FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

138 KANDAHAR LANE

TOWN OF THE BLUE MOUNTAINS
COUNTY OF GREY

PREPARED FOR:

TYROLEAN VILLAGE RESORTS LIMITED

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC.
40 HURON STREET, SUITE 301
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OCTOBER 2021

CFCA FILE NO. 109 - 5854

CROZIER
CONSULTING ENGINEERS

Revision Number	Date	Comments
Rev.0	April 2021	Issued for Draft Plan Approval
Rev.1	October 2021	Reissued for Draft Plan Approval

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1.0 Introduction

C.F. Crozier and Associates (Crozier) has been retained by Tyrolean Village Resorts to prepare a Functional Servicing and Stormwater Management Report to support the Draft Plan Application for the Proposed Development located at 138 Kandahar Lane in the Town of The Blue Mountains, Grey County. The Site is legally described as Collingwood CON 2 PT LOT 19: RP 16R2119 PT PART 2, Town of The Blue Mountains, County of Grey. Refer to the Site Location on Figure 1 for the location of the proposed development.

2.0 Site Description

138 Kandahar Lane property covers approximately 3.2 hectares and is bound by Tyrolean Lane to the North, Recreational open space to the West, Kandahar Lane to the East, and Arlberg Crescent to the South. The Site currently consists of a driveway which fronts onto Tyrolean Lane. The rest of the land consists of an open grass field on the east side of the lot and sparse forested areas covering the remainder of the Site.

The Proposed Development consists a 0.91ha portion of the 138 Kandahar Lane property and contains 12 Lodges fronting along Tyrolean Lane. Refer to the Conceptual Site Plan prepared by Pascuzzo Planning Inc, August 2021 on Figure 2.

External documents/plans were reviewed over the course of completing this engineering report. As such, the servicing and design considerations contained herein are assisted by the following:

- Site Survey by JoeTOPO Surveys and CADD Inc. – October 2020, and;
- Geotechnical Report by Soil Engineers Ltd. – February 2021.

3.0 Water Servicing

Potable water for the Site will be supplied by the Town of The Blue Mountains water distribution system.

3.1 Existing Water Servicing

The existing water distribution infrastructure at or near the Subject Site includes the following:

- An existing 200 mm diameter watermain adjacent to the development lands on Tyrolean Lane and Kandahar Lane.
- An existing 150 mm diameter watermain on Arlberg Crest.

3.2 Upcoming Township Upgrades

The Town is currently preparing to replace the existing municipal watermain along Tyrolean Lane as part of the scope in a larger municipal infrastructure project .

3.3 Design Water Demand

To estimate the proposed water demands for future development of the Site, the Town of The Blue Mountains Engineering Standards (2009) were consulted to determine the average, maximum day and peak hour water demands.

Water demands for the short-term rental complex were determined using the following design figures:

- Average Hotel Flow Rate 225 L/bed/day
- Beds Per Unit 8 Beds/Unit
- Total Number of Beds 96 Beds
- Max Day/Peak Hour Factors 2.0/4.5

It is estimated that the maximum water demands for the proposed development are as follows:

- Average Day 0.25 L/sec
- Max Day 0.50 L/sec
- Peak Hour 1.13 L/sec

Fire flows required to service the site were calculated to be 100.00 L/s per the Fire Underwriter's Survey and 45 L/s per the Ontario Building Code. The preliminary design flow (peak hour + fire flow) for the Subject Site is 101.13L/s. Refer to Appendix A for potable water servicing demand and fire flow demand calculations.

3.4 Proposed Water Servicing

The Proposed Development is proposed to have individual water service for each unit that will connect to the new watermain along Tyrolean Lane. It is anticipated that as part of the construction of the replacement watermain along Tyrolean Lane individual water service to service the Proposed Development will be extended to property line.

Fire protection for the residential units will be provided by the existing fire hydrant at the corner of Kandahar and Tyrolean Lane.

The Proposed Development will need to be added to the Town water model to confirm available flow rates and pressures to service the development.

Refer to Figure 3 for the General Servicing plan.

4.0 Sanitary Servicing

Sanitary servicing for the development will be achieved via connection to the Town of The Blue Mountains sanitary sewer system.

4.1 Existing Sanitary Servicing

Currently there is no sanitary sewer located within the Tyrolean Lane. As part of the aforementioned municipal infrastucutre project gravity sanitary sewer gravity sanitary sewer will be extended along Tyrolean Lane.

4.2 Design Sanitary Flow

Preliminary sanitary flows for the Site were estimated using the following criteria as specified in the Town of The Blue Mountains Engineering Standards:

- Average Residential Flow Rate 225 L/bed/day
- Infiltration 0.23 L/s/ha

- Beds Per Unit 8 Beds/unit
- Total Number of Beds 96 Beds

Based on these values it is estimated that peak sanitary flow from the site will be 1.28 L/s. Since the Site was designated to be developed by the Town in the Official Plan (2016) and the relatively low flows from the proposed development, and with 2,522 sanitary units available at the Craiglieth Sanitary treatment plant per the 2019 Year End Water & Wastewater Capacity Assessment there will be sufficient capacity in the existing municipal sanitary system. Refer to Appendix B for sanitary design calculations.

4.3 Proposed Sanitary Servicing

The subject Development will be serviced with individual gravity sanitary services that will connect to the future Tyrolean Lane sanitary sewer. It is anticipated that gravity sanitary services will be extended to property line as part of the Tyrolean Lane sanitary sewer construction. Conveyance capacity of the future sanitary sewer will need to be confirmed as part of the sanitary sewer design process.

Refer to Figure 3 for the proposed General Servcicing Plan.

5.0 Stormwater Management

5.1 Existing Drainage Conditions

5.1.1 Internal

The Subject Lands are presently vacant, consisting of open field and sparse tree cover. The property is relatively flat, with a southwest to northeast gradient of approximately 3% and approximately 8.25 m of relief. Runoff from the Subject Lands sheet flows towards roadside ditches along Kandahar Lane and Tyrolean Lane. The Kandahar Lane and Tyrolean Lane ditches are graded to convey overland flows to the Southwest corner of the intersection of Kandahar Lane and Tyrolean Lane. From here stormwater is conveyed across the intersection through a culvert discharging to Watercourse 6 and ultimately Georgian Bay.

On-site soils are classified as Kemble (KSC Type II) Silty Clay with imperfect drainage characteristics (Grey County Soil Mapping, 1981).

A Geotechnical Investigation Report, dated February 2021 by Soil Engineers Ltd., has been submitted under separate cover. The Site will require topsoil to be stripped to a depth of approximately 0.15 to 0.30 m. Below the topsoil Layer there is an additional 0.6 to 1.0 m thick Earth Fill layer, unsuitable for structural use, was identified in the geotechnical report and is required to be removed where structural soil is required. Soil Engineers also did not encounter groundwater in any of the 10 boreholes completed.

5.1.2 External Drainage

A topographic survey completed October 2020 by JoeTOPO Surveys and CADD Inc. shows all of the 138 Kandahar Lane property drain northeast to the Tyrolean Lane and Kandahar Lane intersection culvert.

5.2 Proposed Drainage Conditions

The stormwater management features for this site are being designed to comply with the policies and standards of the various agencies including the Town of The Blue Mountains, Ministry of the Environment and Forestry, and the Grey Sauble Conservation Authority.

The stormwater management strategy for the proposed development are listed below:

- Water Quantity Control
  - Capture and control of the post development flows to pre-development flows for all storm events from the 2 year to 100 year events.

- Water Quality Control
  - Provide MOECP enhanced Level of treatment (80% TSS removed) of runoff prior to being released to the Tyrolean Lane Ditch.

5.2.1 Internal

The Proposed Development will consist of 12 Lodges fronting onto Tyrolean lane and include separate driveways, rear yard parking areas and landscaped amenity spaces. Six independent stormwater management systems that will be shared between two adjacent units will provide the quality and quantity requirements for the development.

Refer to Figure 4 for the proposed grading and Drainage Plan.

The stormwater analysis has been completed for a single stormwater management system that services a pair of lots, as the stotmwater management system is identical for all six unit pairs.

Each two unit catchment is divided into to drainage areas. Drainage area one consists of lawn and a small portion of the two unit driveways as shown in Figure 4. Drainage area 1B has been graded to discharge uncontrolled directly to the Tyrolean Lane Ditch. Drainage area 1A will comprise the remainder of the two lots including the buildings, driveways, parking areas, rear amenity spaces and part of the front lawns as shown in Figure 5. Stormwater in Drainage Area 1A will directed towards the shared rear yard Low Impact Development (LID) Feature or the two catchbasins in the front yards. The LID feature is anticipated to be a sand filter or biofilter the details of which will be confirmed at the detailed design stage.

All stormwater captured in drainage area 1A will ultimately be captured and conveyed via a storm sewer along the property line between the two units to a catchbasin with and orfice plate. The orifice plate will control the rate of discharge and cause stormwaters to back up in the storm pipes and into the shared onsite storage areas. Water released from the orifice plate, will then be discharged to the Tyrolean Lane ditch. In events larger than the 100 year an emergency overland flow route between the two units will convey stormwater north directly to the Tyrolean Lane ditch. Refer to Figure 6 Typical Lot Side Yard Section for cross section illustrating side yard drainage.

5.2.2 External Drainage

A swale at the back of the units running west to east will intercept external drainage and direct it to the Kandahar Lane ditch south of proposed Unit 12 and ultimately to the culvert crossing at the Tyrolean Lane and Kandahar Lane intersection. All other external drainage will remain unchanged.

5.3 Stormwater Quantity Analysis

Given the relatively small drainage area for the stormwater management systems, the analysis of onsite quantity control requirements was performed using the Modified Rational Method, per industry standard. A composite runoff coefficient for the existing and proposed site condition was calculated using values from the Town of The Blue Mountains Engineering Standards (2009). Table 1 illustrates the determination of pre and post development runoff coefficients.

Table 1: Pre and Post Development Conditions Composite Runoff Coefficient

	Pre Development			Post Development		
Drainage Area	**Area (m^2)**	**Runoff Coefficient***	**A x C**	**Area (ha)**	**Runoff Coefficient***	**A x C**
Roof	0.0	0.9	0.00	0.028	0.9	0.025
Asphalt	0.0	0.9	0.00	0.048	0.9	0.043
Lawn	0.151	0.3	0.045	0.075	0.3	0.023
Total RC	0.30			0.60		

*Per TOTBM Design Standards

The calculated composite runoff coefficients were utilized in the Modified Rational Method. Rainfall events were modeled using Owen Sound IDF data, and a ten minute time of concentration. The results of the analysis are shown in Table 2. Detailed calculations for the Modified Rational Method have been included in Appendix C of this report.

Table 2: Modified Rational Method Storage Volume Results

	Pre-Development	Post-Development			
Storm	**Uncontrolled Peak Flow (m^3/s)**	**Uncontrolled From 1B Peak Flow (m^3/s)**	**Controlled From 1A Peak Flow (m^3/s)**	**Total Post Development Flow (m^3/s)**	**Storage Volume Requirements (m^3)**
5 Year	0.014	0.012	0.001	0.014	8.2
100 Year	0.023	0.020	0.002	0.023	14.0

As demonstrated by Table 2, 14.0m^3 of storage is required 1A to control the post-development flow rates to the pre-development flow rates. Flows will be controlled by way of a orifice installed at the outlet cathchbasin . Stormwater storage will be provided by surface ponding within the LID Feature and the amenity space at the rear of the lots.

5.4 Stormwater Quality Controls

As Georgian Bay is the ultimate receiver of runoff from the Subject Development an "Enhanced Level" of treatment is required for stormwater quality control. Quality control will be provided by the LID feature located at the rear of the lot. As previously stated, it is anticipated that the LID feature will be a sand filter or bio-filter. In the event a LID feature determined to not be practical at the detailed design stage a pre-fabricated treatment unit (e.g. oil grit separator) can be specified to provide the required quality control.

6.0 Utilities

The proposed development will be serviced with natural gas, telephone, cable TV and hydro. All such utilities are currently available on the boundary roadways. Circulation and coordination with the utilities will be undertaken to confirm capacity at the detailed design stage.

7.0 Conclusions and Recommendations

Based on the information offered in this report, we offer the following conclusions:

1. Individual connections to the reconstructed public watermain along Tyrolean Lane.
2. Fire flows have been determined based on the short method calculations for grouping of Single Detached dwellings as per the Fire Underwriter Survey (FUS) and Ontario Building Code (OBC).
3. Gravity sanitary sewer connections will be provided to each unit connecting to the future sanitary sewer along Tyrolean Lane.
4. Stormwater quantity and quality will be provided by shared LID features located at the rear of the Lot.

Based on the above conclusions, we recommend the approval of the Planning Applications the 138 Kandahar Lane Subdivision, from the perspective of functional servicing and stormwater management. Thank you.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Brendan Hummelen, P. Eng.
Project Engineer

C.F. CROZIER & ASSOCIATES INC.

Justin L'Abbe, E.I.T.
Engineering Intern

BH/jl'a

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APPENDIX A

Potable Water Demand and Fire Flow Demand Calculations

CROZIER
CONSULTING ENGINEERS

Project: Tyrolean Lane Lodges
File: 109-5854
Date: 16-Mar-21
By: JL'A

Tyrolean Lane Lodges

Number of Residential Units	Single Detached	12 units
	Semi Detached	0 units
	Townhomes	0 units
	N'Hood Park	0 units
	TOTAL:	**12 units**
Number of Beds Per Unit		8.00 Beds/unit
Total Development # of Beds		96 Beds

Water Demand Rate

Average Daily Demand Rate (2009 TOTBM Engineering Standards)		225 L/Bed/day

Total Water Demand Flows

Average Daily Demand		0.25 L/sec
	TOTAL:	0.25 L/sec
Minimum Day Factor (MOECC Design Guideslines for Drinking Water Systems)		0.40
Minimum Day Demand Flow		0.10 L/sec
Max Day Peak Factor (per MOECC Design Guidelines for Drinking Water Systems)		2.00
Max Day Demand Flow		0.50 L/sec
Peak Hour Factor (per MOECC Design Guidelines for Drinking Water Systems)		4.50
Peak Hour Flow		1.13 L/sec

Tyrolean Lane Lodges
Fire Protection Volume Calculation - Single Units
CFCA File: 109-5854

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \sqrt{A}$$

where

F = the required fire flow in litres per minute

C = coefficient related to the type of construction
- = 1.5 for wood frame construction (structure essentially all combustible)
- = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
- = 0.8 for non-combustible construction (unprotected metal structural components)
- = 0.6 for fire-resistive construction (fully protected frame, floors, roof)

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.

Proposed Buildings	Fire resistive construction
400 sq.m. total floor area	1.0 C

Therefore F= 4,000 L/min (rounded to nearest 1000 L/min)

Fire flow determined above shall not exceed:
- 30,000 L/min for wood frame construction
- 30,000 L/min for ordinary construction
- 25,000 L/min for non-combustible construction
- 25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Non-Combustible	-25%	Free Burning	15%
Limited Combustible	-15%	Rapid Buring	25%
Combustible	No Charge		

Low fire Hazard occupancy for dwellings	0% reduction

0 L/min reduction

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above maybe reduce by up to 50% for complete automatic sprinkler protection.

Buildings will have automatic sprinklers (typical 30% reduction)

0 L/min reduction

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 metres by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) esposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	30.1 to 45 m	5%
10.1 to 20 m	15%		

Exposed buildings

Name		**Distance**		
North	Adjacent Dwelling	20	0%	0
East	Adjacent Dwelling	2.4	25%	1000
South	Adjacent Dwelling	100	5%	200
West	Adjacent Dwelling	6.5	20%	800
				2,000 L/min Surcharge

Determine Required Fire Flow

No.1	4,000	
No. 2	0 reduction	
No. 3	0 reduction	
No. 4	2,000 surcharge	
Required Flow:	**6,000 L/min**	
Rounded to nearest 1000l/min:	**6,000 L/min** or	100.0 L/s
		1,585 USGPM

Determine Required Fire Storage Volume

Flow from above 6,000 L/min

Required duration 2.00 hours

Therefore: 720,000 Litres or
720 cu.m. is the required fire storage volume.

Required Duration of Fire Flow	
Flow Required L/min	Duration (hours)
2,000 or less	1.0
3,000	1.25
4,000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	3.0
16,000	3.5
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32,000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

Fire Protection Water Supply Guideline
Part 3 of the Ontario Building Code (2006)

$$Q = KVS_{TOT}$$

Q = minimum supply of water in litres (L)
K = water supply coefficient
V = total building volume in cubic metres
S_{TOT} = total of spatial coefficient values from property line exposures on all sides

K =	23.0	Group C building with combustible construction (Table 1)
V =	2200	Total building volume in cubic metres
S_{TOT} =	2	S_{TOT} Need Not Exceed 2.0

Q = 101200 L

Based on ranges listed in Table 2, the required minimum water supply flow rate is **2700 L/min**

45 L/s

APPENDIX B

Sanitary Servicing Demand Calculations

CROZIER
CONSULTING ENGINEERS

File: 109-5854
Date: March 15, 2021
By: JL'A
Check By: BH

Tyrolean Lane Lodges - Sanitary Design Criteria

Developed Site Area (Roads + Residences)		0.93	ha
Number of Residential Units		12	units
Beds Per Unit		8	beds
Number of Beds		96	Beds
Unit Sewage flows			
Residential		225	L/B-day
Infiltration (typical)		0.23	L/s/ha
Total Design Sewage Flows			
Infiltration/Inflow Residential		0.21	L/sec
Average Daily Residential Flow		0.25	L/sec
Residential Peak Factor	(Harmon Formula)	4.2	
Total Peak Daily Flow		**1.28**	**L/sec**

APPENDIX C

Modified Rational Method

CROZIER CONSULTING ENGINEERS

PROJECT: 138 Kandahar Lane
PROJECT No.: 109-5854
DATE: 2021-04-01
DESIGN: JL'A
CHECK: BH

Rational Method (Runoff Coefficent Calculation)

Controlled area			
Description	Area m^2	Run-off Coefficient	A*C
Lawn	624.3	0.3	187.29
Structure	282.64	0.9	254.38
Driveway/Parking Lot	467.54	0.9	420.79
			0.63

Uncontrolled area			
Description	Area m^2	Run-off Coefficient	A*C
Lawn	128.87	0.3	38.66
Structure	0	0.9	0
Driveway/Parking Lot	9.48	0.9	8.53
			0.34

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PROJECT: Tyrolean Lane Lodges
PROJECT No.: 109-5854
DATE: 2021-03-31
DESIGN: JL'A
CHECK: BH

Rational Method(5 Yr Pre-Development)

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet$

Intensity

$i_{(Td)} = A\ (T_d)^{B}$

Pre-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Dundalk	Intensity (mm/hr):	106.48
Return Period	5		
Time of Concentration (min)	10		
Coeff A	29.1		
Coeffic B	-0.724		
Runoff Coeff (Unadjusted)	0.3000	Flow (m^3/s)	0.0135
Runoff Coefficient (Adjustec	0.3000		
Area (ha)	0.1510		

CROZIER CONSULTING ENGINEERS

PROJECT: Tyrolean Lane Lodges
PROJECT No.: 109-5854
DATE: 2021-03-31
DESIGN: JL'A
CHECK: BH

Rational Method (100 Yr Pre-Development)

Peak Flow

$$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$$

Intensity

$$i_{(Td)} = A\,(T_d)^{B}$$

Pre-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Blue Mountains	Intensity (mm/hr):	178.98
Return Period	100 yr		
Time of Concentration (min)	10		
Coeff A	47.7		
Coeffic B	-0.738		
Runoff Coeff (Unadjusted)	0.300	Flow (m^3/s)	0.0227
Runoff Coefficient (Adjusted)	0.300		
Area (ha)	0.151		

CROZIER CONSULTING ENGINEERS

PROJECT: Tyrolean Lane Lodges
PROJECT No.: 109-5854
DATE: 2021-03-31
DESIGN: JL'A
CHECK: BH

Modified Rational Method Storage Sizing (5 Yr Post-Development Controled Area)

Peak Flow

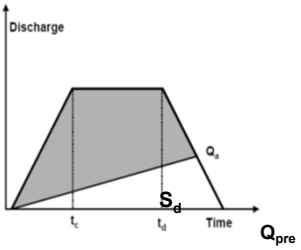
$$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$$

Intensity

$$i_{(Td)} = A\ (T_d)^{B}$$

Storage

$$S_d = Q_{post} \cdot T_d - Q_{pre}\ (T_d + T_c) / 2$$



Pre-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Dundalk	Intensity (mm/hr):	106.48
Return Period	5		
Time of Concentration (min)	10		
Coeff A	29.1		
Coeffic B	-0.724		
Runoff Coeff (Unadjusted)	0.30	Flow (m^3/s)	0.0123
Runoff Coefficient (Adjusted)	0.30		
Area (ha)	0.1374		

Post-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Owen Sound	Intensity (mm/hr):	106.48
Return Period	5 yr		
Time of Concentration (min)	10		
Coeff A	29.1		
Coeffic B	-0.724		
Runoff Coeff (unadjusted)	0.63	Uncont. Flow (m^3/s)	0.0257
Runoff Coefficient (Adjusted)	0.63		
Area (ha)	0.1374		

Target Flow (m^3/s)	0.0121

REQUIRED STORAGE VOLUME:	**8.2**

Storage Volume Determination (Detailed)				
T_d	i	T_d	Q_{Uncont}	S_d
min	*mm/hr*	*sec*	m^3/s	m^3
10	106.48	600	0.026	8.1
15	79.39	900	0.019	8.2
20	64.47	1200	0.016	7.8
25	54.85	1500	0.013	7.1
30	48.07	1800	0.012	6.3
35	42.99	2100	0.010	5.4
40	39.03	2400	0.009	4.4
45	35.84	2700	0.009	3.4
50	33.21	3000	0.008	2.2
55	30.99	3300	0.007	1.1
60	29.10	3600	0.007	-0.1
65	27.46	3900	0.007	-1.4
70	26.03	4200	0.006	-2.7
75	24.76	4500	0.006	-4.0
80	23.63	4800	0.006	-5.3
85	22.61	5100	0.005	-6.7

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PROJECT: Tyrolean Lane Lodges
PROJECT No.: 109-5854
DATE: 2021-03-31
DESIGN: JL'A
CHECK: BH

Rational Method (5 Yr Post-Development Uncontroled Area)

Peak Flow

$$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$$

Intensity

$$i_{(Td)} = A\ (T_d)^{B}$$

Post-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Owen Sound	Intensity (mm/hr):	106.48
Return Period	5 yr		
Time of Concentration (min)	10		
Coeff A	29.1		
Coeffic B	-0.724		
Runoff Coeff (unadjusted)	0.3410	Uncont. Flow (m^3/s)	0.0014
Runoff Coefficient (Adjusted)	0.3410		
Area (ha)	0.0138		

CROZIER CONSULTING ENGINEERS

PROJECT: Tyrolean Lane Lodges
PROJECT No.: 109-5854
DATE: 2021-03-31
DESIGN: JL'A
CHECK: BH

Modified Rational Method Storage Sizing (100 Yr Post-Development Controled Area)

Peak Flow

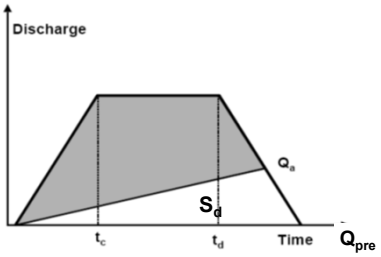
$$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$$

Intensity

$$i_{(Td)} = A\ (T_d)^{B}$$

Storage

$$S_d = Q_{post} \cdot T_d - Q_{pre}\ (T_d + T_c) / 2$$



Pre-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Blue Mountains	Intensity (mm/hr):	178.98
Return Period	100 yr		
Time of Concentration (mi	10		
Coeff A	47.7		
Coeffic B	-0.738		
Runoff Coeff (Unadjusted)	0.30	Flow (m^3/s)	0.0208
Runoff Coefficient (Adjuste	0.30		
Area (ha)	0.1381		

Post-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Blue Mountains	Intensity (mm/hr):	178.98
Return Period	100 yr		
Time of Concentration (mi	10		
Coeff A	47.7		
Coeffic B	-0.738		
Runoff Coeff (unadjusted)	0.63	Uncont. Flow (m^3/s	0.0436
Runoff Coefficient (Adjuste	0.63		
Area (ha)	0.1381		

Target Flow (m^3/s)	0.0203

REQUIRED STORAGE VOLUME:	**14.0**

Storage Volume Determination (Detailed)

T_d	i	T_d	Q_{Uncont}	S_d
min	*mm/hr*	*sec*	m^3/s	m^3
10	178.98	600	0.044	14.0
15	132.69	900	0.032	13.9
20	107.31	1200	0.026	13.1
25	91.02	1500	0.022	12.0
30	79.56	1800	0.019	10.5
35	71.00	2100	0.017	8.9
40	64.34	2400	0.016	7.2
45	58.98	2700	0.014	5.3
50	54.57	3000	0.013	3.4
55	50.86	3300	0.012	1.3
60	47.70	3600	0.012	-0.8
65	44.96	3900	0.011	-2.9
70	42.57	4200	0.010	-5.1
75	40.46	4500	0.010	-7.4
80	38.58	4800	0.009	-9.7
85	36.89	5100	0.009	-12.0

CROZIER
CONSULTING ENGINEERS

PROJECT: Tyrolean Lane Lodges
PROJECT No.: 109-5854
DATE: 2021-03-31
DESIGN: JL'A
CHECK: BH

Rational Method (100 Yr Post-Development Uncontroled Area)

Peak Flow

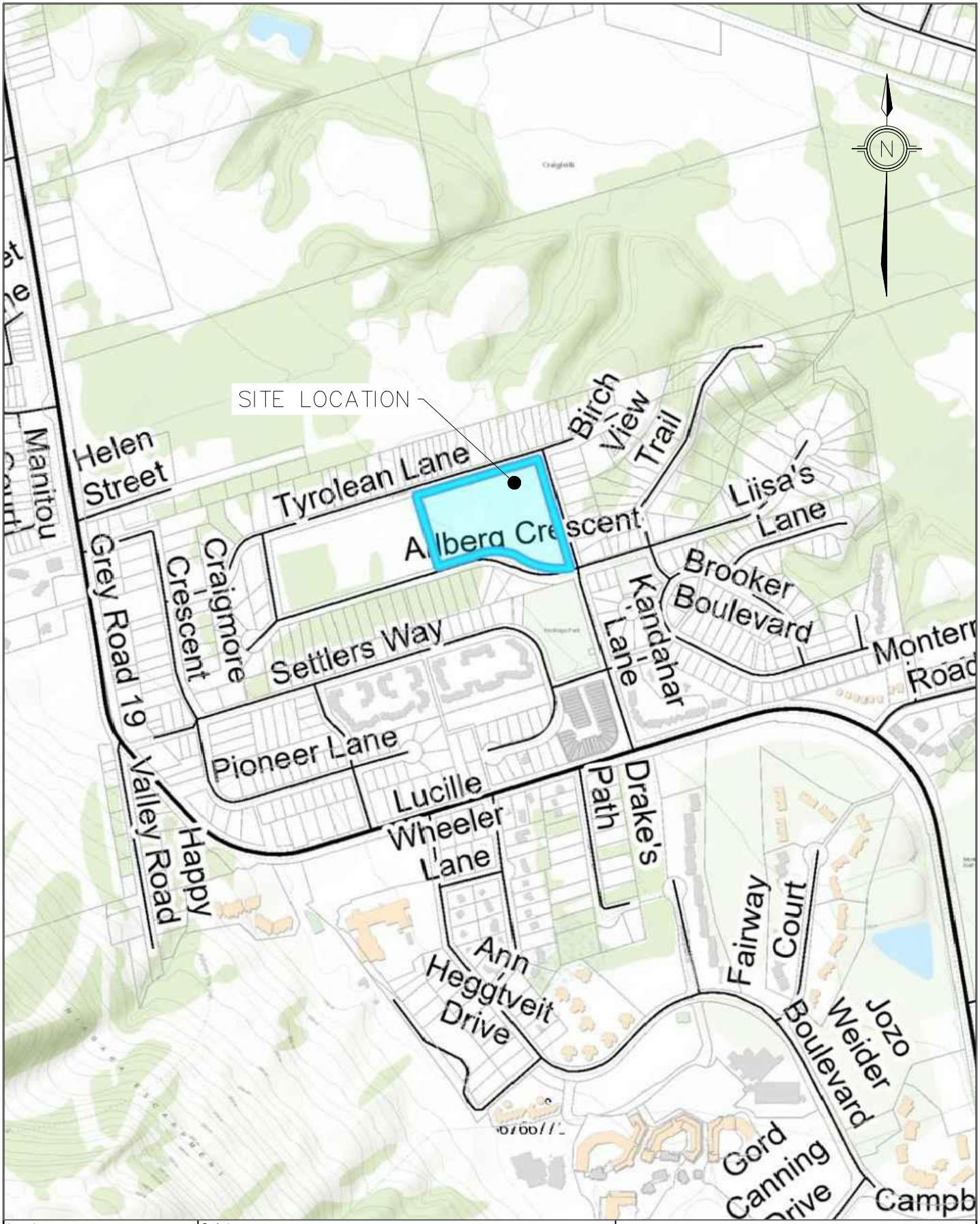
$$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$$

Intensity

$$i_{(Td)} = A\,(T_d)^{B}$$

Post-Development Scenario Data			
Inputs		**Outputs**	
IDF Location	Owen Sound	Intensity (mm/hr):	178.98
Return Period	100yr		
Time of Concentration (min)	10		
Coeff A	47.7		
Coeffic B	-0.738		
Runoff Coeff (unadjusted)	0.34	Uncont. Flow (m^3/s)	0.0024
Runoff Coefficient (Adjusted)	0.34		
Area (ha)	0.01		

FIGURES



Legend

Project

TYROLEAN LANE LODGES
TOWN OF THE BLUE MOUNTAINS

Drawing

SITE LOCATION

CROZIER CONSULTING ENGINEERS
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P.N.R.	P.N.R.	109-5854

Scale	Date	Check By	Drawing
N.T.S.	04/06/2021	B.H.	FIG1

Conceptual Site Plan

138 Kandahar Lane
Town of The Blue Mountains
County of Grey

Total Area of Property = 3.20 ha

Official Plan Designation: Resort Commercial
Permitted Uses: Lodges

Zoning (2018-65) Development (D) Zone

Proposed Zoning: Resort Commercial Exception (C3-X) Zone

These lands may also be used for the purposes of a Lodge as well as uses, buildings and structures accesssory thereto. For the purposes of this exception

1. a Lodge means a fully detached building or structure, or any part thereof, that contains a single dwelling unit and that operates or offers a place of temporary or permanent residence, lodging or occupancy by way of concession, lease license, rental agreement or similary commercial contract for any period of time. (Including seasonal resort staff housing)

2. These lands shall be developed in accordance with the Residential R1-1 Zone provisions.

Proposal for 12 - Lodges in a Draft Plan of Subdivision

All units on Full Municipal Services (to be serviced in 2022)

Proposed Density:
12 units on 0.9 ha (13.3 units/ha)

Future Development = 2.3 ha

1.5 m Trail Dedication = 200 m²

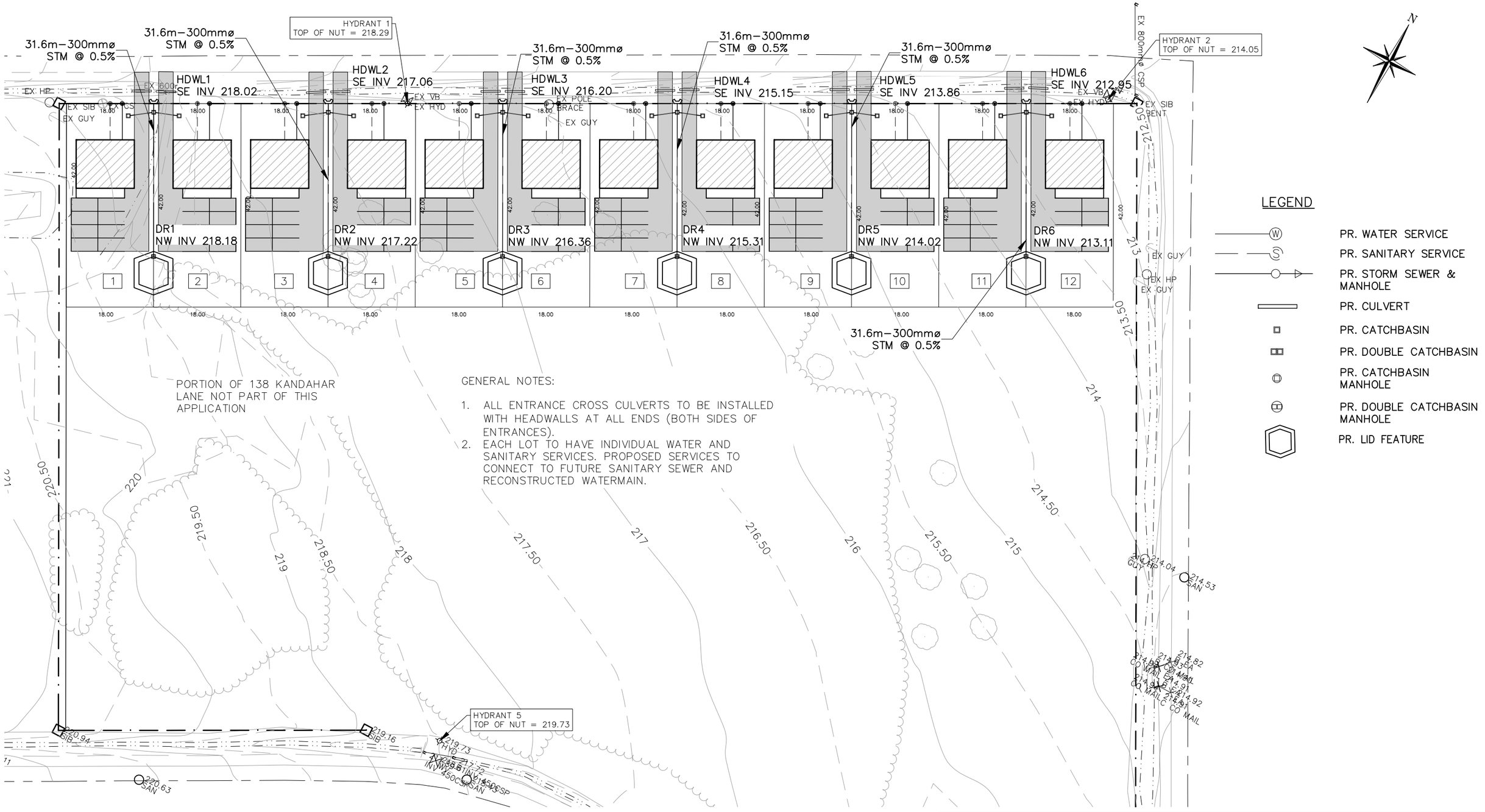
Future Additional
Resort Accomodation
and Recreation Block
2.3 ha

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

PROJECT: 1007-20	DRAWN: AP	DATE: AUG/2021

DWG: 1007-20-CP3

PASCUZZO PLANNING INC.



LEGEND

- PR. WATER SERVICE
- PR. SANITARY SERVICE
- PR. STORM SEWER & MANHOLE
- PR. CULVERT
- PR. CATCHBASIN
- PR. DOUBLE CATCHBASIN
- PR. CATCHBASIN MANHOLE
- PR. DOUBLE CATCHBASIN MANHOLE
- PR. LID FEATURE

Project
TYROLEAN LANE LODGES
TOWN OF THE BLUE MOUNTAINS

Drawing
GENERAL SERVICING

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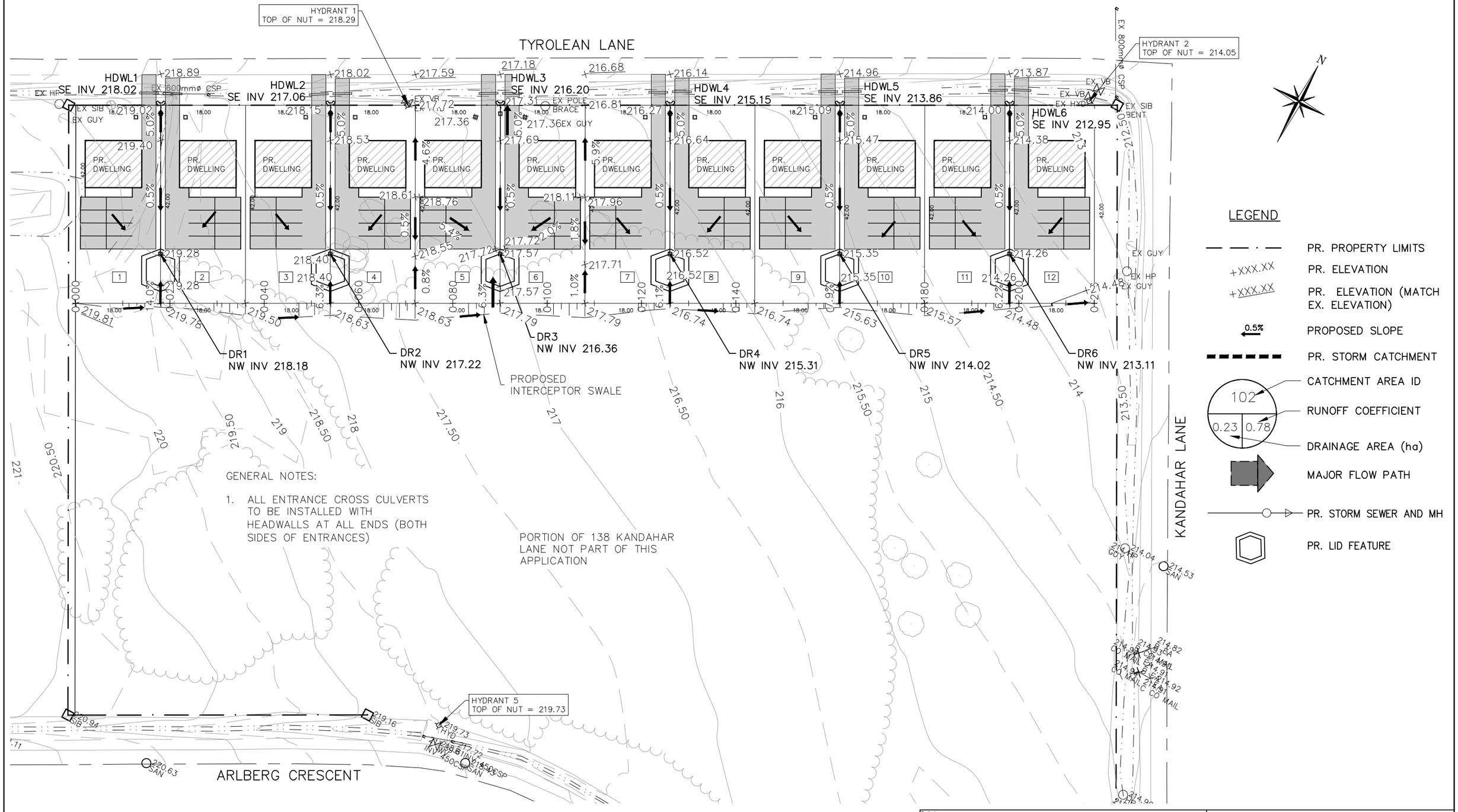
Scale	Date	Check By	Drawing
1: 750	04/06/2021	B.H.	FIG3



Project
TYROLEAN LANE LODGES
TOWN OF THE BLUE MOUNTAINS

Drawing
GRADING AND DRAINAGE

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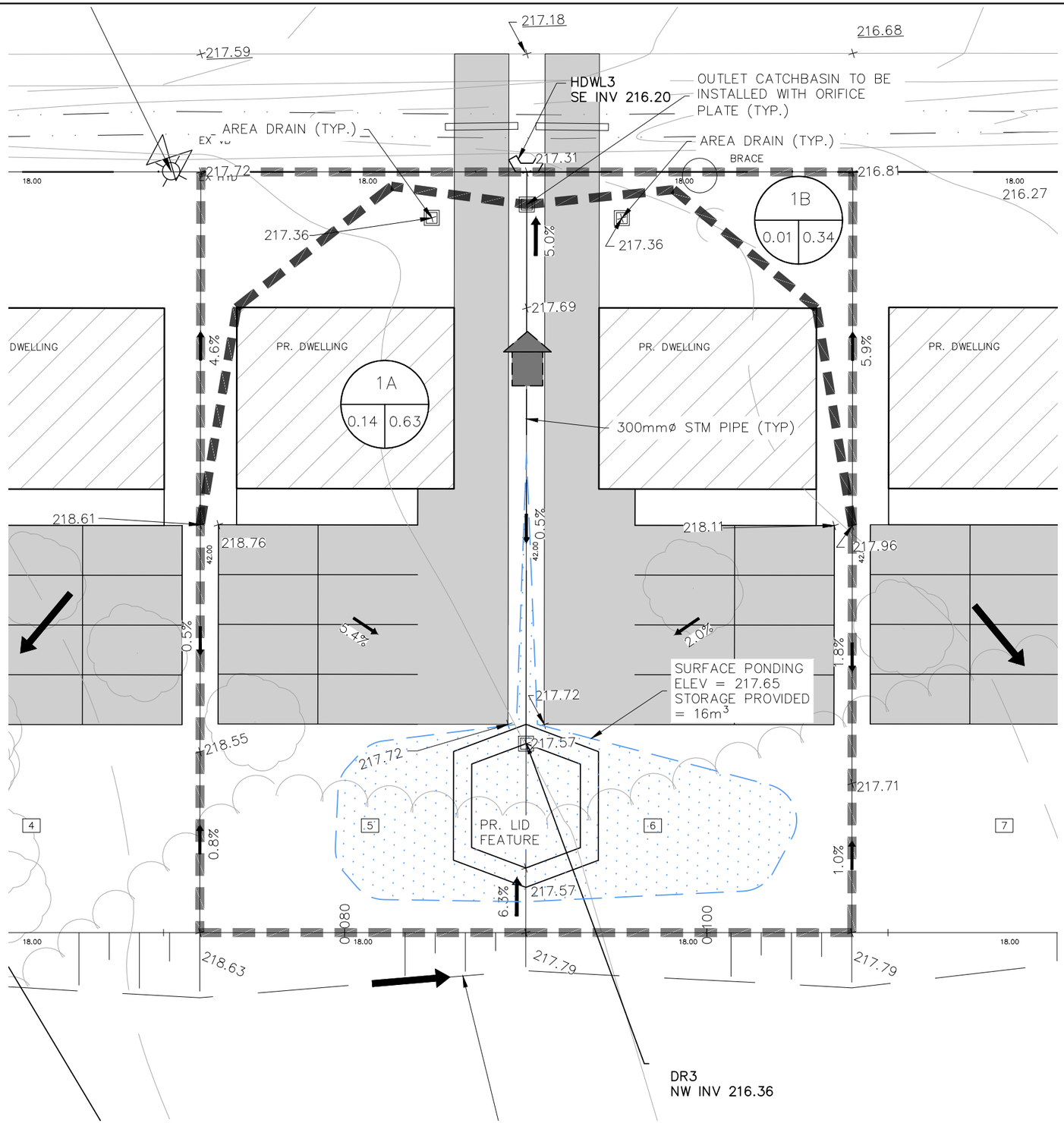
Scale	Date	Check By	Drawing
1: 750	04/06/2021	B.H.	FIG4



LEGEND

- PR. PROPERTY LIMITS
- +XXX.XX — PR. ELEVATION
- +XXX.XX — PR. ELEVATION (MATCH EX. ELEVATION)
- 0.5% — PROPOSED SLOPE
- PR. STORM CATCHMENT
- 102 / 0.23 / 0.78 — CATCHMENT AREA ID; RUNOFF COEFFICIENT; DRAINAGE AREA (ha)
- MAJOR FLOW PATH
- PR. STORM SEWER AND MH
- PR. LID FEATURE

GENERAL NOTES:

1. ALL ENTRANCE CROSS CULVERTS TO BE INSTALLED WITH HEADWALLS AT ALL ENDS (BOTH SIDES OF ENTRANCES)

Project
TYROLEAN LANE LODGES
TOWN OF THE BLUE MOUNTAINS

Drawing
TYPICAL SWM DRAINAGE PLAN

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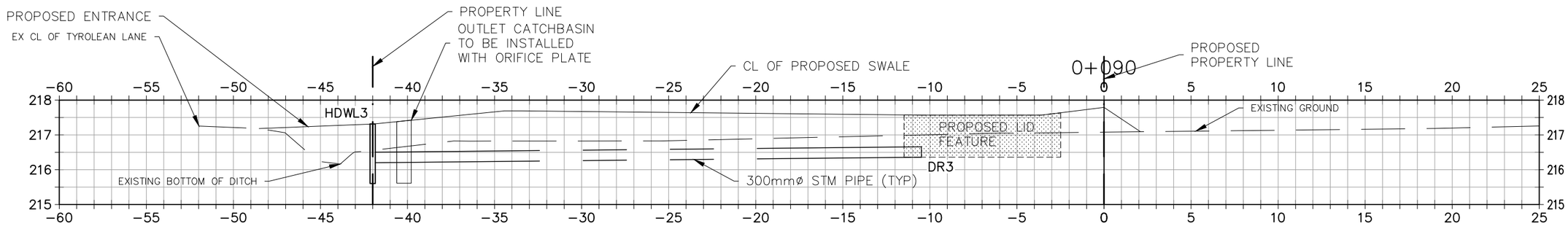
Scale 1:250	Date 04/06/2021	Check By B.H.	Drawing FIG5



Project

TYROLEAN LANE LODGES
TOWN OF THE BLUE MOUNTAINS

Drawing

TYPICAL LOT SIDE YARD SECTION

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Drawn By	Design By	Project
P.N.R.	P.N.R.	109−5854
Scale: H 1:250 V 1:125	Date: 04/06/2021	Check By: B.H.	Drawing: FIG6