Functional Site Servicing and Stormwater Management Design Brief

18-Unit Apartment Building
814 Scott Street
Fort Frances, Ontario

January 29, 2021

Prepared for:

Hillside Construction

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Prepared by:

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Prepared by _____
(signature)

Luke Viljakainen, B.Eng.

Reviewed by _____
(signature)

Tyler Rizzuto, BA, CPT

LICENSED PROFESSIONAL ENGINEER
A. F. ROSE
100097516
1/29/2021
PROVINCE OF ONTARIO

Approved by _____
(signature)

Adam Rose, P.Eng

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Hillside Construction Inc. (Owner) to complete civil engineering, geotechnical, and legal and topographical survey services to support the design of a new 18-unit apartment building in Fort Frances, Ontario.

Stantec understands the project is located within the municipality at 814 Scott Street. The existing building on the property will be demolished to accommodate the proposed development, which also includes 23 parking stalls, concrete sidewalks, and greenspace.

The property is approximately 0.2 ha and is currently zoned Commercial (C2). Due to the land use change from commercial to residential, a record of Site Condition (RSC) will be required in accordance with Ontario Regulation (O. Reg.) 153/04 made under the Environmental Protection Act. The RSC will be completed under separate cover.

The purpose of this report is to identify the requirements for site servicing and stormwater management as it relates to current municipal criteria, to demonstrate how the existing infrastructure supports the proposed site, and to address the provision of site grading, domestic and fire water services, storm and sanitary sewers, and stormwater management.

2.0 WATER SERVICING

2.1 EXISTING WATER SERVICING

Existing 250 mm and 150 mm watermains are located within Scott Street and Reid Avenue, respectively. The site is provided a 50 mm water service terminated at property line connecting to the Scott Street watermain. An existing fire hydrant is located at the corner of Scott Street and Reid Avenue.

2.2 PROPOSED WATER SERVICING

Based on the total fixtures proposed for the apartment building and Table 7.6.3.2.A of the OBC (2012), the total Fixture Unit (FU) count was estimated. Based on the FU count calculated and Figure 4-2 of the AWWA Sizing Water Service Lines and Meters, Third Edition (2014), the probable water demand is estimated to be 2.6 L/s. The design flow is summarized in the following table:

Table 1 – Design Flow

Peak Water Demand (L/s)	2.6	AWWA M22 Manual Figure 4-2
Peaking Factors		
Minimum Rate Factor	0.4	MOECP, Design Guidelines for Drinking Water Systems (2008)
Maximum Day Factor	2.75	
Peak Rate Factor (Max. Hour)	4.13	
Peaking factors	Flows (L/s)	
Average Daily Demand (ADD)	0.63	
Hourly Demand	0.25	
Maximum Daily Demand (MDD)	1.73	
Peak Hourly Demand (PHD)	2.60	
Fire Flow (FF)[1]	167	Fire Underwriters Survey (1999)
Fire Flow (FF)	75	A-3.2.5.7. OBC (2012)
MDD + FF	169.60	
PHD	2.60	
Design Flow (MDD + FF)	169.40	
Notes: 1. FUS governs over OBC for calculation purposes.		

The building will be provided a new 50 mm service connecting to the stubbed water service at property line.

2.3 FIRE PROTECTION

It is Stantec's understanding that the proposed apartment building will not be provided a sprinkler system for fire protection. In accordance with section 3.2.5.7 of the OBC (2012), any point of a building perimeter facing a street is to be within 90.0 m horizontally of the nearest fire hydrant. This distance requirement is achieved by the existing fire hydrant located at the corner of Scott Street and Reid Avenue.

Based on the fire hydrant flow test, the available water supply at a residual pressure of 20 psi is 125 L/s (**Appendix A**). According to A-3.2.5.7. of the OBC (2012), the minimum water supply for firefighting purposes for the apartment building is 75 L/s. The Fire Underwriters Survey (FUS) is also used to estimate the require water supply for a major fire; this assessment includes stock details such as building size, type of construction, exposures, occupancy, and fire protection systems. The estimated FUS fire flow is estimated to be 167 L/s (**Appendix B**). The available water supply satisfies section A-3.2.5.7, but not the FUS estimate. The FUS is a recommendation and not a requirement; the available fire flow should be reviewed and approved by the City of Fort Frances Fire Department.

3.0 SANITARY SERVICING

3.1 EXISTING SANITARY SERVICING

Existing 375 mm sanitary sewers are located within Scott Street and Reid Avenue. The site is provided a 150 mm sanitary service terminated at property line connecting to the Reid Avenue sanitary sewer.

3.2 PROPOSED SANITARY SERVICING

The building will be provided a new 150 mm sanitary service extending from the stubbed sanitary service at property line. The sanitary service will target a 2.0% slope and during peak flows will not exceed 17.6% of its available capacity. Detailed calculation can be found in **Appendix C**.

In accordance with section 7.4.7.2.(3) of the OBC (2012), the first manhole to which the sanitary service connects to shall not exceed 30 m. This distance requirement is achieved by a proposed manhole located 8.6 m from the southeast corner of the building; the location of the manhole also facilitates the change in direction and connection to stubbed sanitary service.

4.0 STORMWATER MANAGEMENT

The proposed site will be provided a stormwater management plan (SWM) that addresses quality and quantity control considerations. Through consultation with the Town of Fort Frances and Provincial Best Management Practices (BMP's), the proposed plan will incorporate the following:

1. Control the post-development peak discharge rate for the 50-year storm event to less than or equal to the pre-development rate.
2. Minimal level of sediment and pollutant control is achieved via proposed SWM facility.
3. Pre-development and post-development catchment areas are shown on **Figure 1** and **2**, respectively. Construction Drawings for the development can be found in **Appendix D.**

4.1 EXISTING CONDITIONS

Existing runoff for the subject site is conveyed east via sheet flow to an existing swale and culvert located at the southeast portion of the site. Flow is conveyed through the culvert and discharges into an existing catch basin and subsequent 300 mm storm sewer on Scott Street.

The pre-development catchment area (**Figure 1**) is comprised of existing building, gravel parking lot and green space. The total impervious percentage (TIMP) is 33% for the pre-development conditions.

4.2 PROPOSED SWM PLAN

The subject property is divided into two sub catchment areas (**Figure 2**): catchment 201 is 0.11 ha in size and is comprised of the proposed asphalt parking lot, concrete sidewalks, and green space; catchment 202 is 0.11 ha in size and is comprised of the proposed apartment building, concrete sidewalks, and green space. The TIMP for catchment 201 and 202 is 78% and 48%, respectively.

Catchment 201 will direct stormwater runoff towards the proposed SWM facility via sheet flow and is oversized to accommodate the uncontrolled runoff discharged from catchment 202.

The majority of catchment 202 will direct stormwater runoff towards Scott Street via sheet flow; the east portion of the site between Reid Avenue and the concrete sidewalk will be directed towards the existing culvert and subsequent storm sewer system. The following table summarizes the PCSWMM modeling results for the pre-development, post-development, and controlled development peak flows:

Table 2 – PCSWMM Model Peak Flows for 50-year Storm Event

Catchment	Pre-development[1] (m3/s)	Post-development (m3/s)	Controlled development (m3/s)
201	0.070	0.046	0.025
202		0.041	0.041
Total	0.070	0.087	0.066
Notes: 1. Pre-development runoff for the entire site is directed to Scott Street.			

Based on the PCSWMM controlled development simulation for the 50-year storm event, a total storage of 17 m^3 is required for catchment 201 to obtain a peak flow of 0.025 m^3/s from 0.046 m^3/s The storage facility provides a total of 22 m^3 of active storage (ponding). Flow will be controlled via 100 mm orifice plate located within the proposed catch basin. The catch basin will connect to an existing storm sewer system on Gillon Street. Detailed PCSWMM modelling results can be found in **Appendix E**.

5.0 GRADING AND DRAINAGE PLAN

The lot grading and drainage plan will utilize existing drainage features as well as a proposed stormwater management facility to convey stormwater runoff safely and effectively.

A 2.0% apron is provided around the entire apartment building to ensure positive drainage. Steeper slopes are found along Scott Street, but do not exceed 5.0%. The parking lot targets a 1.2% slope towards the stormwater management facility. Drainage along Reid Avenue is similar to the existing site conditions, where runoff is directed towards an existing culvert at south east portion of the subject site.

The proposed apartment building will achieve a minimum 150 mm clearance from finish floor to landscape areas. The finish floor elevation will be matched at all entrances to the building providing accessible transitions. Sidewalk slopes do not exceed 5.0% with landings less than 10 m apart for accessibility. Ramps are located where barrier free parking stalls meet the parking lot surface. Adequate drainage is provided adjacent to sidewalks to avoid accumulation of water.

6.0 CLOSURE

The information and data contained in this report, including without limitation, the results of any sampling and analyses conducted by Stantec pursuant to its Agreement with the client, have been developed or obtained through the exercise of Stantec's professional judgment and are set forth to the best of Stantec's knowledge, information, and belief. Although every effort has been made to confirm that this information is factual, complete, and accurate, Stantec makes no guarantees or warranties whatsoever, whether expressed or implied, with respect to such information or data.

The information and data presented in this report are based on the purpose and scope of the project and form the basis for any conclusions and recommendations presented herein. Any conclusions and recommendations presented herein do not preclude the existence of environmental and/or engineering concerns other than those that may have been identified.

Work performed by Stantec personnel employed sound engineering assessment principles. Stantec cannot guarantee the accuracy and reliability of information provided by others or third parties. Therefore, Stantec does not claim responsibility for undisclosed environmental concerns or conditions that may result in costs for environmental clean-up and/or remediation. This report is intended for information purposes only.

Respectfully submitted by:

Stantec Consulting Ltd.

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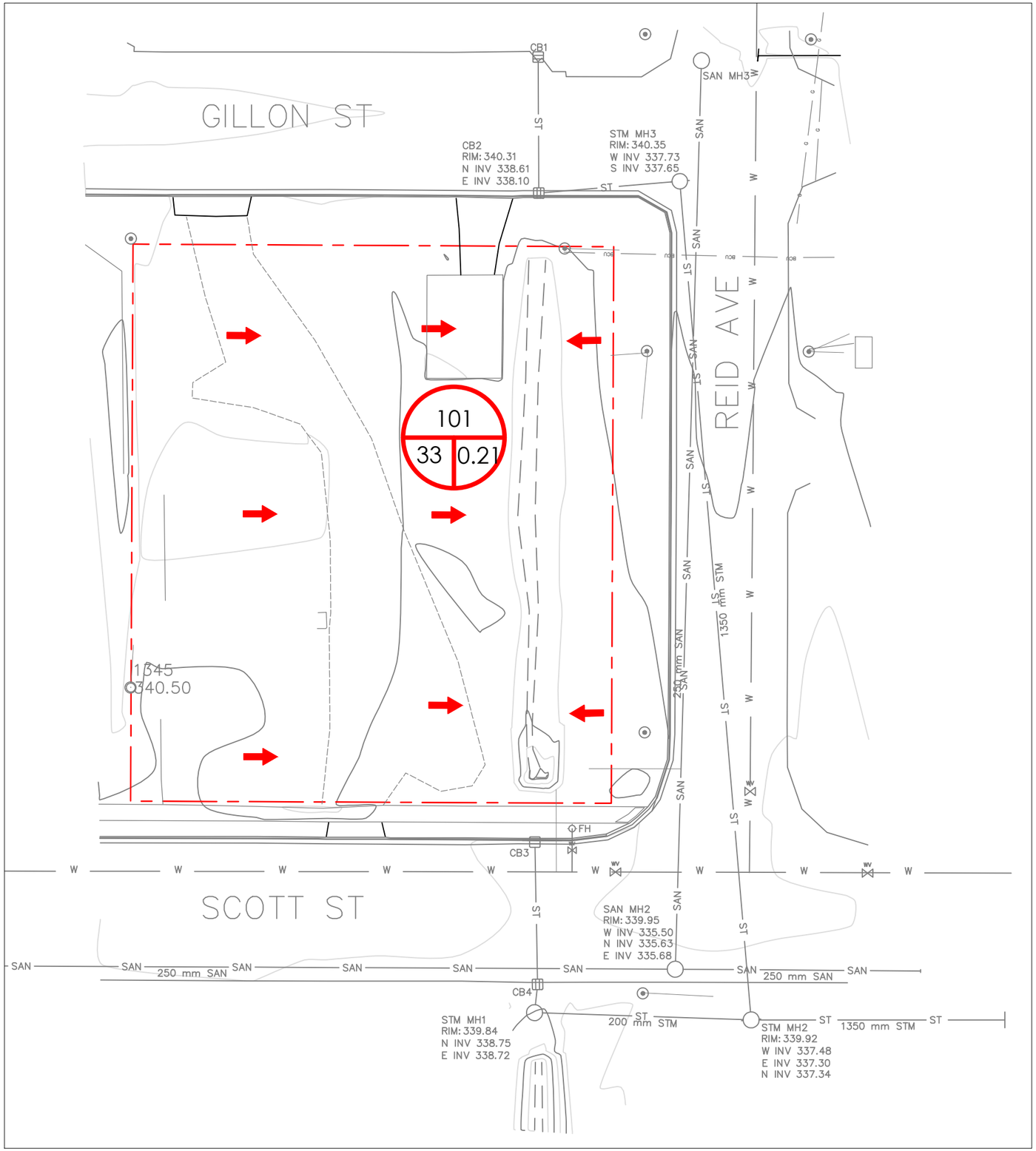
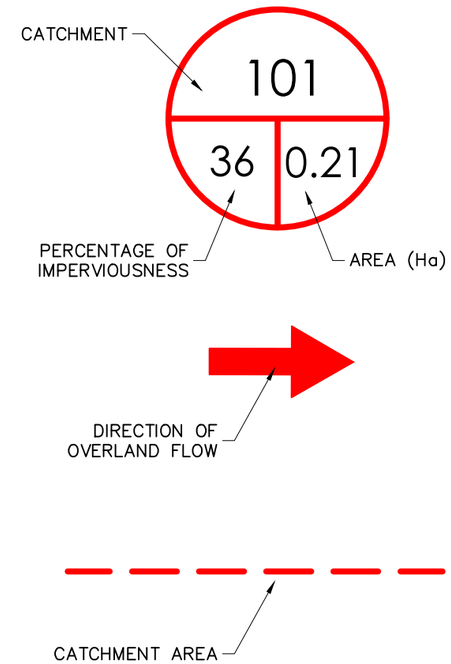
FIGURES



PRE DEVELOPMENT



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Permit/Seal

	By	Appd	YYYY.MM.DD
ISSUED AS FINAL	TR	LV	2021.01.19
Issued			

File Name: 72065C_SWM03
Project Number: 129672065

Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
TR	LV	AR	2020.09.29

Notes

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE FUNCTIONAL SITE SERVICING DESIGN BRIEF.
2. SITE PLAN PREPARED BY OTHERS
3. NOT FOR CONSTRUCTION

CLIENT

HILLSIDE CONSTRUCTION

Project

NEW 18 UNIT APARTMENT BUILDING
CIVIL FUNCTIONAL SITE SERVICING

814 SCOTT STREET, FORT FRANCES, ON

Title

PRE DEVELOPMENT CATCHMENT

Revision	Date
00	2021/01/19

Reference Sheet

Figure No. 01

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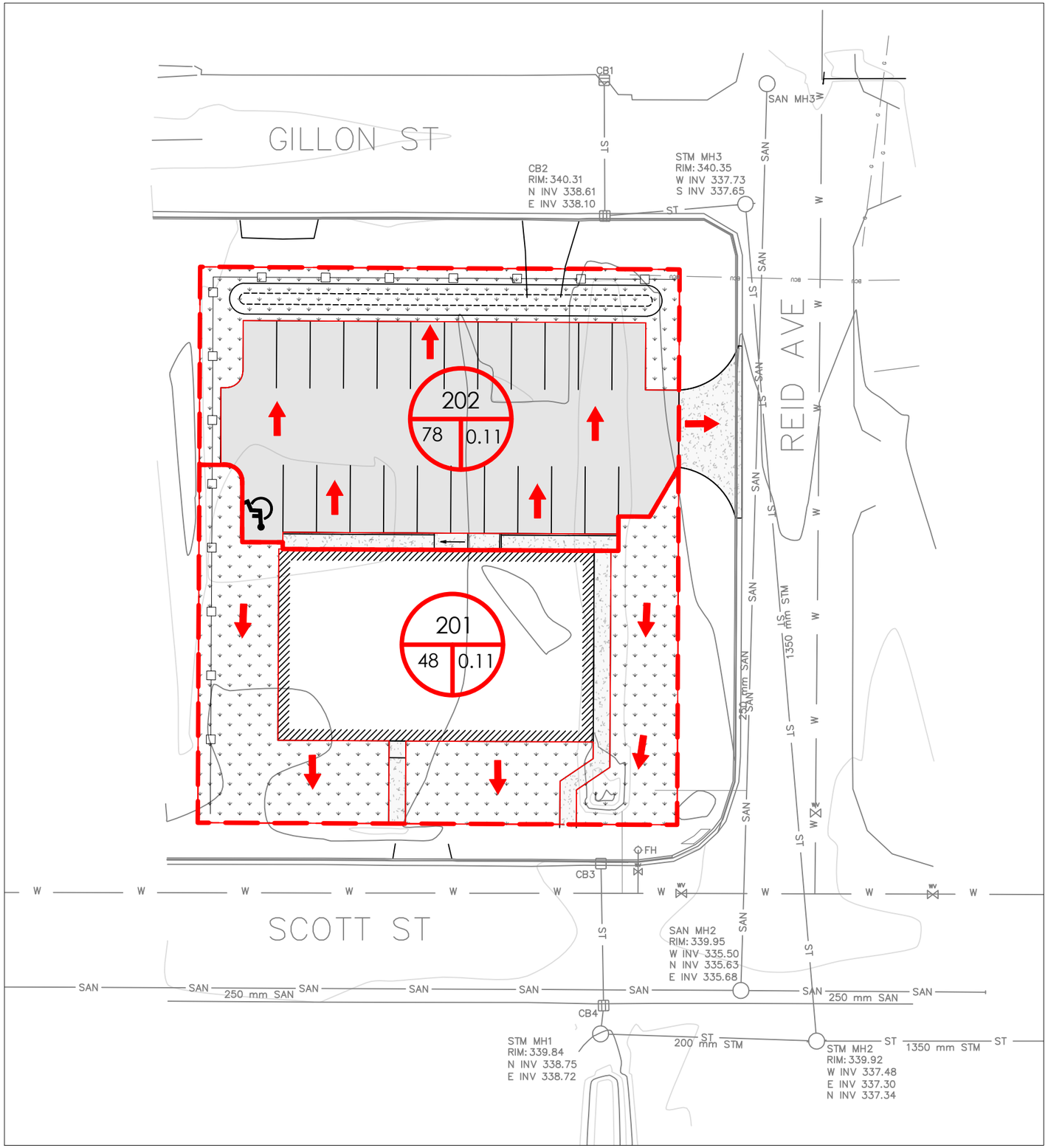
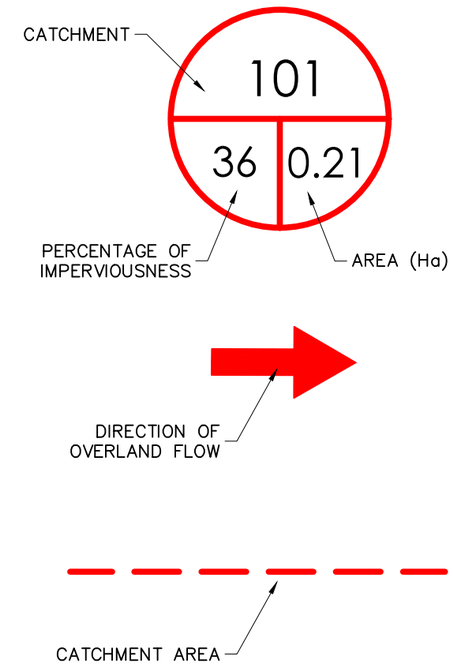


POST DEVELOPMENT



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ISSUED FOR FINAL	TR	LV	2020.01.11
Issued			

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Project Number: 129672065

Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
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CLIENT

HILLSIDE CONSTRUCTION

Project

NEW 18 UNIT APARTMENT BUILDING CIVIL FUNCTIONAL SITE SERVICING

814 SCOTT STREET, FORT FRANCES, ON

Title

POST DEVELOPMENT CATCHMENT

Revision 00

Date 2021/01/19

Reference Sheet

Figure No. 02

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APPENDICES

Appendix A FIRE FLOW ASSESSMENT

Stantec

Hydrant Flow Test - Computation						
18-Unit Apartment Building					Flow Hydrant:	Scott Street
Fort Frances, Ontario					Residual Hydrant:	Reid Avenue
Hillside Construction					Main Size:	250 mm
Flow (Gal/min)	**Flow (L/min)**	**Flow (L/s)**	**Flow (Q ^ 1.852) (L/s)**	**Head (m)**	**Residual Pressure (kPa)**	**Residual Pressure (psi)**
0	**0**	**0.0**	**0**	**53**	**524**	76
267	**1009.3**	**16.8**	**186**	**51**	**497**	72
548	**2071.4**	**34.5**	**706**	**46**	**448**	65
1055	**3987.9**	**66.5**	**2374**	**41**	**407**	59
			7196	**14**	**140**	
700	kpa, max pressure		350	kpa, max daily demand		
550	kpa, homes		275	kpa, max hourly		
			140	kpa, max day + fire		
Graphical interpolation of fire flow availability at 140 kPa					**7260**	L/min
Total test flow rate measured during test					**3987.9**	L/min
Pressure drop from static pressure to desired residual pressure					**384**	kPa
Actual pressure drop measured during test (static - actual residual)					**117**	kPa
Computation for available fire flow at 140kPa					**7600**	L/min
Notes:						
1. Hydrant flow test conducted by Vipond Inc.						

Appendix B FIRE UNDERWRITERS SURVEY

Stantec

Project Name: Apartment Building
Project No. 129672065

Date: 10-Oct-20
Designed By: L.V
Checked By:

Fire Underwriters Survey

Note: This estimate of required fire flow for the proposed development is based on 1999 edition of the Fie Underwriters Survey (FUS).

Outline of Procedure (FUS, 1999)

A. Determine the type of construction.
B. Determine the ground floor area.
C. Determine the height in storeys.
D. Using the fire flow formula, determine the required fire flow to the nearest 1,000L
E. Determine the increase or decrease for occupancy and apply to the value obtained in Table D (FUS, 1999). Do not round
F. Determine the decrease,if any, for automatic sprinkler protection. Do not round off the value.
G. Determine the total increase for exposures. Do not round off the value.
H. To the answer obtained in E, subtract the value obtained in F and add the value obtained in G.
*The final figure is customarily rounded off to the nearest 1000 L/min. (FUS, 1999)

1.0 Fire Flow

A. Non-combustible construction			**C**	0.8	
B. Groundfloor area				498	sq.m
C. Storeys				3	
			Total Area, A	1494	
D. **F = 220 C A$^{1/2}$**			F =	**7000**	L/min
E. Occupancy, apartment		Adjustment	0%	**7000**	L/min
F. Automatic sprinkler protection		Adjustment	0%	**7000**	L/min
G. Increase for exposure:	3.1 m to 10 m	Adjustment, N	20%		
	30.1m to 45m	Adjustment, E	5%		
	30.1m to 45m	Adjustment, S	5%		
		Adjustment, W	0%		
		Adjustment	30%	**9100**	L/min
H. Overall adjustments to fire flow estimates				**9100**	L/min
Therefore the final F_F estimate is:			**Final Fire Flow, F_F =**	10000	**L/Min**
				167	**L/s**
With a corresponding required duration of fire flow of:				**2**	**Hours**

Appendix C SANITARY HYDRAULIC DESIGN SHEET

Table 10
Sanitary Sewer Hydraulic Design Sheet

Designed By: L.V. **Date: 28-Sep-20**
Checked By: **Date:**

Location	Catchment	From	To	Individual	Accumulative			Peak	Extran.	Total	Length	Size	Slope	Capacity	Velocity	Q(d)/Qcap
Street/Lot				P, cap	Area, ha	P, cap	Area, ha	Q(p), L/s	Q(I), L/s	Q(d), L/s	L , m	D, mm	S, m/m	Qcap(full),L/s	V(full),m/s	
1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Building	NA	BLDG	MH1	NA	NA	NA	0.97	3.5	0.3	3.8	8.6	150	0.02	21.5	1.22	17.6%

Equations:

q = average daily per capita (L/cap.d)
I = unit of peak extraneous flow
Q(p) = peak population flow (L/s)
Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)

Maximum Probable Drainage (OBC)

Q(p) = Maximum Probable Demand (OBC)
Q(I) = IA (L/s); Area in ha.
Q(d) = Q(p) +Q(I) (L/s)

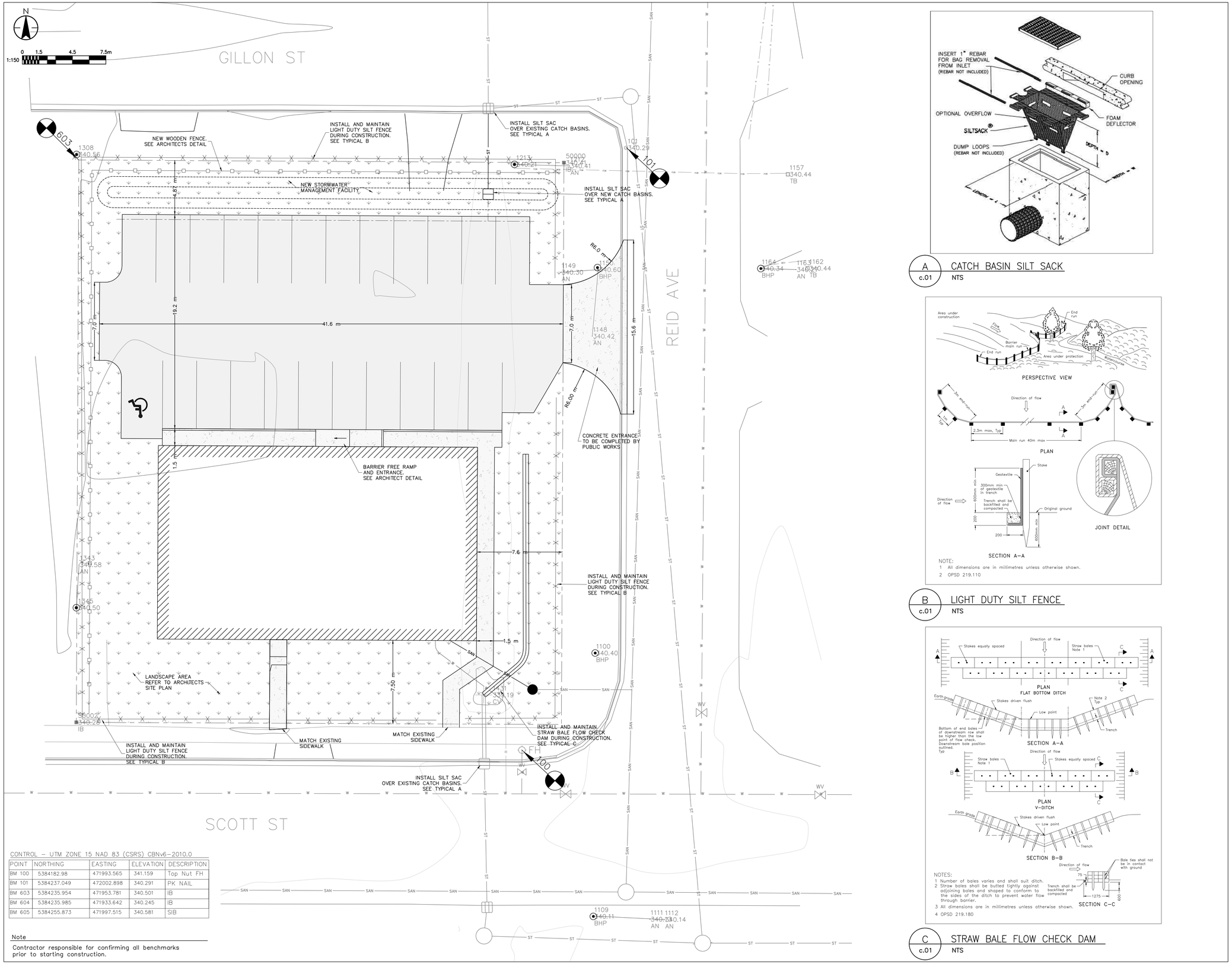
Mannings Equation

Qcap = (D/1000)^2.667*(S/100)^0.5(3.211*n)*1000 L/s
D = pipe size (mm)
S = slope (grade) of pipe (%)
n = roughness coefficient

Input Data:

Smooth wall pipe, n =	0.013	
Residential Sewage Flow =	400	L/cap/day
Single Family Residential Population Density =	175	persons/ha
Peaking Factor (MOECC, 2008) =	4.5	
Extraneous Flow, E =	0.26	L/ha/s

Appendix D CONSTRUCTION DRAWINGS



CONTROL – UTM ZONE 15 NAD 83 (CSRS) CBNv6–2010.0

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
BM 100	5384182.98	471993.565	341.159	Top Nut FH
BM 603	5384237.049	472002.898	340.291	PK NAIL
BM 603	5384235.954	471953.781	340.501	IB
BM 604	5384235.985	471933.642	340.245	IB
BM 605	5384255.873	471997.515	340.581	SIB

Note

Contractor responsible for confirming all benchmarks prior to starting construction.

A c.01 CATCH BASIN SILT SACK

NTS

B c.01 LIGHT DUTY SILT FENCE

NTS

C c.01 STRAW BALE FLOW CHECK DAM

NTS

Stantec

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Consultant

Notes

LEGEND

PROPOSED

- NEW BUILDING
- NEW ASPHALT PARKING LOT
- NEW LANDSCAPE AREA
- NEW CONCRETE SIDEWALK
- NEW MANHOLE
- NEW CATCH BASIN
- NEW FENCE
- NEW SANITARY SERVICE
- NEW WATER SERVICE
- NEW SWALE
- 340.161 DESIGNED GRADE
- 340.161 EXISTING GRADE

EXISTING FEATURES

- EXISTING CATCH BASIN
- EXISTING FIRE HYDRANT
- EXISTING WATER MAIN
- EXISTING HYDRO POLE
- EXISTING STORM WATER SERVICE
- EXISTING SANITARY SERVICE
- EXISTING WATER SERVICE
- EXISTING UNDERGROUND CABLE LINE

UPDATED FOR CONSTRUCTION	TR	AR	2021.01.29
ISSUED FOR CONSTRUCTION	TR	AR	2021.01.20
Issued	By	Appd	YYYY.MM.DD
File Name: 72065C_DD0011	TR	TR	LV	2020.09.30
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

Client/Project Logo

Client/Project
Hillside Construction

New 18-unit Apartment Building

814 Scott Street, Fort Frances ON

Title
SITE PLAN AND EROSION SEDIMENT CONTROL PLAN

Project No. 129672065

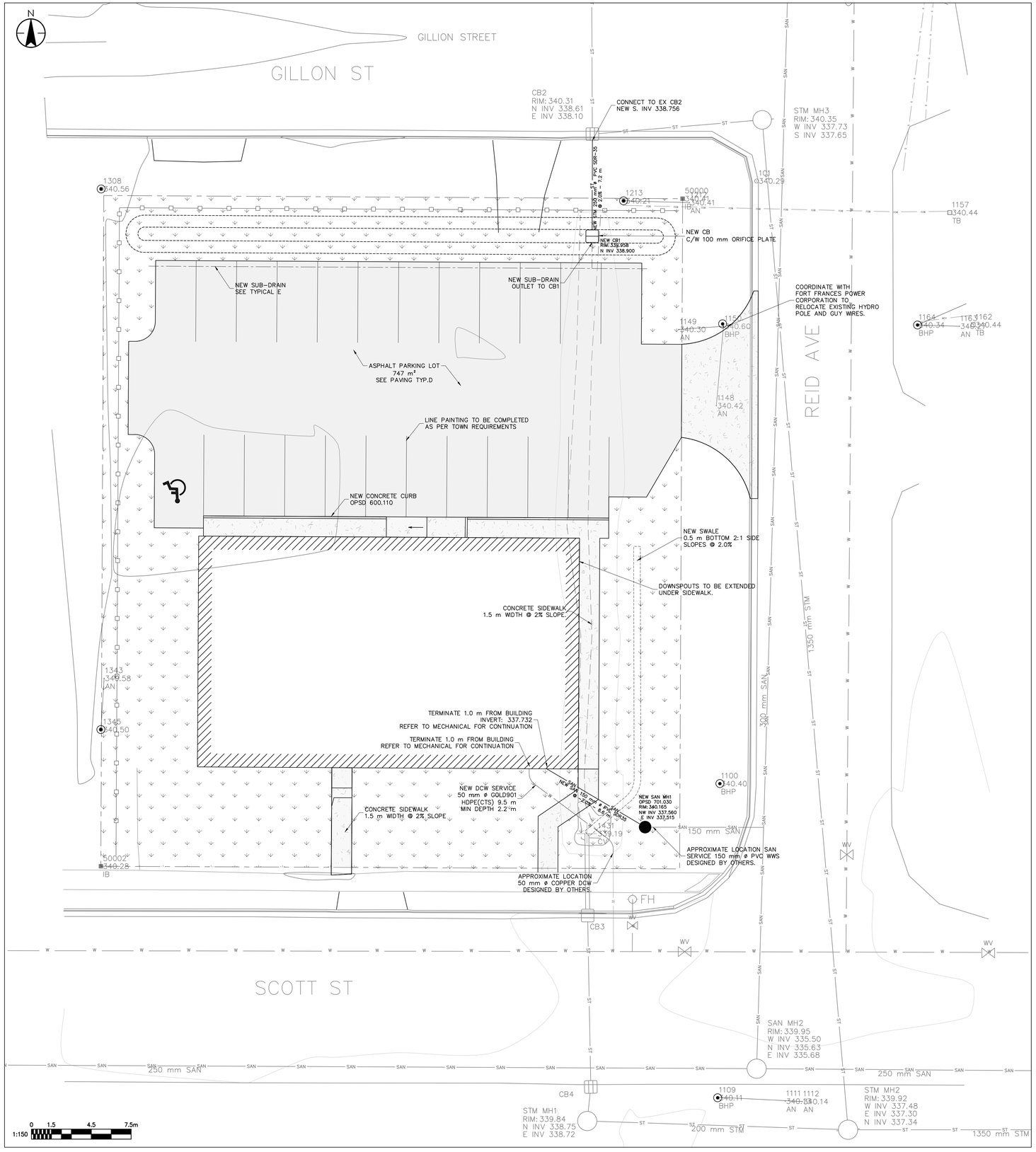
Scale

Revision 00

Sheet 01 of 03

Drawing No. C.01

ORIGINAL SHEET - ARCH D

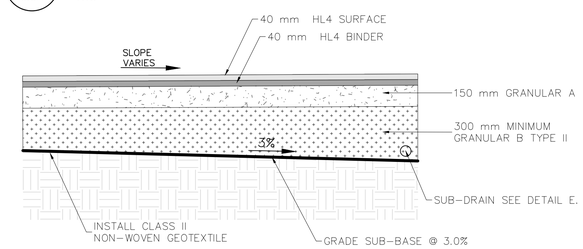


CONSTRUCTION NOTES:

1. SITE PLAN PREPARED BY OTHERS.
2. CONTRACTOR TO REFER TO STANTEC'S GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS.
3. CONTRACTOR TO REFER TO STANTEC'S ENVIRONMENTAL SITE INVESTIGATION REPORT FOR AREAS OF POTENTIAL ENVIRONMENTAL CONCERN.
4. CONTRACTOR TO SUBMIT SHOP DRAWINGS AND TESTING RESULTS TO CONFIRM CONFORMANCE TO OPSS SPECIFICATIONS AND CONTRACT DRAWINGS.
5. CONTRACTOR RESPONSIBLE FOR UNDERGROUND UTILITY LOCATES.
6. MANAGEMENT OF EXCESS MATERIAL TO OPSS.MUNI 180
7. SITE GRADING TO OPSS.MUNI 206
8. CONCRETE SIDEWALKS TO OPSS.MUNI 351
9. CONCRETE CURB AND GUTTER SYSTEMS TO OPSS.MUNI 353
10. TRENCHING, BACKFILLING, AND COMPACTION TO OPSS.MUNI 401
11. EXCAVATING, BACKFILLING AND COMPACTING AROUND MAINTENANCE HOLES AND CATCH BASINS TO OPSS.MUNI 402
    a. MAINTENANCE HOLES TO OPSD 701.030.
    b. CATCH BASINS TO OPSD 705.010.
11. PIPE SUBDRAINS TO OPSS.MUNI 405
12. PIPE SEWER INSTALLATION TO OPSS.MUNI 410
13. HOT MIX ASPHALT TO OPSS.MUNI 310
14. WATERMAIN INSTALLATION TO OPSS.MUNI 411
    14.1. AT LEAST 2.2 m COVER SHALL BE PROVIDED FOR WATER SERVICE. IF COVER CANNOT BE ACHIEVED, INSULATE AS PER OPSD 1109.030.
15. DEWATERING EXCAVATIONS TO OPSS.MUNI 517
16. MATERIAL SPECIFICATION FOR BASE, SUBBASE, SELECT SUBGRADE, AND BACKFILL TO OPSS.MUNI 1010
    a. ALL MATERIALS SHALL BE KEPT FROM FREEZING AND SHALL NOT CONTAIN ANY ORGANICS.
    b. USE OF NATIVE MATERIAL FOR BACKFILL IS NOT PERMITTED.
    c. GRANULAR MATERIAL:
    i. GRANULAR A
    ii. GRANULAR B TYPE I OR II
    iii. BEDDING MATERIAL GRANULAR A OR GRANULAR B TYPE I OR II, WITH 100% PASSING THE 26.5 MM SIEVE.
16. EROSION AND SEDIMENT CONTROL PLAN.
    a. THE CONTRACTOR WILL PRODUCE AN EROSION AND SEDIMENT CONTROL PLAN (THE "EROSION AND SEDIMENT CONTROL PLAN" OR THE "ESC PLAN") FOLLOWING THE GUIDANCE PROVIDED OPSS 805 AND IN ACCORDANCE WITH THE AUTHORITIES HAVING JURISDICTION. THE OBJECTIVE OF THE ESC PLAN IS TO MINIMIZE SEDIMENT INPUTS INTO WATERCOURSES BY REDUCING THE POTENTIAL FOR SEDIMENT, EROSION, AND RUNOFF FROM THE SITE. THE ESC PLAN SHALL INCLUDE DETAILED, SITE-SPECIFIC MEASURES BY WHICH THE CONTRACTOR WILL CONTROL SEDIMENT AND EROSION DURING CONSTRUCTION, INCLUDING THE PROPOSED LOCATIONS FOR EROSION CONTROL MEASURES SUCH AS SILT FENCES, THE LOCATIONS OF SOIL STOCKPILES, AND METHODS FOR EROSION CONTROL ON EXPOSED SOILS AND STOCKPILES. THE CONTRACTOR WILL ENSURE THAT THE ESC PLAN IS PREPARED BY A QUALIFIED PROFESSIONAL.

D / c.02 PARKING LOT PAVING TYPICAL

NTS

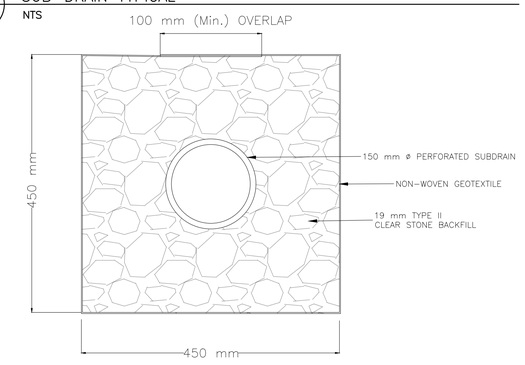


NOTES:

1. REMOVE ORGANIC MATERIALS AND THE CLAY FILL (IF ANY) BELOW THE FOOTPRINT OF THE PROPOSED PARKING AND ACCESS ROADS AREAS. CONSTRUCTION TRAFFIC SHOULD NOT BE PERMITTED ON THE SUBGRADE SOILS.
2. USE A FULLY-LOADED TANDEM TRUCK TO PROOF ROLL THE EXPOSED SUBGRADE AND IDENTIFY AREAS WITH LOW STRENGTH OR UNSUITABLE SOILS.
3. REMOVE UNSUITABLE SOFT SUBGRADE SOILS (SOFT SILT, TOPSOIL, ORGANICS, ETC.), IF ENCOUNTERED, AND REPLACE WITH OPSS GRANULAR B TYPE II SUB-BASE MATERIAL PLACED AND COMPACTED AS PER ONTARIO PROVICIAL STANDARDS AND SPECIFICATION (OPSS 314.07.05.02).
4. INSTALL CLASS II NON-WOVEN GEOTEXTILE AS A SEPARATION LAYER BETWEEN THE SUBGRADE AND OVERLYING GRANULAR FILL.
5. PLACE AND COMPACT GRANULAR B TYPE II SUB-BASE MATERIAL TO THE DESIGN ELEVATION FOR THE UNDERSIDE OF THE GRANULAR A BASE COURSE. PLACE THE GRANULAR B TYPE II SUB-BASE IN LIFTS NOT EXCEEDING 300 MM IN THICKNESS AND COMPACT EACH LIFT TO 100% OF THE SPMDD. PLACEMENT OF GRANULAR FILL SHOULD BE BY END DUMPING FROM THE EDGE OF THE EXCAVATION. THE GRANULAR FILL SHOULD BE PUSHED FORWARD AND LEVELED WITH A TRACK TYPE DOZER TO BUILD A THICKENED SECTION TO SUPPORT THE HAULING OPERATIONS AND AVOID DAMAGE TO THE GEOTEXTILE AND SUBGRADE SOILS.
6. PLACE AND COMPACT GRANULAR A BASE COURSE MATERIAL TO THE DESIGN ELEVATION IN ONE LIFT AND COMPACT TO 100% OF THE SPMDD.
7. PLACE HOT MIX BINDER AND SURFACE ASPHALT AND COMPACT TO 95% MARSHALL DENSITY

E / c.02 SUB-DRAIN TYPICAL

NTS



Stantec

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Notes

LEGEND

PROPOSED

- NEW BUILDING
- NEW ASPHALT PARKING LOT
- NEW LANDSCAPE AREA
- NEW CONCRETE SIDEWALK
- NEW MANHOLE
- NEW CATCH BASIN
- NEW FENCE
- NEW SANITARY SERVICE
- NEW WATER SERVICE
- NEW SWALE
- 340.161 DESIGNED GRADE
- 340.161 EXISTING GRADE

EXISTING FEATURES

- EXISTING CATCH BASIN
- EXISTING FIRE HYDRANT
- EXISTING WATER MAIN
- EXISTING HYDRO POLE
- EXISTING STORM WATER SERVICE
- EXISTING SANITARY SERVICE
- EXISTING WATER SERVICE
- EXISTING UNDERGROUND CABLE LINE

UPDATED FOR CONSTRUCTION	TR	AR	2021.01.29
ISSUED FOR CONSTRUCTION	TR	AR	2021.01.20
Issued	By	Appd	YYYY.MM.DD
File Name: 72065C_DD0011	TR	TR	LV	2020.09.30
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

LICENSED PROFESSIONAL ENGINEER
A. R. ROSE
100097916
1/29/2021
PROVINCE OF ONTARIO

Client/Project Logo

Client/Project
Hillside Construction

New 18-unit Apartment Building

814 Scott Street, Fort Frances ON

Title
NEW CIVIL SITE SERVICING PLAN

Project No. 129672065

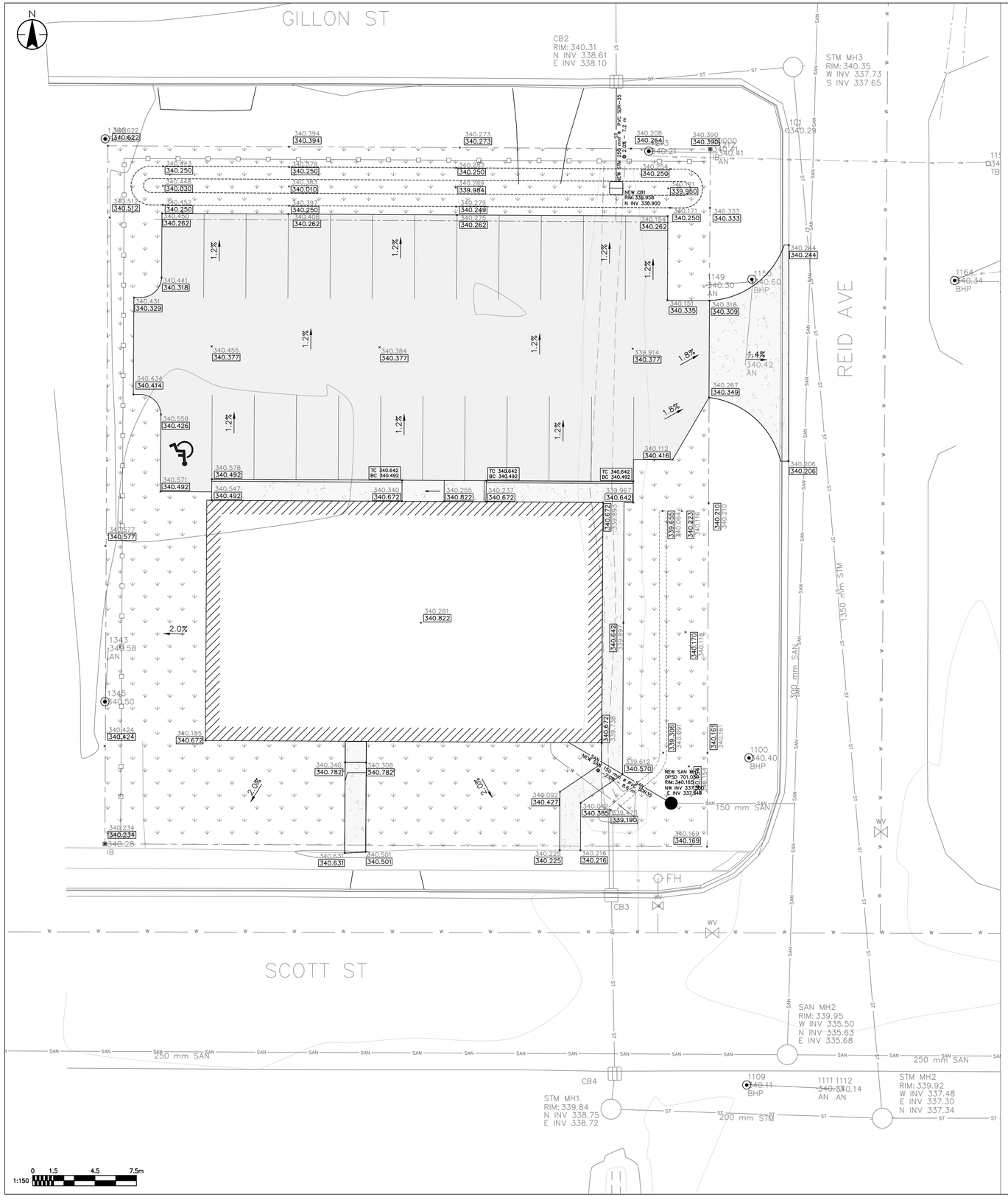
Scale

Revision 00

Sheet 02 of 03

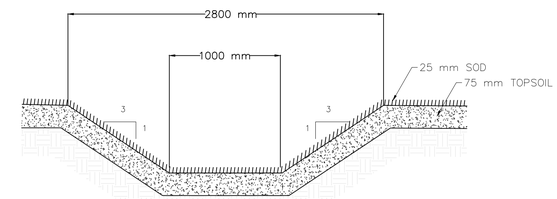
Drawing No. C.02

ORIGINAL SHEET - ARCH D



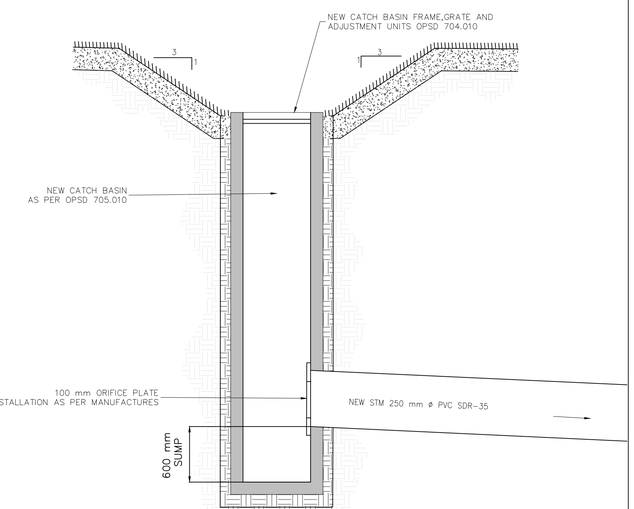
D / c.01 TYPICAL STORMWATER MANAGEMENT FACILITY

NTS



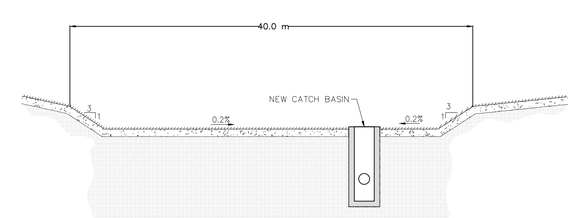
E / c.01 TYPICAL STORMWATER MANAGEMENT FACILITY CATCH BASIN OUTLET

NTS



F / c.01 TYPICAL STORMWATER MANAGEMENT FACILITY

NTS



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Notes

LEGEND

PROPOSED

- NEW BUILDING
- NEW ASPHALT PARKING LOT
- NEW LANDSCAPE AREA
- NEW CONCRETE SIDEWALK
- NEW MANHOLE
- NEW CATCH BASIN
- NEW FENCE
- NEW SANITARY SERVICE
- NEW WATER SERVICE
- NEW SWALE
- 340.161 DESIGNED GRADE
- 340.161 EXISTING GRADE

EXISTING FEATURES

- EXISTING CATCH BASIN
- EXISTING FIRE HYDRANT
- EXISTING WATER MAIN
- EXISTING HYDRO POLE
- EXISTING STORM WATER SERVICE
- EXISTING SANITARY SERVICE
- EXISTING WATER SERVICE
- EXISTING UNDERGROUND CABLE LINE

UPDATED FOR CONSTRUCTION	TR	AR	2021.01.29
ISSUED FOR CONSTRUCTION	TR	AR	2021.01.20
Issued	By	Appd	YYYY.MM.DD
File Name: 72065C_DD0011	TR	TR	LV	2020.09.30
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

LICENSED PROFESSIONAL ENGINEER
A. F. ROSE
100097516
1/29/2021
PROVINCE OF ONTARIO

Client/Project Logo

Client/Project
Hillside Construction

New 18-unit Apartment Building

814 Scott Street, Fort Frances ON

Title
GRADING PLAN AND STORMWATER MANAGEMENT PLAN

Project No. 129672065

Scale

Revision 00

Sheet 03 of 03

Drawing No. C.03

ORIGINAL SHEET - ARCH D

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Appendix E PCSWMM MODELLING RESULTS

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 1
Number of nodes 1
Number of links 0
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
10_year	10_year	INTENSITY	15 min.
100_year	100_year	INTENSITY	15 min.
2_year	2_year	INTENSITY	15 min.
25_year	25_year	INTENSITY	15 min.
29_mm	29_mm	INTENSITY	15 min.
5_year	5_year	INTENSITY	15 min.
50_year	50_year	INTENSITY	15 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	3.60	137.00	0.00	1.5000	100_year	OF1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	

```
*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 02/04/2020 00:00:00
Ending Date .............. 02/05/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.421       117.000
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.154        42.813
Surface Runoff ...........         0.234        64.945
Final Storage ............         0.034         9.310
Continuity Error (%) .....        -0.058


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.234         2.337
Groundwater Inflow .......         0.000         0.000
```

RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.234	2.337
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	117.00	0.00	0.00	42.81	64.94	2.34	0.25	0.555

Analysis begun on: Fri Oct 16 12:21:59 2020
Analysis ended on: Fri Oct 16 12:21:59 2020
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
Element Count
****
Number of rain gages 7
Number of subcatchments ... 3
Number of nodes 5
Number of links 2
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
10_year	10_year	INTENSITY	15 min.
100_year	100_year	INTENSITY	15 min.
2_year	2_year	INTENSITY	15 min.
25_year	25_year	INTENSITY	15 min.
29_mm	29_mm	INTENSITY	15 min.
5_year	5_year	INTENSITY	15 min.
50_year	50_year	INTENSITY	15 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	2.20	137.00	65.00	1.5000	100_year	SU1
202	0.12	68.00	38.00	1.5000	100_year	OUT_202
203	0.10	68.00	77.00	1.5000	100_year	OUT_203

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow

```
--------------------------------------------------------------------------
OUT_201_1            OUTFALL            186.58      0.00       0.0
OUT_201_2            OUTFALL            186.58      0.00       0.0
OUT_202              OUTFALL              0.00      0.00       0.0
OUT_203              OUTFALL              0.00      0.00       0.0
SU1                  STORAGE            186.43      0.30       0.0


************
Link Summary
************
Name              From Node        To Node          Type            Length    %Slope Roughness
-------------------------------------------------------------------------------------------------
OR1               SU1              OUT_201_1        ORIFICE
W1                SU1              OUT_201_2        WEIR


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit           Shape               Depth     Area     Rad.    Width  Barrels     Flow
-----------------------------------------------------------------------------------------



*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
```

```
Starting Date ............ 02/04/2020 00:00:00
Ending Date .............. 02/05/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.282       117.000
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.037        15.203
Surface Runoff ...........         0.240        99.216
Final Storage ............         0.007         3.027
Continuity Error (%) .....        -0.381

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.239         2.394
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.164         1.635
Flooding Loss ............         0.028         0.278
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.048         0.481
Continuity Error (%) .....        -0.007

***************************
Time-Step Critical Elements
***************************
None
```

```
********************************
Highest Flow Instability Indexes
********************************
All links are stable.
```

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
```

```
****************************
Subcatchment Runoff Summary
****************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	117.00	0.00	0.00	14.85	99.57	2.19	0.73	0.851
202	117.00	0.00	0.00	26.21	87.70	0.10	0.05	0.750
203	117.00	0.00	0.00	9.71	105.42	0.10	0.04	0.901

```
******************
Node Depth Summary
******************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OUT_201_1	OUTFALL	0.00	0.00	186.58	0 00:00	0.00
OUT_201_2	OUTFALL	0.00	0.00	186.58	0 00:00	0.00
OUT_202	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OUT_203	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	0.14	0.30	186.73	0 11:53	0.30

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OUT_201_1	OUTFALL	0.000	0.010	0 11:53	0	0.0656	0.000
OUT_201_2	OUTFALL	0.000	0.211	0 11:53	0	1.36	0.000
OUT_202	OUTFALL	0.045	0.045	0 12:00	0.104	0.104	0.000
OUT_203	OUTFALL	0.038	0.038	0 12:00	0.101	0.101	0.000
SU1	STORAGE	0.732	0.732	0 12:00	2.19	2.19	-0.007

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
SU1	0.26	0.511	0 12:00	0.278	0.000

****
Storage Volume Summary
****

	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum

Storage Unit	Volume 1000 m3	Pcnt Full	Pcnt Loss	Pcnt Loss	Volume 1000 m3	Pcnt Full	Occurrence days hr:min	Outflow CMS
SU1	0.330	46	0	0	0.723	100	0 11:53	0.221

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OUT_201_1	51.70	0.001	0.010	0.066
OUT_201_2	51.74	0.031	0.211	1.365
OUT_202	95.76	0.001	0.045	0.104
OUT_203	95.78	0.001	0.038	0.101
System	73.74	0.034	0.304	1.635

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OR1	ORIFICE	0.010	0 11:53			0.50
W1	WEIR	0.211	0 11:53			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								

```
*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Fri Jan 22 13:31:19 2021
Analysis ended on:  Fri Jan 22 13:31:20 2021
Total elapsed time: 00:00:01
```