FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

752 PETERSON ROAD

MUNICIPALITY OF HASTINGS HIGHLANDS

PREPARED FOR:

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PREPARED BY:

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CROZIER

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Shahram Rashvand (Owner) to prepare a Functional Servicing and Preliminary Stormwater Management Report in support of the Zoning By-Law Amendment Application for the proposed development located at 752 Peterson Road in the Municipality of Hastings Highlands (the Site). The purpose of this report is to demonstrate the proposed development is feasible from a functional servicing and stormwater management perspective and conforms with the requirements of the Municipality of Hastings Highlands (Town) and Hastings County (County).

This report has been completed in accordance with the appropriate design guidelines and the Pre-consultation meeting that occurred on July 31, 2023. The relevant background studies and reports used in preparation of this report include:

- Ministry of the Environment Design Guidelines for Drinking-Water Systems (2008)
- Ministry of Environment Stormwater Management Planning and Design Manual (March 2003)
- The Municipality of Hastings Highlands Zoning Bylaw Amendment Guide (November 2022)
- Ontario Building Code (2012)

This report has been prepared in support of the second submission of the Zoning By-Law Amendment for the Site.

2.0 Site Description

The subject lands encompass an area of approximately 5.19 ha and currently consists of a rural property, primarily consisting of trees with a standalone building and garage with driveway access to Peterson Road. A management building has been recently constructed onsite. The property, located in a rural neighbourhood, is bounded by rural properties to the east and west, Peterson Road to the south, and forest lands to the north.

According to the Site Plan prepared by NOAR.CA Inc. dated June 2, 2025; the proposed development will consist of the following elements:

- 17 cabin units with a looped internal roadway.
- Common area consisting of the existing management building and garage, with a proposed pool and parking lot
- Site access point from Peterson Road.

3.0 Soil and Groundwater Conditions

Crozier was retained by the Owner to complete a Hydrogeological Study to support the proposed development. The Hydrogeological Study Report, dated June 2025, is provided under separate cover.

According to the Hydrogeological Study, the Site is located within the physiographic region known as the Algonquin Highlands, which is characterized as hard Precambrian rock overlain by a thin layer of sandy glacial till. Local Ministry of Environment, Conservation and Parks (MECP) well records show granite bedrock in the vicinity of the Site as shallow as 0.9 m below ground surface (mbgs). Groundwater is expected within the bedrock and was identified in surrounding wells at depths between less than 1 mbgs to 16 mbgs.

4.0 Sanitary Servicing

4.1 Existing Sanitary Servicing

Municipal sanitary services are not available in the vicinity of the Site; therefore, the Site and surrounding properties are serviced by onsite sewage systems. The newly constructed management building is serviced by an onsite sewage system east of the building, consisting of a septic tank and leaching bed. The proposed cabins will be serviced by new onsite sewage systems, as described in the subsections below.

4.2 Design Sewage Flow

As noted in Section 2, the proposed development will consist of short-term accommodation units (cabins), the newly constructed management building, and the existing garage. The total daily design sewage flow for the proposed development was calculated in accordance with Tables 8.2.1.3.A and 8.2.1.3.B of the Ontario Building Code (OBC), based on the occupancy for each building as described below:

- The proposed accommodation units were considered "Hotel/Motel" occupancy per Table 8.2.1.3.A of the OBC, which is 250 L/day/room. Each cabin will contain one (1) bedroom with a living area, which was conservatively considered as two (2) rooms. Therefore, the total daily sewage flow per cabin was determined to be 500 L/day.

- The existing management building contains (2) bedrooms, two (2) bathrooms, and a kitchen, consistent with a two (2) bedroom dwelling per Table 8.2.1.3.A of the OBC. The total daily sewage flow the management building is 1,100 L/day.

Based on the above, the total daily design sewage flow is summarized in Table 1. Detailed calculations are provided in **Appendix A**.

Table 1: Total Daily Design Sewage Flow

Description	Unit	Unit Flow (L/day)	Number of Units	Total Flow (L/day)
Guest Cabins	Per two (2) hotel rooms	500	17	8,500
Management Building	2-bedroom dwelling	1,100	1	1,100
Total Daily Design Sewage Flow:				**9,600**

The total daily design sewage flow for the Site is 9,600 L/day. Properties with a total daily design sanitary sewage flow exceeding 10,000 L/day are subject to Section 53 of the Ontario Water Resources Act and require an Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation and Parks (MECP). Given the total daily design sewage flow is less than 10,000 L/day, an ECA will not be required for the sewage works. However, building permit(s) will be required prior to constructing the sewage systems.

4.3 Proposed Sanitary Servicing Strategy

The cabins will be serviced by seven (7) onsite sewage systems. The management building will continue to be serviced by the existing sewage system.

The proposed sewage systems for the cabins will consist of a septic tank, pump tank, and subsurface disposal via leaching bed, to be constructed as a filter bed. Refer to **Figure 1** for the locations and preliminary footprints of the proposed sewage systems.

Sanitary sewage flow will be directed from each cabin to a septic tank, sized for a minimum of 3Q or 3,600 L per OBC. 3,600 L septic tanks are proposed. The tank shall be equipped with an effluent filter on the outlet of the tank in accordance with OBC requirements. The tank should also be equipped with risers and access lids that are accessible at finished grade.

Effluent from each septic tank will flow by gravity to a pump tank, which will then discharge to the filter bed. Each filter bed has been sized to receive effluent from between one (1) and three (3) cabins, as shown on **Figure 1**, and have been sized in accordance with OBC. Given the shallow depth to bedrock, the filter beds have been designed with a T-time of greater than 50 min/cm. Sizing for each filter bed is summarized below in **Table 2**.

Table 2: Filter Bed Design Summary

Onsite Sewage System	Sanitary Flow (L/day)	Filter Bed Construction			
		Contact Area (m^2)		Loading Area (m^2)	
		Minimum (Q/75)	Provided	Minimum (Q/L)[1]	Provided
3 Cabins	1,500	25	24	375	378
2 Cabins	1,000	13	15	250	253
1 Cabins	500	7	12	125	129.5

1. L = 4 L/m^2/day, consistent with a T-time greater than 50 min/cm

Supporting calculations are included in **Appendix A**.

As described in Section 4.2, it is Crozier's professional opinion that the proposed cabins are consistent with a "Hotel/Motel" occupancy per Table 8.2.1.3A of the OBC. Should the guest cabins be considered a "Resort Hotel or Cottage", the total daily design sewage flow for the cabins would be 17,000 L/day [500 L/day/person assuming two (2) people per cabin]. The provided leaching bed footprints can accommodate these higher flows if constructed as Type A dispersal beds. as demonstrated below in **Table 3.**

Table 3: Type A Dispersal Bed Footprint – 17,000 L/day Scenario

Onsite Sewage System	Sanitary Flow (L/day)	Minimum Footprint (m^2)[1]	Provided (m^2)
3 Cabins	3,000	375	378
2 Cabins	2,000	250	253
1 Cabins	1,000	125	129.5

1. QT/400, based on a T-time greater than 50 min/cm

Rather than a septic tank, an advanced treatment system consisting of a Level IV treatment unit meeting the CAN/BNQ 3680-600 standard would be required prior to discharge to the Type A dispersal beds. These treatment units can be accommodated in place of the septic tanks shown on **Figure 1**. Therefore, if required, the proposed private servicing plan can accommodate a total daily design sewage flow of 17,000 L/day. In that case, an ECA application and any required supporting studies would be prepared and submitted to the MECP for review in upcoming stages of the project.

5.0 Water Servicing

5.1 Existing Water Servicing

There are no municipal water services in the vicinity of the Site. There is one (1) well onsite (A354294), which was installed in September 2022. The well is 159 mm (6.25 inches) in diameter and is installed within bedrock to a depth of approximately 59.4 mbgs. According to the well record, the recommended pumping rate of the well is 10 gallons per minute, or 45.5 L/min.

As part of the Hydrogeological Study (Crozier, June 2025), a pumping test was completed on the well. The pumping test included 90 minutes of pumping, followed by 50 minutes of recovery. Analysis from the data suggests that the well is able to sustain a pumping rate of 30 L/min. Refer to the Hydrogeological Study Report for further details.

Water quality samples were also collected by Crozier as part of the pumping test. Results indicate that the concentration of key drinking water parameters (e.g., E. Coli, coliforms, etc.) are in compliance with the Ontario Drinking Water Quality Standards (ODQWS). Refer to the Hydrogeological Study Report for further details.

5.2 Design Water Demand

Water demand for the proposed development was calculated based on a fixture rate count, and a peak daily demand of 33 GPM per the Technical Peer Review provided by Jp2g Consultants Inc. (February 2025). Peaking factors were taken from the MOE Design Guidelines for Drinking Water Systems serving fewer than 500 people (2008). **Table 4** summarizes the anticipated water demand, and **Appendix B** contains the detailed water demand calculations.

Table 4: Estimated Design Water Demand

Average Day Demand (L/s)	Maximum Day Peaking Factor[1]	Maximum Day Demand (L/s)	Peak Hour Peaking Factor[1]	Peak Hour Demand (L/s)
0.15	9.5	1.38	14.3	2.08

1. Based on MECP suggested factor from Table 3-3 MOE Design Guidelines for Drinking Water Systems fewer than 500 people (2008)

A detailed water model of the system will be provided at detailed design to confirm the pump is adequately sized to provide normal operating pressures between 50 and 70 psi.

5.3 Proposed Domestic Water Servicing Strategy

The development is proposed to be serviced by the existing well. Based on the pumping test data, the existing well has sufficient capacity to meet the average day, maximum day and peak hour water demand for the proposed development. In addition, water samples collected as part of the Hydrogeological Study show that water quality meets the ODWQS. Therefore, the existing well is suitable to provide domestic water for the proposed development.

A conceptual watermain route and water service connections are shown on **Figure 1**. The water servicing design and any treatment requirements will be refined during detailed design.

6.0 Drainage Conditions

The drainage conditions for the site in both pre-development and post-development conditions are outlined in the following sections.

6.1 Existing Drainage Conditions

According to the topographic survey (Lejan Land Surveying Inc., November 9, 2023), the site currently consists of mostly forested areas with an existing garage, and associated gravel driveway off Peterson Road. The topography of the site consists of a high point in the middle of the site and is sloped in all directions from this point. Under pre-development conditions, drainage from the site is predominantly sheet flow, and is split into four different drainage catchments. Details of each drainage catchment is provided below.

- Catchment 101 (A = 1.00 ha; RC = 0.31) consists of the southeastern portion of the site. It consists of a portion of the existing driveway, and forested areas, Drainage from this catchment is directed towards the ditch along Peterson Road and outlets through a 700 mm diameter culvert to Cannon Lake.

- Catchment 102 (A = 2.21 ha; RC = 0.25) consists of the southwestern portion of the site. It primarily consists of forested areas, the existing garage, and portions of the existing driveway. Drainage from this catchment is directed towards the ditch along Peterson Road where it is conveyed to the west.

- Catchment 103 (A = 1.84 ha; RC = 0.25) consists of the majority of the northern portions of the site. It consists of forested areas and a portion of Beaver Pond. Drainage from this catchment is conveyed towards Beaver Pond.

- Catchment 104 (A = 0.42 ha; RC = 0.25) consists a portion of the northeastern corner of the site and consists of forested areas. Drainage from this catchment is conveyed towards the neighbouring property to the east.

The existing drainage conditions are outlined in the Pre-Development Drainage Plan (**Figure 3**).

6.2 Proposed Drainage Conditions

Based on the Site Plan prepared by NOAR.CA Inc. (June 2, 2025), the proposed development will consist of 17 cabin units, associated internal roadway, paved access to Peterson Road, and common area including a management building, parking lot, garage, and pool.

The proposed grading of the site will aim to retain the majority of the natural topography and vegetation. Therefore, disturbance will only occur in areas of construction around new buildings, roadways, and parking. Swales, culverts, and erosion control measures will be used to convey stormwater runoff away from the built form and areas accessed by vehicular and pedestrian traffic. Beyond that, we will transition into existing ground and minimize the use of sloping or retaining walls.

Under post-development conditions, the site is proposed to be divided into twelve (12) drainage catchments as shown in the post-development drainage figure (**Figure 4**). The runoff from these catchments is to be collected by a system of swales and culverts located along the internal roadway of the site. The proposed drainage plan will convey runoff to the existing stormwater outlets to mimic pre-development drainage conditions. Details of each drainage catchment is provided below.

- Catchment 201A (A = 0.76 ha; RC = 0.46) is located in the southeastern portion of the site and consists of forested areas, paved driveways and parking areas, and unit 4. Drainage from this catchment is conveyed towards the Peterson Road ditch, before it outlets to Cannon Creek through an existing 700mm diameter culvert.

- Catchment 201B (A = 0.43 ha; RC = 0.30) consists of half of the management building, unit 5, forested areas, and internal driveway. Drainage from this catchment is directed through culvert 1 to Catchment 201A.

- Catchment 201C (A = 0.20 ha; RC = 0.34) consists of unit 6, forested areas, and internal driveway. Drainage from this catchment is directed through culvert 2 to Catchment 201A.

- Catchment 202A (A = 0.59 ha; RC=0.33) is located in the southwestern portion of the site and consists of forested areas, internal driveway, and units 2, and 3. Drainage from this catchment is directed uncontrolled towards the Peterson Road ditch, which drains to the west.

- Catchment 202B (A = 0.52 ha; RC = 0.37) consists of units 1, 15, and 16, internal driveway, and forested areas. Drainage from this catchment is directed through culvert 8 to Catchment 202A.

- Catchment 202C (A = 0.57 ha; RC = 0.31) consists of unit 14, internal driveway, and forested areas. Drainage from this catchment is directed through culvert 7 to Catchment 202B.

- Catchment 202D (A = 0.19 ha; RC = 0.37) consists of unit 13, internal driveway, and forested areas. Drainage from this catchment is directed through culvert 6 to Catchment 202C.

- Catchment 203A (A = 1.48 ha; RC = 0.27) is located in the northwestern portion of the site and consists of unit 12, internal driveway, and forested areas. Drainage from this catchment is directed towards Beaver Pond.

- Catchment 203B (A = 0.10 ha; RC = 0.39) consists of unit 11, internal driveway, and forested areas. Drainage from this catchment is directed through culvert 5 to Catchment 203A.

- Catchment 203C (A = 0.11 ha; RC = 0.42) consists of unit 10, internal driveway, and forested areas. Drainage from this catchment is directed through culvert 4 to Catchment 203A.

- Catchment 203D (A = 0.20 ha; RC = 0.43) consists of unit 8, internal driveway, and forested areas. Drainage from this catchment is directed through culvert 3 to Catchment 203A.

- Catchment 204 (A = 0.31 ha; RC = 0.32) consists of units 7 and 9, internal driveway and forested areas. Drainage from this catchment is directed to the neighbouring property to the east, mimicking pre-development conditions.

Refer to the Preliminary Site Grading Plan (**Figure 2**) that illustrates the proposed site drainage and the Post-Development Drainage Plan (**Figure 4**) for proposed drainage conditions.

7.0 Stormwater Management

Stormwater management and site drainage for the proposed development must adhere to the applicable engineering standards of the Municipality of Hastings Highlands, Hastings County and Ministry of Environment, Conservation, and Parks (MECP).

The stormwater management strategy is summarized in the following sections.

7.1 Stormwater Quantity Control

The Modified Rational Method was used to mode the stormwater management system and demonstrate the proposed outlets for the site have capacity for the proposed development under the 5-year storm event. The hydraulic parameters for the site were determined using the Ontario Ministry of Transportation (MTO) lookup tool for the intensity-duration-frequency (IDF) data for a 5-year storm event. The IDF curve and associated parameters are provided in **Appendix C**. These flows were used to size the culverts located throughout the site and compare the pre- and post-development drainage. The culverts were sized to be at no more than 80% capacity during the 5-year storm event. To prevent clogging within culverts, all culverts were sized to a minimum of 400 mm pipe diameter. The pre- and post-development peak flows from each catchment and capacity of receiving outlets are summarized in **Table 5** below.

Table 5: Outlet Capacity Summary

Outlet	Pre-Development			Post-Development		
	Catchments	Peak Flow (L/s)	Outlet Percent Full (%)	Catchments	Peak Flow (L/s)	Outlet Percent Full (%)
700 mm diameter culvert to Cannon Lake	101	122.15	17%	201A, 201B, 201C	217.46	23%
Peterson Road Ditch	102	223.64	16%	202A, 202B, 202C, 202D	251.04	18%
Beaver Pond	103	182.90	N/A	203A, 203B, 203C, 203D	228.72	N/A
Neighbouring Property to the east	104	41.41	N/A	204	40.00	N/A

Based on the results summarized in Table 5, it is determined that the post-development flows are not increased significantly and that the proposed outlets for the site have capacity to convey the additional flows from the proposed development under the 5-year storm event.

The stormwater management calculations are provided in **Appendix C**. The location of culverts and drainage ditches are shown on the Site Grading Plan (**Figure 2**).

7.2 Stormwater Quality Control

Stormwater quality controls for the proposed development must incorporate measures to provide "enhanced protection" as outlined by the Ministry of Environment Stormwater Management Planning and Design Manual (2003). Enhanced water quality protection involves the removal of at least 80% of the total suspended solids (TSS) from 90% of the annual runoff volume.

Since the majority of the site will remain under natural conditions, it is assumed that the site will produce clean runoff. Therefore, there are no proposed quality controls.

8.0 Erosion and Sediment Controls During Construction

Erosion and Sediment controls will be installed prior to the commencement of any construction activities and will be maintained until the site is stabilized or as directed by the Site Engineer and/or the Municipality of Hastings Highlands. Controls will be inspected after each significant rainfall event and maintained in proper working condition. A summary of proposed controls to be implemented is included below.

Interceptor Swales and Flow Check Dams

Interceptor swales have been specified near the Peterson Road ditch to intercept and convey flow to the sediment trap, ensuring no interference with existing drainage conditions.

Silt Fencing

Sediment Control Silt Fence will be installed on the perimeter of the site to intercept sheet flow. Additional Sediment Control Silt Fence may be added based on field decisions by the Site Engineer and Owner prior to, during, and following construction.

Mud Mat

A mud mat will be installed at the entrance to the construction zone to prevent mud tracking from the site onto the surrounding lands and perimeter roadway network.

Dust Suppression

During construction activities, the Contractor will ensure that measures for dust suppression are provided as required.

9.0 Conclusions & Recommendations

This report was prepared in support of the Zoning By-Law Amendment Application for the property located at 752 Peterson Road in the Municipality of Hastings Highlands. Based on the information provided herein, we conclude that the proposed development can be adequately serviced for sanitary, water, and stormwater management in accordance with the Municipality of Hastings Highlands, and Hastings County. Our conclusions and recommendations include:

1. Access to the Site will be provided through a proposed driveway connection to Peterson Road, replacing the existing access.

2. A Post-Development Drainage Plan (**Figure 3**) has been completed to demonstrate both minor and major flow routes for the site under post-development conditions.

3. The development will be serviced via private onsite sewage systems. The preliminary onsite sewage system design includes seven (7) onsite sewage systems, which will each service between 1 to 3 cabins and consist of a septic tank, pumping tank, and discharge to a leaching bed constructed as a filter bed. The total daily design sewage flow for the development is 9,600 L/day, and therefore building permits will be required to construct the sewage works.

4. The domestic water supply for the development will be provided by the existing well and a looped watermain system.

5. The Site grading will aim to retain the majority of the natural topography and vegetation of the Site. Beyond that, we will transition into existing ground in accordance with Town and County engineering requirements.

6. The stormwater runoff from the proposed development will be collected and conveyed through a series of swales and culverts. The runoff from the site will outlet to existing stormwater outlets, mimicking pre-development conditions.

7. Erosion and sediment controls will be implemented prior to construction and maintain to the satisfaction of the Municipality and Site Engineer until the site is stabilized.

Based on the above conclusions, we recommend the approval of the Zoning By-Law Amendment Application from the perspective of functional servicing and preliminary stormwater management.

Respectfully submitted,

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CM/tc

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APPENDIX A

Sanitary Servicing Calculations

ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

Project Name: 752-8 Peterson Road
Project Number: 2497-6768
Date: 2025-06-27
Designed By: ZS
Checked By: KR

input required

References

Occupancy		Unit Flow	Number of Units	Number of Pa/Unit	Total Flow (L/day)
Cabins		500	1	1	500
Total Daily Design Sanitary Sewage Flow (L/day):					500

Pre-Treatment Options

Required septic tank size = 3600 L minimum

Propose Level IV Treatment (Y/N): N

Native Percolation time, T = 50 min/cm

Imported Sand Percolation time = 10 min/cm

Option #1 - In Ground Absorption Trench

Length of distribution pipe required = 125.0 m 200 m^2

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Option #2 -Raised Absorption Trench

Length of distribution pipe required = 25.0 m

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Maximum loading rate = 6 $L/m^2/day$

Minimum loading area = 83 m^2

Option #3 - Filter Bed

Minimum required contact area = 7 m^2

Required extended contact area = 29 m^2

Maximum loading rate = 6 $L/m^2/day$

Minimum loading area = 83 m^2

Option #3 - Type A Dispersal Bed

Stone area required = 7 m^2

Sand area required = 63 m^2

Option #5 - Shallow Buried Trench

Length of distribution pipe required = 10 m 20 m^2
Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

Project Name: 752-8 Peterson Road
Project Number: 2497-6768
Date: 2025-06-27
Designed By: ZS
Checked By: KR

input required

References

Occupancy		Unit Flow	Number of Units	Number of Pa/Unit	Total Flow (L/day)
Cabins		500	2	1	1000
					0
Total Daily Design Sanitary Sewage Flow (L/day):					1000

Pre-Treatment Options

Required septic tank size = 3600 L minimum

Propose Level IV Treatment (Y/N): N

Native Percolation time, T = 50 min/cm

Imported Sand Percolation time = 10 min/cm

Option #1 - In Ground Absorption Trench

Length of distribution pipe required = 250.0 m 400 m^2

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Option #2 -Raised Absorption Trench

Length of distribution pipe required = 50.0 m

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Maximum loading rate = 6 $L/m^2/day$

Minimum loading area = 167 m^2

Option #3 - Filter Bed

Minimum required contact area = 13 m^2

Required extended contact area = 59 m^2

Maximum loading rate = 6 $L/m^2/day$

Minimum loading area = 167 m^2

Option #3 - Type A Dispersal Bed

Stone area required = 13 m^2

Sand area required = 125 m^2

Option #5 - Shallow Buried Trench

Length of distribution pipe required = 20 m 40 m^2
Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

Project Name: 752-8 Peterson Road
Project Number: 2497-6768
Date: 2025-06-27
Designed By: ZS
Checked By: KR

input required

References

Occupancy		Unit Flow	Number of Units	Number of Pa/Unit	Total Flow (L/day)
Cabins		500	3	1	1500
					0
Total Daily Design Sanitary Sewage Flow (L/day):					**1500**

Pre-Treatment Options

Required septic tank size = 3600 L minimum

Propose Level IV Treatment (Y/N): N

Native Percolation time, T = 50 min/cm

Imported Sand Percolation time = 10 min/cm

Option #1 - In Ground Absorption Trench

Length of distribution pipe required = 375.0 m 600 m^2

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Option #2 -Raised Absorption Trench

Length of distribution pipe required = 75.0 m

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Maximum loading rate = 6 $L/m^2/day$

Minimum loading area = 250 m^2

Option #3 - Filter Bed

Minimum required contact area = 20 m^2

Required extended contact area = 88 m^2

Maximum loading rate = 6 $L/m^2/day$

Minimum loading area = 250 m^2

Option #3 - Type A Dispersal Bed

Stone area required = 20 m^2

Sand area required = 188 m^2

Option #5 - Shallow Buried Trench

Length of distribution pipe required = 30 m 60 m^2
Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

Project Name: 752-8 Peterson Road
Project Number: 2497-6768
Date: 2025-06-27
Designed By: JD
Checked By: KR

input required

House Details: 2 bedroom
78 m2

References

Description		Number of Units	Additional Flow per Unit (L)	Total Flow (L/day)
Base Flow				1100
Additional Flow				
i) Each bedroom over 5		0	500	0
ii) Area over 200m^2				
A) Each 10m^2 over 200m^2 to 400m^2		0	100	0
B) Each 10m^2 over 400m^2 to 600m^2		0	75	0
C) Each 10m^2 over 600m^2		0	50	0
	Total Additional Sewage Flow from Area			0
iii) Fixture Units over 20		0	50	0
			Addition flow (greatest of i,ii,iii)	**0**
	Total Daily Design Sanitary Sewage Flow (L/day):			**1100**

Pre-Treatment Options

Required septic tank size = 3600 L minimum

Propose Level IV Treatment (Y/N): Y

Native Percolation time, T = 50 min/cm

Imported Sand Percolation time = 10 min/cm

Option #1 - In Ground Absorption Trench

Length of distribution pipe required = 183.3 m 293 m^2

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Option #2 -Raised Absorption Trench

Length of distribution pipe required = 36.7 m

Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m

Maximum loading rate = 6 L/m^2/day

Minimum loading area = 183 m^2

Option #3 - Filter Bed

Minimum required contact area = 11 m^2

Required extended contact area = 65 m^2

Maximum loading rate = 6 L/m^2/day

Minimum loading area = 183 m^2

Option #4 - Type A Dispersal Bed

Stone area required = 15 m^2

Sand area required = 138 m^2

Option #5 - Shallow Buried Trench

Length of distribution pipe required = 22 m 44 m^2
Length of runs = m
Number of runs = runs
Length of distribution pipe provided = 0 m 2 cells six runs of 12 m = 12 x 26 = 312

1875

320

APPENDIX B

Water Demand Calculations

Project: 752 Peterson Road
Project No.: 2497-6768

Created By: CM/MF **Date:** 2024-08-19
Checked By: TE/JD **Updated:** 2025-06-27

Domestic Water Demand

Site Population

Site Area	5.3	ha
Equivalent Population	30-150	persons
Average Day Demand	2.31	GPM
	0.15	L/s
Peak Hour Demand	33.0	GPM
	2.1	L/s

Peaking Factors

Max Day =	9.50	
Peak Hour =	14.30	
Average Day =	0.15	L/s
Max Day =	1.38	L/s
Peak Hour =	2.08	L/s

Criteria	Average Daily Water Demand (L/s)	Max Day Demand (L/s)	Peak Hourly Demand (L/s)
Municipality Comments & MECP Design Guidelines	0.15	1.38	2.08

Notes & References

MECP Design Guidelines for Sewage Works

Per First Submission Civil Engineering comments dated February 2025

MECP Design Guidelines for Drinking-Water Systems, Table 3-1: Peaking Factors

Max Day = (Average Day Demand) * (Max Day Factor)
Peak Hour = (Average Day Demand) * (Peak Hour Factor)

APPENDIX C

Stormwater Management Calculations

Active coordinate

45° 13' 15" N, 77° 58' 45" W (45.220833,-77.979167)

Retrieved: Thu, 23 May 2024 18:03:15 GMT

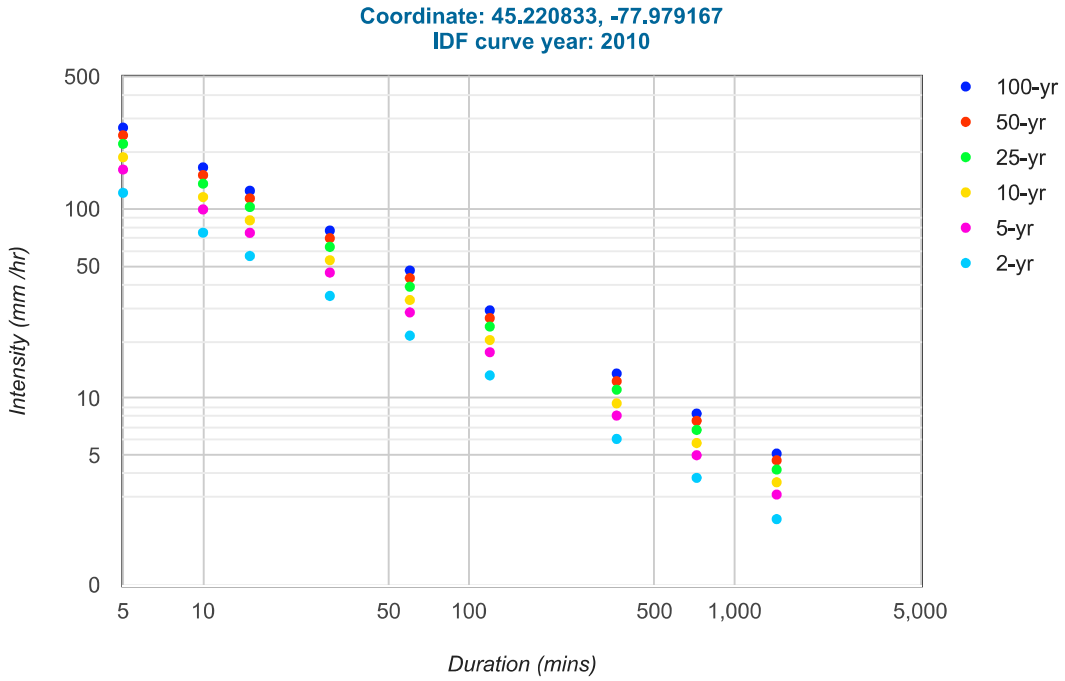
Location summary

These are the locations in the selection.

IDF Curve: 45° 13' 15" N, 77° 58' 45" W (45.220833,-77.979167)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 45° 13' 15" N, 77° 58' 45" W (45.220833,-77.979167)

Retrieved: Thu, 23 May 2024 18:03:15 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	21.4	28.4	33.0	38.8	43.1	47.3
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	121.6	74.9	56.4	34.7	21.4	13.2	6.1	3.8	2.3
5-yr	161.3	99.4	74.8	46.1	28.4	17.5	8.1	5.0	3.1
10-yr	187.4	115.5	87.0	53.6	33.0	20.3	9.4	5.8	3.6
25-yr	220.4	135.8	102.3	63.0	38.8	23.9	11.1	6.8	4.2
50-yr	244.8	150.8	113.6	70.0	43.1	26.5	12.3	7.6	4.7
100-yr	268.7	165.5	124.7	76.8	47.3	29.1	13.5	8.3	5.1

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.1	12.5	14.1	17.4	21.4	26.4	36.7	45.2	55.7
5-yr	13.4	16.6	18.7	23.1	28.4	35.0	48.7	60.0	73.9
10-yr	15.6	19.2	21.7	26.8	33.0	40.7	56.6	69.7	85.9
25-yr	18.4	22.6	25.6	31.5	38.8	47.8	66.5	82.0	101.0
50-yr	20.4	25.1	28.4	35.0	43.1	53.1	73.9	91.1	112.2
100-yr	22.4	27.6	31.2	38.4	47.3	58.3	81.1	99.9	123.1

Terms of Use

Project: 752 Peterson Road
Project No.: 2497-6768
Created By: CM
Checked By: TE
Date: 2024-05-22
Updated: 2025-06-27

Modified Rational Calculations - Input Parameters

Storm Data: **(per MTO IDF Curves)**

Time of Concentration: T_c = 10 min

Return Period	A	B	I (mm/hr)
2 yr	21.4	-0.699	107.01
5 yr	28.4	-0.699	142.01
10 yr	33.0	-0.699	165.01
25 yr	38.8	-0.699	194.01
50 yr	43.1	-0.699	215.51
100 yr	47.3	-0.699	236.52

Note: Rainfall Intensity stastics provided per MTO IDF Curve.

Pre- Development Conditions

Catchment I.D.	Total Area (ha)	Runoff Coefficient C	5-Year Flow (L/s)	100-Year Flow (L/s)	
101	1.00	0.31	122.15	203.43	Outlet to Cross Culvert
102	2.21	0.25	223.64	372.48	Outlet to Peterson Road Culvert (West)
103	1.84	0.25	182.90	304.62	Outlet to Beaver Pond
104	0.42	0.25	41.41	68.98	Outlet to Neighbouring Property (East)
Total	**5.46**	**-**	**570.10**	**949.50**	

Post- Development Conditions

Catchment I.D.	Total Area (ha)	Runoff Coefficient C	5-Year Flow (L/s)	100-Year Flow (L/s)	
201A	0.76	0.46	139.62	232.54	
201B	0.43	0.30	50.75	84.52	
201C	0.20	0.34	27.09	45.12	
Subtotal	**1.39**	**-**	**217.46**	**362.18**	Outlet to Cross Culvert
202A	0.59	0.33	77.18	128.54	
202B	0.52	0.37	75.73	126.12	
202C	0.57	0.31	70.54	117.49	
202D	0.19	0.37	27.60	45.96	
Subtotal	**1.87**	**-**	**251.04**	**418.11**	Outlet to Peterson Road Culvert (West)
203A	1.48	0.27	160.57	267.42	
203B	0.10	0.39	15.56	25.91	
203C	0.11	0.42	18.53	30.86	
203D	0.20	0.43	34.06	56.73	
Subtotal	**1.89**	-	**228.72**	**380.93**	Outlet to Beaver Pond
204	0.31	0.32	40.00	66.62	
Subtotal	**0.31**	**-**	**40.00**	**66.62**	Outlet to Neighbouring Property (East)
Total	**5.46**	**-**	**737.23**	**1227.84**	

Equations:

Peak Flow
$Q_{post} = 0.0028 \cdot C_{post} \cdot i(T_d) \cdot A$

Intensity
$I = A(T)\text{^}B$

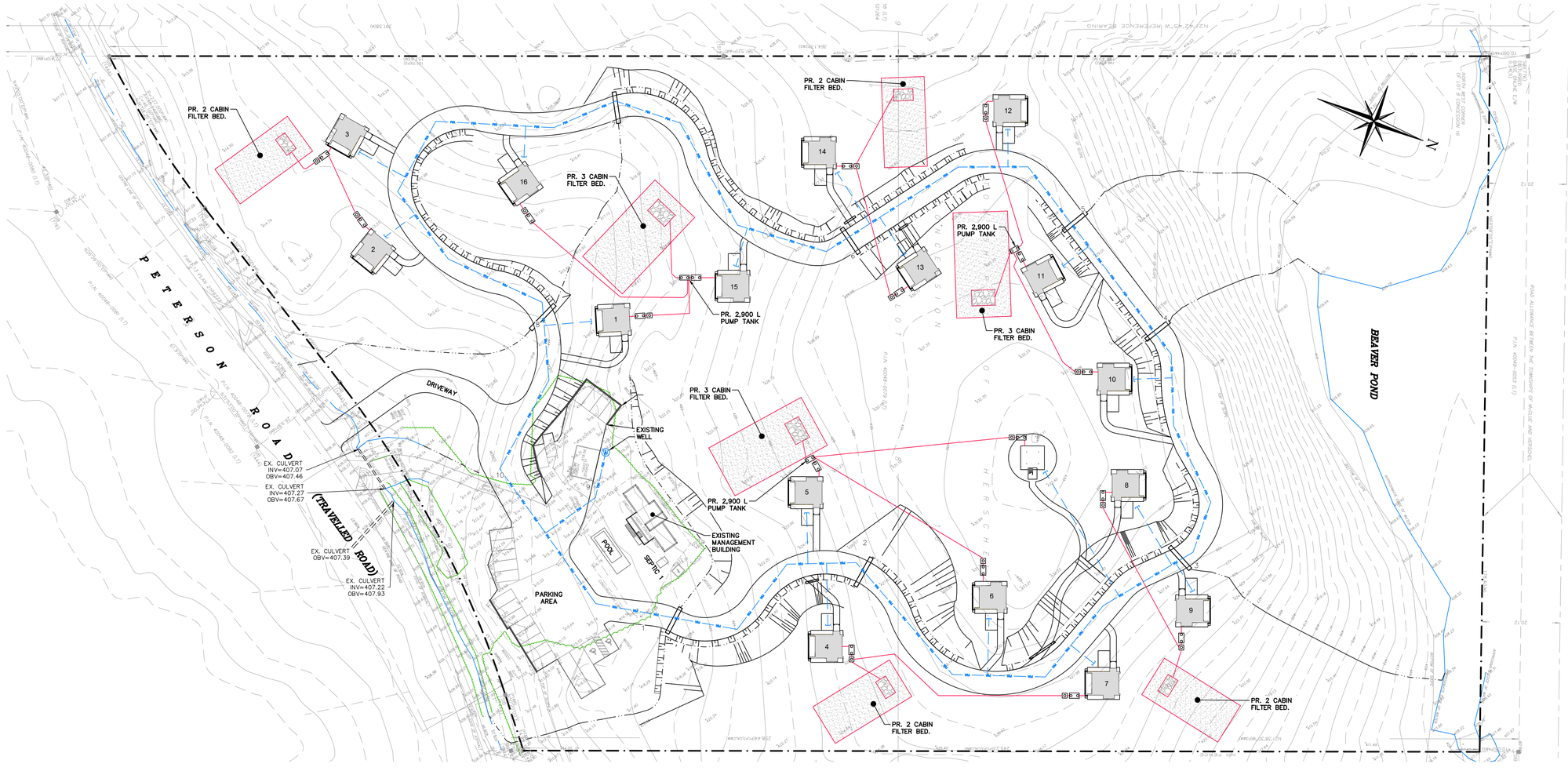
Project: 752 Peterson Road
Project No.: 2497-6768
Created By: CM
Checked By: TE
Date: 2024-05-22
Updated: 2025-06-27

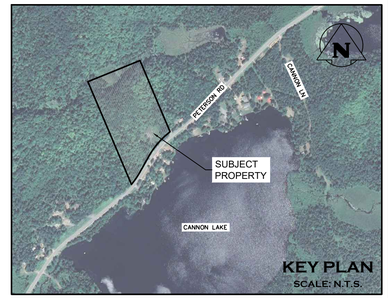
Rational Calculations - Culvert Summary

Culvert I.D.	Contributing Catchments	Total Area (ha)	5-Year Flow (L/s)	Pipe Diameter (mm)	Slope (%)	Percent Full (%)
1	201B	0.43	50.75	400	14%	12.20
2	201C	0.20	27.09	400	1.2%	23.30
3	203D	0.20	34.06	400	1.4%	25.10
4	203C	0.11	18.53	400	1.6%	18.00
5	203B	0.10	15.56	400	1.6%	16.50
6	202D	0.19	27.60	400	1.1%	23.30
7	202C, 202D	0.76	98.14	400	1.1%	46.60
8	202B, 202C, 202D	1.28	173.87	400	1.7%	58.20

*Assume Minimum Pipe size of 400 mm

FIGURES





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING CONTOUR (2.0m)
- x215.00 EXISTING GRADE
- PROPOSED SLOPE (2:1 MAX.)
- 2 PROPOSED CULVERT WITH ID
- PROPOSED DITCH
- PROPOSED 3,600L SEPTIC TANK
- PROPOSED 1,200L PUMP TANK
- PROPOSED FILTER BED
- PROPOSED SANITARY GRAVITY SEWER
- PROPOSED SANITARY FORCEMAIN
- PROPOSED CONCEPTUAL WATERMAIN LAYOUT
- PROPOSED CONCEPTUAL WATERMAIN SERVICE LAYOUT
- W EXISTING DRILLED WELL

Watermain Note
Provide minimum 1.2m frost cover or insulation and/or heat cable as required.

ON–SITE SEWAGE SYSTEM DESIGN NOTES
1 CABIN FILTER BED

PR. CABIN	CABIN PEAK FLOW	Q= 500 L/DAY
SOIL PERCOLATION RATE	T > 50 min/cm	
RAISED FILTER BED STONE AREA	MINIMUM SIZE =Q/75=500/75= 6.66m² PROVIDED STONE AREA = 12m² (3mx4m)	
RAISED FILTER BED TOTAL CONTACT AREA	MINIMUM CONTACT AREA =QxT/850 =500x50/850=29.41m² PROVIDED SAND AREA = 129.5m² (7.0m X 18.5m)	
RAISED FILTER BED SAND AREA	MINIMUM SIZE = Q/4= 500/4 = 125.0m² PROVIDED SAND AREA = 129.5m² (7.0m X 18.5m)	

ON–SITE SEWAGE SYSTEM DESIGN NOTES
2 CABIN FILTER BED

PR. CABIN	CABIN PEAK FLOW	Q= 500 L/DAY
	TOTAL 2 CABIN PEAK FLOW	Q= 1,000 L/DAY
SOIL PERCOLATION RATE	T > 50 min/cm	
RAISED FILTER BED STONE AREA	MINIMUM SIZE =Q/75=1,000/75= 13.3m² PROVIDED STONE AREA = 15m² (3mx5m)	
RAISED FILTER BED TOTAL CONTACT AREA	MINIMUM CONTACT AREA =QxT/850 =1,000x50/850=58.82m² PROVIDED SAND AREA = 253.0m² (11.0m X 23.0m)	
RAISED FILTER BED SAND AREA	MINIMUM SIZE = Q/4= 1,000/4 = 250.0m² PROVIDED SAND AREA = 253.0m² (11.0m X 23.0m)	

ON–SITE SEWAGE SYSTEM DESIGN NOTES
3 CABIN FILTER BED

PR. CABIN	CABIN PEAK FLOW	Q= 500 L/DAY
	TOTAL 3 CABIN PEAK FLOW	Q= 1,500 L/DAY
SOIL PERCOLATION RATE	T > 50 min/cm	
RAISED FILTER BED STONE AREA	MINIMUM SIZE =Q/75=1,500/75= 20m² PROVIDED STONE AREA = 24m² (6mx4m)	
RAISED FILTER BED TOTAL CONTACT AREA	MINIMUM CONTACT AREA =QxT/850 =1,500x50/850=88.24m² PROVIDED SAND AREA = 378m² (14.0m X 27.0m)	
RAISED FILTER BED SAND AREA	MINIMUM SIZE = Q/4= 1,500/4 = 375.0m² PROVIDED SAND AREA = 378m² (14.0m X 27.0m)	

20 0m 20 40
SCALE: 1:600

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED FOR SECOND SUBMISSION	2025/JUN/27
0	ISSUED FOR COORDINATION	2024/MAY/28

ELEVATION NOTE:

ELEVATIONS ARE GEODETIC AND ARE REFERED TO A COSINE

BENCHMARK No. 00819728193 HAVING AN ELEVATION OF 433.147 METRES

SURVEY NOTES:

SURVEY COMPLETED BY LEJAN LAND SURVEYING INC. (2023/NOV/09)
PROJECT No.: 23-143

BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE WESTERLY LIMIT OF LOT 8 CONCESSION 16 A BEARING OF N21°42'45"W AS SHOWN ON PLAN 20R21264 & 20R9373

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

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY NOAR.CA INC.
DRAWING No. A0.3, (JUNE 02, 2025)
DATE RECEIVED 2025/JUN/02

DRAWING NOTES:

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

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ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

752 PETERSON ROAD
MUNICIPALITY OF HASTINGS HIGHLANDS

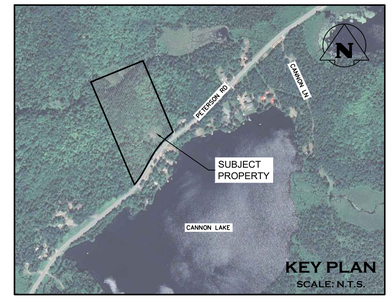
Drawing

PRELIMINARY PRIVATE SERVICING PLAN

Engineer | Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
R.L.	R.L./T.E.		2497–6768
Check	Check	Scale	Dwg.
T.E.	T.E.	1:600	FIG1



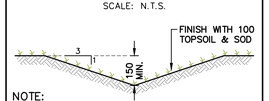
KEY PLAN
SCALE: N.T.S.

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING CONTOUR (2.0m)
- ×215.00 EXISTING GRADE
- ×215.00 PROPOSED GRADE
- ×215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- PROPOSED SLOPE (2:1 MAX.)
- 2.0% PROPOSED SWALE FLOW DIRECTION
- 2 PROPOSED CULVERT WITH ID
- PROPOSED DITCH

TYPICAL GRASSED SWALE DETAIL

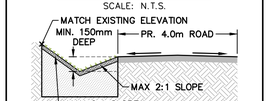
SCALE: N.T.S.



NOTE:
ALL DIMENSIONS ARE IN MILLIMETERS.

TYPICAL DITCH DETAIL

SCALE: N.T.S.



Grading Notes

- Slopes greater than 8% to be armored using local stone;
- Drainage outlets to natural areas to be monitored for signs of erosion and restored as necessary

20 0m 20 40
SCALE: 1:600

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED FOR SECOND SUBMISSION	2025/JUN/27
0	ISSUED FOR COORDINATION	2024/MAY/28

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BENCHMARK No. 00819728193 HAVING AN ELEVATION OF 433.147 METRES

SURVEY NOTES:

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PROJECT No.: 23-143

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Project

752 PETERSON ROAD
MUNICIPALITY OF HASTINGS HIGHLANDS

Drawing

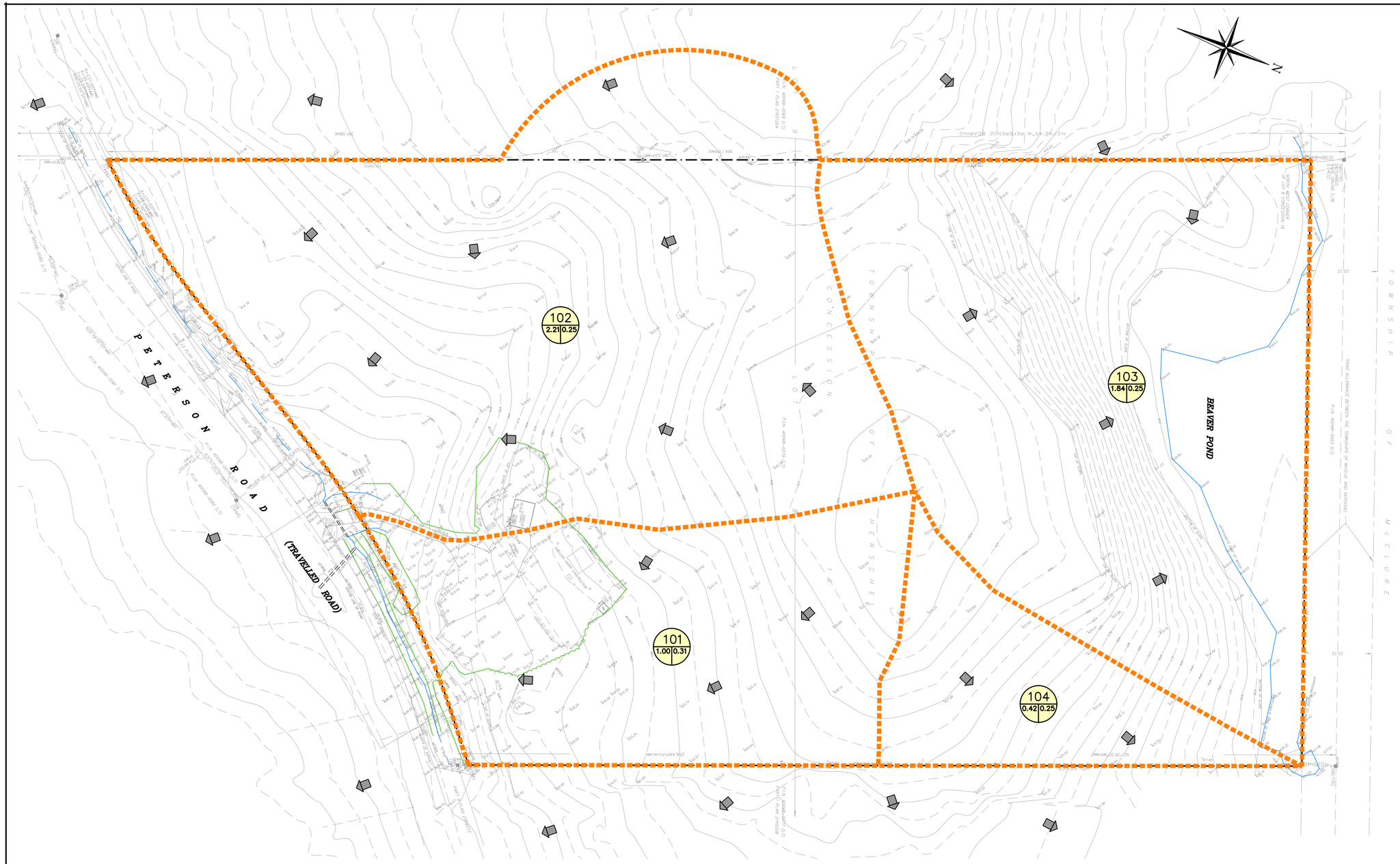
SITE GRADING PLAN

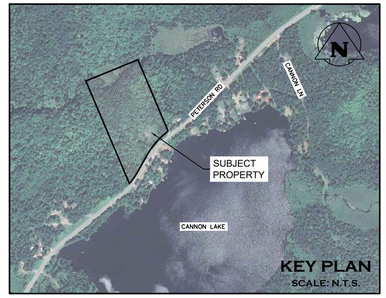
Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	R.L.	Design	R.L. /T.E.	Project No.	2497-6768
Check	T.E.	Check	T.E.	Scale	1:600
				Dwg.	FIG2





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING CONTOUR (2.0m)
- 215.00 EXISTING GRADE
- EXISTING OVERLAND FLOW DIRECTION
- STORM DRAINAGE CATCHMENT
- ID / A | RC — CATCHMENT I.D. / AREA (ha) | RUNOFF COEFFICIENT

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED FOR SECOND SUBMISSION	2025/JUN/27
0	ISSUED FOR COORDINATION	2024/MAY/28

ELEVATION NOTE:

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BENCHMARK No. 00819728193 HAVING AN ELEVATION OF 433.147 METRES

SURVEY NOTES:

SURVEY COMPLETED BY LEJAN LAND SURVEYING INC. (2023/NOV/09)
PROJECT No.: 23-143

BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE WESTERLY LIMIT OF LOT 8 CONCESSION 16 A BEARING OF N21°42'45"W AS SHOWN ON PLAN 2OR21264 & 2OR9373

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

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY NOAR.CA INC.
DRAWING No. A0.3, (JUNE 02, 2025)
DATE RECEIVED 2025/JUN/02

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Project

752 PETERSON ROAD
MUNICIPALITY OF HASTINGS HIGHLANDS

Drawing

PRE-DEVELOPMENT DRAINAGE PLAN

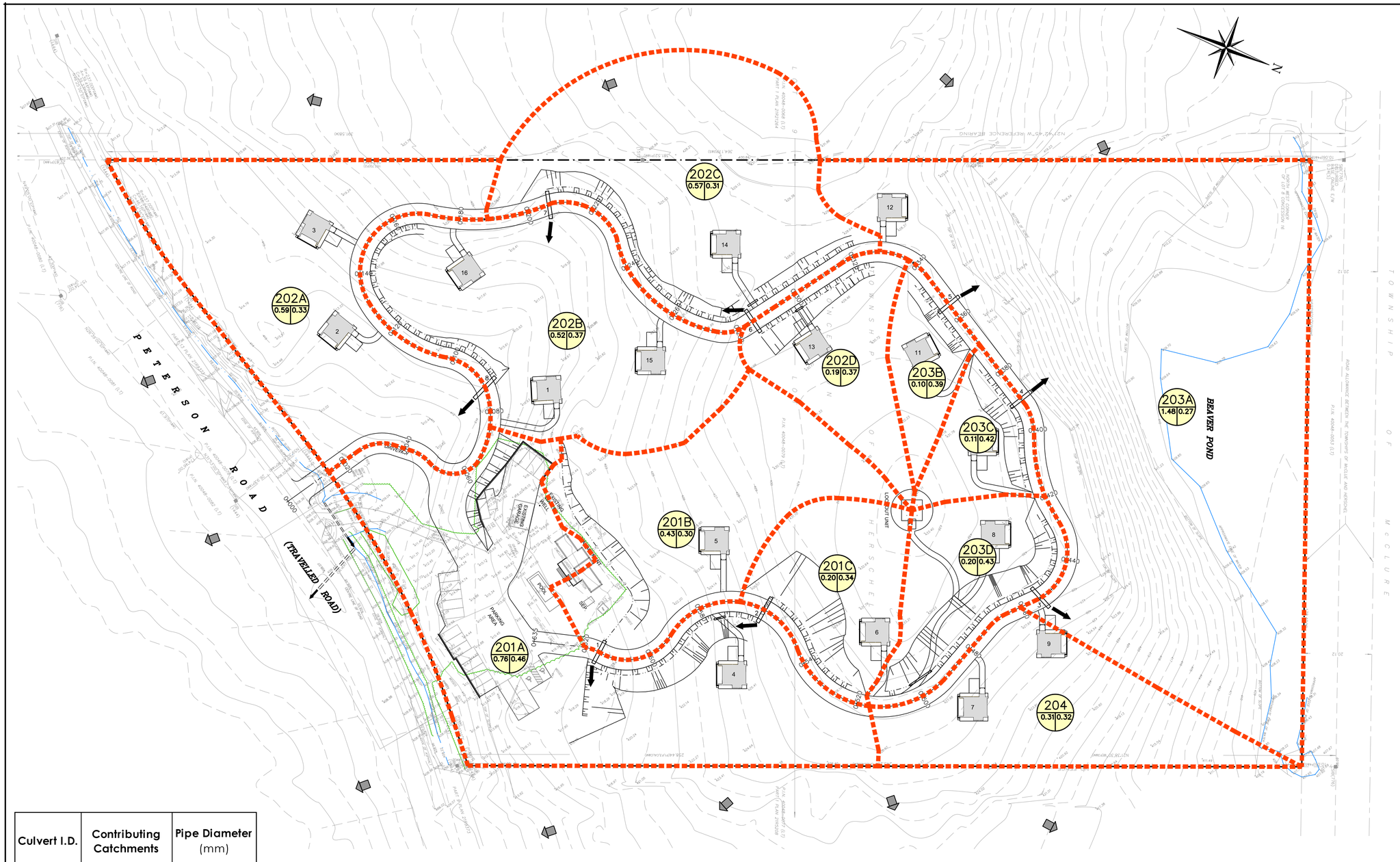
Engineer

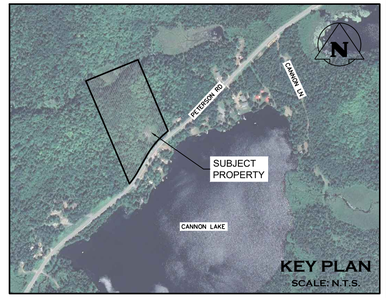
Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.
R.L.	R.L./T.E.	2497-6768
Check	**Check**	**Scale** / **Dwg.**
T.E.	T.E.	1:600 / FIG3

20 0m 20 40
SCALE: 1:600





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING CONTOUR (2.0m)
- 215.00 EXISTING GRADE
- PROPOSED SLOPE (2:1 MAX.)
- EXISTING OVERLAND FLOW DIRECTION
- 2 PROPOSED CULVERT WITH ID
- PROPOSED DITCH
- STORM DRAINAGE CATCHMENT
- ID / A|RC CATCHMENT I.D. / AREA (ha) | RUNOFF COEFFICIENT
- FLOW DIRECTION

Culvert I.D.	Contributing Catchments	Pipe Diameter (mm)
1	201B	400
2	201C	400
3	203D	400
4	203C	400
5	203B	400
6	202D	400
7	202C, 202D	400
8	202B, 202C, 202D	400

20 0m 20 40
SCALE: 1:600

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED FOR SECOND SUBMISSION	2025/JUN/27
0	ISSUED FOR COORDINATION	2024/MAY/28

ELEVATION NOTE:

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BENCHMARK No. 00819728193 HAVING AN ELEVATION OF 433.147 METRES

SURVEY NOTES:

SURVEY COMPLETED BY LEJAN LAND SURVEYING INC. (2023/NOV/09)
PROJECT No.: 23-143

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SITE PLAN NOTES:

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DATE RECEIVED 2025/JUN/02

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Project

752 PETERSON ROAD
MUNICIPALITY OF HASTINGS HIGHLANDS

Drawing

POST-DEVELOPMENT DRAINAGE PLAN

Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
R.L.	R.L. /T.E.		2497-6768
Check	Check	Scale	Dwg.
T.E.	T.E.	1:600	FIG4