



# APLIN MARTIN

ENGINEERING ARCHITECTURE PLANNING SURVEYING

2784805 ONTARIO INC.  
77 Wallings Road, Halliburton, ON  
Functional Servicing and Stormwater Management Report

405-55 St. Clair Avenue West, Toronto, ON M4V 2Y7  
| [WWW.APLINMARTIN.COM](http://WWW.APLINMARTIN.COM) | (416) 644-1900

Project No: 21-7010  
January 31, 2024

Aplin & Martin Consultants Ltd.

## Quality Information

Prepared By:  
Aplin & Martin Consultants



Name: Michelle Yip, EIT  
Title: Engineering Designer



Approved By:  
Aplin & Martin Consultants

Name: Chesley Blahut, P.Eng.  
Title: Project Manager

## Revision History

Revision	Date	Details	Name	Title
1	31-Jan-24	First Submission	Chesley Blahut	Project Manager

## Distribution List

# Hard Copies	PDF Submission	Company/Association
1	1	2784805 Ontario Inc.

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## 1.0 INTRODUCTION

Aplin Martin has been retained by 2784805 Ontario Inc. to prepare a Functional Servicing and Stormwater Management Report (FSRSWM) in support of a proposal for a temporary use of the property located at 77 Wallings Road with a number of 'glamping' pods for short term accommodations of the vacationing public, in the Town of Dysart Et Al (the Town) and the County of Halliburton (the County).

This report has been prepared to assess and identify the Stormwater Management (SWM) requirements for this development in accordance with the Ministry of Environment, Conservation and Parks (MECP). It contains an SWM section that identifies the SWM design details by quantifying the quantity and quality control measures employed as well as water retention for water balance and erosion control, in accordance with the applicable guidelines.

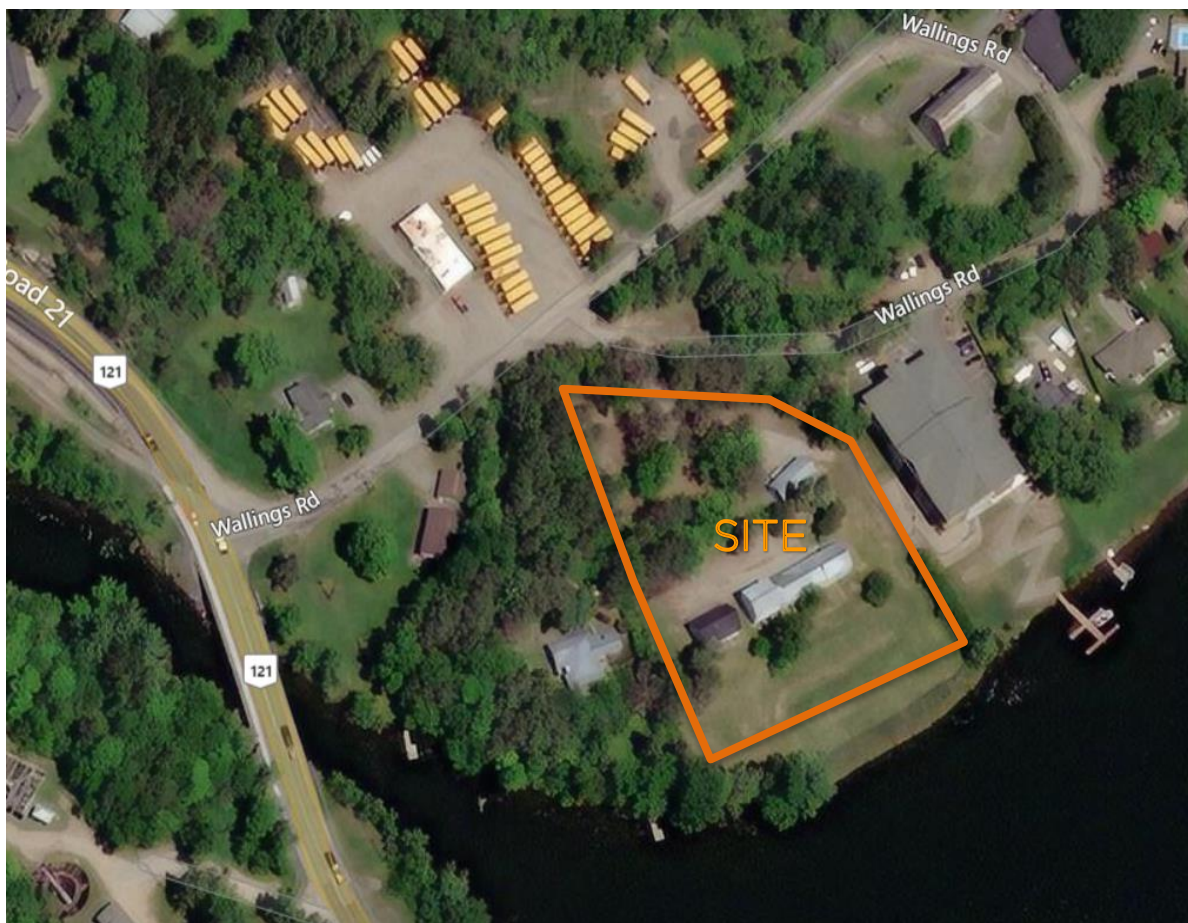


Figure 1: Aerial View (Source: Bing Maps, 2021)

## 2.0 SITE CONDITIONS

### 2.1. EXISTING SITE CONDITIONS

The subject site is bound by Wallings Road to the north, existing cottage developments to the east and west, and the Head Lake to the south. The existing property consists of four (4) cottages with an asphalt driveway providing vehicular access to Wallings Road. Refer to **Figure 1** below for an aerial photo of the site under current conditions and **Appendix A** for the site topographic survey prepared by Vladimir Dosen Surveying.

It should be noted that there is an existing sanitary pump connection provided to the existing building that connects into the municipal sanitary sewer within Wallings Road. As well as an existing well provided to the existing building that provides water supply to the development. Refer to **Appendix C** for the Site Grading and Servicing Plan (C01).

### 2.2. PROPOSED SITE CONDITIONS

The proposed development will consist of 6 glamping pods with a proposed gravel walkway and retaining wall between the existing buildings and the lake. The pods do not contain or require foundations or service connections, being temporary in nature. It is intended that visitors to the property will utilize the facilities within the existing buildings.

It is important to note that the new development does not require additional sanitary or water services and therefore the existing services will remain in use and are sufficient to support the development. The existing buildings are serviced with an existing well for their water supply and sanitary is pumped to the existing municipal sanitary sewer on Wallings Road. Both services will be maintained and will be unaffected by the addition of the temporary pods.

## 3.0 STORMWATER MANAGEMENT

### 3.1. DESIGN CRITERIA

SWM for the proposed development will be designed in accordance with Ministry of Environment, Conservation and Parks (MECP) Stormwater Planning and Design Manual A summary of the criteria applicable to this project is as follows:

- **Quantity Control** – The site is designed to control post-development flows to the pre-development condition for the return frequencies of 2-100-year storms.
- **Quality Control** – Stormwater is to be treated to Enhanced level protection achieving 80% Total Suspended Solids (TSS). Water quality is achieved by providing inherently clean surfaces for the proposed development.
- **Erosion Control** – The first 5mm of runoff shall be trained onsite. This will be accomplished using various low-impact-development (LID) measures.

### 3.2. EXISTING CONDITIONS

Under existing conditions, the subject site (A1 Pre) and (A2 Pre) consists of the existing cottages. Stormwater conveys overland through the primary catchment containing the asphalt driveway as well as the existing cottages drains to the south via overland flow before entering Head Lake. Refer to **Table 1** below for a summary of the pre-development drainage area.

PRE-DEVELOPMENT DRAINAGE AREA		
	A1 PRE	A2 PRE
Total Area (ha)	0.13	0.90
Landscaped Area (ha)	0.13	0.74
Impervious Area (ha)	0.00	0.16
Runoff Coefficient	0.20	0.32
AC	0.03	0.29

*Table 1: Pre-Development Composite Runoff Coefficient*

Refer to **Appendix B** for detailed calculations and **Fig-01** depicting pre-development drainage conditions.

### 3.3. PROPOSED CONDITIONS

The proposed Stormwater Management strategy maintains existing drainage patterns. The proposed development will consist of the subject site (A2 Post) which remains unchanged in pre to post conditions and (A1 Post) which is the proposed development area. Quantity control is proposed via an infiltration gallery to maintain pre-development conditions.

Refer to **Table 2** below for a summary of the post-development drainage area.

POST-DEVELOPMENT DRAINAGE AREA		
	A1 POST	A2 POST
Total Area (ha)	0.13	0.90
Landscaped Area (ha)	0.10	0.74
Impervious Area (ha)	0.03	0.16
Runoff Coefficient	0.37	0.32
AC	0.05	0.29

*Table 2: Post-Development Composite Runoff Coefficient*

As shown above, A2 Post remains unchanged in pre- and post-development conditions and therefore, no additional measures are proposed. There is an increase in impervious area in A1 Post and quantity control measures are proposed to meet pre-development conditions.

The proposed SWM strategy will control flows from post- to pre-development rates for storm events from 2-year to 100-year. A time of concentration of 10 minutes and post-development runoff coefficients have been used in conjunction with the Ministry of Transportation for Halliburton, Intensity Duration Frequency (IDF) parameters to establish the corresponding post-development release rates. Modified Ration Method (MRM) calculations were performed using the Region's IDF parameters to quantify the required storage for this development under the 100-year event. See **Table 3** below for a summary of the post-development flows, target release rate and storage requirements.

Storm Event	Pre/Post Storm Runoff (L/s)	Storage Required (m <sup>3</sup> )	Storage Provided (m <sup>3</sup> )
2-Year	6.42	15.92	15.93
100-Year	17.74	58.33	58.33

*Table 3: Post-Development Quantity Control Summary*

Refer to **Table 4** below for a summary of the proposed infiltration gallery. As well as refer to **Appendix D** for infiltration sizing calculations.

INFILTRATION GALLERY (100-YEAR)	
Width	1.65 m
Length	70.00 m
Depth	1.30 m
Porosity of Storage Area	0.40
Total Effective Volume	60.06 m <sup>3</sup>
Maximum Storage Required	58.33 m <sup>3</sup>

*Table 4: Infiltration Gallery Summary*

A Preliminary Hydrogeological Assessment was completed by Harden Environmental Services Limited dated January 31, 2022. The assessment was completed to characterize the existing groundwater conditions of the Site, identify potential impacts to the local groundwater regime and provide recommendation related to groundwater control/management. The report identified a recommended infiltration for LID design to be 7 mm/hr (including a factor of safety of 2). Refer to **Appendix B** for Preliminary Hydrogeological Study.

One (1) monitoring well located at the site with the MECP designation of A001499 was drilled to determine the groundwater elevation on site. It was determined that the recommended groundwater elevation for the site is 320m. Refer to **Appendix B** for a summary of groundwater levels.

### 3.4. EROSION CONTROL

An infiltration gallery (100-year) will be proposed south of the proposed glamping pods with a total bottom area of 115.50m<sup>2</sup> to satisfy erosion control criteria, a volume of 2m<sup>3</sup> is required. The total volume provided in the infiltration facility of 60m<sup>3</sup> will be satisfy this requirement.

A check on the drawdown time was performed as part of the LID design. It was determined that during a 2-year storm event, the infiltration facility can be drawn down within 48hrs. The infiltration facility will also have sufficient clearance to groundwater. Based on the findings of the Preliminary Hydrogeological Assessment, a water elevation of 320m should be expected. The approximate clearance to the



bottom of the infiltration will be 2m based on an average ground elevation of 322m and infiltration depth of 1.30m. Retention of the first 5mm storm event on-site will be achieved by means of infiltration.

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our reflection of the proposed development along with all supporting documentation the following conclusions and recommendations are made:

- SWM quantity control objectives are satisfied as all post-development peak flow rates are below the pre-development levels for all storm up to and including the 100-Year storm.
- SWM water balance objectives are to be achieved by retaining the 5 mm storm event across the developed area impervious area. This retention will achieve via the proposed infiltration facility.
- SWM water quality objectives are achieved as all surfaces for the proposed development are inherently clean.

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# APPENDIX A

## SUPPORTING DOCUMENTATION

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SURVEYOR'S REAL PROPERTY REPORT  
PART 1) PLAN AND TOPOGRAPHIC DETAIL OF  
CONCESSION 8  
(GEOGRAPHIC TOWNSHIP OF DYSART)  
TOWNSHIP OF DYSART ET AL  
COUNTY OF HALIBURTON  
SCALE 1:200  
VLADIMIR DOSEN SURVEYING, O.L.S.

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PLAN OR MAKE UP OF IT OR ANY PART THEREOF WITHOUT THE WRITTEN PERMISSION  
OF VLADIMIR DOSEN, O.L.S.

- LEGEND**
- DENOTES SURVEY MONUMENT PLANTED
  - DENOTES CONCRETE PIN
  - DENOTES IRON BAR
  - DENOTES PLASTIC BAR
  - DENOTES STANDARD IRON BAR
  - DENOTES SHORT STANDARD STANDARD IRON BAR
  - DENOTES MEASURED
  - (D&S) DENOTES DEARDEN AND STANTON LTD., O.L.S.
  - (D&P) DENOTES DEPARTMENT OF PUBLIC WORKS ONTARIO
  - (934) DENOTES H. C. BISHOP, O.L.S.
  - (1593) DENOTES GREG BISHOP SURVEYING AND CONSULTING LTD., O.L.S.
  - (1730) DENOTES R. M. MCGILVER, O.L.S.
  - (OU) DENOTES ORIGIN UNKNOWN
  - (P1) DENOTES PLAN 19R-10249
  - (P2) DENOTES PLAN 19R-10039
  - (P3) DENOTES PLAN 19R-227
  - (P4) DENOTES PLAN 19R-1981
  - (P5) DENOTES PLAN 19R-9930
  - # DENOTES DIAMETER/ROUND
  - A/C DENOTES TIES TO ALUMINUM
  - BF DENOTES AIR CONDITIONING UNIT
  - BR DENOTES TIES TO BRICK
  - CB DENOTES BOARD FENCE
  - DB DENOTES TIES TO BRICK
  - DSE DENOTES DOOR SILL ELEVATION
  - FM DENOTES TIES TO FOUNDATION
  - OW DENOTES CATCH BASIN
  - MH DENOTES MAN HOLE
  - ST DENOTES TIES TO STONE
  - UP DENOTES UTILITY POLE
  - DENOTES CONIFEROUS TREE
  - DENOTES DECIDUOUS TREE

**EASEMENT**  
① SUBJECT TO RIGHT OF WAY AS IN INST. No. D14521

**BENCHMARK NOTE:**  
ELEVATIONS ARE GROUND AND ARE  
RELATED TO TOWNSHIP OF DYSART ET AL  
BENCHMARK No. D018760.06  
HAVING A PUBLISHED ELEVATION  
OF 320.367 METRES.

**BEARING NOTE:**  
BEARINGS ARE ASTROMOMIC AND ARE  
DERIVED FROM THE NORTHWEST LIMIT  
OF PARTS 2, 3, 9, 10 AND 11,  
AS SHOWN ON PLAN 19R-9930  
HAVING A BEARING OF N35°12'45"W.

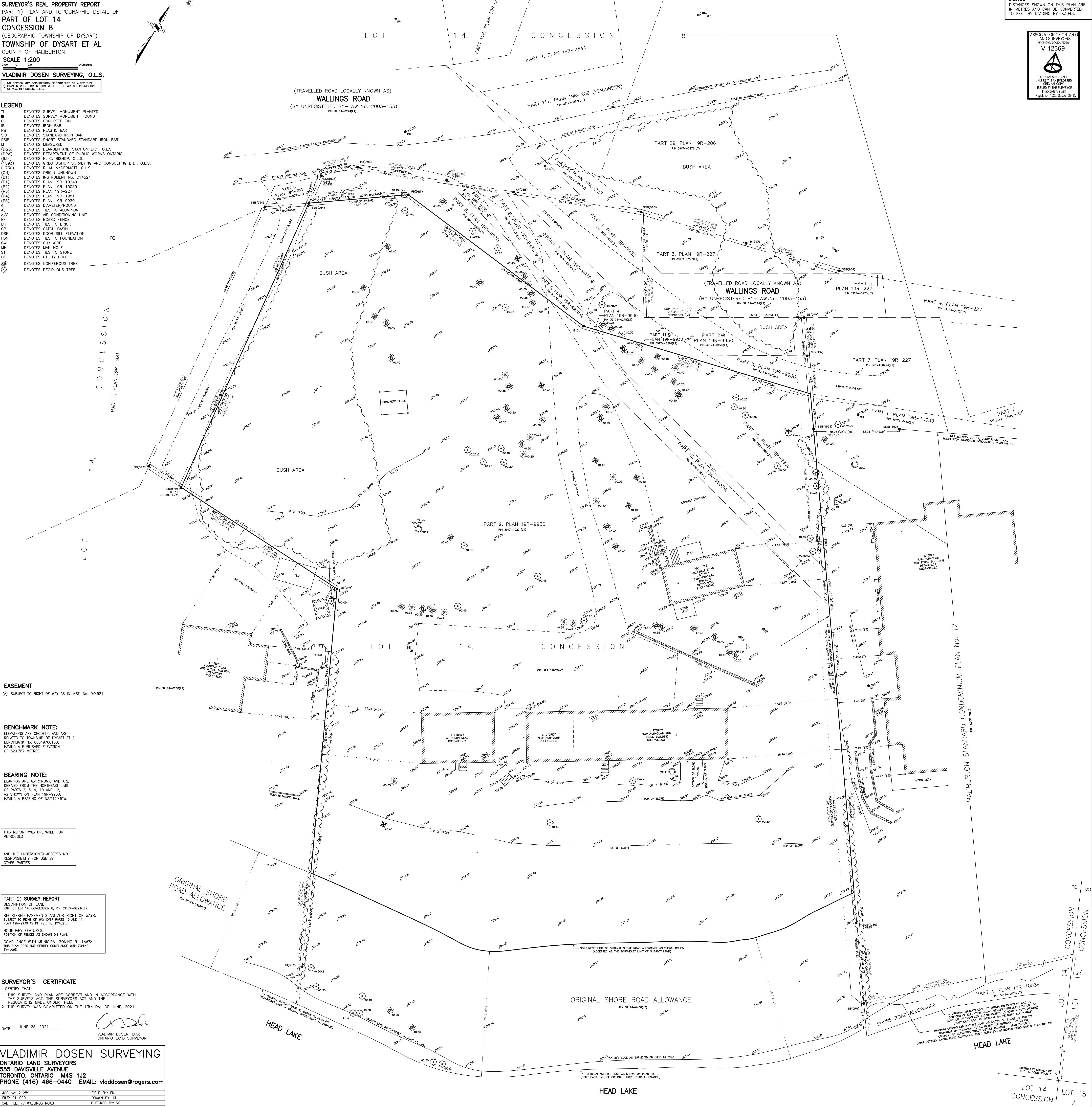
THIS REPORT WAS PREPARED FOR  
PETROGOLD  
AND THE UNDERSIGNED ACCEPTS NO  
RESPONSIBILITY FOR USE BY  
OTHER PARTIES

**PART 2) SURVEY REPORT**  
DESCRIPTION OF LAND:  
PART OF LOT 14, CONCESSION 8, PIN 39174-0291(1),  
REGISTERED EASEMENTS AND/OR RIGHT OF WAYS:  
SUBJECT TO RIGHT OF WAY AS SHOWN ON PLAN 19R-9930 AS IN INST. No. D14521  
BOUNDARY FEATURES:  
POSITION OF FENCES AS SHOWN ON PLAN  
COMPLIANCE WITH MUNICIPAL ZONING BY-LAWS:  
THIS PLAN DOES NOT CERTIFY COMPLIANCE WITH ZONING  
BY-LAWS

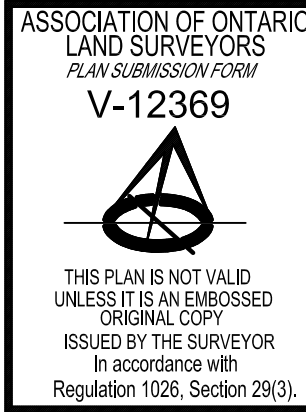
**SURVEYOR'S CERTIFICATE**  
I CERTIFY THAT:  
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH  
THE SURVEY ACT, THE SURVEYORS ACT AND THE  
REGULATIONS MADE UNDER THEM.  
2. THE SURVEY WAS COMPLETED ON THE 13th DAY OF JUNE, 2021

DATE: JUNE 25, 2021  
VLADIMIR DOSEN, B.Sc.  
ONTARIO LAND SURVEYOR  
**VLADIMIR DOSEN SURVEYING**  
ONTARIO LAND SURVEYORS  
555 DAVISVILLE AVENUE  
TORONTO, ONTARIO M4S 1J2  
PHONE (416) 466-0440 EMAIL: vladdosen@rogers.com

JOB No: 21259	FIELD BY: FK
FILE: 21-090	DRAWN BY: AT
CAD FILE: 22 WALLINGS ROAD	CHECKED BY: VD



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







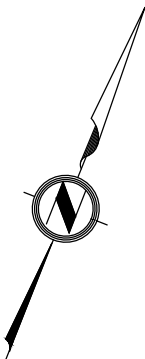
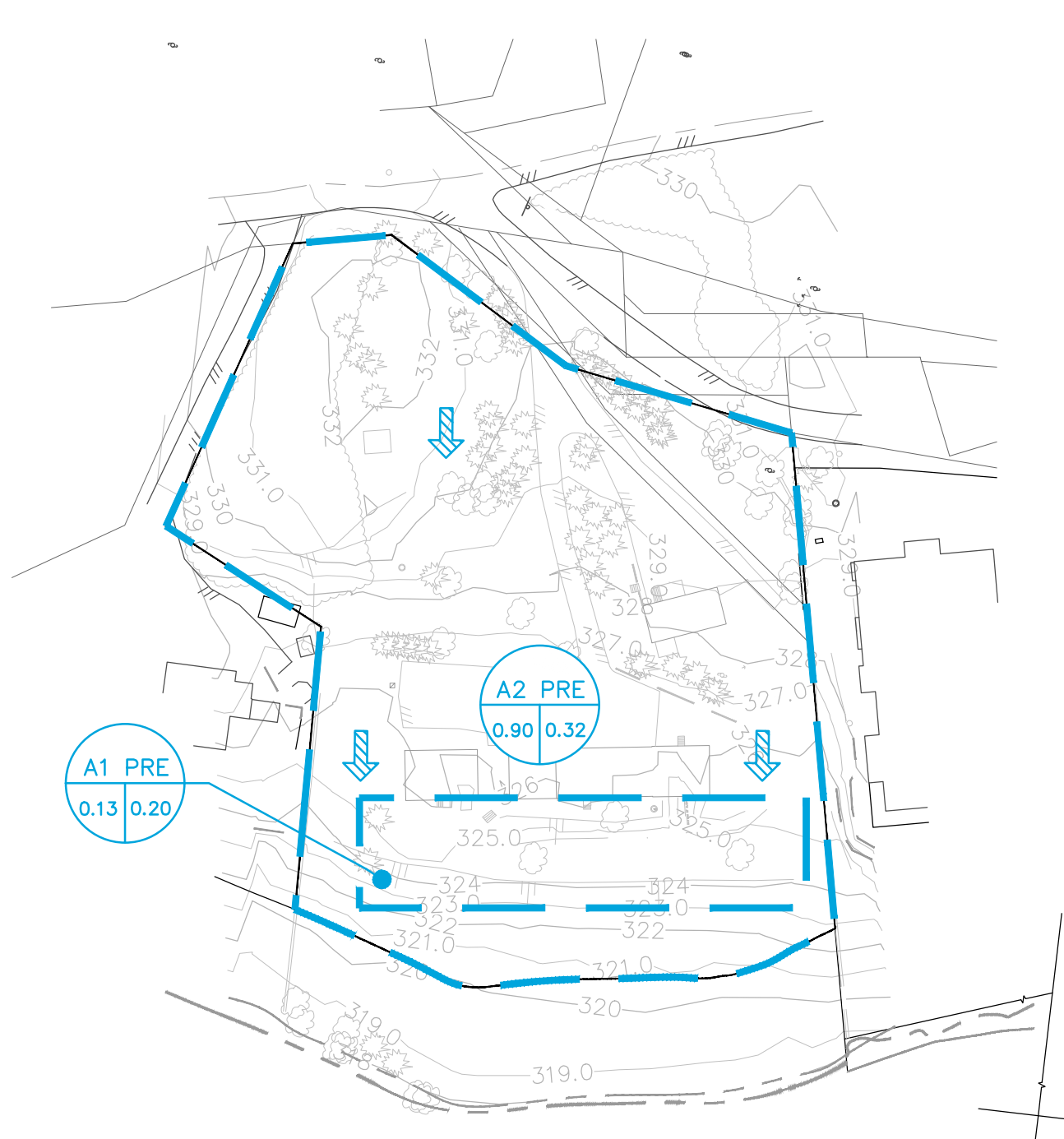
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# APPENDIX B

## STORMWATER MANAGEMENT

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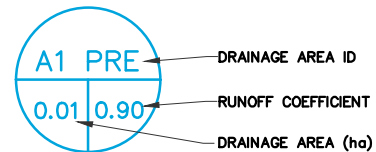
Aplin & Martin Consultants Ltd.  
405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7  
Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT:  
**2784805 ONTARIO INC.**  
18 ERICA ROAD  
THORNHILL, ON L4J 2G1

PROJECT:  
**PROPOSED GLAMPING DEVELOPMENT**  
77 WALLINGS ROAD  
HALIBURTON, ON

LEGEND:

- EXISTING PROPERTY LINE
- PRE-DEVELOPMENT DRAINAGE AREA
- OVERLAND FLOW AAROW



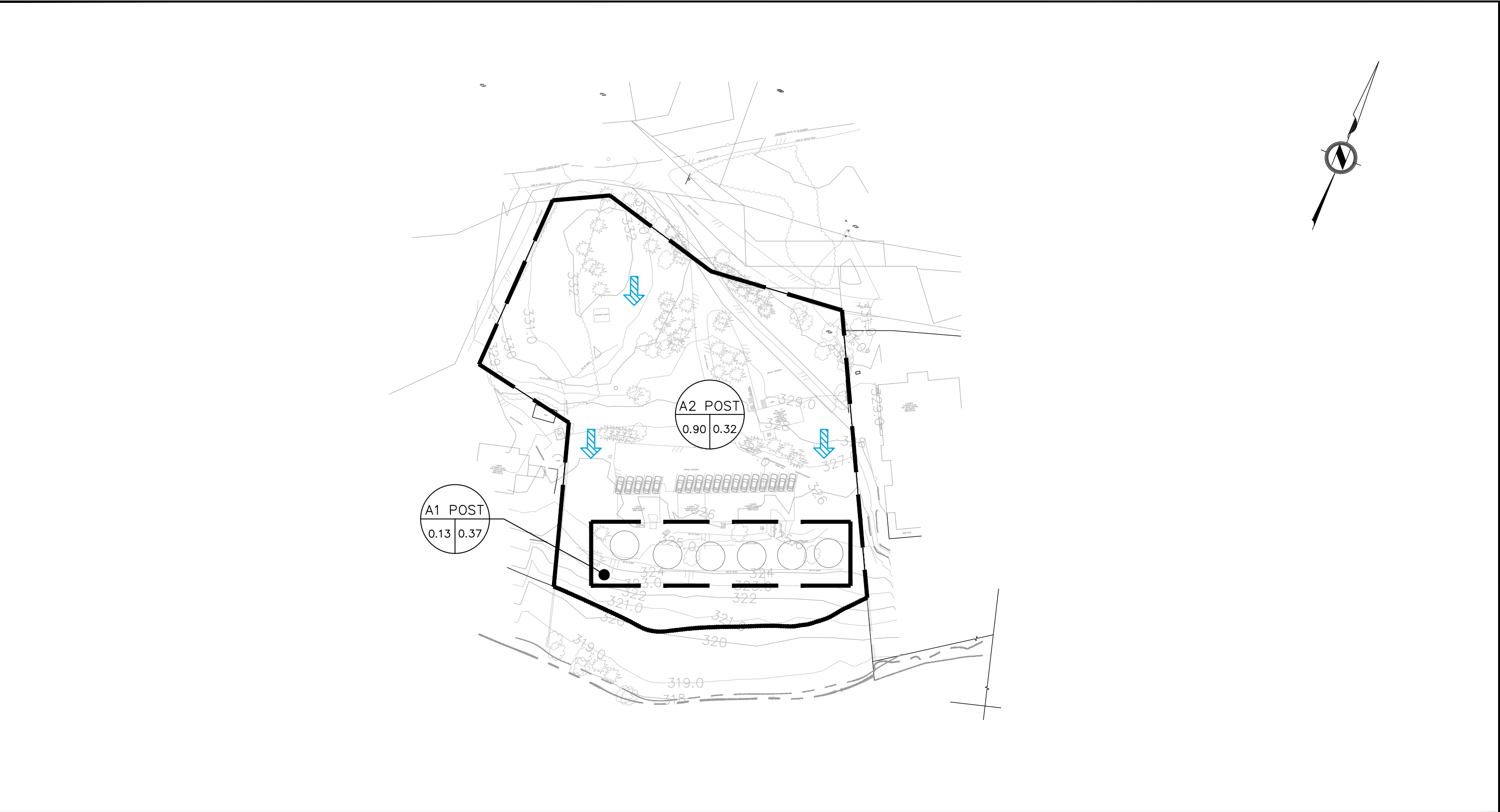
TITLE:  
**PRE-DEVELOPMENT  
DRAINAGE AREA PLAN**

PROJECT NO.  
**21-7010**

FIGURE NO.  
**FIG-01**

DRAWING DATE:  
**NOVEMBER, 2023**

SCALE :  
**1:1000**

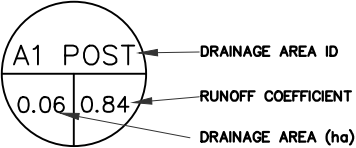


Aplin & Martin Consultants Ltd.  
405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7  
Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT:  
**2784805 ONTARIO INC.**  
18 ERICA ROAD  
THORNHILL, ON L4J 2G1

PROJECT:  
**PROPOSED GLAMPING DEVELOPMENT**  
77 WALLINGS ROAD  
HALIBURTON, ON

- LEGEND:
- POST-DEVELOPMENT DRAINAGE AREA
  - OVERLAND FLOW ROUTE
  - BUILDING OUTLINE
  - PROPOSED PROPERTY LINE



TITLE:	
POST-DEVELOPMENT DRAINAGE AREA PLAN	
PROJECT NO. <b>21-7010</b>	DRAWING DATE: <b>NOVEMBER, 2023</b>
FIGURE NO. <b>FIG-02</b>	SCALE : <b>1:1000</b>

AM Proj #

Project Title:

Project Location:

21-7010

Glamping Development

77 Wallings Road, Haliburton, ON

Composite Runoff Coefficient

A1 Pre	
Total Area	0.13
Landscaped Area	0.13
Impervious Area	0.00
Runoff Coefficient	0.20

A2 Pre	
Total Area	0.90
Landscaped Area	0.74
Impervious Area	0.16
Runoff Coefficient	0.32

A1 Post - Controlled	
Total Area	0.13
Landscaped Area	0.10
Impervious Area	0.03
Runoff Coefficient	0.37

A2 Post - Unchanged	
Total Area	0.90
Landscaped Area	0.74
Impervious Area	0.16
Runoff Coefficient	0.32

Storm Event	Return Period Factor	A1 Post	A2 Post
2-10 Years	1.00	0.37	0.32
25 Year	1.10	0.40	0.36
50 Year	1.20	0.44	0.39
100 Year	1.25	0.46	0.40

AM Proj # 21-7010  
 Project Title: Glamping Development  
 Project Location: 77 Wallings Road, Haliburton, ON

Pre-Development Runoff Coefficient					
A1 Pre	Total Area	0.13	C (2-10 YR)	C (25 YR) <sup>1</sup>	C (50 YR) <sup>1</sup>
	Pervious	0.13	0.20	0.22	0.24
	Impervious	0.00	0.90	0.95	1.00
	Composite 'C'		0.20	0.22	0.24
A2 Pre	Total Area	0.90	C (2-10 YR)	C (25 YR) <sup>1</sup>	C (50 YR) <sup>1</sup>
	Pervious	0.74	0.20	0.22	0.24
	Impervious	0.16	0.90	0.95	1.00
	Composite 'C'		0.32	0.35	0.37

Pre-Development Peak Flows			
Area ID	A	C	Tc
	(ha)		(min)
A1 Pre	0.13	0.20	10.0
A2 Pre	0.90	0.32	10.0

[IDF Data : Ministry of Transportation for Haliburton \(45.045833,-78.520833\)\)](#)

Storm Frequency (Yr)	a	b		
2	21.90	-0.699		
5	29.00	-0.699		
10	33.70	-0.699		
25	39.70	-0.699		
50	44.10	-0.699		
100	48.40	-0.699		
Storm Frequency: 2 Year				
Area ID	AC	I (mm/hr)	Q (m <sup>3</sup> /s)	Q (L/s)
A1 Pre	0.03	76.63	0.01	5.49
A2 Pre	0.29	76.63	0.06	61.72
Storm Frequency: 5 Year				
Area ID	AC	I (mm/hr)	Q (m <sup>3</sup> /s)	Q (L/s)
A1 Pre	0.03	101.47	0.01	7.27
A2 Pre	0.29	101.47	0.08	81.74
Storm Frequency: 10 Year				
Area ID	AC	I (mm/hr)	Q (m <sup>3</sup> /s)	Q (L/s)
A1 Pre	0.03	117.91	0.01	8.45
A2 Pre	0.29	117.91	0.09	94.98
Storm Frequency: 25 Year				
Area ID	AC	I (mm/hr)	Q (m <sup>3</sup> /s)	Q (L/s)
A1 Pre	0.03	138.91	0.01	10.94
A2 Pre	0.31	138.91	0.12	120.64
Storm Frequency: 50 Year				
Area ID	AC	I (mm/hr)	Q (m <sup>3</sup> /s)	Q (L/s)
A1 Pre	0.03	154.30	0.01	12.16
A2 Pre	0.31	154.30	0.13	134.01
Storm Frequency: 100 Year				
Area ID	AC	I (mm/hr)	Q (m <sup>3</sup> /s)	Q (L/s)
A1 Pre	0.03	169.35	0.01	14.55
A2 Pre	0.34	169.35	0.16	157.74

AM Proj # 21-7010  
Project Title: Glamping Development  
Project Location: 77 Wallings Road, Haliburton, ON

Post-Development Runoff Coefficient

A1 Post - Controlled site area

Total Area	0.13	C (2-10 YR)	C (25 YR) <sup>1</sup>	C (50 YR) <sup>1</sup>	C (100 YR) <sup>1</sup>
Impervious	0.03	0.90	0.95	1.00	1.00
Pervious	0.10	0.20	0.22	0.24	0.25
Composite 'C'		0.37	0.40	0.42	0.43

A2 Post - Unchanged

Total Area	0.90	C (2-10 YR)	C (25 YR) <sup>1</sup>	C (50 YR) <sup>1</sup>	C (100 YR) <sup>1</sup>
Impervious	0.16	0.90	0.95	1.00	1.00
Pervious	0.74	0.20	0.22	0.24	0.25
Composite 'C'		0.32	0.35	0.37	0.38



2 YEAR MODIFIED RATIONAL METHOD

Area ID	A1 Post		Area ID	A1 Pre	
Area	0.13	ha	Area	0.13	ha
C	0.37		C	0.20	
AC	0.05		AC	0.03	

Equivalent Existing Area Release Rate		
Infiltration Area	0.012	ha
Infiltration Rate	7.00	mm/hr
Release Rate	0.23	L/s
Storage Required	15.92	m <sup>3</sup>
Max Storage Provided	15.93	m <sup>3</sup>

		A1 PRE	A1 POST				
Rainfall Duration Tr	Rainfall Intensity I	Pre-Dev Storm Runoff (A)	Post-Dev Storm Runoff (B)	Excess Post-Dev Runoff (B-A)	Runoff Volume	Infiltrated Volume	Storage Volume
min	mm/hr	L/s	L/s	L/s	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>
10	89.52	6.42	11.66	5.24	7.00	0.14	6.86
50	30.98	2.22	4.03	1.81	12.10	0.68	11.42
100	18.87	1.35	2.46	1.10	14.74	1.37	13.38
150	14.05	1.01	1.83	0.82	16.47	2.05	14.42
200	11.39	0.82	1.48	0.67	17.80	2.73	15.06
250	9.67	0.69	1.26	0.57	18.89	3.42	15.47
300	8.46	0.61	1.10	0.50	19.82	4.10	15.72
350	7.55	0.54	0.98	0.44	20.64	4.78	15.86
400	6.84	0.49	0.89	0.40	21.38	5.47	15.92
450	6.27	0.45	0.82	0.37	22.05	6.15	15.90
500	5.80	0.42	0.76	0.34	22.67	6.83	15.84
550	5.41	0.39	0.70	0.32	23.24	7.52	15.73
600	5.07	0.36	0.66	0.30	23.78	8.20	15.58
650	4.78	0.34	0.62	0.28	24.28	8.88	15.40
700	4.53	0.32	0.59	0.27	24.75	9.57	15.19

100 YEAR MODIFIED RATIONAL METHOD

Area ID	A1 Post		Area ID	A1 Pre	
Area	0.13	ha	Area	0.13	ha
C	0.43		C	0.25	
AC	0.05		AC	0.03	

Equivalent Existing Area Release Rate		
Infiltration Area	0.012	ha
Infiltration Rate	7.00	mm/hr
Release Rate	0.23	L/s
Storage Required	58.33	m <sup>3</sup>
Max Storage Provided	58.33	m <sup>3</sup>

		A1 PRE	A1 POST				
Rainfall Duration Tr	Rainfall Intensity I	Pre-Dev Storm Runoff (A)	Post-Dev Storm Runoff (B)	Excess Post-Dev Runoff (B-A)	Runoff Volume	Infiltrated Volume	Storage Volume
min	mm/hr	L/s	L/s	L/s	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>
10	198.32	17.74	30.18	12.44	18.11	0.14	17.97
100	41.69	3.73	6.34	2.62	38.07	1.37	36.70
400	15.20	1.36	2.31	0.95	55.51	5.47	50.05
700	10.08	0.90	1.53	0.63	64.43	9.57	54.87
1000	7.76	0.69	1.18	0.49	70.82	13.67	57.16
1300	6.40	0.57	0.97	0.40	75.91	17.77	58.15
1600	5.49	0.49	0.84	0.34	80.19	21.87	58.33
1900	4.84	0.43	0.74	0.30	83.92	25.97	57.95
2200	4.34	0.39	0.66	0.27	87.22	30.07	57.16
2500	3.95	0.35	0.60	0.25	90.22	34.17	56.05
2800	3.64	0.33	0.55	0.23	92.95	38.27	54.68
3100	3.37	0.30	0.51	0.21	95.48	42.37	53.11
3400	3.15	0.28	0.48	0.20	97.83	46.47	51.36
3700	2.96	0.26	0.45	0.19	100.04	50.57	49.47
4000	2.80	0.25	0.43	0.18	102.11	54.67	47.44

Quantity Control - LID Design

Site Area	10230 m <sup>2</sup>
Controlled Site Area (A1-Pre)	1274 m <sup>2</sup>

Maximum Allowable Depth (MOE Equation 4.2)

Infiltration Rate*	14.00 mm/hr
Infiltration Rate FS*	2.00
Design Infiltration Rate	7.00 mm/hr
Drawdown Time	48.00 hr
Maximum Depth	0.34 m

Minimum Bottom Area (MOE Equation 4.3)

Min. Required Volume	15.92 m <sup>3</sup>
Infiltration Rate	7.00 mm/hr
Porosity of Storage Media	0.40
Drawdown Time	48.00 hr
Minimum Bottom Area Required	118.42 m <sup>2</sup>

Quantity Control - Infiltration Gallery (2 YR)

Width	1.65 m
Length	71.00 m
Depth	0.34 m
Total Bottom Area	117.15 m <sup>2</sup>
Porosity of Storage Media	0.40
Total Trench Volume	15.93 m <sup>3</sup>
Total Effective Volume	15.93 m <sup>3</sup>
Max Storage Required	15.92 m <sup>3</sup>

$$A = \frac{1000V}{lnT}$$

A = Bottom area of the trench (m2)  
V = Runoff volume to be infiltrated  
P = Percolation rate surrounding native soil (mm/h)  
n = Porosity of the stoage media (0.4 for clear stone)  
T = Retention Time (24 to 48 hours)

$$d = \frac{IT}{1000n}$$

d = Maximum allowable depth of the soakaway pit (m)  
P = Percolation rate (mm/hr)  
T = Drawdown time (24 to 48 hours)

Quantity Control - Infiltration Gallery (100 YR)

Width	1.65 m
Length	70.00 m
Depth	1.30 m
Total Bottom Area	115.50 m <sup>2</sup>
Porosity of Storage Media	0.40
Total Trench Volume	60.06 m <sup>3</sup>
Total Effective Volume	60.06 m <sup>3</sup>
Max Storage Required	58.33 m <sup>3</sup>

AM Proj #

Project Title:

Project Location:

21-7010

Glamping Development

77 Wallings Road, Haliburton, ON

### Erosion Control

#### Volume Retention Requirement

Imp Area (ha)	Depth (mm)	Volume (m <sup>3</sup> )
0.13	5.0	6.37

#### Abstraction Volume

Landuse	Area (m <sup>2</sup> )	Depth (mm)	IA Volume (m <sup>3</sup> )
Impervious - Proposed Glamping Pods	305.78	0.00	0.00
Landscape	852.82	5.00	4.26
Sum			4.26
Remaining Volume			2.11
Infiltration Trench	115.50	1.30	60.06
Provided Volume			60.06



Harden Environmental Services Ltd.  
4622 Nassagaweya-Puslinch Townline Road  
R.R. 1, Moffat, Ontario, L0P 1J0  
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies

Geochemistry

Phase I / II

Regional Flow Studies

Contaminant Investigations

OMB Hearings

Water Quality Sampling

Monitoring

Groundwater Protection  
Studies

Groundwater Modelling

Groundwater Mapping

File: 2021- 77 Wallings Road Haliburton

March 9, 2022

2784805 Ontario Inc  
18 Erica Road  
Thornhill On  
L4J 2G1

Attn: Mr. Gil Shcolyar

Dear Gil:

**Re: Storm Water Management Support -Hydrogeology**

We are pleased to provide the following information for the site located at 77 Wallings Road in Haliburton.

**Groundwater Elevation**

A water well is located at the site with the MECP designation of A001499. The water well record for this well is attached.

The water level in the well was measured at 10.11 metres below casing top or 9.34 metres below ground surface on January 31, 2022.

The elevation of the top of the well provided on the site survey is 329.69 metres above mean sea level (m AMSL). The water table in the well has an elevation of 319.58 m AMSL.

The lake level has a high-water level of 316.98 m AMSL according to the site plan.

We recommend using a groundwater elevation of 320 m AMSL for the central portion of the site. The water table will decrease to the lake level and will increase closer to Wallings Road. It is our opinion that the groundwater level at Wallings Road will not exceed 322 m AMSL.

No groundwater was encountered during the geotechnical investigation.



### **Estimate of Infiltration**

To calculate saturated hydraulic conductivity in the silty till, we have used the following equation:

$$K = C(d_{10})^2$$

Where K = hydraulic conductivity (cm/s)

$d_{10}$  = grain size of the 10<sup>th</sup> percentile (cm)

C = constant according to the following table: Very fine sand, poorly sorted C = 40-80

$d_{10}$  from the grain size analysis provided by Sola Engineering is 0.00014 cm and we have assumed a C value of 60. Therefore, the estimated saturated hydraulic conductivity of the silty till material is  $1.2 \times 10^{-6}$  cm/s.

In order to estimate infiltration potential in the lot level infiltration galleries, we converted the saturated hydraulic conductivity to an infiltration rate based on the formula provided by the Ministry of Municipal Affairs and Housing (MMAH) document *Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario.* The estimated infiltration rate is 14mm/hr. Design infiltration values should use a safety factor of 2, thereby resulting in design infiltration rate of 7 mm/hr.

Sincerely,

Harden Environmental Services Ltd.

A handwritten signature in black ink, appearing to read 'S. Denhoed', followed by a horizontal line.

Stan Denhoed, M.Sc., P.Eng.  
Senior Hydrogeologist



Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10<sup>th</sup> of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

Address of Well Location (County/District/Municipality)				Township		Lot		Concession	
MNR HALIBURTON Fire Centre				Dysart		17		18	
RR#/Street Number/Name				City/Town/Village		Site/Compartment/Block/Tract etc.			
Wallings Rd., Haliburton				Haliburton					
GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation:	Undifferentiated	Averaged	
83	17	6 95 05 5	4 99 101 0	Magellan			Differentiated, specify		

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
Black	Topsoil			0	0.2
Brown	Sand & gravel			0.2	0.6
Red	Granite			0.6	2.4
Black	Granite	some red layers		2.4	11.0
Black & Green	Granite			11.0	12.5
Black, Red	Granite			12.5	29.9
Black	Granite	some red		29.9	76.2

<b>Hole Diameter</b>			<b>Construction Record</b>				<b>Test of Well Yield</b>					
Depth From	Metres To	Diameter Centimetres	Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To	Pumping test method	Draw Down	Recovery		
0	6.1	25.4						Time min	Water Level Metres	Time min	Water Level Metres	
6.1	76.2	15.2										
<b>Water Record</b>			<b>Casing</b>				<b>Static Level</b>				<b>Recovery</b>	
Water found at Metres	Kind of Water		15.9	<input checked="" type="checkbox"/> Steel <input type="checkbox"/> Fibreglass	0.5	+0.9	6.1	Pump intake set at - (metres) 67.7	7.3			
11.0	<input checked="" type="checkbox"/> Fresh	<input type="checkbox"/> Sulphur		<input type="checkbox"/> Plastic <input type="checkbox"/> Concrete				Pumping rate - (litres/min) 27.3	1	8.5	1 29.1	
69.2m	<input checked="" type="checkbox"/> Fresh	<input type="checkbox"/> Sulphur		<input type="checkbox"/> Galvanized				Duration of pumping 4 hrs + min	2	9.6	2 26.4	
71.0m	<input checked="" type="checkbox"/> Fresh	<input type="checkbox"/> Sulphur		<input type="checkbox"/> Steel <input type="checkbox"/> Fibreglass				Final water level end of pumping 31.2 metres	3	10.5	3 26.3	
	<input type="checkbox"/> Gas	<input type="checkbox"/> Salty		<input type="checkbox"/> Plastic <input type="checkbox"/> Concrete				Recommended pump type	4	11.3	4 26.1	
	<input type="checkbox"/> Other:	<input type="checkbox"/> Minerals		<input type="checkbox"/> Galvanized				Recommended pump depth 73.2 metres	5	11.9	5 25.0	
After test of well yield, water was			<b>Screen</b>				<b>Recommended pump rate</b>				<b>Recovery</b>	
<input checked="" type="checkbox"/> Clear and sediment free			Outside diam	<input type="checkbox"/> Steel <input type="checkbox"/> Fibreglass	Slot No.			(litres/min)	15	17.3	15 17.0	
<input type="checkbox"/> Other, specify				<input type="checkbox"/> Plastic <input type="checkbox"/> Concrete				If flowing give rate - (litres/min)	20	18.6	20 15.5	
Chlorinated <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				<input type="checkbox"/> Galvanized					25	19.9	25 14.3	
			<b>No Casing or Screen</b>				<b>If pumping discontinued, give reason.</b>				<b>Recovery</b>	
			<input checked="" type="checkbox"/> Open hole			6.1	76.2		30	21.0	30 13.4	
									40	22.8	40 12.4	
									50	24.1	50 11.8	
									60	25.0	60 11.4	

<b>Plugging and Sealing Record</b>			<input checked="" type="checkbox"/> Annular space	<input type="checkbox"/> Abandonment
Depth set at - Metres	Material and type (bentonite slurry, neat cement slurry) etc.		Volume Placed (cubic metres)	
From To				
0 6.1	Cement			
<b>Method of Construction</b>				
<input type="checkbox"/> Cable Tool	<input type="checkbox"/> Rotary (air)	<input type="checkbox"/> Diamond	<input type="checkbox"/> Digging	
<input type="checkbox"/> Rotary (conventional)	<input checked="" type="checkbox"/> Air percussion	<input type="checkbox"/> Jetting	<input type="checkbox"/> Other	
<input type="checkbox"/> Rotary (reverse)	<input type="checkbox"/> Boring	<input type="checkbox"/> Driving		
<b>Water Use</b>				
<input type="checkbox"/> Domestic	<input type="checkbox"/> Industrial	<input type="checkbox"/> Public Supply	<input type="checkbox"/> Other	
<input type="checkbox"/> Stock	<input type="checkbox"/> Commercial	<input type="checkbox"/> Not used		
<input type="checkbox"/> Irrigation	<input type="checkbox"/> Municipal	<input type="checkbox"/> Cooling & air conditioning		
<b>Final Status of Well</b>				
<input checked="" type="checkbox"/> Water Supply	<input type="checkbox"/> Recharge well	<input type="checkbox"/> Unfinished	<input type="checkbox"/> Abandoned, (Other)	
<input type="checkbox"/> Observation well	<input type="checkbox"/> Abandoned, insufficient supply	<input type="checkbox"/> Dewatering		
<input type="checkbox"/> Test Hole	<input type="checkbox"/> Abandoned, poor quality	<input type="checkbox"/> Replacement well		
<b>Well Contractor/Technician Information</b>				
Name of Well Contractor		Well Contractor's Licence No.		
G.Hart & Sons Well Drilling Ltd.		2662		
Business Address (street name, number, city etc.)				
Box 850, Fenelon Falls, ON				
Name of Well Technician (last name, first name)		Well Technician's Licence No.		
Watson, Bryan		T-2441		
Signature of Technician/Contractor		Date Submitted		
		YYYY MM DD		

<b>Location of Well</b>			
In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.			
Audit No.	Z 01591		Date Well Completed
			2003 11 29
Was the well owner's information package delivered?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Date Delivered
			2003 11 27
<b>Ministry Use Only</b>			
Data Source	Contractor		
	2662		
Date Received	YYYY MM DD	Date of Inspection	YYYY MM DD
MAR 25 2004			
Remarks	Well Record Number		
CSS 185	2706683		

# Particle Size Distribution Report



GRAIN SIZE - mm.											
% +3"			% Gravel			% Sand			% Fines		
			Coarse	Fine	Coarse	Medium	Fine				
○	0		0	0	0	1	2	97			
×	Colloids	LL	PL	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
○		26.3	18.9	0.0215	0.0103	0.0083	0.0047	0.0022			
Material Description									USCS	AASHTO	
○ CLAYEY SILT (VISUAL/MANUAL) CLAYEY SILT (LAB)									CL-ML	A-4(6)	

**Project No.** 10936      **Client:** 2784805 Ontario Inc.  
**Project:** Proposed Residential Development  
☐ **Location:** BH7 SS4      **Depth:** 7.5'-9'      **Sample Number:** 22-016  
**Date:** ☐

**Remarks:**  
☐ Sampled By: Clement  
 Date: 12/22/2021  
 Note: Additional information is available upon request

## SOLA ENGINEERING INC.

Enclosure

13

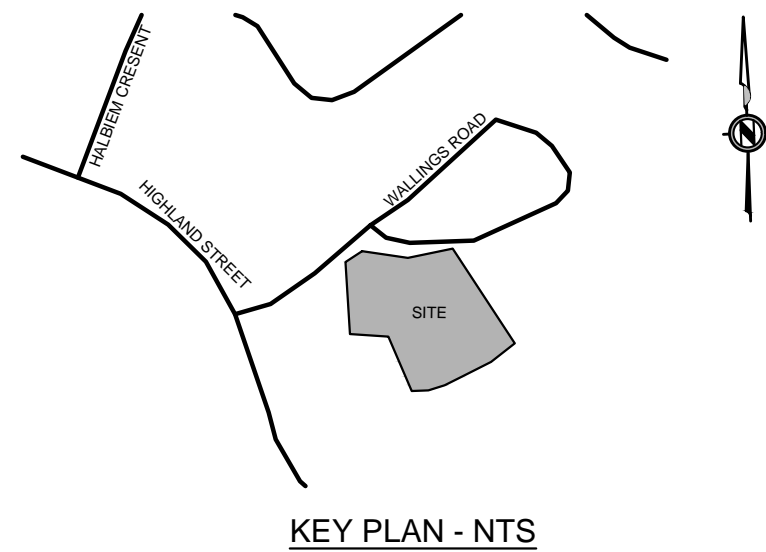
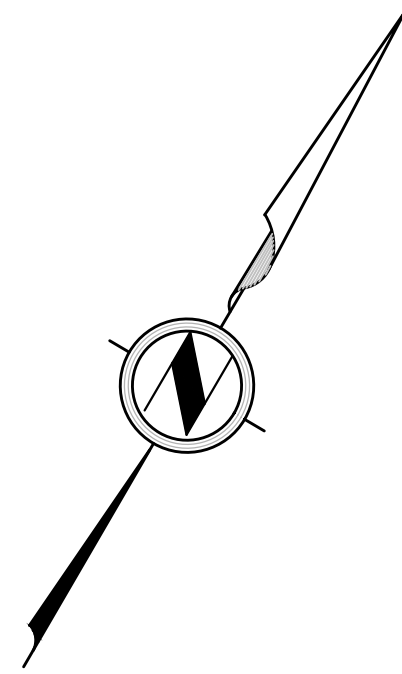
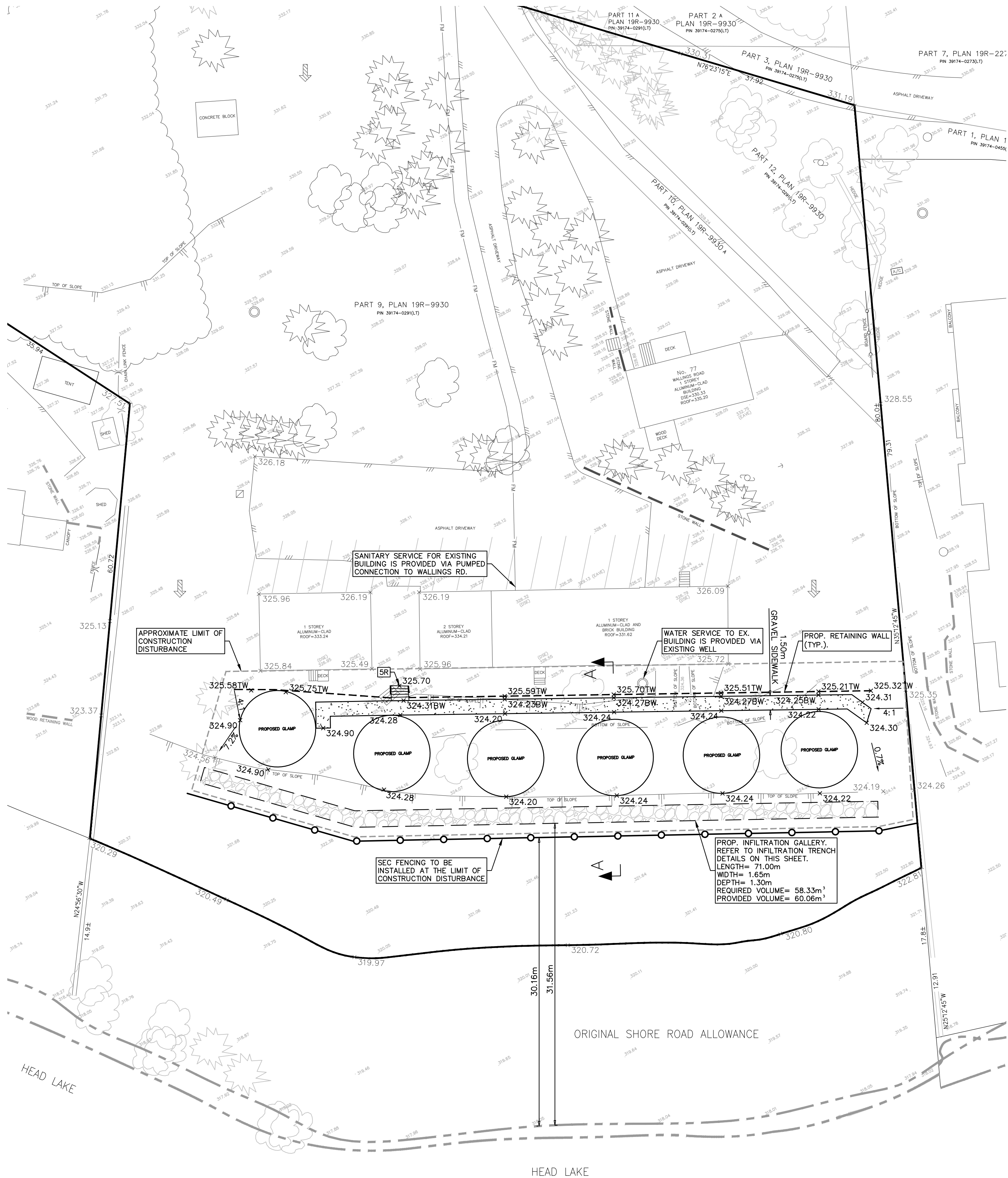
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# APPENDIX C

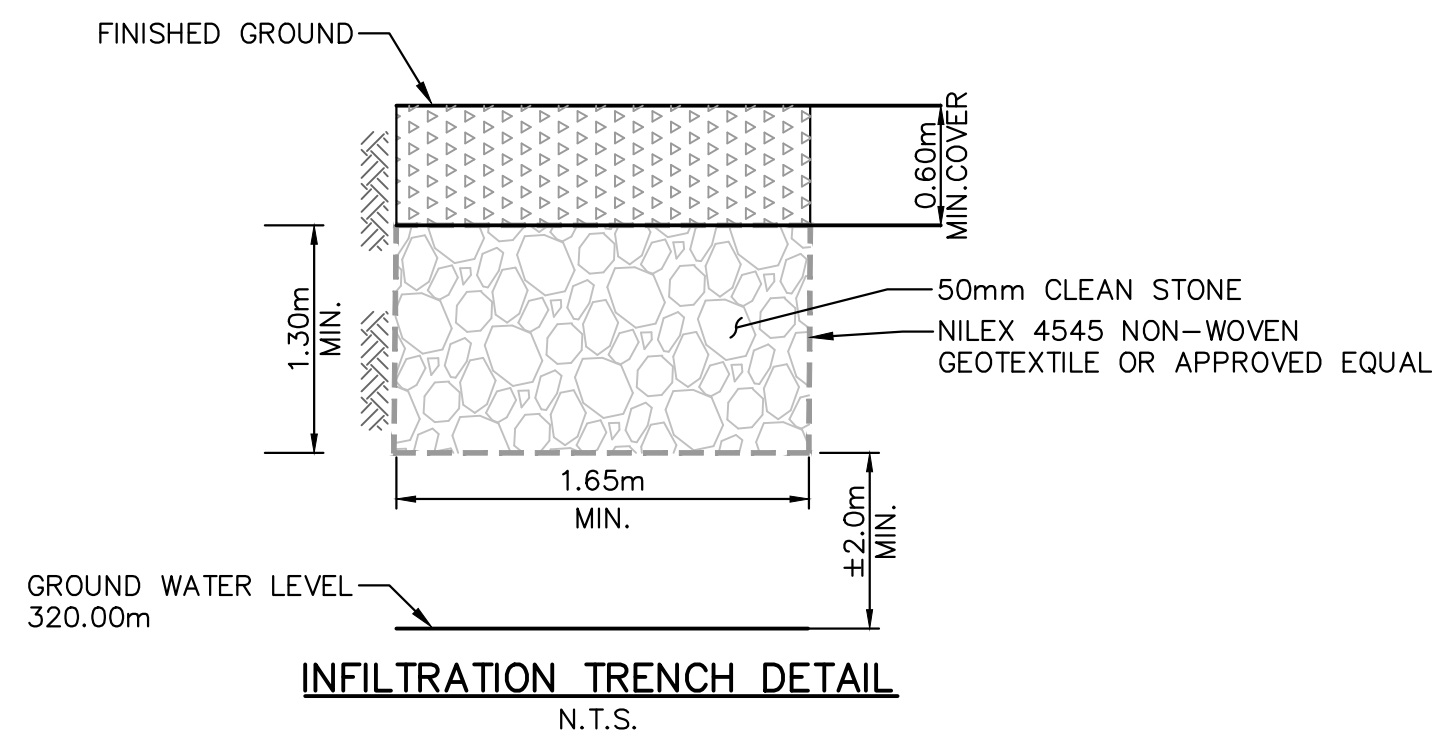
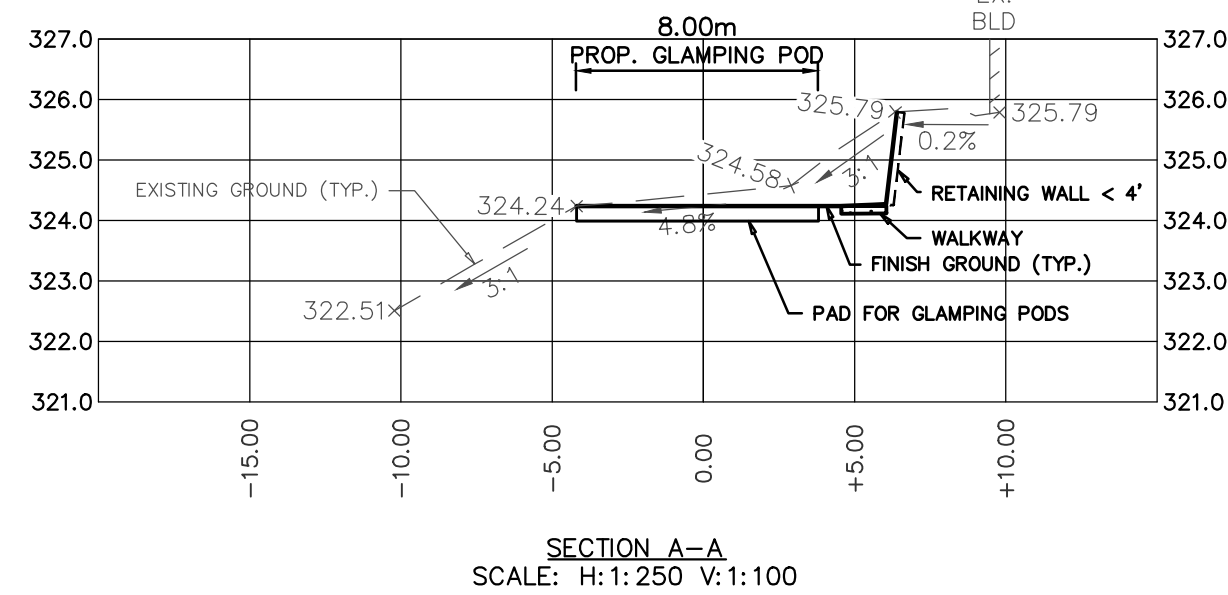
## ENGINEERING DRAWINGS

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LEGEND	
PROPERTY LINE	---
PROPOSED RETAINING WALL	---
EXISTING TOP OF BANK	---
PROPOSED EDGE OF PAVEMENT	---
EXISTING EDGE OF PAVEMENT	---
PROPOSED GRAVEL SIDEWALK	---
EXISTING PUMP CONNECTION	---
LIMIT OF CONSTRUCTION DISTURBANCE	---
SEC FENCING	---
EXISTING GROUND CONTOUR	---
EXISTING/PROPOSED ELEVATION	× 329.96 / × 328.94
TOP/BOTTOM OF WALL ELEVATION	× 326.05TW/BW
PROPOSED SWALE ELEVATION	× 328.19SW
GRADE	2.0%
EXISTING/PROPOSED OVERLAND FLOW ROUTE	---
EXISTING/PROPOSED CATCH BASIN	---
EXISTING/PROPOSED MANHOLE	---
EXISTING HYDRO POLE	---



REV	DATE	DESCRIPTION	BY	APP
1	2024/01/30	FIRST SUBMISSION	MY	CAB

1	2024/01/30	FIRST SUBMISSION	MY	CAB
REV	DATE	DESCRIPTION	BY	APP

1	2024/01/30	FIRST SUBMISSION	MY	CAB
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REV	DATE	DESCRIPTION	BY	APP

1	2024/01/30	FIRST SUBMISSION	MY	CAB
REV	DATE	DESCRIPTION	BY	APP

Site: 50 - 2024 - 801p1 - M4 VGN 2023 12 18 7010 VGN VGN SITE PRODUCTION 21-7010 - NEW - Grading & Servicing Site Grading Site - 20240130