACING BETWEEN HOUSES IS 2.4 METRES OR LESS, THE EPS SHOULD BE PLACED WITHIN 1.2 METRES OF THE HOUSE TO BE CONSTRUCTED. THE REMAINING 1.2 METRES OF EPS SHOULD BE PLACED AT THE TIME THE ADJACENT HOUSE IS CONSTRUCTED.

GEMTEC
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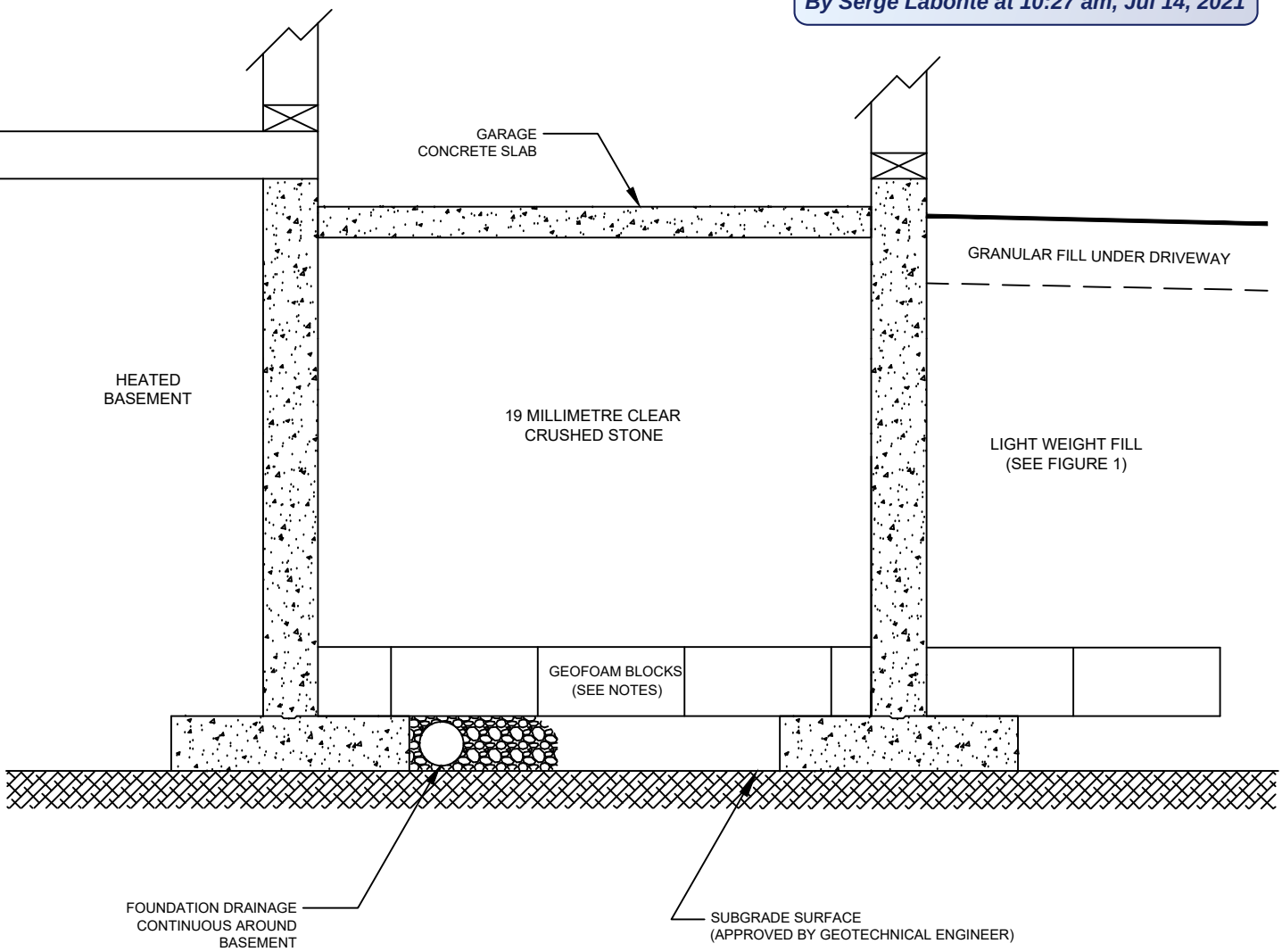
Project	Drawing
WEST CAPITAL AIRPARK - PHASE 2A CARP, ONTARIO	EXTERIOR LIGHT WEIGHT FILL DETAIL

Drwn By	Chkd By	Date	Project No.	Revision No.	
S.L.	W.A.M.	JANUARY, 2021	64153.80	0	**FIGURE 1**



NOT TO SCALE

NOTES

1) LIGHTWEIGHT FILL TO CONSIST OF GEOFOAM BLOCKS WHICH MEET ASTM D6817 SPECIFICATIONS FOR GEOFOAM MATERIAL. EPS 12 (TYPE I) TO BE USED AROUND FOUNDATIONS IN LANDSCAPED AREAS ONLY. IN AREAS OF HARD SURFACING (GARAGE,DRIVEWAY), EPS 15 TO BE USED.

2) LIGHTWEIGHT FILL CAN BE POSITIONED HIGHER IN THE PROFILE THAN INDICATED.

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Project	Drawing
WEST CAPITAL AIRPARK - PHASE 2A CARP, ONTARIO	LIGHT WEIGHT FILL FOR GARAGES AND PORCHES

Drwn By	Chkd By	Date	Project No.	Revision No.	
S.L.	W.A.M.	JANUARY, 2021	64153.80	0	**FIGURE 2**

NOTE: Soil site class E has been revised to site class D. Please see below Paterson report.

REVIEWED
By Serge Labonte at 10:27 am, Jul 14, 2021

Assessment Area	Lot/Block	Original Ground Surface (metres)			Proposed Ground Surface (metres)			Proposed USF Grade (metres)	Grade Raise or Cut over Original Ground Surface (metres)			Grade Raise Limit (metres)	Grade Raise Within Permissible?			Estimated Bearing Pressure at SLS (kilopascals)	Earth Cover over Footings (metres)			Frost Protection Required	Min. LWF Thickness in Garage & Porch (metres)	Site Class for Seismic Site Response	Lot-Specific Notes
		Front	Rear	Side Terrace	Front	Rear	Side Terrace		Front	Rear	Side Terrace		Front	Rear	Side Terrace		Front	Rear	Side Terrace				
D[2]	52	115.59	115.61		116.35	116.55		114.11	0.76	0.94		1.2	Yes	Yes		75	2.24	2.44		No		E	
D[2]	53	115.40	115.48		116.30	116.50		114.06	0.90	1.02		1.2	Yes	Yes		75	2.24	2.44		No		E	
D[2]	85-A-E	114.96	115.23		116.00	116.25		113.81	1.04	1.02		1.2	Yes	Yes		75	2.19	2.44		No		E	
D[2]	85-F-K	115.05	115.20		116.20	116.45		114.01	1.15	1.25		1.2	Yes	No[1]		75	2.19	2.44		No		E	
D[2]	85-L-O	114.92	114.94		116.20	116.45		114.01	1.28	1.51		1.2	No	No		75	2.19	2.44		No	0.31	E	
A[2]	85-P-U	114.53	114.56		115.85	116.10		113.66	1.32	1.54		1.7	Yes	Yes		75	2.19	2.44		No		E	
A[2]	85-V-1	114.44	114.33		115.65	115.90		113.46	1.21	1.57		1.7	Yes	Yes		75	2.19	2.44		No		E	
C[2]	54	114.18	114.05		115.55	115.15		113.31	1.37	1.10		1.4	Yes	Yes		75	2.24	1.84		No		E	
C[2]	55	114.16	114.07		115.40	115.40		113.16	1.24	1.33		1.4	Yes	Yes		75	2.24	2.24		No		E	
C[2]	56	114.17	114.16		115.40	115.40		113.16	1.23	1.24		1.4	Yes	Yes		75	2.24	2.24		No		E	
C[2]	57	114.22	114.18		115.35	115.35		113.11	1.13	1.17		1.4	Yes	Yes		75	2.24	2.24		No		E	
C[2]	58	114.24	114.15		115.30	115.30		113.06	1.06	1.15		1.4	Yes	Yes		75	2.24	2.24		No		E	
C[2]	59	114.24	114.11		115.40	115.30		113.16	1.16	1.19		1.4	Yes	Yes		75	2.24	2.14		No		E	
C[2]	60	114.27	114.20		115.45	115.25		113.21	1.18	1.05		1.4	Yes	Yes		75	2.24	2.04		No		E	
C[2]	61	114.39	114.22		115.55	115.35		113.31	1.16	1.13		1.4	Yes	Yes		75	2.24	2.04		No		E	
C[2]	62	114.35	114.16		115.60	115.40		113.36	1.25	1.24		1.4	Yes	Yes		75	2.24	2.04		No		E	
C[2]	63	114.12	114.05		115.75	115.35		113.51	1.63	1.30		1.4	No	Yes		75	2.24	1.84		No	0.23	E	
C[2]	64	114.04	113.89		115.80	115.20		113.56	1.76	1.31		1.4	No	Yes		75	2.24	1.64		No	0.36	E	
B[2]	65	113.84	113.69		115.95	115.15		113.71	2.11	1.46		1.5	No	Yes		75	2.24	1.44		Yes	0.61	E	
B[2]	66	113.68	113.49		115.95	114.90		113.71	2.27	1.41		1.5	No	Yes		75	2.24	1.19		Yes	0.77	E	
C[2]	67	113.90	113.73		116.05	115.10		113.81	2.15	1.37		1.4	No	Yes		75	2.24	1.29		Yes	0.75	E	
C[2]	68	114.41	114.20		116.05	115.40		113.81	1.64	1.20		1.4	No	Yes		75	2.24	1.59		No	0.24	E	
C[2]	69	114.44	114.36		115.90	115.30		113.66	1.46	0.94		1.4	No	Yes		75	2.24	1.64		No	0.06	E	
C[2]	70	114.88	114.67		115.95	115.55		113.71	1.07	0.88		1.4	Yes	Yes		75	2.24	1.84		No		E	
C[2]	71	114.30	114.51		115.75	115.75		113.51	1.45	1.24		1.4	No[1]	Yes		75	2.24	2.24		No		E	
C[2]	72	114.36	114.49		115.40	115.60		113.16	1.04	1.11		1.4	Yes	Yes		75	2.24	2.44		No		E	
C[2]	73	114.53	114.57		115.50	115.70		113.26	0.97	1.13		1.4	Yes	Yes		75	2.24	2.44		No		E	
C[2]	74	114.71	114.69		115.65	115.85		113.41	0.94	1.16		1.4	Yes	Yes		75	2.24	2.44		No		E	
C[2]	75	114.66	114.48		115.70	115.85		113.46	1.04	1.37		1.4	Yes	Yes		75	2.24	2.39		No		E	
E[2]	76	114.76	114.68		115.80	115.65		113.56	1.04	0.97		1.0	No[1]	Yes		75	2.24	2.09		No		E	
E[2]	77	115.13	115.35		115.85	115.65		113.61	0.72	0.30		1.0	Yes	Yes		75	2.24	2.04		No		E	
E[2]	78	115.10	115.28		115.95	115.65		113.71	0.85	0.37		1.0	Yes	Yes		75	2.24	1.94		No		E	
E[2]	79	114.73	114.66		116.10	115.65		113.86	1.37	0.99		1.0	No	Yes		75	2.24	1.79		No	0.37	E	
E[2]	80	115.38	115.00		116.20	115.80		113.96	0.82	0.80		1.0	Yes	Yes		75	2.24	1.84		No		E	
E[2]	81	115.58	115.26		116.30	115.90		114.06	0.72	0.64		1.0	Yes	Yes		75	2.24	1.84		No		E	
E[2]	82	115.66	115.62		116.45	116.15		114.21	0.79	0.53		1.0	Yes	Yes		75	2.24	1.94		No		E	
C[2]	83-A-E	114.63	114.58	114.63	115.75	115.85	115.90	113.41	1.12	1.27	1.27	1.4	Yes	Yes	Yes	75	2.34	2.44	2.49	No		E	
C[2]	83-F-K	114.34	114.32	114.26	115.35	115.55	115.35	113.11	1.01	1.23	1.09	1.4	Yes	Yes	Yes	75	2.24	2.44	2.24	No		E	
C[2]	84-A-E	114.61	114.66	114.77	115.95	115.95	116.15	113.71	1.34	1.29	1.38	1.4	Yes	Yes	Yes	75	2.24	2.24	2.44	No		E	
C[2]	84-F-J	114.46	114.35	114.35	115.95	115.95	115.95	113.71	1.49	1.60	1.60	1.4	No	No	No	75	2.24	2.24	2.24	No	0.20	E	
A[3]	1	117.00	117.25		117.60	117.85		115.41	0.60	0.60		1.5	Yes	Yes			2.19	2.44		No		E	
A[3]	2	117.00	117.28		117.65	117.85		115.41	0.65	0.57		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	3	117.00	117.31		117.85	118.05		115.61	0.85	0.74		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	4	117.50	117.40		117.90	118.10		115.66	0.40	0.70		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	5	117.50	117.41		118.20	118.20		115.96	0.70	0.79		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	6	117.50	117.48		118.00	118.20		115.76	0.50	0.72		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	7	117.50	117.47		118.10	118.10		115.86	0.60	0.63		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	8	117.50	117.49		117.85	118.05		115.61	0.35	0.56		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	9	117.00	117.31		117.85	118.05		115.61	0.85	0.74		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	10	117.00	117.27		117.80	117.80		115.56	0.80	0.53		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	11	117.00	117.31		117.65	117.75		115.41	0.65	0.44		1.5	Yes	Yes			2.24	2.34		No		E	
A[3]	12	117.00	117.20		117.65	117.85		115.41	0.65	0.65		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	13	117.00	116.97		117.55	117.75		115.31	0.55	0.78		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	14	117.00	116.85		117.45	117.55		115.21	0.45	0.70		1.5	Yes	Yes			2.24	2.34		No		E	
A[3]	15	117.00	116.85		117.35	117.45		115.11	0.35	0.60		1.5	Yes	Yes			2.24	2.34		No		E	
A[3]	16	116.50	116.91		117.25	117.45		115.01	0.75	0.54		1.5	Yes	Yes			2.24	2.44		No		E	

NOTE: Soil site class E has been revised to site class D. Please see below Paterson report.

REVIEWED
By Serge Labonte at 10:27 am, Jul 14, 2021

Assessment Area	Lot/Block	Original Ground Surface (metres)			Proposed Ground Surface (metres)			Proposed USF Grade (metres)	Grade Raise or Cut over Original Ground Surface (metres)			Grade Raise Limit (metres)	Grade Raise Within Permissible?			Estimated Bearing Pressure at SLS (kilopascals)	Earth Cover over Footings (metres)			Frost Protection Required	Min. LWF Thickness in Garage & Porch (metres)	Site Class for Seismic Site Response	Lot-Specific Notes
		Front	Rear	Side Terrace	Front	Rear	Side Terrace		Front	Rear	Side Terrace		Front	Rear	Side Terrace		Front	Rear	Side Terrace				
A[3]	17	116.50	117.19		117.25	117.45		115.11	0.75	0.26		1.5	Yes	Yes			2.14	2.34		No		E	
A[3]	18	116.50	117.11		117.30	117.50		115.06	0.80	0.39		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	19	116.50	116.88		117.10	117.40		114.96	0.60	0.52		1.5	Yes	Yes			2.14	2.44		No		E	
A[3]	20	116.50	116.78		117.00	117.25		114.81	0.50	0.47		1.5	Yes	Yes			2.19	2.44		No		E	
A[3]	21	116.50	116.46		116.80	117.10		114.66	0.30	0.64		1.5	Yes	Yes			2.14	2.44		No		E	
A[3]	22	116.00	115.70		116.65	116.85		114.41	0.65	1.15		1.5	Yes	Yes			2.24	2.44		No		E	
A[3]	23	115.50	115.50		116.65	116.65		114.41	1.15	1.15		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	24	115.50	115.00		116.60	116.40		114.36	1.10	1.40		1.5	Yes	Yes			2.24	2.04		No		E	
A[3]	25	115.00	115.00		116.55	116.20		114.31	1.55	1.20		1.5	No[1]	Yes			2.24	1.89		No		E	
A[3]	26	115.50	114.50		116.65	116.00		114.41	1.15	1.50		1.5	Yes	Yes			2.24	1.59		No		E	
A[3]	27	116.00	114.50		116.70	116.00		114.46	0.70	1.50		1.5	Yes	Yes			2.24	1.54		No		E	
A[3]	28	116.00	115.00		116.65	116.45		114.41	0.65	1.45		1.5	Yes	Yes			2.24	2.04		No		E	
A[3]	29	116.00	115.56		116.55	116.55		114.31	0.55	0.99		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	30	116.00	115.45		116.55	116.65		114.31	0.55	1.20		1.5	Yes	Yes			2.24	2.34		No		E	
A[3]	31	116.00	116.00		116.95	117.15		114.91	0.95	1.15		1.5	Yes	Yes			2.04	2.24		No		E	
A[3]	32	116.50	116.00		117.00	117.22		114.96	0.50	1.22		1.5	Yes	Yes			2.04	2.26		No		E	
A[3]	33	116.50	116.00		117.10	117.30		115.06	0.60	1.30		1.5	Yes	Yes			2.04	2.24		No		E	
A[3]	34	116.50	116.00		117.10	117.30		115.06	0.60	1.30		1.5	Yes	Yes			2.04	2.24		No		E	
A[3]	35	116.50	116.00		117.30	117.50		115.26	0.80	1.50		1.5	Yes	Yes			2.04	2.24		No		E	
A[3]	36	116.50	116.00		117.30	117.30		115.26	0.80	1.30		1.5	Yes	Yes			2.04	2.04		No		E	
A[3]	37	116.50	116.00		117.20	117.20		115.16	0.70	1.20		1.5	Yes	Yes			2.04	2.04		No		E	
A[3]	38	116.50	116.00		117.20	117.20		115.16	0.70	1.20		1.5	Yes	Yes			2.04	2.04		No		E	
A[3]	39	116.50	116.00		117.40	117.40		115.16	0.90	1.40		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	40	116.50	116.00		117.45	117.45		115.21	0.95	1.45		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	41	116.50	116.50		117.55	117.55		115.31	1.05	1.05		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	42	116.50	116.50		117.55	117.55		115.31	1.05	1.05		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	43	116.50	116.50		117.65	117.65		115.41	1.15	1.15		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	44	117.00	116.50		117.65	117.65		115.41	0.65	1.15		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	45	117.00	116.50		117.75	117.75		115.51	0.75	1.25		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	46	117.00	117.00		117.80	117.80		115.56	0.80	0.80		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	47	117.00	117.00		118.00	118.00		115.76	1.00	1.00		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	48	117.00	117.00		117.85	117.85		115.61	0.85	0.85		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	49	117.00	117.00		117.60	117.60		115.36	0.60	0.60		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	50	117.00	117.00		117.50	117.50		115.26	0.50	0.50		1.5	Yes	Yes			2.24	2.24		No		E	
A[3]	51	116.00	116.00		116.90	117.00		114.70	0.90	1.00		1.5	Yes	Yes			2.20	2.30		No		E	

Note:

1 - The grade raise exceedances are within 0.05 metres, or less, of the permissible grade raise. Based on the conservative approach with the maximum permissible grade raise assessment, and the degree of accuracy during the construction of the houses, it is our opinion that the proposed grades at these blocks and lots are acceptable, from a geotechnical perspective.

2 - Assessment area as defined in Figure 1 from geotechnical investigation dated July 22, 2019

3 - Assessment area as defined in Figure 1 from supplemental geotechnical investigation dated January 27, 2021

patersongroup

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Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science
Archaeological Services

www.patersongroup.ca

July 23, 2020
Report: PG5409-LET.01

DCR/Phoenix Development Corporation Limited
18 Bentley Avenue
Ottawa, Ontario
K2E 6T8

Attention: **Mr. Sandy Pollock**

Subject: **Seismic Shear Wave Velocity Testing**
Phase 2A - West Capital Airpark Residential Development
Diamondview Road - Carp, Ontario

Dear Sir,

Further to your request, Paterson Group (Paterson) completed site-specific seismic shear wave velocity testing to determine the seismic site classification for the proposed development at the aforementioned location.

Design for Earthquakes

Shear wave velocity testing was completed for the subject site to accurately determine the applicable seismic site classification for the proposed buildings in accordance with Table 4.1.8.4.A of the Ontario Building Code (OBC) 2012. The results of the shear wave velocity testing are attached to the present report.

Field Program

The field program was carried out on June 26, 2020 by Paterson personnel. The shear wave velocity testing array was placed across the southeast portion of the subject site, oriented approximately east-west as shown on Drawing PG5409-1 - Shear Wave Velocity Test Location Plan attached to the current report. Paterson field personnel placed 24 horizontal 4.5 Hz geophones mounted to the ground surface by means of two 75 mm ground spikes attached to the geophone land case. The geophones were spaced at 3 m intervals and connected by a geophone spread cable to a Geode 24 channel seismograph.

The seismograph was also connected to a computer laptop and a hammer trigger switch attached to a 12 pound dead blow hammer. The hammer trigger switch sends a start signal to the seismograph. The hammer is used to strike an I-beam seated into the ground surface parallel to the geophone array, which creates a polarized shear wave. The hammer shots are repeated 4 to 8 times at each shot location to improve signal to noise ratio. The shots are also completed in forward and reverse directions (i.e. striking both sides of the I-beam seated parallel to the geophone array). The shots are located at the midpoint of the array as well as 3, 4.5 and 20 m away from the first geophone and 3, 4.5 and 30 m away from the last geophone.

Data Processing and Interpretation

Interpretation of the shear wave velocity results was completed by Paterson personnel. Shear wave velocity measurement was made using reflection/refraction methods. The interpretation is repeated at each shot location to provide an average shear wave velocity, Vs_{30}, of the upper 30 m profile immediately below the proposed building foundations. The layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave records to compute the bedrock depth at each location. The bedrock velocity was interpreted using the main refractor wave velocity, which is considered a conservative estimate of the bedrock shear wave velocity due to the increasing quality of bedrock with depth. It should be noted that as bedrock quality increases, the bedrock shear wave velocity also increases.

Depth to bedrock was based on refusal to dynamic cone penetration testing (DCPT) carried out by others at borehole BH 18-1. Refusal to the DCPT was noted at an approximate depth of 25.0 m below the existing ground surface at borehole BH 18-1.

Based on available geological mapping, the local bedrock consists of interbedded limestone and shale of the Verulam formation with an anticipated overburden thickness of 15 to 50 m. It is anticipated that the footings will be placed the undisturbed silty sand and/or sandy silt deposits. Through interpretation of the test results, the bedrock shear wave velocity is **2,148 m/s**.

The Vs_{30} was calculated using the standard equation for average shear wave velocity provided in the OBC 2012, and as presented below.

$$V_{s30} = \frac{Depth_{OfInterest}(m)}{\left(\frac{(Depth_{Layer1}(m)}{Vs_{Layer1}(m/s)} + \frac{Depth_{Layer2}(m)}{Vs_{Layer2}(m/s)}\right)}$$

$$V_{s30} = \frac{30m}{\left(\frac{24m}{171m/s} + \frac{6m}{2148m/s}\right)}$$

$$V_{s30} = 210m/s$$

Based on the results of the shear wave velocity testing, the average shear wave velocity, Vs_{30}, for foundations at the site is 210 m/s. Therefore, a **Site Class D** is applicable for design of the proposed buildings whose footings are founded on an undisturbed silty sand and/or sandy silt bearing surface. The soils underlying the subject site are not susceptible to liquefaction.

We trust that this information satisfies your requirements.

Paterson Group Inc.

Kevin A Pickard, EIT

David J. Gilbert, P.Eng.

Attachments

- ❑ Figures 1 and 2 - Seismic Shear Wave Velocity Profiles
- ❑ Drawing PG5409-1 - Test Hole Location Plan

Report Distribution

- ❑ Phoenix Homes (1 digital copy)
- ❑ Paterson Group (1 copy)

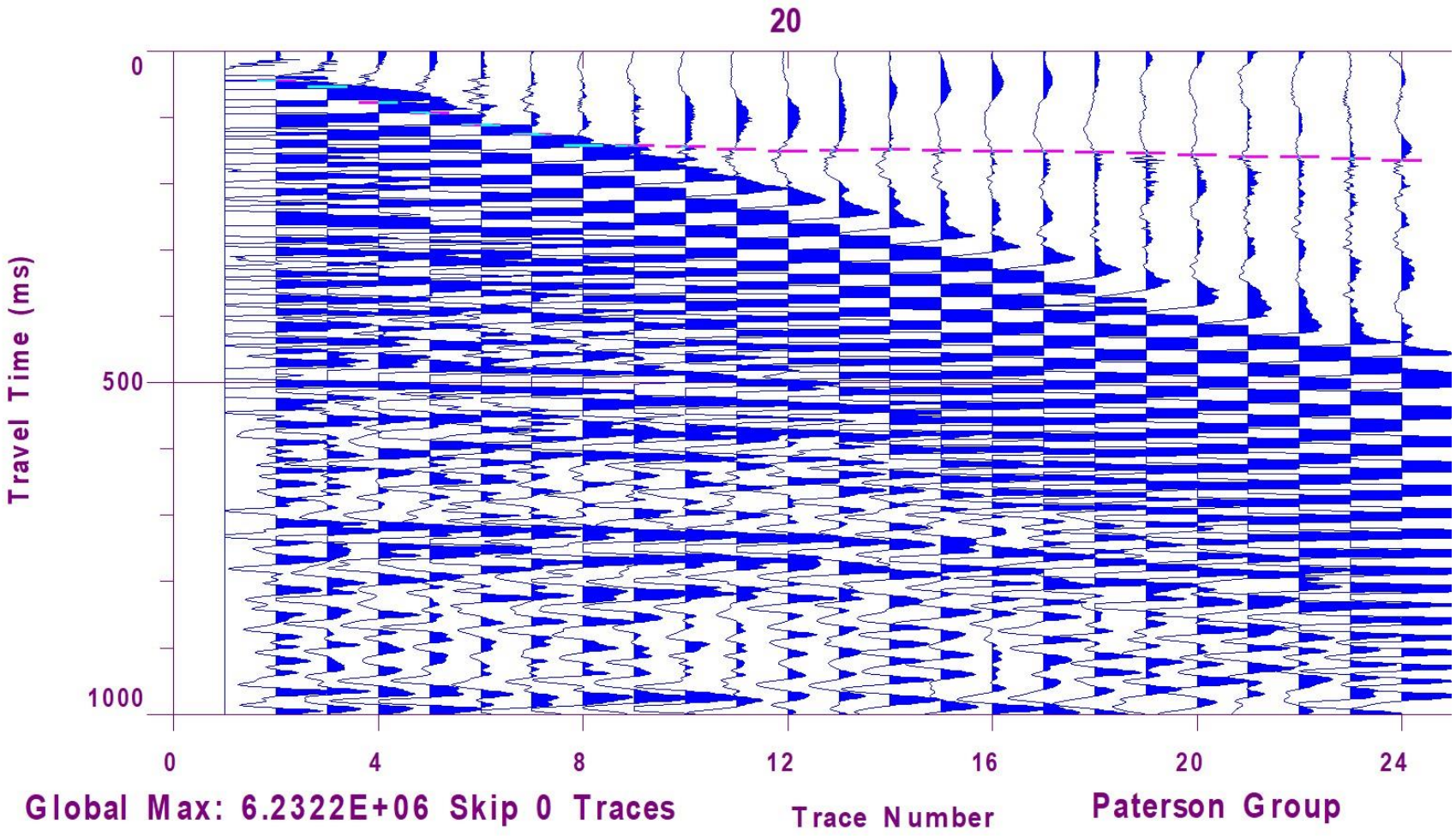


Figure 1 – Shear Wave Velocity Profile at Shot Location -3 m

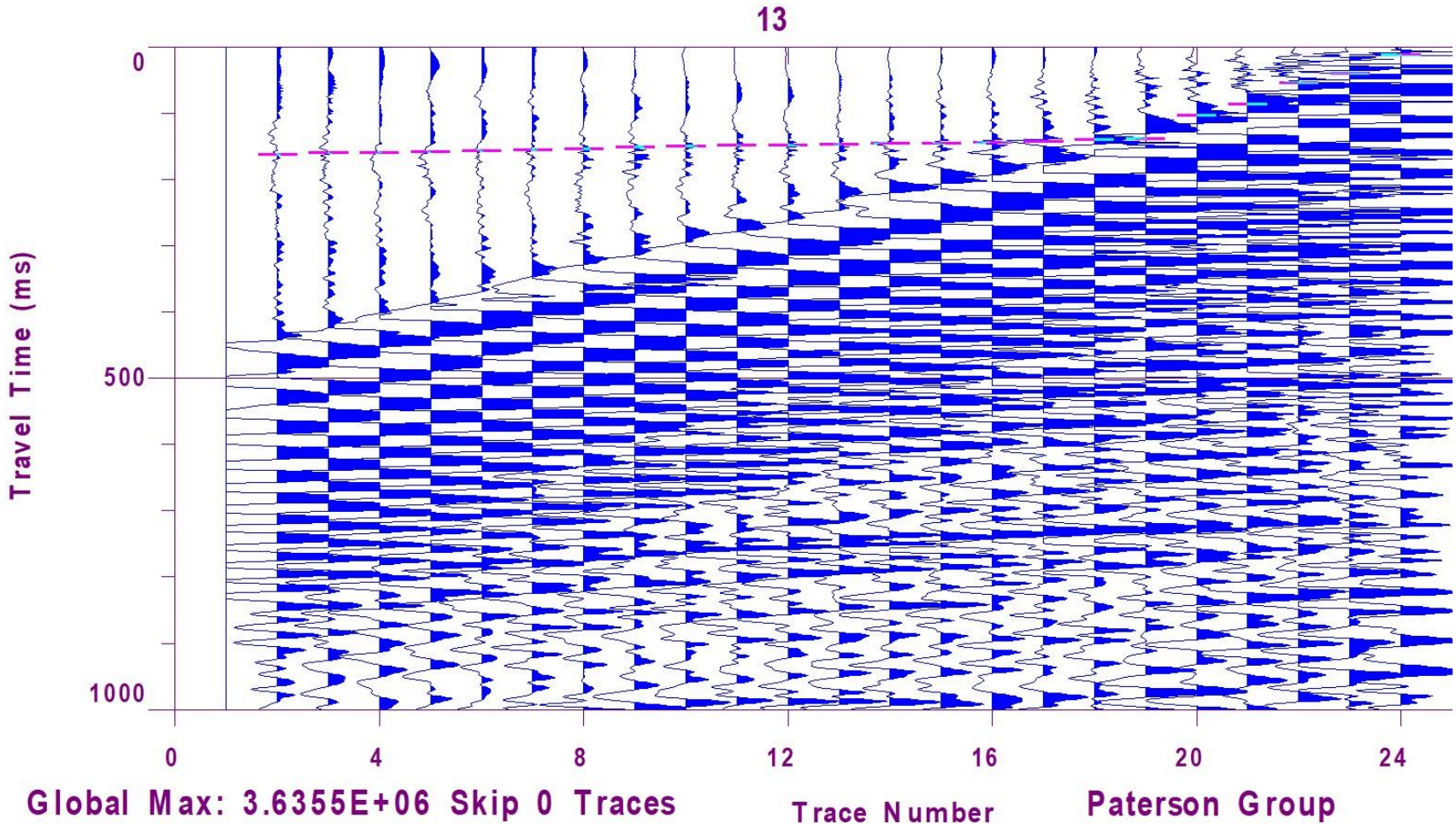
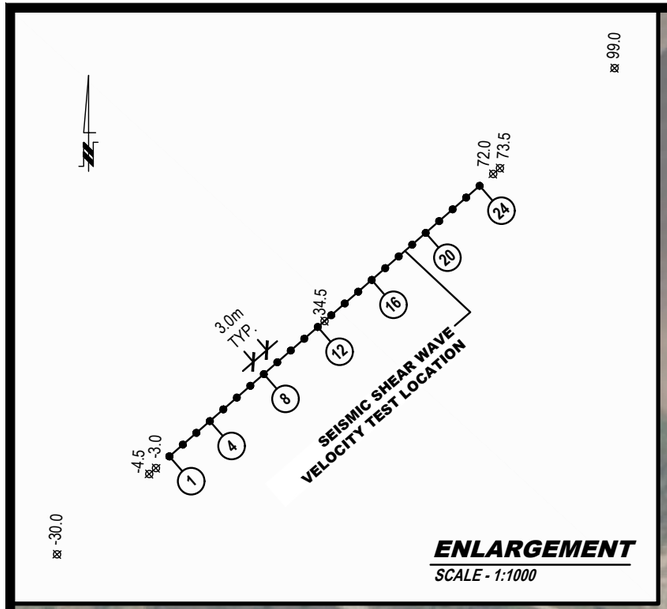


Figure 2 – Shear Wave Velocity Profile at Shot Location +72 m



ENLARGEMENT
SCALE - 1:1000

REVIEWED
By Serge Labonte at 10:28 am, Jul 14, 2021

BH 18-8
113.55

BH 18-7
113.92

BH 18-6
114.89

AREA B

BH 18-5
115.18

BH 18-9
114.93

BH 18-10
116.15

BH 18-4
115.99

AREA A

BH 18-3
116.55

BH 18-1
117.22
(92.23)

BH 18-2
117.41

SEISMIC SHEAR WAVE
VELOCITY TEST LOCATION
(SEE ENLARGEMENT)

DIAMONDVIEW ROAD

LEGEND:

- BOREHOLE LOCATION (GEMTEC, PROJECT 64153.80, JULY 2019)
- BOREHOLE WITH MONITORING LOCATION (GEMTEC, PROJECT 64153.80, JULY 2019)
- 117.22 GROUND SURFACE ELEVATION (m)
- (92.23) PRACTICAL DCPT REFUSAL ELEVATION (m)
- GEOPHONE LOCATIONS
- 20 GEOPHONE NUMBER
- -3.0 SHOT LOCATION

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS PROVIDED BY GEMTEC CONSULTING ENGINEERS

SCALE: 1:3000

0 25 50 75 100 125 150 200m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

DCR / PHOENIX DEVELOPMENT CORPORATION LIMITED
GEOTECHNICAL INVESTIGATION
WEST CAPITAL AIRPARK RESIDENTIAL DEVELOPMENT - PHASE 2A
DIAMONDVIEW ROAD
CARP, ONTARIO

Title:
TEST LOCATION PLAN

Scale: 1:3000	Date: 07/2020
Drawn by: YA	Report No.: PG5409-LET.01
Checked by: KP	Dwg. No.: PG5409-1
Approved by: DJG	Revision No.:

p:\autocad drawings\geotechnical\pg54xx\pg5409\pg5409-1-test hole location plan.dwg

Document 2 – Addressing Table

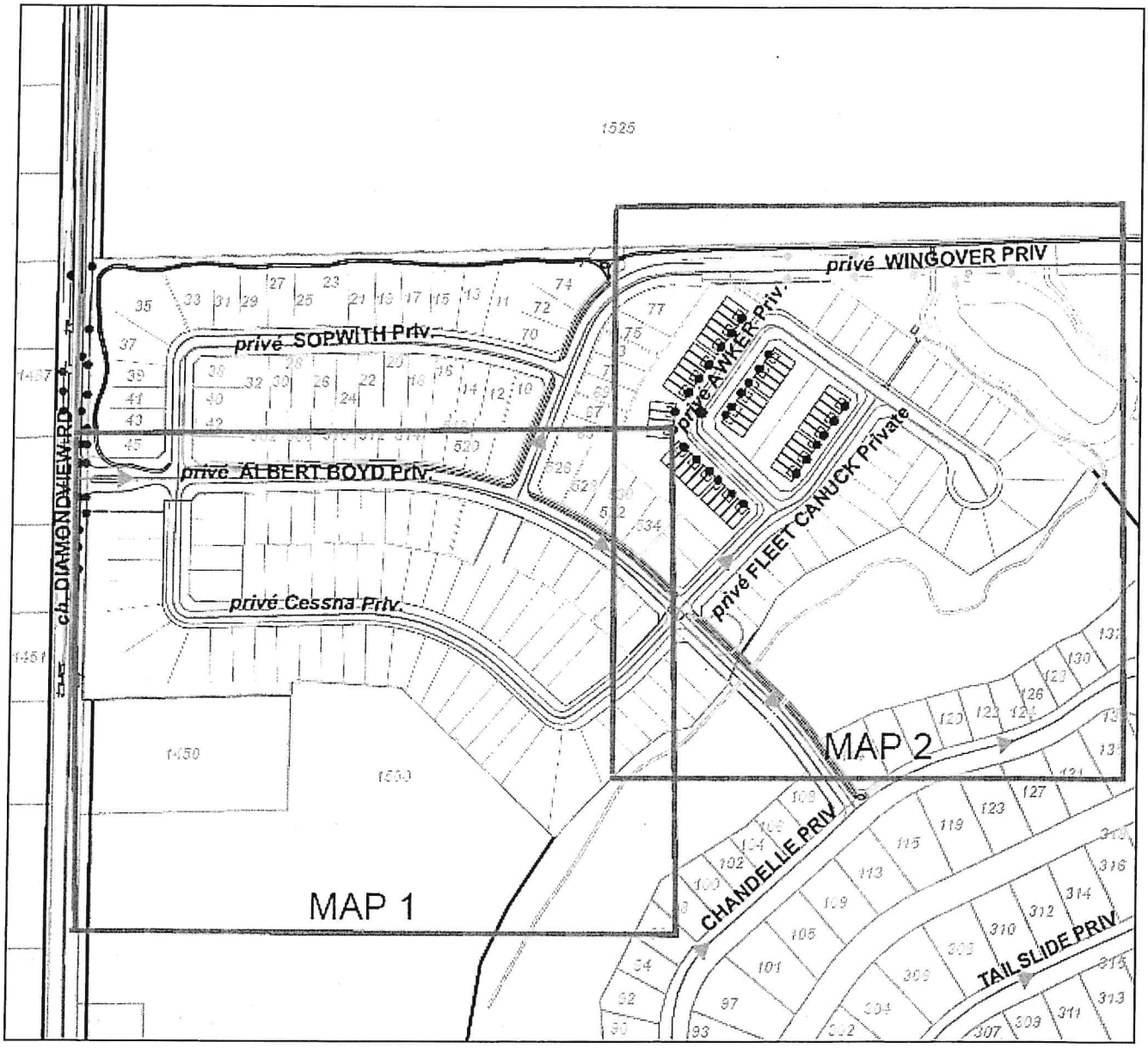
Municipal Addressing for 1500 chemin Thomas Argue Road			
Street Name		**Addresses Assigned**	**Segment**
City of Ottawa Official Format: privé **Cessna** Priv.		Even Numbers **1902-1994** Odd Numbers **1903- 2019**	From privé Albert Boyd Private to privé Albert Boyd Private
English: **Cessna** Private	French: privé **Cessna**		
City of Ottawa Official Format: privé **Albert Boyd** Priv.		Even Numbers Odd Numbers **521**	From privé Cessna Private to privé Wingover Private
English: **Albert Boyd** Private	French: privé **Albert Boyd**		
City of Ottawa Official Format: privé **Fleet Canuck** Priv.		Even Numbers **402-406** **410-450** Odd Numbers **401-441**	From privé Albert Boyd Private to privé Hawker Private
English: **Fleet Canuck** Private	French: privé **Fleet Canuck**		
City of Ottawa Official Format: privé **Hawker** Priv.		Even Numbers **1920-1946** **1980-1988** Odd Numbers **1901-1989**	From privé Albert Boyd Private to end of segment
English: **Hawker** Private	French: privé **Hawker**		

REVIEWED
By Serge Labonte at 10:29 am, Jul 14, 2021

Ottawa
MUNICIPAL NUMBERING
ASSIGNED
ISSUED
March 30 2021

City of Ottawa
Address Circulation

Carp Airport (Phase 2)
1500 chemin Thomas Argue Road
D07-16-18-0007



KEY PLAN

REVIEWED
By Serge Labonte at 10:29 am, Jul 14, 2021

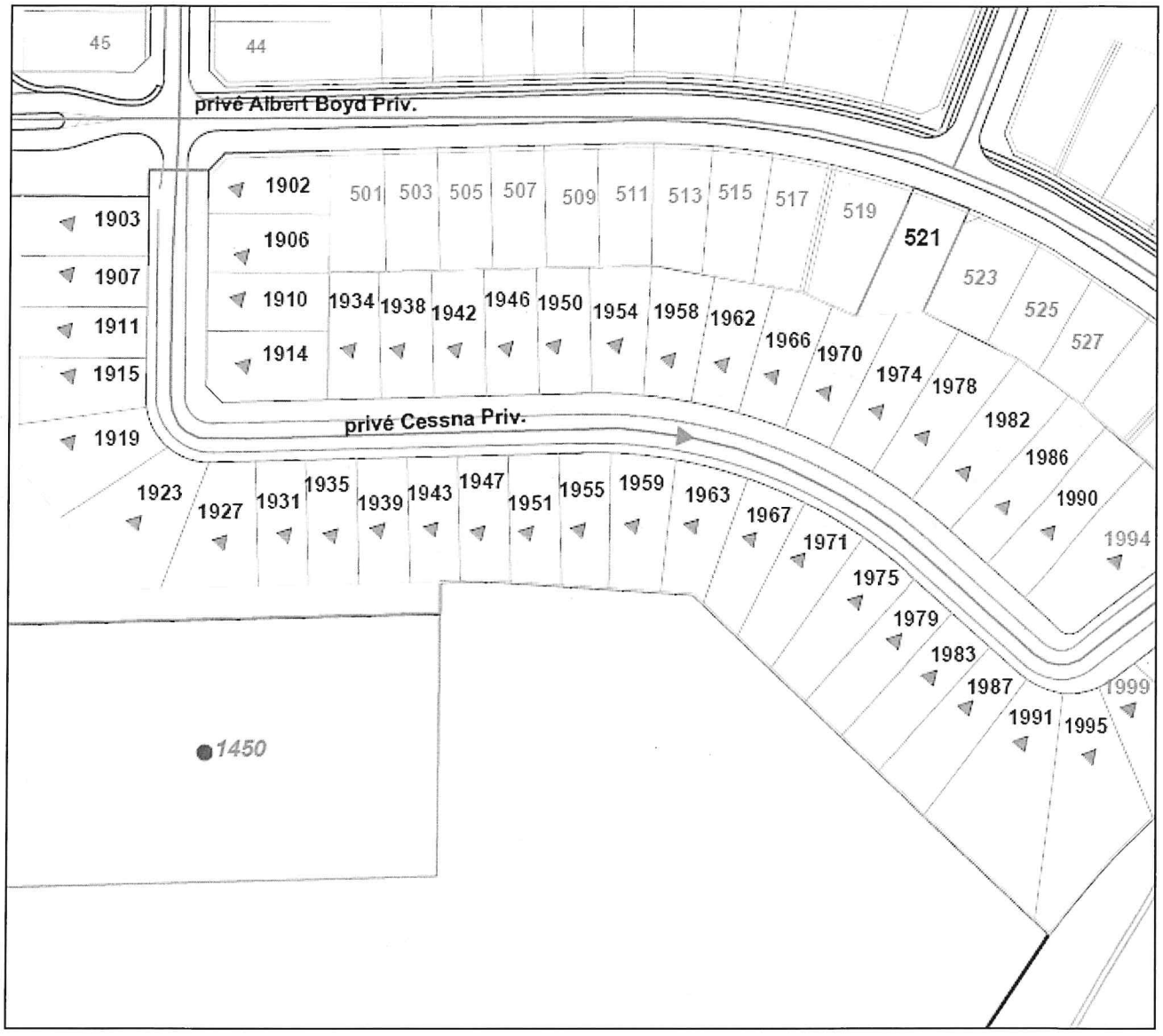
Document 3 – cont.

Ottawa
MUNICIPAL NUMBERING
ASSIGNED
by
ISSUED
March 30 2021

City of Ottawa
Address Circulation

Carp Airport (Phase 2)
1500 Thomas Argue
D07-16-18-0007

40 20 0 40 Meters



MAP 1

Document 3 – cont.

Ottawa
MUNICIPAL NUMBERING
ASSIGNED
ISSUED
March 30 2021

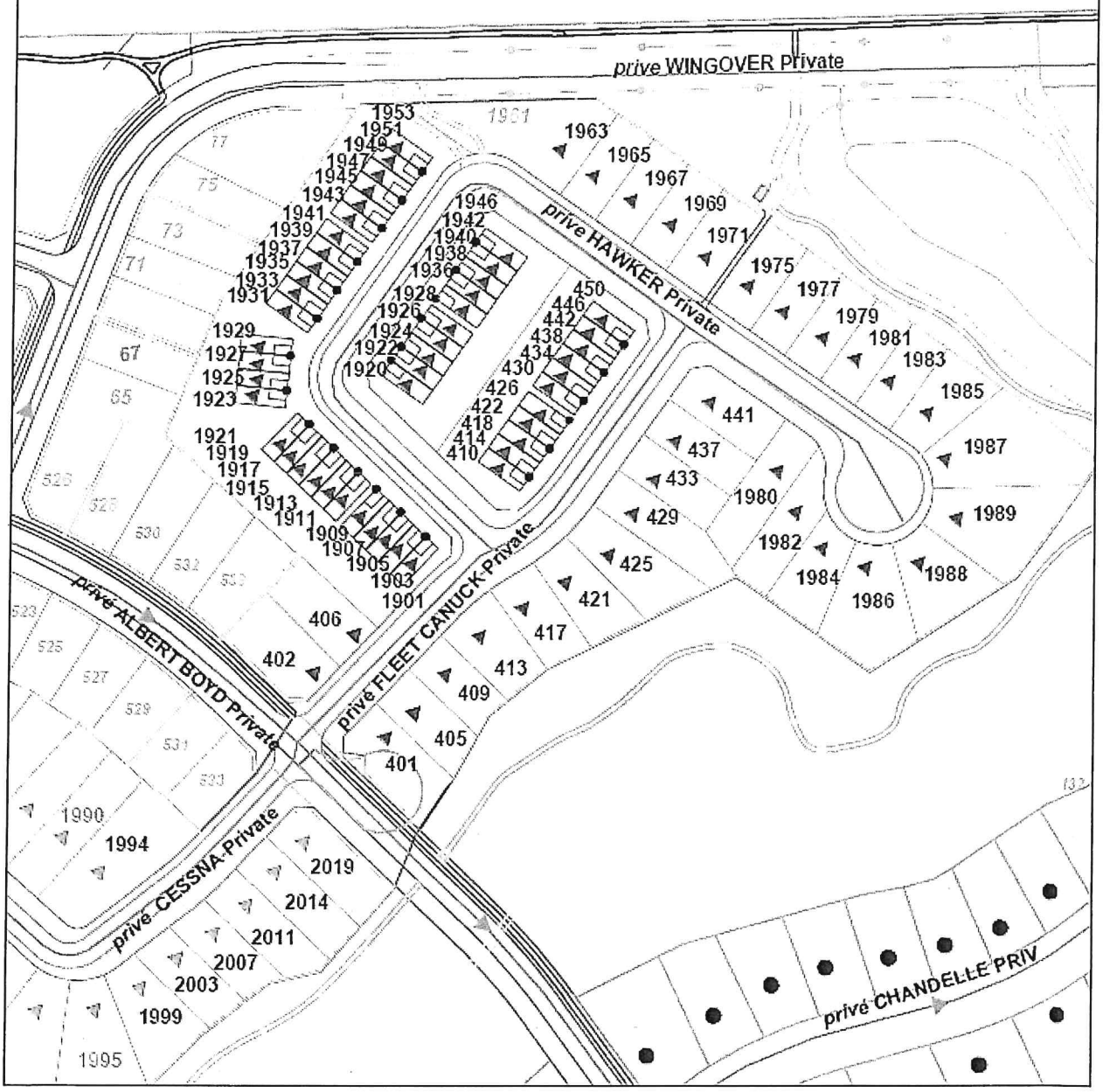
City of Ottawa
Address Circulation

Carp Airport (Phase 2)
1500 chemin Thomas Argue Road

D07-16-18-0007

40 20 0 40 Meters

Note- pilot Harry Hawker and three others, including Thomas Sopwith, formed H.G. Hawker Engineering in 1920. The company produced dozens of designs of aircrafts until 1963. The civic numbers of 1920- 1963 are included in the range of addresses.



MAP 2