FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

20 SCOTT STREET

TOWN OF GRAND VALLEY
DUFFERIN COUNTY

PREPARED FOR:

HRYCYNA LAW GROUP

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC.
2800 HIGH POINT DRIVE, SUITE 100
MILTON, ON L9T 6P4

OCTOBER 2019

CFCA FILE NO. 1559-5037

CROZIER
CONSULTING ENGINEERS

Revision Number	Date	Comments
Rev.0	March 2019	Issued for First Submission
Rev.1	October 2019	Issued for Second Submission

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Hrycyna Law Group (Owner) to prepare a Functional Servicing & Preliminary Stormwater Management Report to support the Draft Plan Application to permit the residential development at 20 Scott Street in the Town of Grand Valley in Dufferin County.

This report is the second submission and offers additional details related to the first submission comments and subsequent design updates. The purpose of this report is to demonstrate that the proposed Site can be developed in accordance with the Town of Grand Valley guidelines from a servicing & stormwater management perspective.

The following reports and design standards were referenced during the preparation of this report:

- Town of Grand Valley Engineering Standards, updated May 2016
- Grand Valley Master Servicing Plan Update, RJ Burnside, dated May 2014
- MOE Design Requirements for Drinking-Water Systems, dated 2008
- Meritech Servicing Brief, 20 Scott Street, dated June 2018
- Geotechnical Investigation, Proposed Townhouse Development, 20 Scott Street, Chung & Vander Doelen, dated January 3, 2018
- Functional Servicing and Preliminary Stormwater Management Report, C.F. Crozier, dated March 2019
- Stormwater Management Technical Memo, C.F. Crozier, dated July 7, 2019 (Appendix D)

2.0 Site Description

The subject property is approximately 1.22 ha and currently consists of a single residential dwelling, ancillary building, driveway landscaped areas, and tree cover. The property is located in a residential neighbourhood and is bounded by existing residential dwellings to the north and east, Scott Street to the south and Crozier Street to the west. The site consists of steeply sloping topography extending from the west side of Crozier Street towards Scott Street.

The elements envisioned for this development based on the Site Plan prepared by Cube Architects (Drawing A001, August 8, 2019) include:

- 14 condominium townhouse units
- 9 condominium single detached units
- Internal private condominium road network
- Associated parking and landscaped areas
- 2 freehold detached dwellings fronting Scott Street
- Temporary stormwater management block (future freehold lot)

3.0 Water Servicing

The following sections outline the existing and proposed water servicing infrastructure and preliminary water demands.

3.1 Existing Water Servicing

As-constructed drawings for Scott Street and surrounding roads were obtained from the Town of Grand Valley. A review of as-constructed drawing M-796-25/P21 dated July 1996 indicates that:

- An existing 150 mm diameter watermain is located along Scott Street, which connects to Crozier Street to the west and Bielby Street to the east. The 150 mm diameter watermain services the existing residential dwellings along Scott Street.
- An existing fire hydrant is located near the existing Site entrance, directly adjacent to the proposed development. This hydrant will be required to be relocated as part of the development.

Refer to Appendix A for the referenced as-built drawings.

3.2 Design Water Demand

The proposed domestic water demand was estimated using the following documents:

- Town of Grand Valley Engineering Standards, updated May 2016
- Grand Valley Master Servicing Plan Update, RJ Burnside, dated May 2014
- MOECP Design Requirements for Drinking-Water Systems, dated 2008

An average daily water demand of 339 L/capita/day was used with an occupancy density of 4 persons/unit for the 23 proposed units. The estimated domestic water demand design flows are presented in Table 1, with supporting calculations provided in Appendix B.

Table 1: Estimated Domestic Design Water Demand

Standard	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Peak Hourly Demand (L/s)
Town of Grand Valley	0.41	1.0	1.5

3.3 Proposed Water Servicing

The development is proposed to be serviced by a 150 mm diameter watermain and two internal fire hydrants – one at the north end of the internal road near townhouse unit 14 and one at the end of the internal cul-de-sac. We understand the feasibility of connecting townhouse units 11 to 14 to the existing watermain within Crozier Street will be evaluated during detailed design. Alternatively, a flushing system could be constructed in this location to eliminate concerns of standing water in the system at the dead end.

The proposed 150 mm diameter watermain will connect to the existing 150 mm diameter watermain within Scott Street. Burnside completed a review and analysis of the existing Town water model and system, including the addition of the proposed site demands. The proposed watermain is required to loop back to Scott Street through the existing 6.0 m wide servicing easement along the east property limit as a result of this analysis. The proposed watermain layout is shown on the Preliminary Servicing Plan, Figure 1.

The three freehold lots adjacent to Scott Street are proposed to be serviced with individual water connections to the existing 150 mm diameter watermain.

4.0 Sanitary Servicing

The following sections outline the existing and proposed sanitary servicing infrastructure and preliminary sanitary design flows.

4.1 Existing Sanitary Servicing

As-constructed drawings for Scott Street and surrounding roads were obtained from the Town of Grand Valley. A review of Town of Grand Valley as-constructed drawings M-796-25/P21 and M-796-24/P20 in addition to the Master Servicing Plan, indicate that:

- A 200 mm diameter sanitary sewer runs from east to west within Scott Street, which receives flows from the existing residential dwellings along Scott Street, including the existing dwelling at 20 Scott Street.
- Sanitary flows collected within the Scott Street sewer drain to an existing maintenance hole, located adjacent to the Site. These flows are conveyed south through an existing easement to the 200 mm diameter sanitary sewer within Grier Street to the south.

4.2 Design Sanitary Flow

The Town of Grand Valley Design Criteria were referenced to calculate sanitary design flows for the proposed development. A unit sewage flow of 450 L/capita/day was used with an occupancy density of 4 persons/unit for the 26 units in the proposed development. Infiltration flow and a peaking factor was applied to the unit sewage flow to obtain the total estimated design sewage flow. The estimated domestic sanitary demand design flows are presented in Table 2, with supporting calculations provided in Appendix B.

Table 2: Estimated Sanitary Design Flows

Average Flow (L/s)	**Peaking Factor**	**Peak Flow** (L/s)	**Infiltration Flow** (L/s)	**Total Flow** (L/s)
0.54	4.0	2.2	0.22	2.4

4.3 Proposed Sanitary Servicing

The development is proposed to be serviced by the existing 200 mm diameter sanitary sewer on Scott Street. The sanitary sewer will extend from the existing maintenance hole with a minimum slope of 1% to a property line sanitary maintenance hole within the proposed private roadway. The proposed sanitary service will be designed per the Town standards.

The three freehold lots adjacent to Scott Street are proposed to be serviced with individual sanitary connections to the existing 200 mm diameter sanitary sewer.

The Preliminary Servicing Plan (Figure 1) illustrates the location of the sanitary sewer and all connections.

It is our understanding based on discussions with the Town and Burnside that the existing municipal infrastructure and downstream treatment system has capacity to support the proposed development, without any required external improvements.

5.0 Existing Drainage Conditions

The following sections outline the existing drainage conditions for the site, including contributing external flows to the Site.

5.1 Existing Site Drainage Conditions

The 1.22 ha Site currently consists of trees, grassed areas and a single residential dwelling. There is no existing stormwater management infrastructure within the Site.

The topographic surveys provided by Van Harten Surveying Inc., dated December 7, 2018 indicates that the majority of the site (Catchment 101, 1.22 ha) drains from northwest to southeast towards Scott Street and the low-lying area in the southeast portion of the Site. The survey also shows an existing low-lying depressional area in the northeast portion of the Site and on neighbouring lands where a small portion of the Site drains. Crozier Staff completed a site walk for the property and confirmed these drainage patterns.

Refer to Figure 3 for pre-development drainage catchments.

5.2 Crozier Street External Drainage

There is an existing municipal storm drainage Block located adjacent to the north limits of the Site. This municipal drainage Block contains an existing stormwater conveyance system. The storm sewer and ditch convey municipal storm drainage from Crozier Street east, towards a low point on the adjacent private lands. The private lands are owned by Thomasfield Homes Ltd. and are proposed for future residential development.

Approximately 0.13 ha (Catchment EXT_1) of Crozier Street right-of-way adjacent to the Site contributes municipal stormwater runoff to the Site under existing conditions, as shown on Figure 3. Stormwater runoff flows overland along Crozier Street and discharges down the steep slope adjacent to the site, ultimately draining to a low point within Scott Street, located near the south east corner of the Site.

5.3 Scott Street External Drainage

An external area of Scott Street adjacent to the Site, consisting of residential front yards and the Scott Street right-of-way, drain overland to the existing low point on Scott Street. This stormwater will either infiltrate or spill overland onto adjacent properties.

It is our understanding that an existing storm drainage system and legal outlet does not exist for the Scott Street drainage. Crozier completed a hydrologic investigation to determine the existing ponding limits within the Site and adjacent private lands as a result of no drainage outlet within Scott Street. A Stormwater Management Technical Memo (Crozier, July 5, 2019) was submitted under separate cover and is appended to this report. Please refer to Appendix D for this memo and additional information regarding the existing ponding conditions.

A gravity storm sewer outlet for Scott Street is required for the existing drainage and would ultimately be considered in future conditions. The Owner and their consulting team is currently working with the Town on this matter.

5.4 Adjacent Residential External Drainage

There is an existing catchbasin on Scott Street located at this low point, which currently does not have a legal outlet. Under existing conditions, stormwater ponds above the existing catchbasin, and either infiltrates over time or spills overland onto adjacent properties.

A small 0.07 ha drainage catchment (Catchment EXT_2) of private lawn property adjacent to the eastern Site limits contributes runoff to the Site. This runoff drains onto the Site, ponds and infiltrates under existing conditions.

6.0 Proposed Drainage Conditions

Under proposed conditions, the Site is separated into northern and southern drainage catchments. The northern Catchment 201(0.79 ha), drains from south west to north east discharging into the existing municipal ditch north east of the Site. Runoff from Catchment 201 is collected and conveyed by the Site's internal storm sewer system located along the internal road network and will discharge to the existing municipal drainage ditch to the northeast. Stormwater runoff generated from Catchment 201 is primarily from the majority of the internal roadway and clean rooftops and lot lawn areas.

Given that the existing municipal drainage ditch outlets to the private lands owned by Thomasfield Developments, a formal Temporary Storm Drainage Easement will be required between Thomasfield, the Town of Grand Valley and Hrycyna Law Group. A Letter of Understanding for the Temporary Storm Drainage Easement between Hrycyna Law Group and Thomasfield, dated February 5, 2019 has been prepared and authorized by the required parties until the formal drainage agreement is prepared. Upon ultimate build out of the residential development proposed by Thomasfield, stormwater drainage will be accommodated and conveyed through future storm drainage systems to the Grand River.

The runoff from the southern Catchment 202 (0.35 ha) generally sheet flows from north to southeast discharging to Scott Street and the low-lying area in the southeast portion of the Site, consistent with existing conditions. Stormwater runoff generated from Catchment 202 is primarily from a small portion of the internal condo road and clean rooftops and lot lawn areas.

Overall, the total area discharging to Scott Street from pre-development conditions is reduced by approximately 70%. Therefore, the proposed drainage pattern will significantly reduce contributing stormwater runoff to the existing low point on Scott Street as well as overland spills to adjacent properties. A summary of the change in land areas discharging to Scott Street is presented in Table 3 and Figure 3 illustrates the proposed drainage patterns.

Table 3: Drainage Area Comparison for Scott Street Outlet

Conditions	Impervious Area (ha)	Pervious Area (ha)	Total Area (ha)
Pre-Development[1]	0.06	1.29	1.35
Post-Development[2]	0.12	0.28	0.40

Note: 1) The total pre-development area contributing to Scott Street was determined by adding Catchment EXT_1 and Catchment 101.
2) The total post-development contributing area is represented by Catchment 202 and Catchment 203.

Conveyance of stormwater runoff from the majority of the Site (Catchment 201) will be provided through the internal storm sewer system (sized to convey the 100-year storm event). Storms greater than the 100-year rainfall event will be conveyed overland through the internal roadway to the proposed drainage swale between Lots 5 and 6 for the majority of Catchment 201, ultimately discharging to the existing municipal drainage ditch at the northeast corner of the Site.

The major overland flow route for Catchment 202 will drain towards the low-point within Scott Street, consistent with the minor drainage from the Site.

A small 0.05 ha drainage catchment consisting of landscaped area (Catchment 203) will drain uncontrolled to Crozier Street. Stormwater runoff from this catchment is considered negligible considering the proposed land use and small contributing area.

External catchments draining onto the site will continue to be collected and conveyed under proposed conditions.

7.0 Stormwater Management

Stormwater management design criteria was established with the Town of Grand Valley and Burnside. The Site is not regulated by the Grand River Conservation Authority and therefore their stormwater management criteria has not been applied. The stormwater management criteria for the Site include:

<u>Quantity Control</u>

- No quantity controls are required for the Site. Collection of runoff and conveyance of drainage to the Grand River is encouraged to beat the peak flows from upstream drainage areas.

<u>Quality Control</u>

- An enhanced level of water quality control is required (80% Total Suspended Solids removal).

The following sections outline the details associated with stormwater quantity and quality control for the Site.

7.1 Stormwater Quantity Control

A MIDUSS hydrologic model was prepared to determine the 100-year pre- and post-development peak flows as well as runoff volumes discharging into the ditch north east of the Site and to Scott Street from the Site. A summary of the peak flows and volumes is presented in Table 4 and detailed MIDUSS model results are provided in Appendix C.

Table 4: Pre-Development and Post-Development Site Peak Flows and Volumes (100-Year Storm)

Outlet	Pre-Development		Post-Development	
	Peak Flow (L/s)	**Runoff Volume** (m^3)	**Peak Flow** (L/s)	**Runoff Volume** (m^3)
Scott Street	351	719	122	244
Ex. Municipal Ditch	0	0	328	547

Note: 1) Refer to Figure 3 for the pre-development and post-development catchments contributing to each outlet.

As indicated in Table 5, contributing peak flow and runoff volume to Scott Street is reduced by approximately 66% and 65%, respectively under post-development conditions. This solution ultimately improves upon the existing conditions by providing a net-reduction in overall contributing stormwater, which will reduce the frequency of nuisance ponding within the area of the existing low-lying area of Scott Street.

In addition to the proposed Scott Street drainage improvements, Crozier prepared and submitted a Stormwater Management Technical Memo outlining an interim infiltration design to accommodate the remaining stormwater runoff volume from the proposed development. This solution proposes to use one of the proposed freehold lots on Scott Street as an infiltration gallery to further improve drainage conditions under development. While this report proposes the interim infiltration design as a viable solution, we understand that Hrycyna Law Group and the Town of Grand Valley are working collaboratively to review this proposed interim solution and a permanent gravity storm sewer solution. Refer to Appendix D for the supporting Stormwater Management Technical Memo for additional details.

The temporary drainage agreement with Thomasfield will allow for the peak flow discharging from drainage Catchment 201 through the Thomasfield lands, to the Grand River. The stormwater flows from Catchment 201 will require a trapezoidal channel of minimum 1.0 m bottom width, 2.8 m top width and 0.3 m depth at a 0.3% slope to convey 351 L/s. Refer to the preliminary channel sizing sheet in Appendix C.

7.2 Stormwater Quality Control

To achieve the stormwater quality standards, an oil/grit separator (OGS) was sized to meet the enhanced level of water quality (80% Total Suspended Solids removal). A Stormceptor STC 1000 OGS or approved equivalent is proposed for the Site.

The OGS will be located downstream of the cul-de-sac and upstream of the ditch. A detailed report of the OGS sizing is provided in Appendix C and the location of the OGS is shown in the Preliminary Servicing Plan, Figure 1.

8.0 Erosion and Sediment Controls During Construction

Erosion and sediment controls will be installed prior to the beginning of any construction activities. They will be maintained until the Site is stabilized or as directed by the Site Engineer and/or Town of Grand Valley. Controls will be inspected after each significant rainfall event and maintained in proper working condition.

The following erosion and sediment controls will be included during construction on the Site:

Heavy Duty Silt Fencing

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

Rock Mud Mat

A rock mud mat will be installed at the entrance to the construction zone to prevent mud tracking from the Site onto surrounding lands and the perimeter roadway network. All construction traffic will be restricted to this access only.

Silt Sacks in Catch Basins

Silt Sacks shall be installed in all new catch basins until the finished surfaces are stabilized.

9.0 Conclusions

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

1. Water servicing for the Site will be provided through a new looped connection to the existing 150 mm diameter watermain on Scott Street.

2. Sanitary servicing will be provided through a new connection to the existing 200 mm diameter sanitary sewer on Scott Street.

3. Individual water and sanitary services will be provided from Scott Street for the three freehold units.

4. The proposed development will be designed such that the drainage area discharging to Scott Street will be reduced by approximately 70%. The remaining 30% will be directed to a proposed interim stormwater management infiltration system to improve the existing drainage issues on Scott Street.

5. The majority of the Site's stormwater runoff will discharge into the existing municipal ditch north east of the Site and will be conveyed to the adjacent private lands and ultimately to the Grand River.

6. An agreement and drainage easement between the Owner and adjacent private land owners is required for the proposed stormwater drainage outlet for the Site.

7. Stormwater quality control will be provided through an oil-grit separator (STC 1000 or approved equivalent) which will treat runoff prior to discharging to the municipal ditch.

8. Erosion and sediment controls will be implemented on-site prior to construction and maintained during construction. A sediment and erosion control plan will be developed during the detailed design process.

Therefore, we conclude that the proposed development meets the requirements of the Town of Grand Valley from a site servicing perspective.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Brendan Walton, E.I.T.
Land Development

C.F. CROZIER & ASSOCIATES INC.

Jurgen Koehler, P.Eng.
Associate

C.F. CROZIER & ASSOCIATES INC.

K.J. Firth, P.Eng.
Partner

BW/kb

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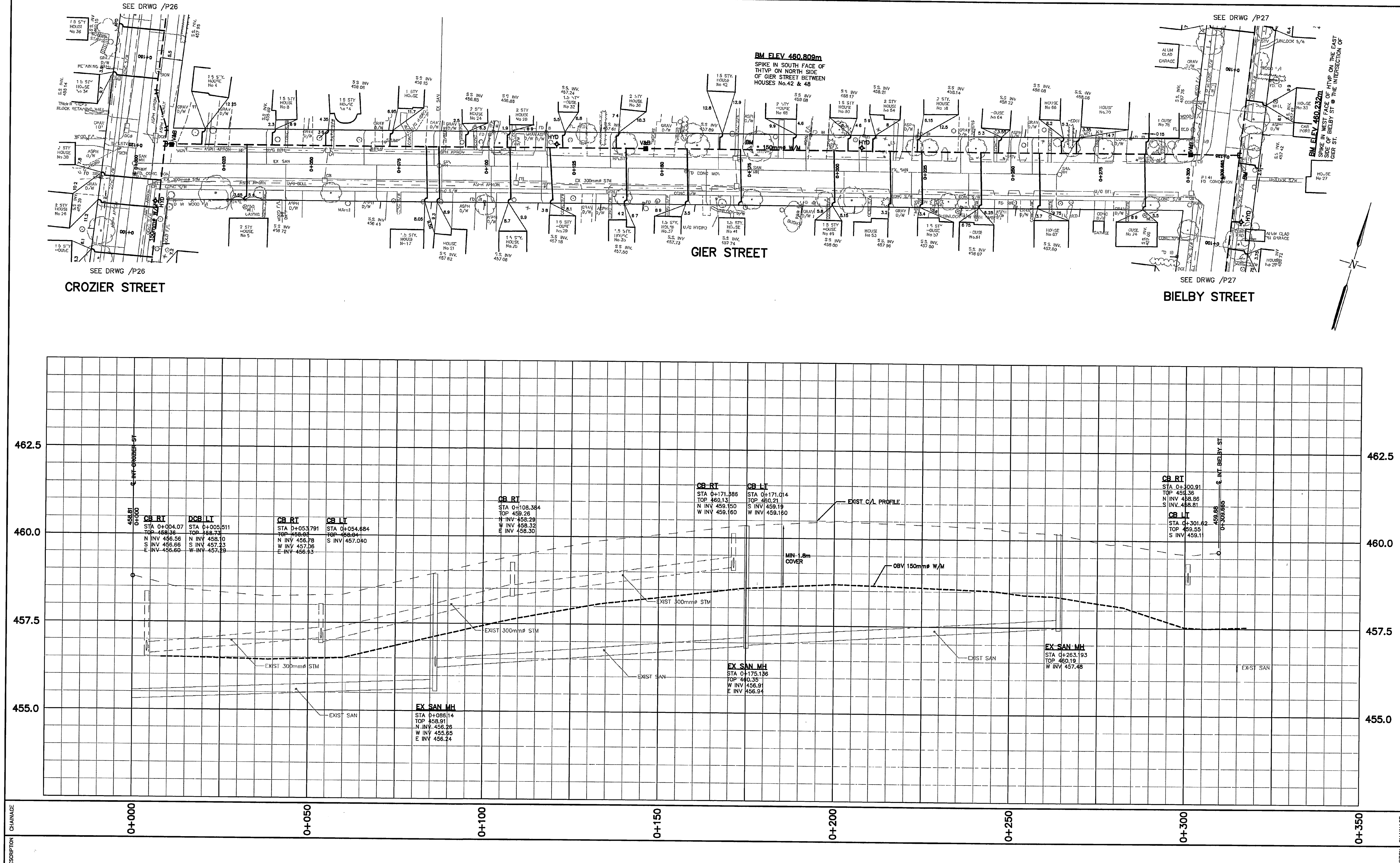
APPENDIX A

Reference Material



NOTES

LICENSED PROFESSIONAL ENGINEER — M.K. O'HARA — 23/01/97 — PROVINCE OF ONTARIO

NO.	REVISIONS	DATE	APP'D
1	WATERMAIN AND ASSOCIATED APPURTENANCES AS PER ADDENDUM No. 3	11/93	M.K.O.
2	STREET NAMES ADDED	11/93	M.K.O.
3	HYDRANT FROM STA 0+299 (GIER ST) TO STA 0+107 (BIELBY ST)	11/93	M.K.O.
4	W/M ROAD CROSSING FROM STA 0+303 TO STA 0+316	11/93	M.K.O.
5	REVISED' AS CONSTRUCTED'	05/95	M.K.O.

COMMUNAL WATER SUPPLY SYSTEM

MOEE PROJECT N° 41-3011-01

CONTRACT N° 5

CLIENT

VILLAGE OF GRAND VALLEY

BOX 249, 5 MAIN STREET NORTH, GRAND VALLEY LON 1G0

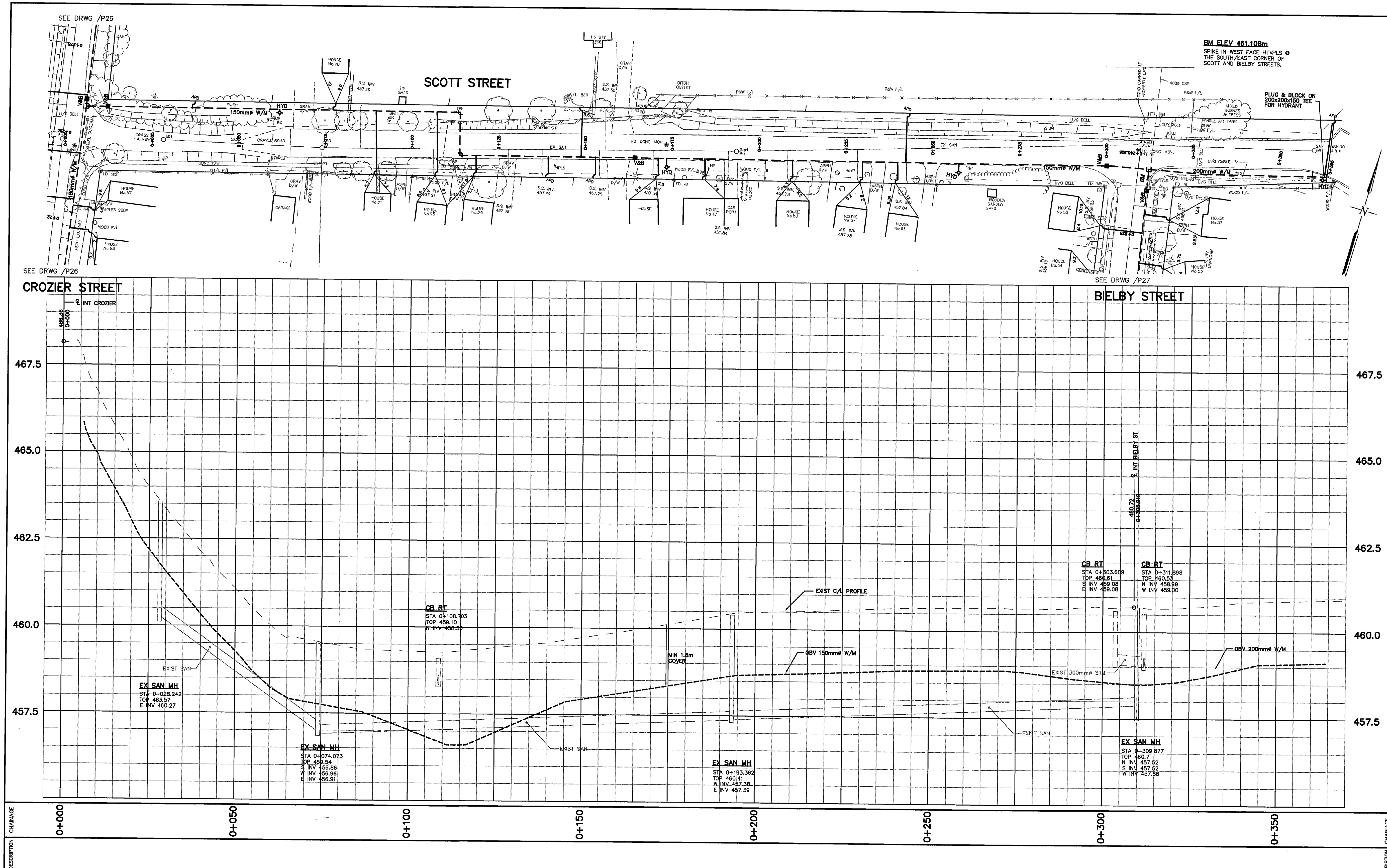
R.J. BURNSIDE & ASSOCIATES LTD.
CONSULTING MUNICIPAL ENGINEERS & PLANNERS
15 TOWNLINE, ORANGEVILLE, ONTARIO L9W 3R4

TITLE

PLAN & PROFILE
GIER STREET
0+000 to 0+309.665

DRAWN C.G.HUNTER	DRAWING NO. M-796-24/P20
DESIGNED D.G.HOWELLS	SCALE HORIZ. 1:500 VERT. 1:50
DATE OCT 1993	ISSUED

M796P20.DWG



NOTES

M.K. O'HARA — LICENSED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO — 23/01/97

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3	REVISED 'AS CONSTRUCTED'	05/95	M.K.O.

COMMUNAL WATER SUPPLY SYSTEM

MOEE PROJECT N° 41-3011-01

CONTRACT N° 5

CLIENT
VILLAGE OF GRAND VALLEY
BOX 249, 5 MAIN STREET NORTH, GRAND VALLEY L0N 1G0

TITLE
PLAN & PROFILE
SCOTT STREET
0+000 to 0+365

R.J. BURNSIDE & ASSOCIATES LTD.
CONSULTING MUNICIPAL ENGINEERS & PLANNERS
15 TOWNLINE, ORANGEVILLE, ONTARIO L9W 3R4

DRAWN: C.G.HUNTER	DRAWING NO. M-796-25/P21
DESIGNED: D.G.HOWELLS	SCALE: HORIZ. 1:500, VERT. 1:50
DATE: OCT 1993	ISSUED

M796P21.DWG

APPENDIX B

Water and Sanitary Calculations

CROZIER CONSULTING ENGINEERS

Project: 20 Scott Street
Project No.: 1559-5037

Created By: BW/CK
Checked By: JRK

Date: 2019-02-24
Updated: 2019-10-07

Domestic Water Demand Calculations

Notes & References

Population Estimate

Site Area:	1.12	ha	
Population Density:	4	persons/unit	Section 2.3, Town of Grand Valley Engineering Standards (2016)
Number of units:	26		
Population:	**104**		

Design Parameters

Average Day Demand (L/cap/d)
339

Section 3.7, Town of Grand Valley Engineering Standards (2016)

Historical demand from Grand Valley Master Servicing Plan Update, RJ Burnside, pg. 3 (2014)

Water Demand

Average Day Demand =	35,256	L/day	Average Day Demand (L/d) = Average Day Demand (L/cap/d) * population
	0.41	L/s	

Peaking Factors

Max Day =	2.5	Section 3.4.2, MOE Design Requirements for Drinking-Water Systems (2008)
Peak Hour =	3.8	

Average Day =	0.41	L/s	
Max Day =	**1.02**	L/s	Max Day = Average Day Demand * Max Day
Peak Hour =	**1.53**	L/s	Peak Hour = Average Day Demand * Peak Hour

Summary Table

Average Daily Water Demand (L/s)	**Max Day Demand** (L/s)	**Peak Hourly Demand** (L/s)
0.41	1.02	1.53

CROZIER CONSULTING ENGINEERS

Project: 20 Scott Street
Project No.: 1559-5037
Created By: CK
Checked By: BW/JRK
Date: 2019-02-25
Updated: 2019-10-07

Domestic Sanitary Design Flow Calculations

			Notes & References
Population Estimate			
Site Area:	1.12	ha	
Population Density:	4	persons/unit	Section 2.3, Town of Grand Valley Engineering Standards (2016)
Number of units:	26		
Population:	**104**		
Design Parameters			Section 2.3, Town of Grand Valley Engineering Standards (2016)

Average Daily Flow (L/cap/d)
450

Sanitary Design Flow			
Average Daily Flow =	46800	L/d	Average Daily Flow = Average Daily Flow (L/cap/d) * population / 86400
Average Daily Flow =	**0.54**	L/s	
Harmon Peak Factor, M =	**4.00**		$M = 1 + 14 / (4 + (p/1000)^{0.5})$, Maximum = 4.0 Section 2.5, Town of Grand Valley Engineering
Peak Flow =	**2.17**	L/s	Peak Flow = Average Daily Flow * M
Infiltration =	0.20	L/ha/s	Section 2.4, Town of Grand Valley Engineering Standards (2016)
Total Infiltration =	**0.22**	L/s	
Total Peak Flow =	**2.39**	L/s	Total Peak Flow = Peak Flow + Total Infiltration

Summary Table

Average Daily Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration Flow (L/s)	Total Peak Flow (L/s)
0.54	4.00	2.17	0.22	2.39

APPENDIX C

Stormwater Management Calculations

Pre-Development 100 Year MIDUSS Model

```
                     100yr 20 Scott St pre development 3hr CHI g
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                  C:\Users\milton.swm\Desktop\Other\"
"                                        MIDUSS Files\20 Scott St\Preliminary Model"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4483.750   Coefficient A"
"       20.560   Constant B"
"        0.937   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           215.158    mm/hr"
"             Total depth                  93.661    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1"
"            2   Rectangular"
"            1   Equal length"
"            1   SCS method"
"            1   (#EXT 1) External Catchment West of Site"
"       31.700   % Impervious"
"        0.130   Total Area"
"      123.800   Flow length"
"       45.200   Overland Slope"
"        0.089   Pervious Area"
"      123.800   Pervious length"
"       45.200   Pervious slope"
"        0.041   Impervious Area"
"      123.800   Impervious length"
"       45.200   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       80.000   Pervious SCS Curve No."
"        0.551   Pervious Runoff coefficient"
"        0.079   Pervious Ia/S coefficient"
"        5.016   Pervious Initial abstraction"
"        0.013   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.937   Impervious Runoff coefficient"
"        0.193   Impervious Ia/S coefficient"
"        1.000   Impervious Initial abstraction"
"                    0.046     0.000     0.000     0.000 c.m/sec"
"             Catchment 1            Pervious   Impervious Total Area "
"             Surface Area           0.089      0.041      0.130      hectare"
"             Time of concentration  10.127     1.385      6.273      minutes"
```

```
"              Time to Centroid       98.769     84.871     92.641     minutes"
"              Rainfall depth         93.661     93.661     93.661     mm"
"              Rainfall volume        83.16      38.60      121.76     c.m"
"              Rainfall losses        42.014     5.909      30.569     mm"
"              Runoff depth           51.647     87.752     63.092     mm"
"              Runoff volume          45.86      36.16      82.02      c.m"
"              Runoff coefficient     0.551      0.937      0.674      "
"              Maximum flow           0.031      0.024      0.046      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.046     0.046     0.000     0.000"
" 33           CATCHMENT 101"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           101   Catchment 101"
"         2.200   % Impervious"
"         1.220   Total Area"
"        44.600   Flow length"
"        10.700   Overland Slope"
"         1.193   Pervious Area"
"        44.600   Pervious length"
"        10.700   Pervious slope"
"         0.027   Impervious Area"
"        44.600   Impervious length"
"        10.700   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        80.000   Pervious SCS Curve No."
"         0.550   Pervious Runoff coefficient"
"         0.079   Pervious Ia/S coefficient"
"         5.016   Pervious Initial abstraction"
"         0.013   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.916   Impervious Runoff coefficient"
"         0.193   Impervious Ia/S coefficient"
"         1.000   Impervious Initial abstraction"
"                     0.323     0.046     0.000     0.000 c.m/sec"
"              Catchment 101          Pervious   Impervious Total Area "
"              Surface Area           1.193      0.027      1.220      hectare"
"              Time of concentration  8.457      1.156      8.193      minutes"
"              Time to Centroid       103.642    86.793     103.033    minutes"
"              Rainfall depth         93.661     93.661     93.661     mm"
"              Rainfall volume        1117.53    25.14      1142.67    c.m"
"              Rainfall losses        42.186     7.906      41.432     mm"
"              Runoff depth           51.476     85.755     52.230     mm"
"              Runoff volume          614.19     23.02      637.20     c.m"
"              Runoff coefficient     0.550      0.916      0.558      "
"              Maximum flow           0.316      0.014      0.323      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
```

```
"                    0.323     0.351     0.000     0.000"
" 33          CATCHMENT 2"
"             2   Rectangular"
"             1   Equal length"
"             1   SCS method"
"             2   (# EXT2) External Catchment East of Limits"
"         0.000   % Impervious"
"         0.090   Total Area"
"         4.140   Flow length"
"         9.600   Overland Slope"
"         0.090   Pervious Area"
"         4.140   Pervious length"
"         9.600   Pervious slope"
"         0.000   Impervious Area"
"         4.140   Impervious length"
"         9.600   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        80.000   Pervious SCS Curve No."
"         0.551   Pervious Runoff coefficient"
"         0.079   Pervious Ia/S coefficient"
"         5.016   Pervious Initial abstraction"
"         0.013   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.193   Impervious Ia/S coefficient"
"         1.000   Impervious Initial abstraction"
"                    0.031     0.351     0.000     0.000 c.m/sec"
"             Catchment 2            Pervious   Impervious Total Area "
"             Surface Area           0.090      0.000      0.090      hectare"
"             Time of concentration  2.099      0.287      2.099      minutes"
"             Time to Centroid       92.671     84.831     92.671     minutes"
"             Rainfall depth         93.661     93.661     93.661     mm"
"             Rainfall volume        84.29      0.00       84.30      c.m"
"             Rainfall losses        42.014     5.909      42.014     mm"
"             Runoff depth           51.647     87.752     51.647     mm"
"             Runoff volume          46.48      0.00       46.48      c.m"
"             Runoff coefficient     0.551      0.000      0.551      "
"             Maximum flow           0.031      0.000      0.031      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.031     0.374     0.000     0.000"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.031     0.000     0.000     0.000"
" 33          CATCHMENT 102"
"             2   Rectangular"
"             1   Equal length"
"             1   SCS method"
"           102   Area Outletting Towards Ditch"
"         0.000   % Impervious"
```

```
"        0.010   Total Area"
"        2.500   Flow length"
"       13.100   Overland Slope"
"        0.010   Pervious Area"
"        2.500   Pervious length"
"       13.100   Pervious slope"
"        0.000   Impervious Area"
"        2.500   Impervious length"
"       13.100   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       80.000   Pervious SCS Curve No."
"        0.551   Pervious Runoff coefficient"
"        0.079   Pervious Ia/S coefficient"
"        5.016   Pervious Initial abstraction"
"        0.013   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.193   Impervious Ia/S coefficient"
"        1.000   Impervious Initial abstraction"
"                        0.003     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.000      0.010      hectare"
"             Time of concentration  1.413      0.193      1.413      minutes"
"             Time to Centroid       92.491     84.831     92.491     minutes"
"             Rainfall depth         93.661     93.661     93.661     mm"
"             Rainfall volume        9.37       0.00       9.37       c.m"
"             Rainfall losses        42.014     5.909      42.014     mm"
"             Runoff depth           51.647     87.752     51.647     mm"
"             Runoff volume          5.16       0.00       5.16       c.m"
"             Runoff coefficient     0.551      0.000      0.551      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                        0.003     0.003     0.000     0.000"
```

Post-Development 100 Year Storm MIDUSS Model

```
                    100yr 20 Scott St post development 3hr CHI b
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                             Version 2.25  rev. 473"
"                MIDUSS created                                   February 7, 2010"
"           10   Units used:                                             ie METRIC"
"                Job folder:                 C:\Users\milton.swm\Desktop\Other\"
"                     MIDUSS Files\20 Scott St\Preliminary Model\2nd submission"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4483.750   Coefficient A"
"       20.560   Constant B"
"        0.937   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           215.158    mm/hr"
"             Total depth                  93.661    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1"
"            2   Rectangular"
"            1   Equal length"
"            1   SCS method"
"            1   (#EXT 1) West External Catchment Outletting to Catchment 201"
"        0.000   % Impervious"
"        0.030   Total Area"
"       50.000   Flow length"
"       10.000   Overland Slope"
"        0.030   Pervious Area"
"       50.000   Pervious length"
"       10.000   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       80.000   Pervious SCS Curve No."
"        0.551   Pervious Runoff coefficient"
"        0.079   Pervious Ia/S coefficient"
"        5.016   Pervious Initial abstraction"
"        0.013   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.193   Impervious Ia/S coefficient"
"        1.000   Impervious Initial abstraction"
"                     0.010     0.000     0.000     0.000 c.m/sec"
"             Catchment 1           Pervious   Impervious Total Area "
"             Surface Area          0.030      0.000      0.030      hectare"
"             Time of concentration 9.243      1.264      9.243      minutes"
```

```
"              Time to Centroid       98.041     84.850     98.041     minutes"
"              Rainfall depth         93.661     93.661     93.661     mm"
"              Rainfall volume        28.10      0.00       28.10      c.m"
"              Rainfall losses        42.014     5.909      42.014     mm"
"              Runoff depth           51.647     87.752     51.647     mm"
"              Runoff volume          15.49      0.00       15.49      c.m"
"              Runoff coefficient     0.551      0.000      0.551      "
"              Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                       0.010     0.010     0.000     0.000"
" 33           CATCHMENT 201"
"             2   Rectangular"
"             1   Equal length"
"             1   SCS method"
"           201   Area Outletting to Ditch"
"        51.000   % Impervious"
"         0.800   Total Area"
"        39.000   Flow length"
"         5.000   Overland Slope"
"         0.392   Pervious Area"
"        39.000   Pervious length"
"         5.000   Pervious slope"
"         0.408   Impervious Area"
"        39.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        80.000   Pervious SCS Curve No."
"         0.551   Pervious Runoff coefficient"
"         0.079   Pervious Ia/S coefficient"
"         5.016   Pervious Initial abstraction"
"         0.013   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.937   Impervious Runoff coefficient"
"         0.193   Impervious Ia/S coefficient"
"         1.000   Impervious Initial abstraction"
"                       0.337     0.010     0.000     0.000 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           0.392      0.408      0.800      hectare"
"              Time of concentration  9.803      1.340      4.397      minutes"
"              Time to Centroid       98.498     84.863     89.788     minutes"
"              Rainfall depth         93.661     93.661     93.661     mm"
"              Rainfall volume        367.15     382.14     749.29     c.m"
"              Rainfall losses        42.014     5.909      23.601     mm"
"              Runoff depth           51.647     87.752     70.061     mm"
"              Runoff volume          202.46     358.03     560.49     c.m"
"              Runoff coefficient     0.551      0.937      0.748      "
"              Maximum flow           0.135      0.240      0.337      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
```

```
                     100yr 20 Scott St post development 3hr CHI b
"                    0.337     0.344     0.000     0.000"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.337     0.000     0.000     0.000"
" 33         CATCHMENT 2"
"           2   Rectangular"
"           1   Equal length"
"           1   SCS method"
"           2   (#EXT 2) External Catchment on Western Property Limit Outletting to
203"
"       0.000   % Impervious"
"       0.090   Total Area"
"      25.000   Flow length"
"       2.000   Overland Slope"
"       0.090   Pervious Area"
"      25.000   Pervious length"
"       2.000   Pervious slope"
"       0.000   Impervious Area"
"      25.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      80.000   Pervious SCS Curve No."
"       0.551   Pervious Runoff coefficient"
"       0.079   Pervious Ia/S coefficient"
"       5.016   Pervious Initial abstraction"
"       0.013   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.000   Impervious Runoff coefficient"
"       0.193   Impervious Ia/S coefficient"
"       1.000   Impervious Initial abstraction"
"                    0.031     0.000     0.000     0.000 c.m/sec"
"            Catchment 2            Pervious   Impervious Total Area "
"            Surface Area           0.090      0.000      0.090      hectare"
"            Time of concentration  9.882      1.351      9.882      minutes"
"            Time to Centroid       98.560     84.865     98.560     minutes"
"            Rainfall depth         93.661     93.661     93.661     mm"
"            Rainfall volume        84.29      0.00       84.30      c.m"
"            Rainfall losses        42.014     5.909      42.014     mm"
"            Runoff depth           51.647     87.752     51.647     mm"
"            Runoff volume          46.48      0.00       46.48      c.m"
"            Runoff coefficient     0.551      0.000      0.551      "
"            Maximum flow           0.031      0.000      0.031      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.031     0.031     0.000     0.000"
" 33         CATCHMENT 202"
"           2   Rectangular"
"           1   Equal length"
"           1   SCS method"
"         202   Section Outletting to Scott St"
```

```
"       30.000   % Impervious"
"        0.350   Total Area"
"       58.200   Flow length"
"        5.000   Overland Slope"
"        0.245   Pervious Area"
"       58.200   Pervious length"
"        5.000   Pervious slope"
"        0.105   Impervious Area"
"       58.200   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       80.000   Pervious SCS Curve No."
"        0.551   Pervious Runoff coefficient"
"        0.079   Pervious Ia/S coefficient"
"        5.016   Pervious Initial abstraction"
"        0.013   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.937   Impervious Runoff coefficient"
"        0.193   Impervious Ia/S coefficient"
"        1.000   Impervious Initial abstraction"
"                     0.109     0.031     0.000     0.000 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.245      0.105      0.350      hectare"
"             Time of concentration  12.464     1.704      7.931      minutes"
"             Time to Centroid       100.805    84.953     94.126     minutes"
"             Rainfall depth         93.661     93.661     93.661     mm"
"             Rainfall volume        229.47     98.34      327.81     c.m"
"             Rainfall losses        42.014     5.909      31.182     mm"
"             Runoff depth           51.647     87.752     62.479     mm"
"             Runoff volume          126.54     92.14      218.68     c.m"
"             Runoff coefficient     0.551      0.937      0.667      "
"             Maximum flow           0.070      0.062      0.109      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.109     0.140     0.000     0.000"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.109     0.000     0.000     0.000"
" 33          CATCHMENT 203"
"            2   Rectangular"
"            1   Equal length"
"            1   SCS method"
"          203   Area Outletting to Crozier St"
"       10.000   % Impervious"
"        0.050   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.045   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
```

```
"        0.005   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       80.000   Pervious SCS Curve No."
"        0.551   Pervious Runoff coefficient"
"        0.079   Pervious Ia/S coefficient"
"        5.016   Pervious Initial abstraction"
"        0.013   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.937   Impervious Runoff coefficient"
"        0.193   Impervious Ia/S coefficient"
"        1.000   Impervious Initial abstraction"
"                      0.010     0.000     0.000     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.045      0.005      0.050      hectare"
"             Time of concentration  22.704     3.104      19.591     minutes"
"             Time to Centroid       109.518    85.613     105.722    minutes"
"             Rainfall depth         93.661     93.661     93.661     mm"
"             Rainfall volume        42.15      4.68       46.83      c.m"
"             Rainfall losses        42.014     5.909      38.403     mm"
"             Runoff depth           51.648     87.752     55.258     mm"
"             Runoff volume          23.24      4.39       27.63      c.m"
"             Runoff coefficient     0.551      0.937      0.590      "
"             Maximum flow           0.009      0.003      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                      0.010     0.010     0.000     0.000"
```

Worksheet for Site Outlet Channel to Thomasfield

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.30000	%
Normal Depth	0.30	m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	1.00	m

Results

Discharge	0.42	m^3/s
Flow Area	0.57	m^2
Wetted Perimeter	2.90	m
Hydraulic Radius	0.20	m
Top Width	2.80	m
Critical Depth	0.21	m
Critical Slope	0.01194	m/m
Velocity	0.74	m/s
Velocity Head	0.03	m
Specific Energy	0.33	m
Froude Number	0.52	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.30	m
Critical Depth	0.21	m
Channel Slope	0.30000	%

Worksheet for Site Outlet Channel to Thomasfield

GVF Output Data

Critical Slope	0.01194	m/m

Stormceptor®

FORTERRA

Detailed Stormceptor Sizing Report – 20 Scott St

Project Information & Location			
Project Name	20 Scott St	**Project Number**	1559-5037
City	Grand Valley	**State/ Province**	Ontario
Country	Canada	**Date**	2/25/2019
Designer Information		**EOR Information (optional)**	
Name	Chris Kwan	**Name**	
Company	C.F. Crozier and Associates	**Company**	
Phone #	905-875-0026	**Phone #**	
Email	ckwan@cfcrozier.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	20 Scott St
Recommended Stormceptor Model	STC 1000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	City of Toronto PSD
Rainfall Station	WATERLOO WELLINGTON A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary

Stormceptor Model	% TSS Removal Provided
STC 300	69
STC 750	78
STC 1000	80
STC 1500	80
STC 2000	83
STC 3000	85
STC 4000	88
STC 5000	88
STC 6000	90
STC 9000	93
STC 10000	93
STC 14000	95
StormceptorMAX	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	2980
Rainfall Station Name	WATERLOO WELLINGTON A	**Total Rainfall (mm)**	16119.1
Station ID #	9387	**Average Annual Rainfall (mm)**	474.1
Coordinates	43°27'N, 80°23'W	**Total Evaporation (mm)**	651.5
Elevation (ft)	1028	**Total Infiltration (mm)**	8452.0
Years of Rainfall Data	34	**Total Rainfall that is Runoff (mm)**	7015.6

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Stormceptor®

FORTERRA™

Drainage Area	
Total Area (ha)	0.84
Imperviousness %	47.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

City of Toronto PSD		
Particle Diameter (microns)	Distribution %	Specific Gravity
10.0	20.0	2.65
30.0	10.0	2.65
50.0	10.0	2.65
95.0	20.0	2.65
265.0	20.0	2.65
1000.0	20.0	2.65

Stormceptor® FORTERRA

Site Name	20 Scott St

Site Details

Drainage Area

Drainage Area	
Total Area (ha)	0.84
Imperviousness %	47.0

Surface Characteristics

Surface Characteristics	
Width (m)	183.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency	
Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Infiltration Parameters	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow	
Dry Weather Flow (lps)	0

Winter Months

Winter Months	
Winter Infiltration	0

TSS Loading Parameters

TSS Loading Parameters	
TSS Loading Function	

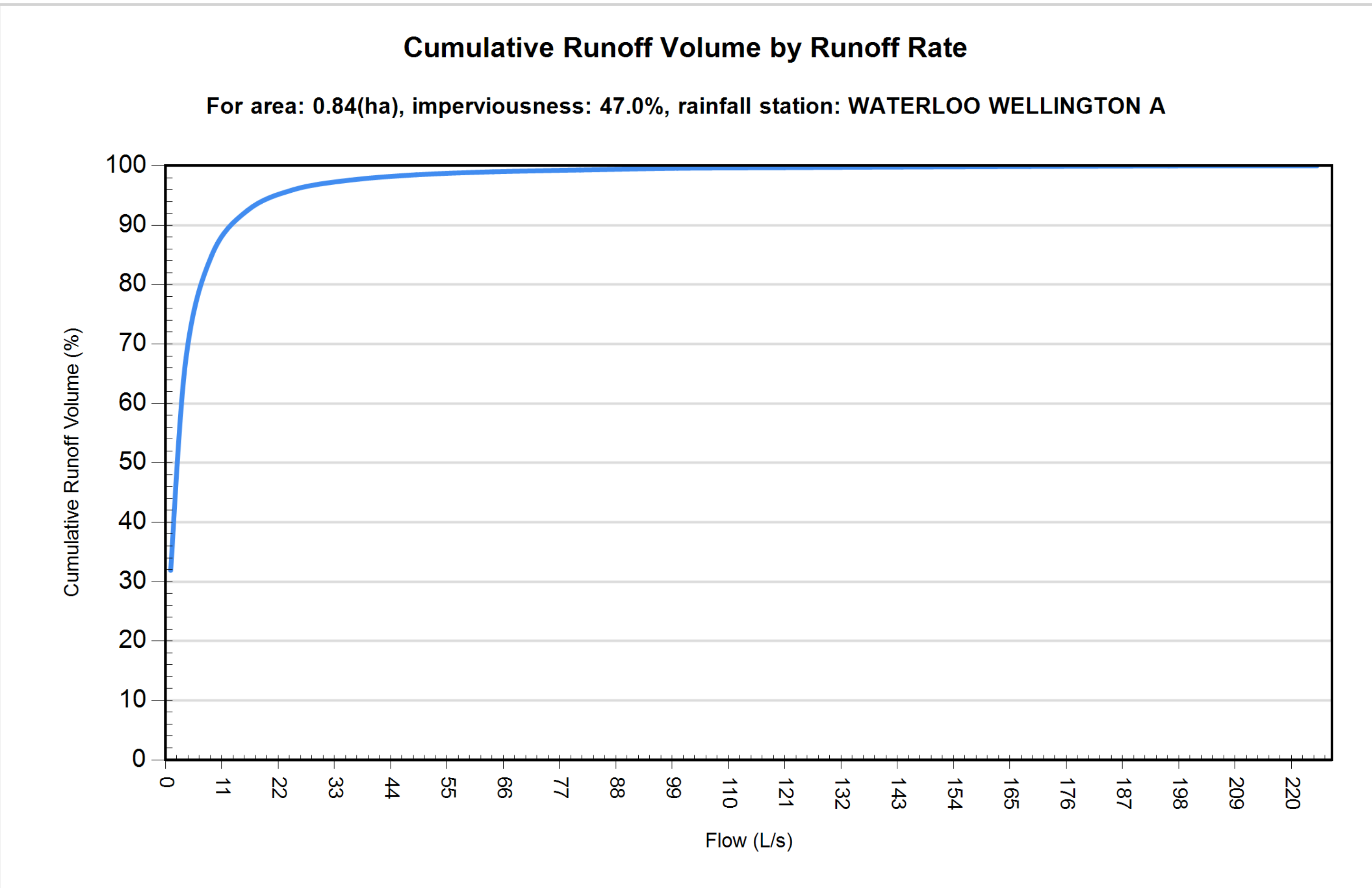
Buildup/Wash-off Parameters

Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

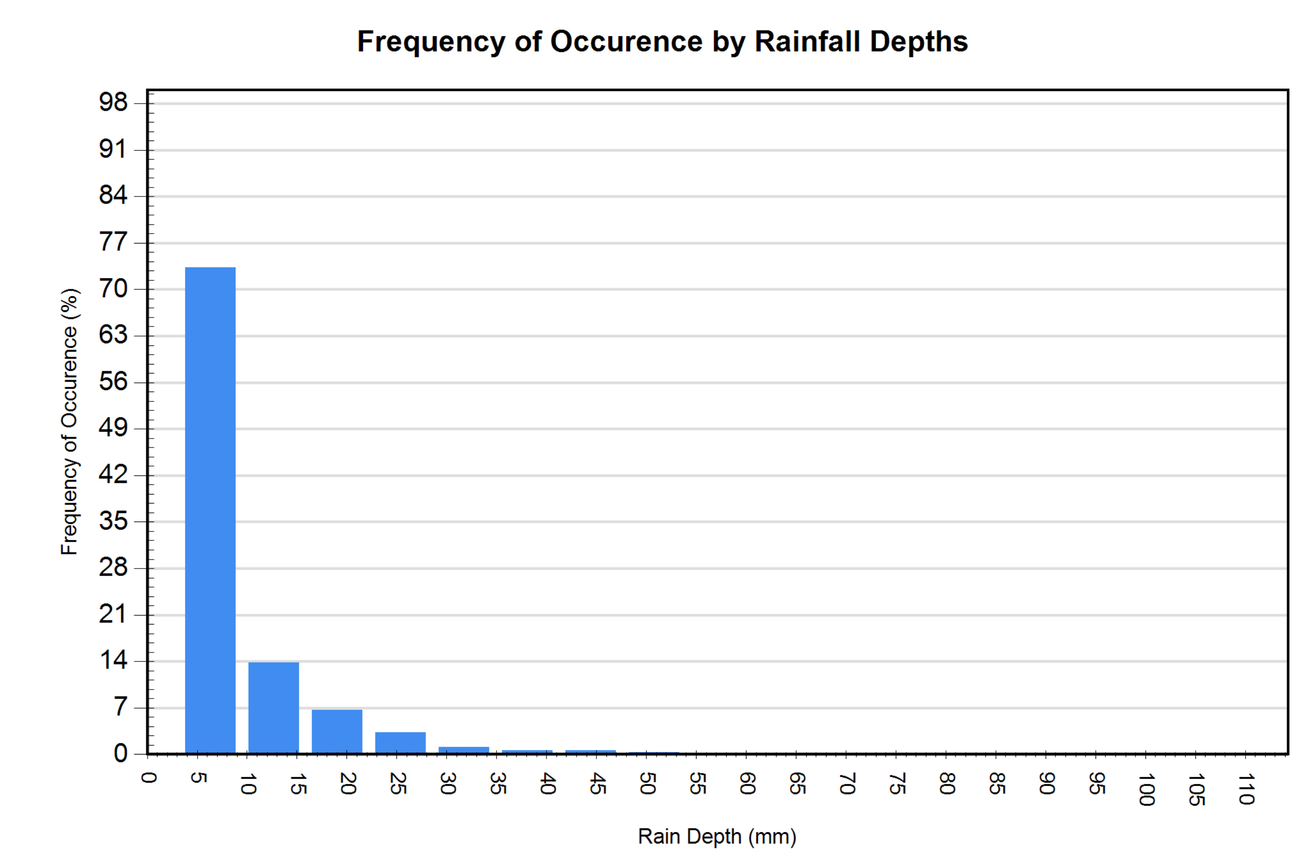
TSS Availability Parameters	
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	18905	40393	31.9
4	40144	19154	67.7
9	50344	8955	84.9
16	54880	4419	92.5
25	56936	2362	96.0
36	57893	1406	97.6
49	58388	911	98.5
64	58683	616	99.0
81	58899	400	99.3
100	59050	248	99.6
121	59135	164	99.7
144	59197	102	99.8
169	59254	45	99.9
196	59281	18	100.0
225	59293	6	100.0



Rainfall Event Analysis

Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	2184	73.3	3643	22.6
12.70	411	13.8	3779	23.4
19.05	199	6.7	3108	19.3
25.40	97	3.3	2102	13.0
31.75	34	1.1	964	6.0
38.10	17	0.6	590	3.7
44.45	18	0.6	723	4.5
50.80	8	0.3	380	2.4
57.15	4	0.1	212	1.3
63.50	0	0.0	0	0.0
69.85	4	0.1	267	1.7
76.20	0	0.0	0	0.0
82.55	0	0.0	0	0.0
88.90	3	0.1	256	1.6
95.25	1	0.0	93	0.6
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

APPENDIX D

Stormwater Management Technical Memo

2800 High Point Drive
Suite 100, Milton, ON
L9T 6P4
T. 905.875.0026
F. 905.875.4915
cfcrozier.ca

TECHNICAL MEMO

DATE	July 5, 2019	**PROJECT NO.**	1559-5037
RE	20 Scott Street, Town of Grand Valley Proposed Infiltration Facility for Interim Stormwater Management		

TO	Gord Feniak, P.Eng. Carley Dixon, P.Eng. R.J. Burnside Inc.
FROM	Jurgen Koehler, P.Eng. K.J. Firth, P.Eng.
CC	Mark Kluge, Planner (Town of Grand Valley) Daniel Hrycyna (Lisgar (Grand Valley) Ltd.) Sandy Anderson, P.Eng., M.Sc., Chung and Vander Doelen Engineering Ltd.

1.0 Introduction

C.F. Crozier and Associates Inc. has been retained by Lisgar (Grand Valley) Ltd. (Owner) to prepare engineering materials in support of the proposed Zoning By-Law Amendment and consent application for the site located at 20 Scott Street (Site) in the Town of Grand Valley.

Crozier is working collaboratively with the Town of Grand Valley and R.J. Burnside & Associates staff, alongside Lisgar (Grand Valley) Ltd. and Chung and Vander Doelen Ltd. to develop an interim stormwater solution. The solution, proposed within this Technical Memo, dedicates one of the proposed freehold lots to become an interim stormwater management infiltration facility to serve as a temporary stormwater control. The proposed solution is considered temporary until such time that a permanent gravity storm drainage solution is constructed within Scott Street.

The Town of Grand Valley decommissioned the existing storm sewer drainage system located near the southeast corner of the Site, therefore, an outlet for the drainage contributing to the Scott Street right-of-way is required to support both the Zoning By-Law approval for the proposed condominium development and the proposed consent applications for the three freehold lots fronting Scott Street (Lots A, B and C).

An interim solution is recommended because the proposed development cannot independently cover the costs of a permanent gravity storm sewer solution for Scott Street. The proposed interim solution improves upon the existing drainage conditions, while also providing a formal temporary outlet for the portion of the proposed development draining towards Scott Street.

The following sections outline the existing drainage conditions and the proposed interim stormwater management solution. This memo should be read in conjunction with the calculations and figures attached and noted within this memo, and the Functional Servicing and Preliminary Stormwater Management Report for 20 Scott Street (Crozier, March 2019).

2.0 Existing Soil Conditions

Chung and Vander Doelen Ltd. completed a geotechnical investigation of the Site as part of the re-zoning application for the proposed development (Geotechnical Investigation, Proposed Townhouse Development, 20 Scott Street, February 25, 2019). This report was submitted separately to the Town for review and consideration.

Chung and Vander Doelen's investigations identified that the soils are generally conducive to natural infiltration, especially in the low-lying area in the southeast corner of the site. The borehole investigations on the Site identified a large sand deposit with the following depths:

- Borehole 12: approximately 3.51 m to 5.49 m below ground surface
- Borehole 13: approximately 4.70 m to 5.03 m below ground surface

This existing soil profile makes this area ideal for infiltration practices, which is the current stormwater management regime for the site and adjacent lands. The borehole logs for Borehole 12 and Borehole 13 are attached to this memo for reference.

3.0 Existing Groundwater Conditions

The geotechnical report (Geotechnical Investigation, Proposed Townhouse Development, 20 Scott Street Chung and Vander Doelen, February 25, 2019) identified deep groundwater within the Site. The observed groundwater elevation within Borehole 12, near the southeast corner of the Site, indicated a groundwater elevation of 453.88 m, or 4.85 m below ground surface.

The deep groundwater elevation in this area is favourable for infiltration because the required vertical separation between the bottom of the infiltration feature and the groundwater elevation is a minimum of 1.0 m. The proposed infiltration feature and associated elevations are further detailed in Section 5.0.

4.0 Existing Drainage Conditions

Most of the Site is covered with vegetation and grassed lawn areas. There is an existing municipal drainage block located along the Site's north property line; this drainage block contains a storm sewer that conveys stormwater from Crozier Street and discharges to the adjacent private lands. Most of the Site's stormwater runoff (1.22 ha) drains overland from west to east and to an existing low-lying area in the southeast corner of the Site. A small portion of the Site's stormwater (0.01 ha) drains north east towards the existing depressed area.

The storm sewer lead for the existing catchbasin, located within the low-lying area by the southeast corner of the Site (future location of Lot C) was decommissioned by the Town of Grand Valley. Previously, stormwater captured by this catchbasin was conveyed east through a roadside ditch and a culvert, eventually discharging to private lands (As-Recorded Drawing No. M-796-25/P21, October 1993). With this outlet closed, stormwater draining to the low-lying area ponds and either infiltrates or evapotranspirates.

Hydrologic modelling of the existing Site was prepared as part of the Functional Servicing and Stormwater Management Report for 20 Scott Street, (Crozier, March 2019). The modelling results indicate that the 100-year design storm produces approximately 744 m^3 of stormwater runoff volume from 1.22 ha of the Site to this low-lying area. The existing storage volume of the low-lying area, calculated in Civil3D based on a maximum ponding elevation of 458.91 m and an area of

1,900 m^2, is approximately 378 m^3. Therefore, based on this analysis, a deficit of stormwater storage of approximately 366 m^3 currently exists on the Site; this deficit of stormwater storage means that there is a risk of flooding to the adjacent lands under existing conditions.

Figure 4, attached to this memo, illustrates the existing ponding area delineated based on the site-specific topographic survey.

5.0 Proposed Interim Infiltration Facility

Overall, the proposed stormwater management design reduces the contributing drainage area and runoff volume to the low-lying area by approximately 70%. This reduction is achieved by directing stormwater to the existing municipal drainage block at the northeast corner of the Site. Further discussion of the overall proposed stormwater management design is provided in the aforementioned Functional Servicing and Stormwater Management Report.

The proposed interim stormwater management design for the remainder of the Site includes a combination of surface and subsurface storage using the highly permeable native soils as an avenue for infiltration. The design allocates one of the proposed freehold lots fronting Scott Street (Lot C), to serve as the interim stormwater management area. Lot C is located near the existing low-lying area of the Site, where stormwater runoff ponds and infiltrates under existing conditions.

Stormwater runoff from the contributing 0.39 ha of the Site will flow overland towards the proposed infiltration facility, located within the low-lying area. Existing grades within and along the easement and along the south limits of the low-lying area are proposed to remain consistent with the existing conditions. This design allows existing overland flow from the external drainage areas to continue to drain unobstructed to the proposed infiltration facilities.

Likewise, the proposed surface depression above the infiltration gallery is designed to match the future proposed grades consistent with the preliminary grading plan. This design approach allows stormwater from the adjacent proposed lands to drain to the infiltration gallery area. Therefore, the overall proposed grading design for the remainder of the development remains consistent with the previously submitted Preliminary Grading Plan. Table 1 outlines the existing and proposed drainage characteristics of the Site.

Table 1: Existing and Proposed Drainage Characteristics to Scott Street Outlet

Characteristic	Existing	Proposed
Contributing Drainage Area (ha)	1.22	0.39
Contributing Runoff Volume[1] **(Required Storage Volume)** (m^3)	719	244
Available Ponding Area (m^2)	1,900	721
Surface Storage Volume[2] (m^3)	378	241
Total Subsurface Storage Volume[3] (m^3)	-	147
Total Storage Volume (m^3)	378	388
Maximum Surface Ponding Elevation (m)	458.91	**458.66**

Note: 1. 100-year runoff volume from MIDUSS Model.
2. Surface storage volume calculated with Civil 3D based on existing and proposed maximum surface ponding elevations.
3. Subsurface storage volume is calculated based on the provided granular material below the infiltration facility and the infiltration trench.

A granular infiltration gallery is proposed below the depression area to reduce nuisance ponding and promote infiltration into the native sandy soils. The infiltration gallery is proposed at 2.0 m below grade and independently provides approximately 130 m^3 of storage. Table 2 outlines the proposed infiltration gallery characteristics.

Table 2: Proposed Infiltration Gallery Characteristics

Area (m^2)	162
Top Elevation (m)	457.85
Bottom Elevation (m)	455.85
Depth (m)	2.0
Void Ratio	0.4
Volume (m^3)	130
Groundwater Elevation[1] (m)	453.88

Note: 1. Groundwater elevation based on Borehole Log 12 by Chung and Vander Doelen.

In addition to the infiltration facility, a 1.0 m wide, 84 m long and 0.5 m deep elongated infiltration trench with approximately 17 m^3 along the east property line of the condominium development is also proposed to accommodate drainage from the contributing external drainage area of the adjacent residential lot.

A perforated underdrain stretching the length of the elongated infiltration trench is proposed to connect to the proposed infiltration facility, allowing stormwater to hydraulically connect between the two features.

The reduction of the contributing runoff volume and additional provided storage reduces the 100-year ponding elevation to **458.66 m** under proposed conditions; approximately 0.25 m lower than the existing ponding elevation of 458.91 m. The proposed infiltration facility provides further demonstrates an overall net-benefit to the existing conditions and adjacent properties since the extent of potential flooding is minimized.

6.0 Conclusions and Recommendations

The proposed interim stormwater management solution for drainage contributing to the Scott Street right-of-way from the proposed development provides enough storage volume to contain stormwater runoff generated from the Site and does not negatively impact adjacent properties. The stormwater storage volumes provided with this design exceed the stormwater storage volumes available under the existing conditions. The overall contributing drainage area and runoff volume from the Site to Scott Street are decreased by approximately 70% under the proposed conditions. The additional subsurface and surface storage volumes proposed further reduce the risk of flooding onto adjacent residential lands.

In addition, with the post-development runoff volume being much smaller than the pre-development volume and with the improved storage and infiltration scenario proposed in the post-development scenario, it is expected that the water table mounding that will accompany each infiltration event will be much smaller than occurs under existing conditions.

We recommend that the proposed interim design solution for stormwater management be implemented to support the Zoning By-Law Amendment and Plan of Consent for the proposed development until such time that a gravity storm drainage system and outlet is provided for Scott Street.

Sincerely,

C.F. CROZIER & ASSOCIATES INC.

Jurgen Koehler, P.Eng.
Associate

C.F. CROZIER & ASSOCIATES INC.

K.J. Firth, P.Eng.
Partner

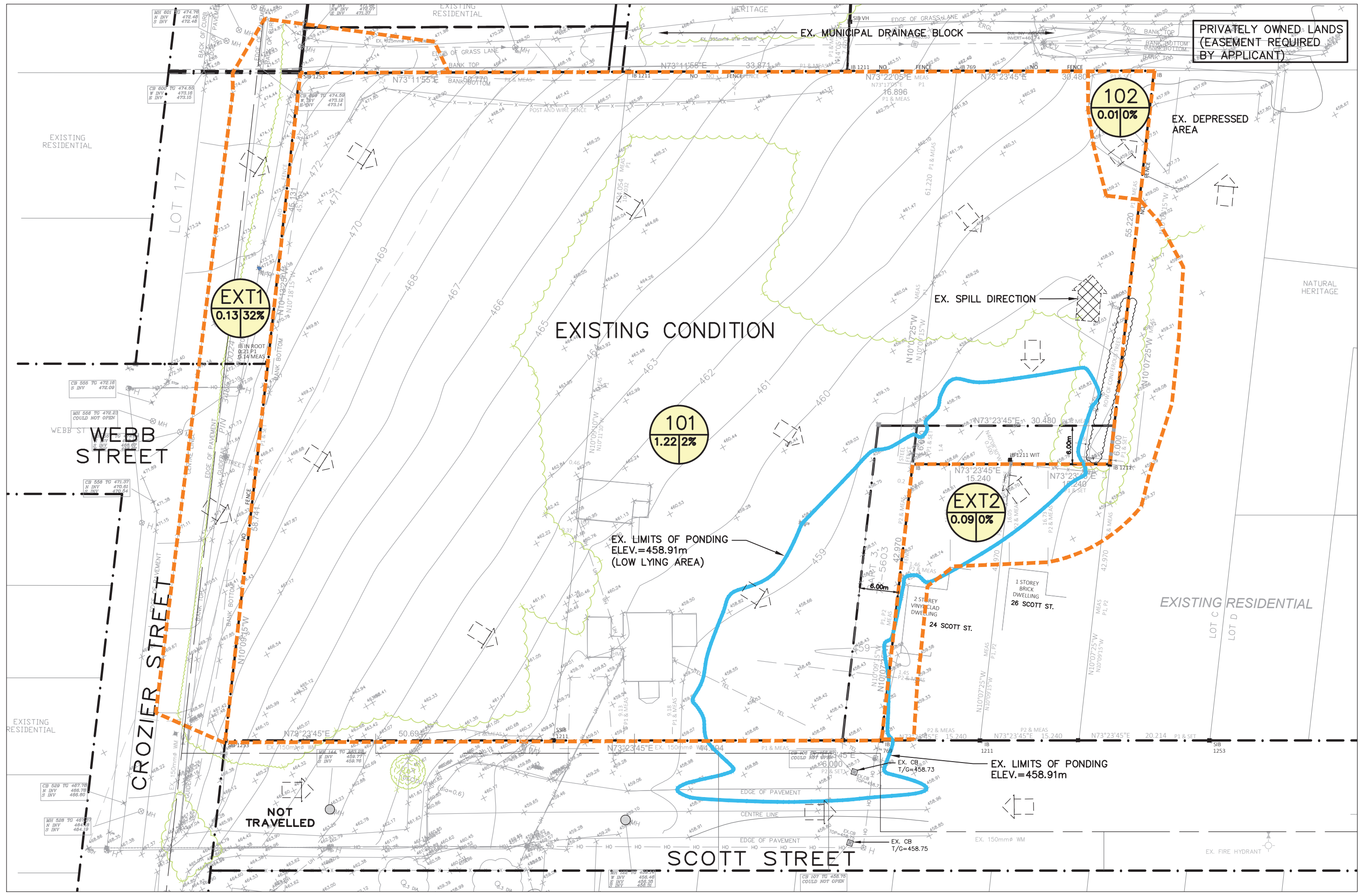
BW/ba

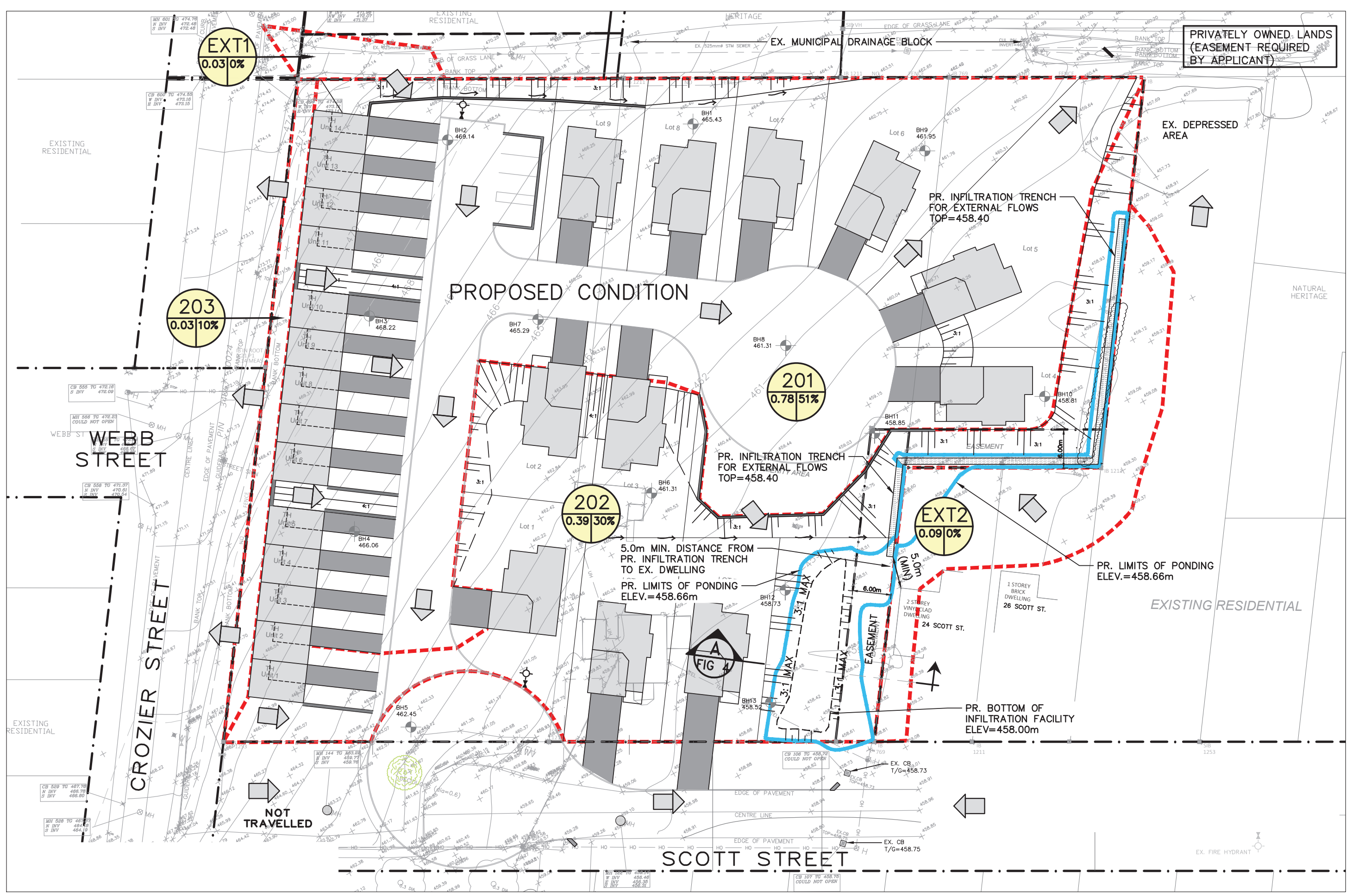
I:\1500\1559-Hrycyna Law Group\5037 - 20 Scott St (Civil)\Memos\2019.07.05 SWM Infiltration Technical Memo.docx

ATTACHMENTS

Figure 4: Existing and Proposed Ponding Limits

Borehole Logs 12 and 13
(Chung & Vander Doelen Engineering)



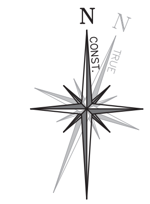


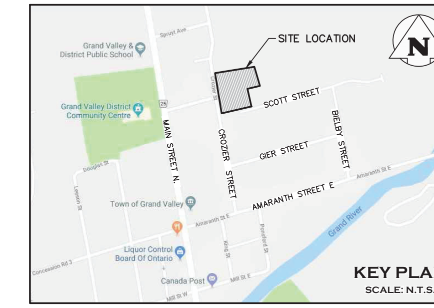
EXISTING INFILTRATION/SURFACE PONDING

PONDING AREA	1900m^2
MAX. PONDING ELEVATION	458.91m
MAX. PONDING DEPTH	0.49m
TOTAL SURFACE VOLUME	378m^3 (AVAILABLE)
REQ'D STORAGE VOLUME (100 YR.)	719m^3 (MIDUSS OUTPUT)

NOTE:

EXISTING PONDING DETAILS ARE BASED ON AVAILABLE TOPOGRAPHIC INFORMATION FOR SUBJECT LANDS AND ADJACENT CATCHMENT AREAS.

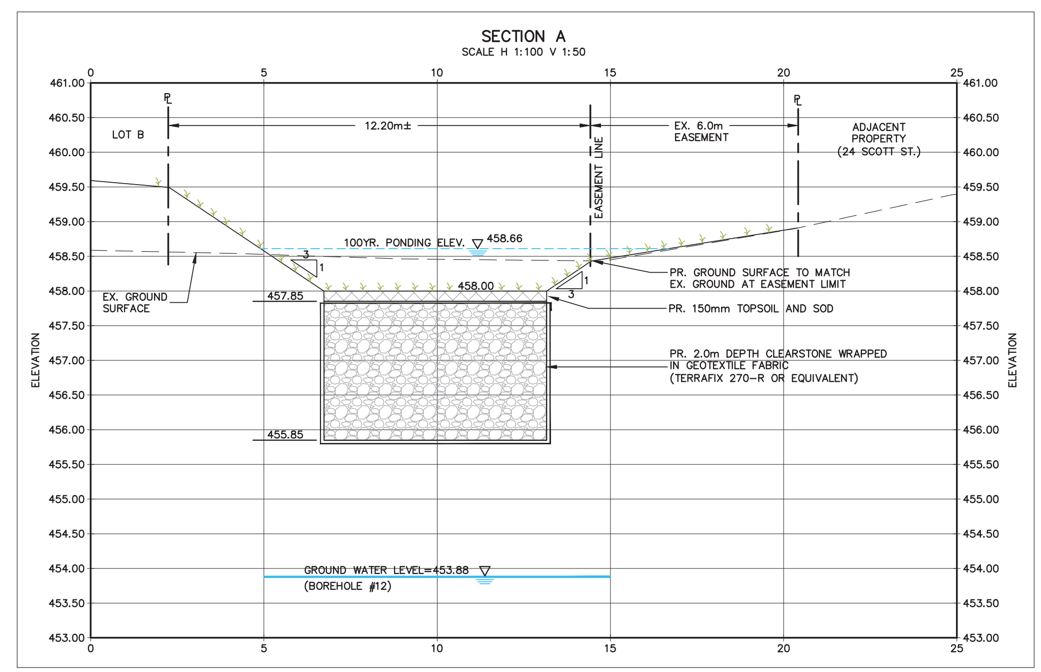




LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE
- PROPOSED OVERLAND FLOW DIRECTION
- EXISTING OVERLAND FLOW DIRECTION
- EXISTING SPILL DIRECTION
- EX. STORM DRAINAGE CATCHMENT
- PR. STORM DRAINAGE CATCHMENT
- PONDING LIMITS
- ID / A | IMP — CATCHMENT I.D. / AREA (ha) | PERCENT IMPERVIOUS (%)

SCALE: 1:500



PROPOSED INFILTRATION FACILITY

100YR. PONDING AREA	721m^2
100YR. PONDING ELEVATION	458.66m
100YR. PONDING DEPTH (WITHIN PR. DEPRESSION AREA)	0.66m
INFILTRATION FACILITY SURFACE VOLUME	241m^3
INFILTRATION FACILTIY SUBSURFACE VOLUME	130m^3
INFILTRATION TRENCH SUBSURFACE VOLUME	17m^3
TOTAL VOLUME	388m^3
REQ'D STORAGE VOLUME (100 YR.)	244m^3

NOTE:

MAXIMUM SURFACE PONDING ELEVATION EXCLUDES AVAILABLE SUBSURFACE STORAGE IN PROPOSED INFILTRATION GALLERY AND TRENCH.

NOT FOR CONSTRUCTION

Stamp

Stamp

PRELIMINARY

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED WITH INTERIM SWM TECHNICAL MEMO	2019/JUL/05
0	NOT ISSUED WITH THIS SUBMISSION	2019/MAR/15

ELEVATION NOTE:

ELEVATIONS ARE RELATED TO THE CANADIAN GEODETIC VERTICAL DATUM 1972. A LOCAL BENCHMARK WAS ESTABISHED ON THE TOP NUT OF A FIRE HYDRANT, LOCATED ON SCOTT STREET, SOUTH OF LOT A, HAVING AN ELEVATION OF 460.67 m.

SURVEY NOTES:

TOPOGRAPHIC SURVEY PREPARED BY VAN HARTEN SURVEYING AND ENGINEERING, DATED JANUARY 29, 2019.

BEARINGS ARE UTM GRID BEARINGS AND ARE DERIVED FROM GPS OBSERVATIONS AND ARE REFERRED TO THE UTM PROJECTION, CENTRAL MERIDIAN 81°00' W LONGITUDE, ZONE 17, NAD 83 (CSRS), EPOCH 2010.

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999759

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON DEVELOPMENT CONCEPT PLAN BY WESTON CONSULTING

DRAWING No.: C3 (2019/MAR/05)
FILE No.: 8947

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.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

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

Project

PROPOSED RESIDENTIAL DEVELOPMENT
20 SCOTT STREET
TOWN OF GRAND VALLEY

Drawing

EXISTING & PROPOSED
PONDING LIMITS

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

Drawn	Design	Project No.	
M.I.M	B.W.	1559-5037	
Check	**Check**	**Scale**	**Dwg.**
S.C.	K.J.F./J.K.	1:500	FIG 4

Enclosure No.: 12
Sheet 1 of 1

FILE No: G17440 — BOREHOLE No. 12

Client: **Mr. Daniel Hrycyna**

Project: **Proposed Townhouse Development**

Location: **20 Scott Street, Grand Valley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D-50T**
Method: **Hollow Stem Auger**
Size: **107 mm I.D.**
Date: **Jun 01 - 17** TO **Jun 01 - 17**

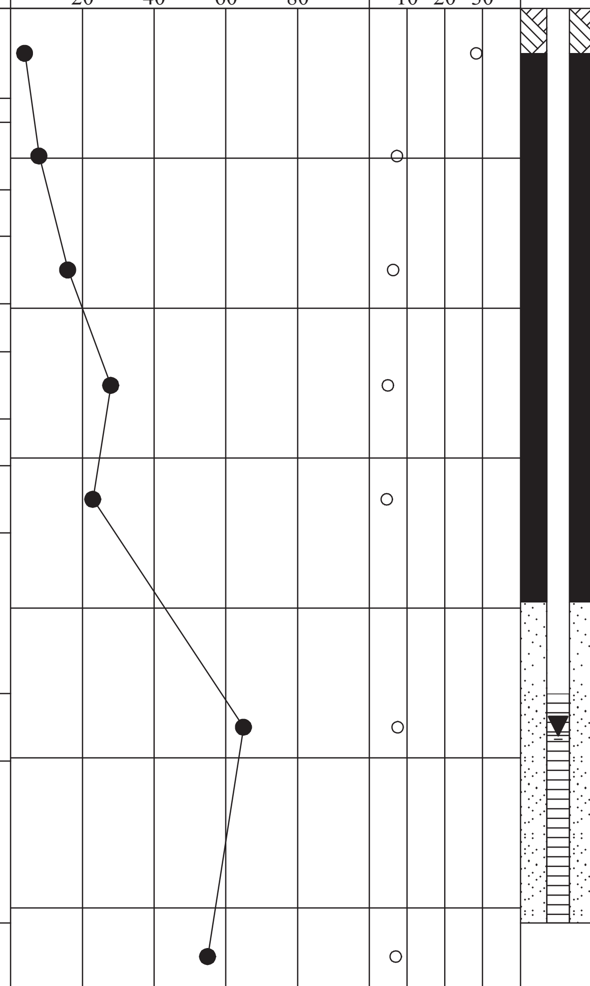
SOIL LITHOLOGY

Ground Elevation: **458.73 m**

ELEV./DEPTH (m)	DESCRIPTION
	460 mm TOPSOIL
458.27 / 0.46	very loose to very dense brown SAND trace to some gravel and silt; occ. silt pockets/seams; damp to saturated
453.24 / 5.49	very dense, brown SILT TILL some sand, trace to some clay, trace gravel saturated
452.18 / 6.55	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	4
2	SS	8
3	SS	16
4	SS	28
5	SS	23
6	SS	65
7	SS	55



REMARKS

DEPTH (m)	REMARKS
0.3	steel monument casing set in concrete
2.0	bentonite seal/50 mm I.D. PVC rizer
4.0	1.5 m long, 50 mm I.D. PVC screen with sandpack
8.0	water level in monitoring measured to 4.85 bgs on June 14, 2017

PROJECT MANAGER: **EYC**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G17440

BOREHOLE No. 13

Client: **Mr. Daniel Hrycyna**

Project: **Proposed Townhouse Development**

Location: **20 Scott Street, Grand Valley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D-50T**
Method: **Hollow Stem Auger**
Size: **82 mm I.D.**
Date: **May 30 - 17** TO **May 30 - 17**

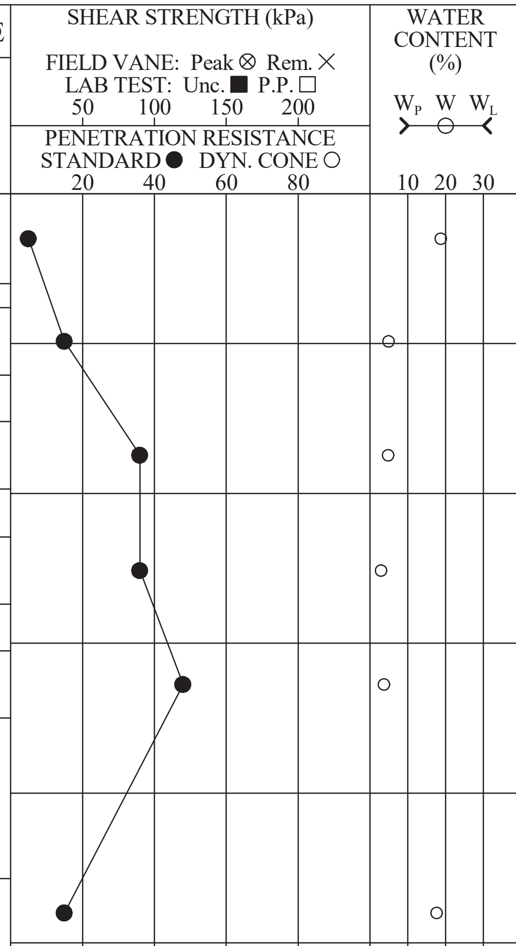
SOIL LITHOLOGY

Ground Elevation: **458.52 m**

ELEV./DEPTH (m)	DESCRIPTION
	300 mm TOPSOIL
458.22 0.30	loose to dense brown SAND trace to some silt, trace gravel to gravelly occ. silt pockets/seams damp to saturated
453.49 5.03	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	5
2	SS	15
3	SS	36
4	SS	36
5	SS	48
6	SS	15



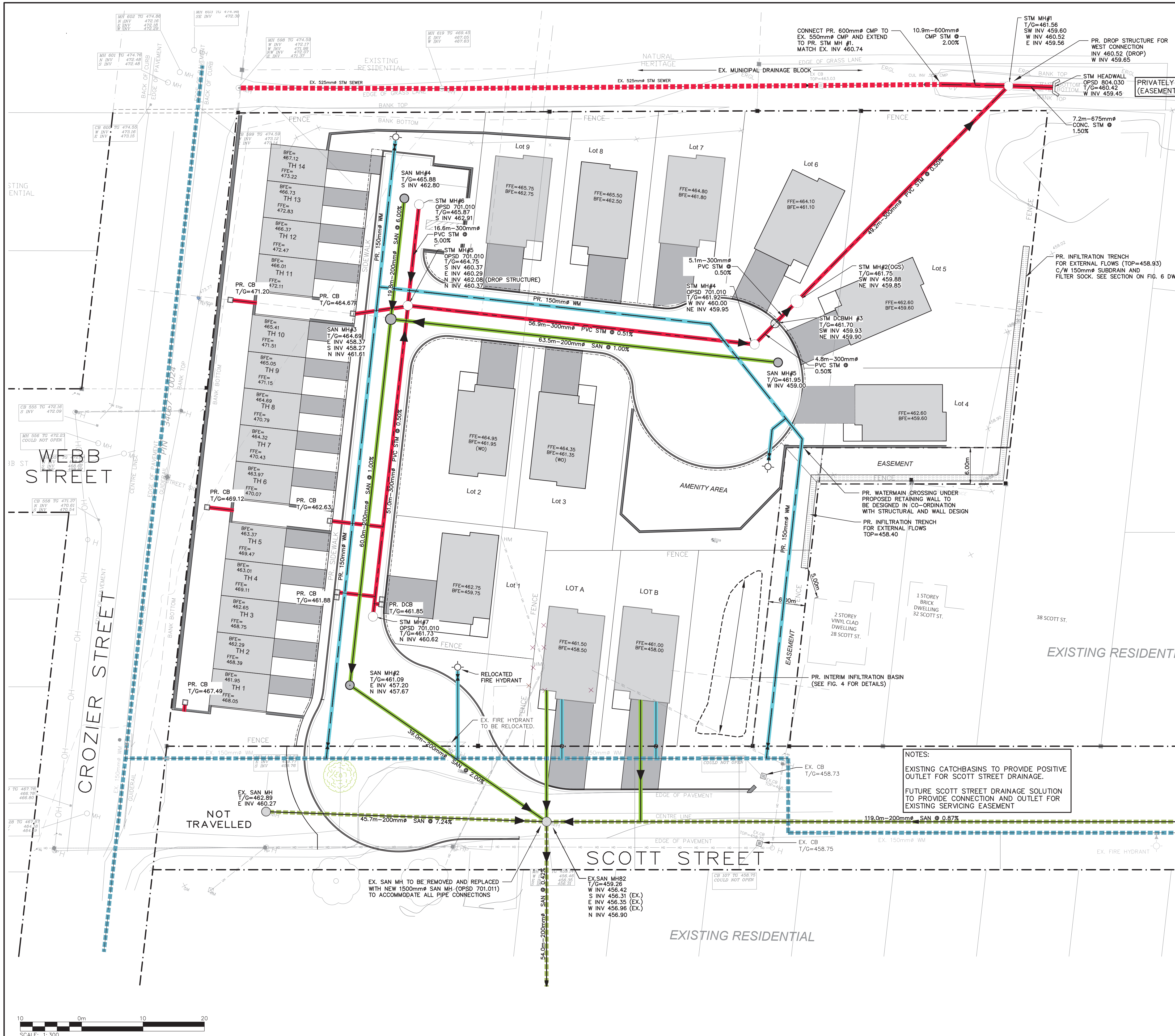
REMARKS

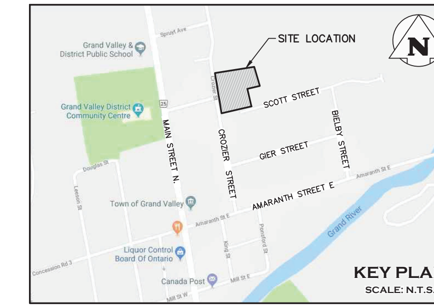
- 2.5 m: borehole cave-in and dry to 2.44 m bgs upon completion of drilling
- 4.8 m: hydrostatic pressure

PROJECT MANAGER: **EYC**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FIGURES





LEGEND

- PROPERTY LINE
- EXISTING WATERMAIN & GATE VALVE
- EXISTING STORM SEWER & MANHOLE
- EXISTING SINGLE / DOUBLE CATCHBASIN
- EXISTING SANITARY SEWER & MANHOLE
- PROPOSED WATERMAIN & GATE VALVE
- PROPOSED WATER SERVICE LATERAL (XXmmø)
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SINGLE / DOUBLE CATCHBASIN
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED SAN. SERVICE LATERAL (125mmø)
- PROPOSED ELECTRICAL TRANSFORMER
- PROPOSED RETAINING WALL

No.	ISSUE / REVISION	YYYY/MMM/DD
2	ISSUED FOR 2nd ZBA SUBMISSION	2019/OCT/07
1	NOT ISSUED WITH THIS SUBMISSION	2019/JUL/05
0	ISSUED FOR 1st SUBMISSION	2019/MAR/15

ELEVATION NOTE:

ELEVATIONS ARE RELATED TO THE CANADIAN GEODETIC VERTICAL DATUM 1972. A LOCAL BENCHMARK WAS ESTABISHED ON THE TOP NUT OF A FIRE HYDRANT, LOCATED ON SCOTT STREET, SOUTH OF LOT A, HAVING AN ELEVATION OF 460.67 m.

SURVEY NOTES:

TOPOGRAPHIC SURVEY PREPARED BY VAN HARTEN SURVEYING AND ENGINEERING, DATED JANUARY 29, 2019.

BEARINGS ARE UTM GRID BEARINGS AND ARE DERIVED FROM GPS OBSERVATIONS AND ARE REFERRED TO THE UTM PROJECTION, CENTRAL MERIDIAN 81°00' W LONGITUDE, ZONE 17, NAD 83 (CSRS), EPOCH 2010.

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999759

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN DEVELOPMENT CONCEPT PLAN BY CUBE ARCHITECTS INC. WESTON CONSULTING

DRAWING No.: A001 (2019/AUG/20)
FILE No.: 1834

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.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

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

Project

PROPOSED RESIDENTIAL DEVELOPMENT
20 SCOTT STREET
TOWN OF GRAND VALLEY

Drawing

PRELIMINARY SERVICING PLAN

NOT FOR CONSTRUCTION

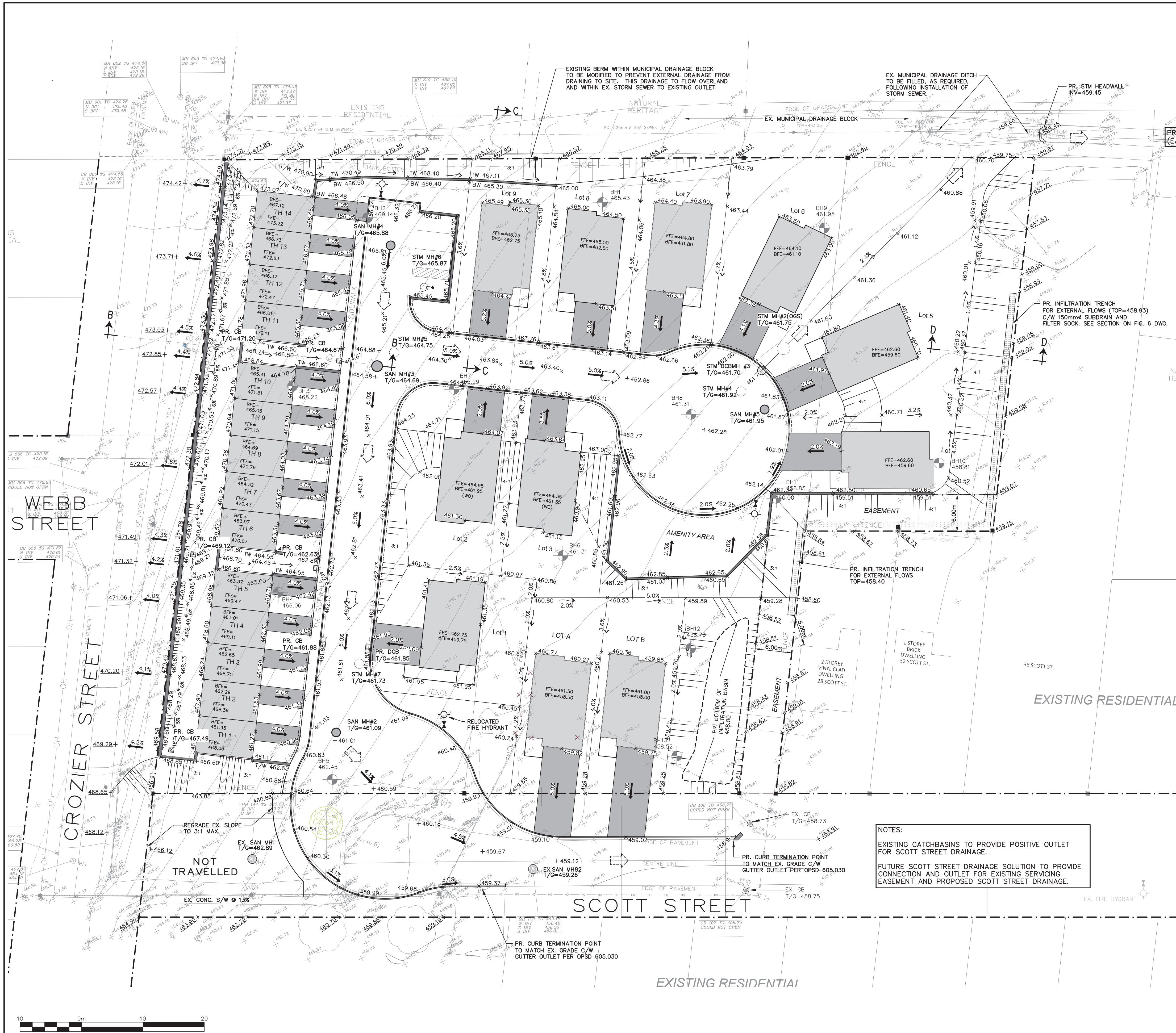
Stamp

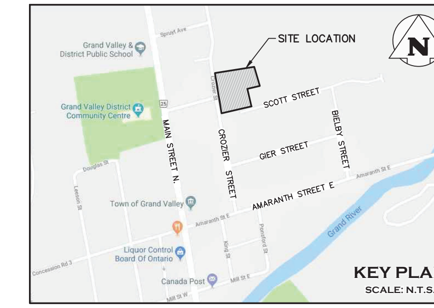
Stamp

PRELIMINARY

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

Drawn	Design	Project No.	
M.I.M	B.W.	1559–5037	
Check	**Check**	**Scale**	**Dwg.**
S.C.	K.J.F./J.K.	1:300	FIG 1





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING FENCE
- 215.00 EXISTING GRADE
- 215.00 PROPOSED GRADE
- 215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- 2.0% PROPOSED GRASSED SWALE
- PROPOSED SNOW STORAGE AREA
- PROPOSED RETAINING WALL
- PROPOSED SLOPE (3:1 MAX.)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- PROPOSED ELECTRICAL TRANSFORMER
- PROPOSED FIRE HYDRANT & GATE VALVE
- BOREHOLE LOCATION PER PLAN PREPARED BY CHUNG & VANDER DOELEN ENGINEERING LTD. DATED, FEBRUARY 2019 – FILE No. G17440

NOTE:
REFER TO FIGURES 4–6 FOR CROSS-SECTION PROFILE DETAILS

NOTE:
ALL PROPOSED RETAINING WALLS ARE SUBJECT TO DETAILED STRUCTURAL ENGINEERING DESIGN. CONSTRUCTION TO BE COMPLETED PER MANUFACTURER'S SPECIFICATIONS AND DETAILS.

No.	ISSUE / REVISION	YYYY/MMM/DD
2	ISSUED FOR 2nd ZBA SUBMISSION	2019/OCT/07
1	NOT ISSUED WITH THIS SUBMISSION	2019/JUL/05
0	ISSUED FOR 1st SUBMISSION	2019/MAR/15

ELEVATION NOTE:

ELEVATIONS ARE RELATED TO THE CANADIAN GEODETIC VERTICAL DATUM 1972. A LOCAL BENCHMARK WAS ESTABISHED ON THE TOP NUT OF A FIRE HYDRANT, LOCATED ON SCOTT STREET, SOUTH OF LOT A, HAVING AN ELEVATION OF 460.67 m.

SURVEY NOTES:

TOPOGRAPHIC SURVEY PREPARED BY VAN HARTEN SURVEYING AND ENGINEERING, DATED JANUARY 29, 2019.

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DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999759

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN DEVELOPMENT CONCEPT PLAN BY CUBE ARCHITECTS INC. WESTON CONSULTING

DRAWING No.: A001 (2019/AUG/20)
FILE No.: 1834

DRAWING NOTES:

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Project

PROPOSED RESIDENTIAL DEVELOPMENT
20 SCOTT STREET
TOWN OF GRAND VALLEY

Drawing

PRELIMINARY GRADING PLAN

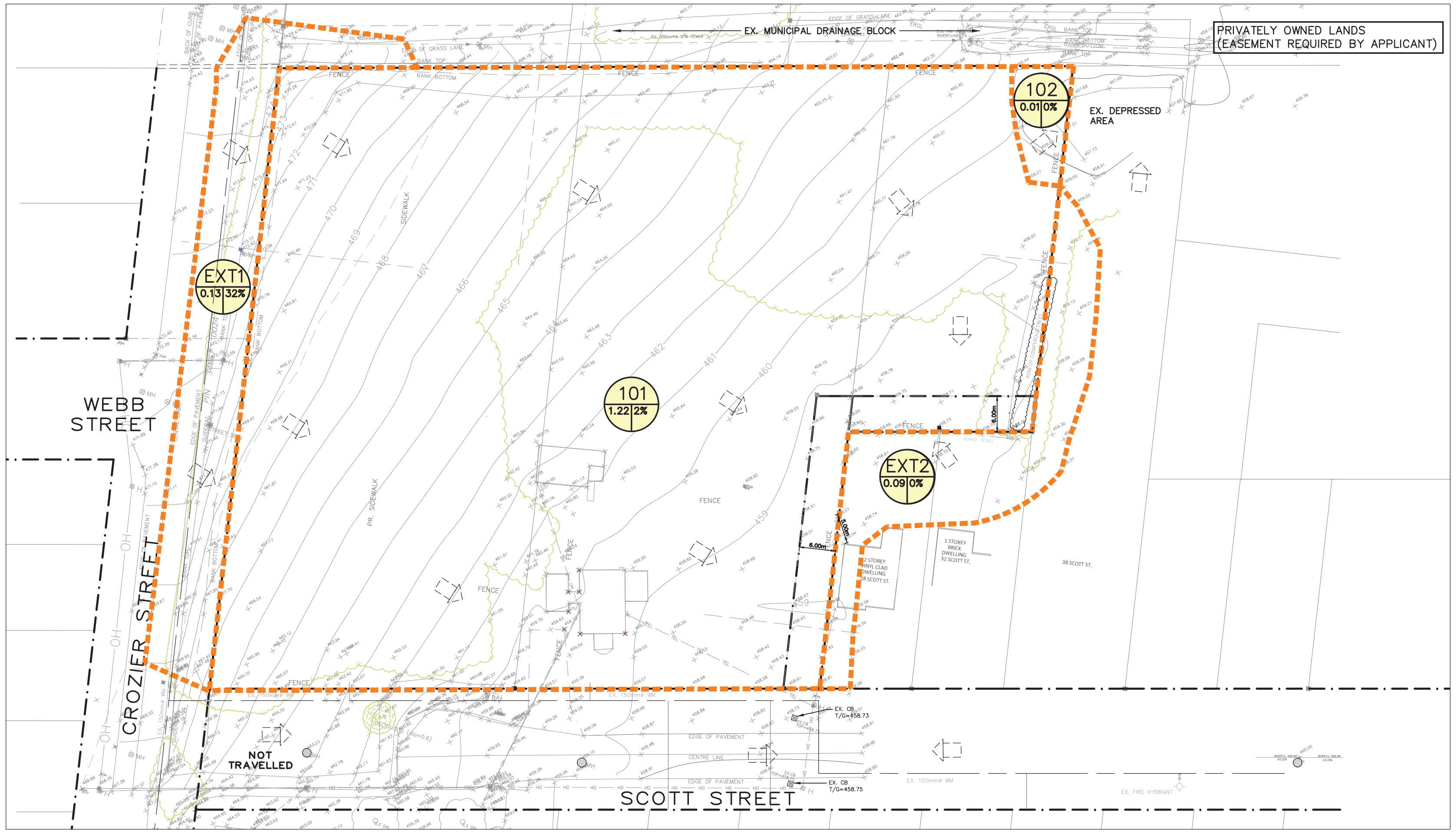
NOT FOR CONSTRUCTION

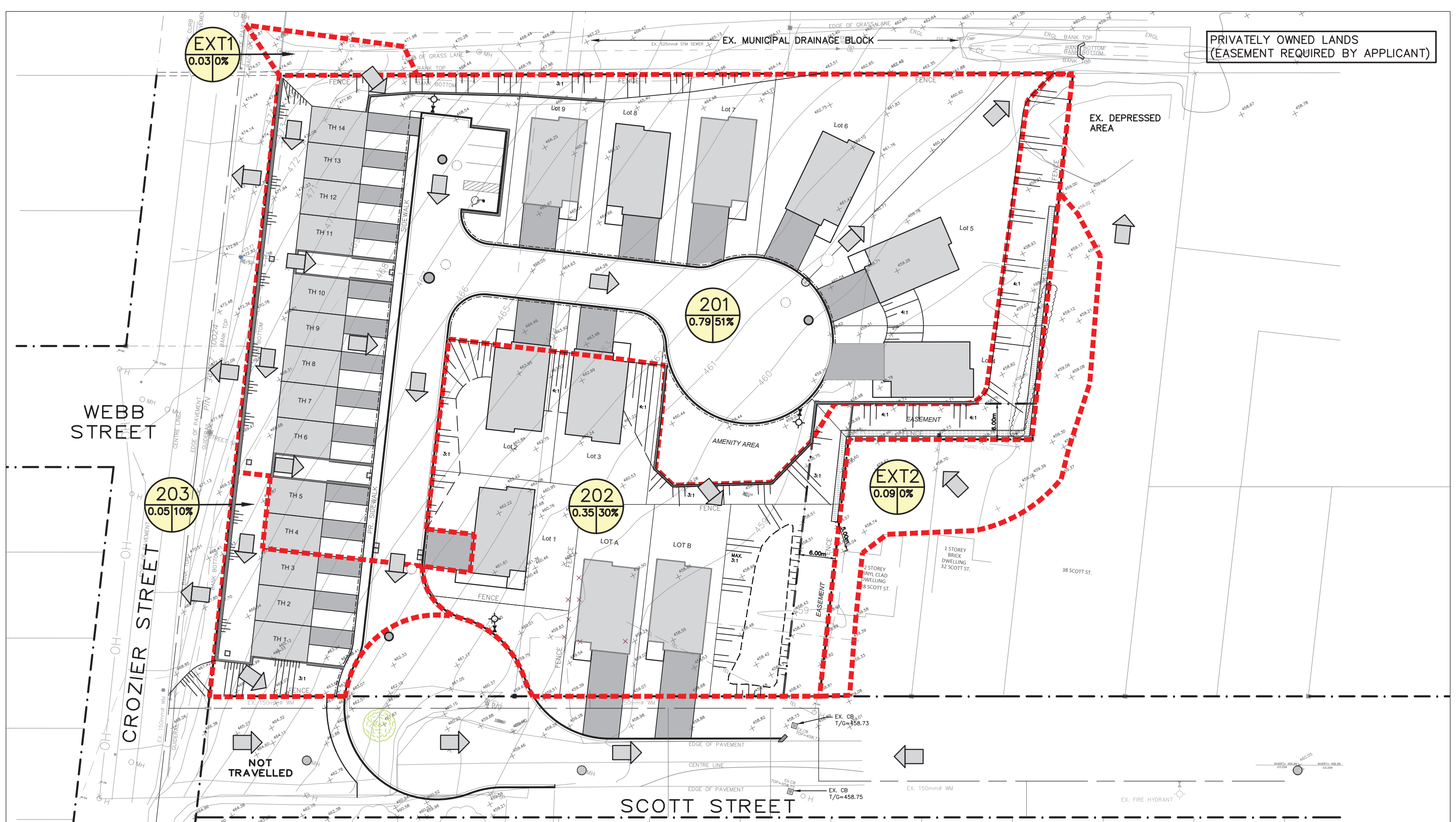
Stamp | Stamp

PRELIMINARY

CROZIER CONSULTING ENGINEERS
2800 High Point Drive
Suite 100
Milton, ON L9T 6P4
905.875.0026 T
905.875.4915 F
www.cfcrozier.ca

Drawn	M.I.M	Design	B.W.	Project No.	1559–5037
Check	S.C.	Check	K.J.F./J.K.	Scale 1:300	Dwg. FIG 2





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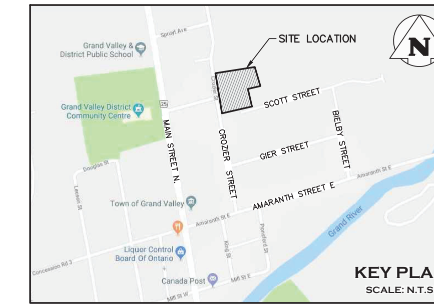

KEY PLAN
SCALE: N.T.S.

LEGEND

	PROPERTY LINE
	EXISTING CONTOUR (1.0m)
	EXISTING DITCH
	EXISTING GRADE
	PROPOSED OVERLAND FLOW DIRECTION
	EXISTING OVERLAND FLOW DIRECTION
	STORM DRAINAGE CATCHMENT
ID / A | IMP	CATCHMENT I.D. AREA (ha) | PERCENT IMPERVIOUS (%)

No.	ISSUE / REVISION	YYYY/MMM/DD
2	ISSUED FOR 2nd ZBA SUBMISSION	2019/OCT/07
1	NOT ISSUED WITH THIS SUBMISSION	2019/JUL/05
0	ISSUED FOR 1st SUBMISSION	2019/MAR/15

ELEVATION NOTE:

ELEVATIONS ARE RELATED TO THE CANADIAN GEODETIC VERTICAL DATUM 1972. A LOCAL BENCHMARK WAS ESTABISHED ON THE TOP NUT OF A FIRE HYDRANT, LOCATED ON SCOTT STREET, SOUTH OF LOT A, HAVING AN ELEVATION OF 460.67 m.

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Project

PROPOSED RESIDENTIAL DEVELOPMENT 20 SCOTT STREET TOWN OF GRAND VALLEY

Drawing

EXISTING & PROPOSED DRAINAGE PLAN

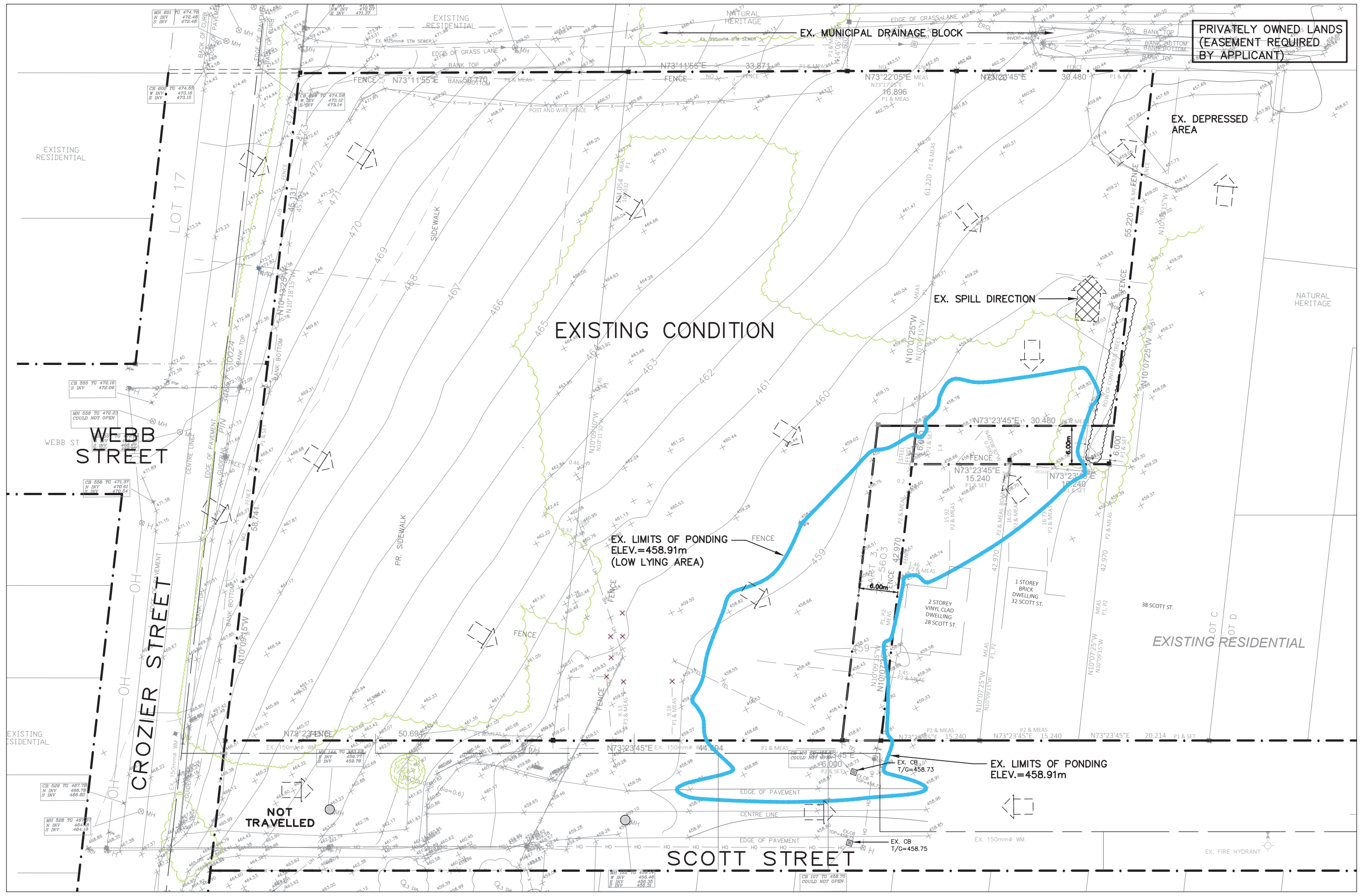
NOT FOR CONSTRUCTION

Stamp | Stamp

PRELIMINARY

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905.875.0026 T
905.875.4915 F
WWW.CFCROZIER.CA

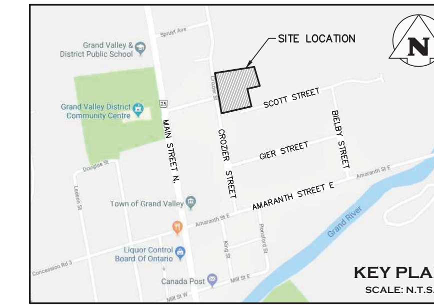
Drawn	M.I.M	Design	B.W.	Project No.	1559-5037
Check	S.C.	Check	K.J.F./J.K.	Scale 1:500	Dwg. FIG 3



EXISTING INFILTRATION/SURFACE PONDING

PONDING AREA	$1900m^2$
MAX. PONDING ELEVATION	458.91m
MAX. PONDING DEPTH	0.49m
TOTAL SURFACE VOLUME	$378m^3$ (AVAILABLE)
REQ'D STORAGE VOLUME (100 YR.)	$719m^3$ (MIDUSS OUTPUT)

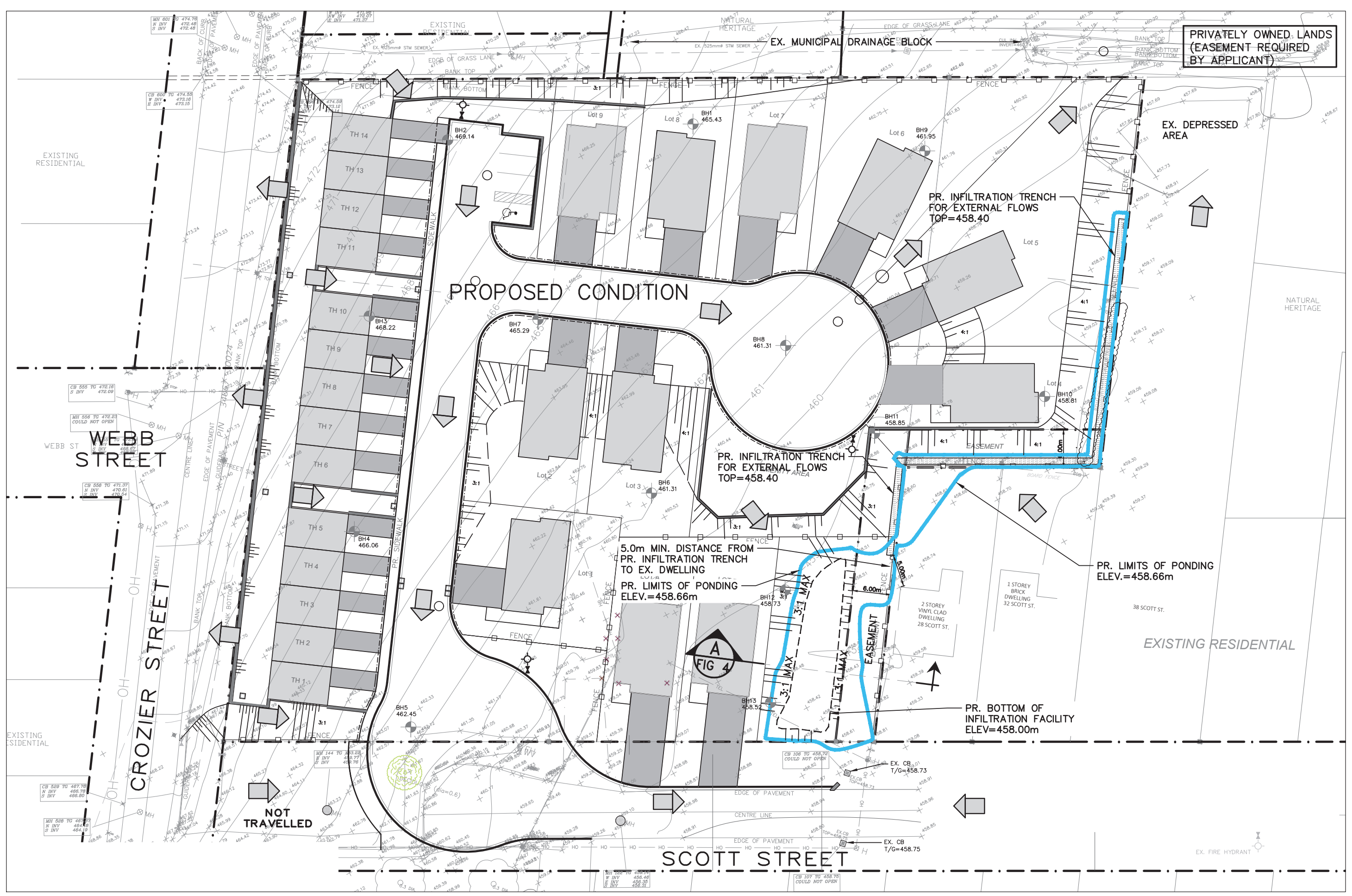
NOTE:
EXISTING PONDING DETAILS ARE BASED ON AVAILABLE TOPOGRAPHIC INFORMATION FOR SUBJECT LANDS AND ADJACENT CATCHMENT AREAS.

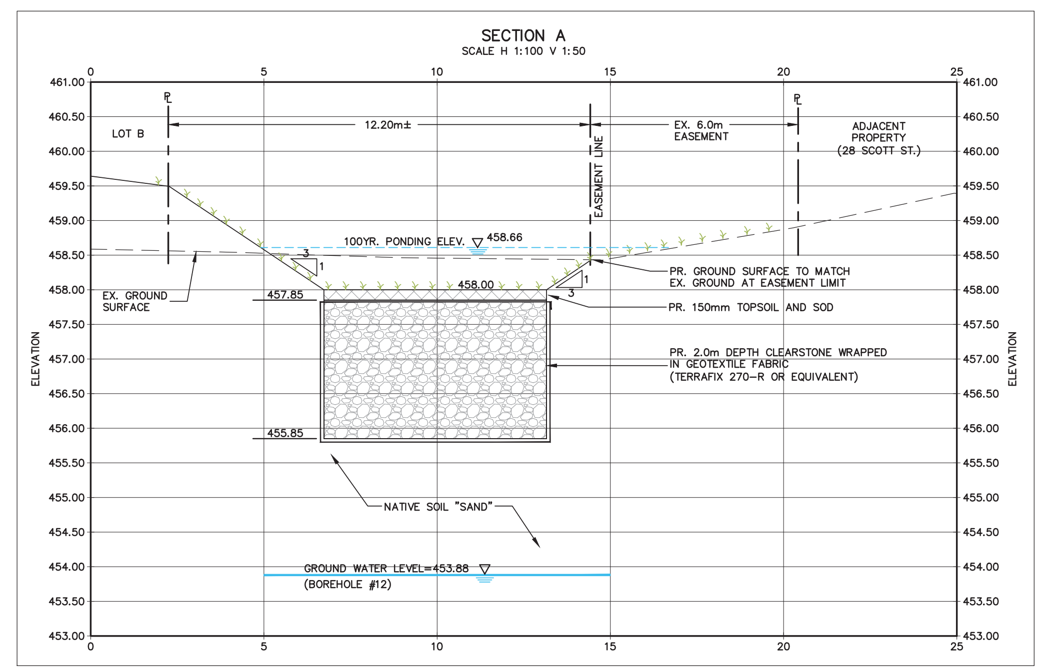


LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE
- PROPOSED OVERLAND FLOW DIRECTION
- EXISTING OVERLAND FLOW DIRECTION
- EXISTING SPILL DIRECTION
- PONDING LIMITS

SCALE: 1:500





PROPOSED INFILTRATION FACILITY

100YR. PONDING AREA	$721m^2$
100YR. PONDING ELEVATION	458.66m
100YR. PONDING DEPTH (WITHIN PR. DEPRESSION AREA)	0.66m
INFILTRATION FACILITY SURFACE VOLUME	$241m^3$
INFILTRATION FACILTY SUBSURFACE VOLUME	$130m^3$
INFILTRATION TRENCH SUBSURFACE VOLUME	$17m^3$
TOTAL VOLUME	$388m^3$
REQ'D STORAGE VOLUME (100 YR.)	$244m^3$

NOTE:
MAXIMUM SURFACE PONDING ELEVATION EXCLUDES AVAILABLE SUBSURFACE STORAGE IN PROPOSED INFILTRATION GALLERY AND TRENCH.

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DRAWING No.: A001 (2019/AUG/20)
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Project
PROPOSED RESIDENTIAL DEVELOPMENT
20 SCOTT STREET
TOWN OF GRAND VALLEY

Drawing
EXISTING & PROPOSED
PONDING LIMITS

NOT FOR CONSTRUCTION

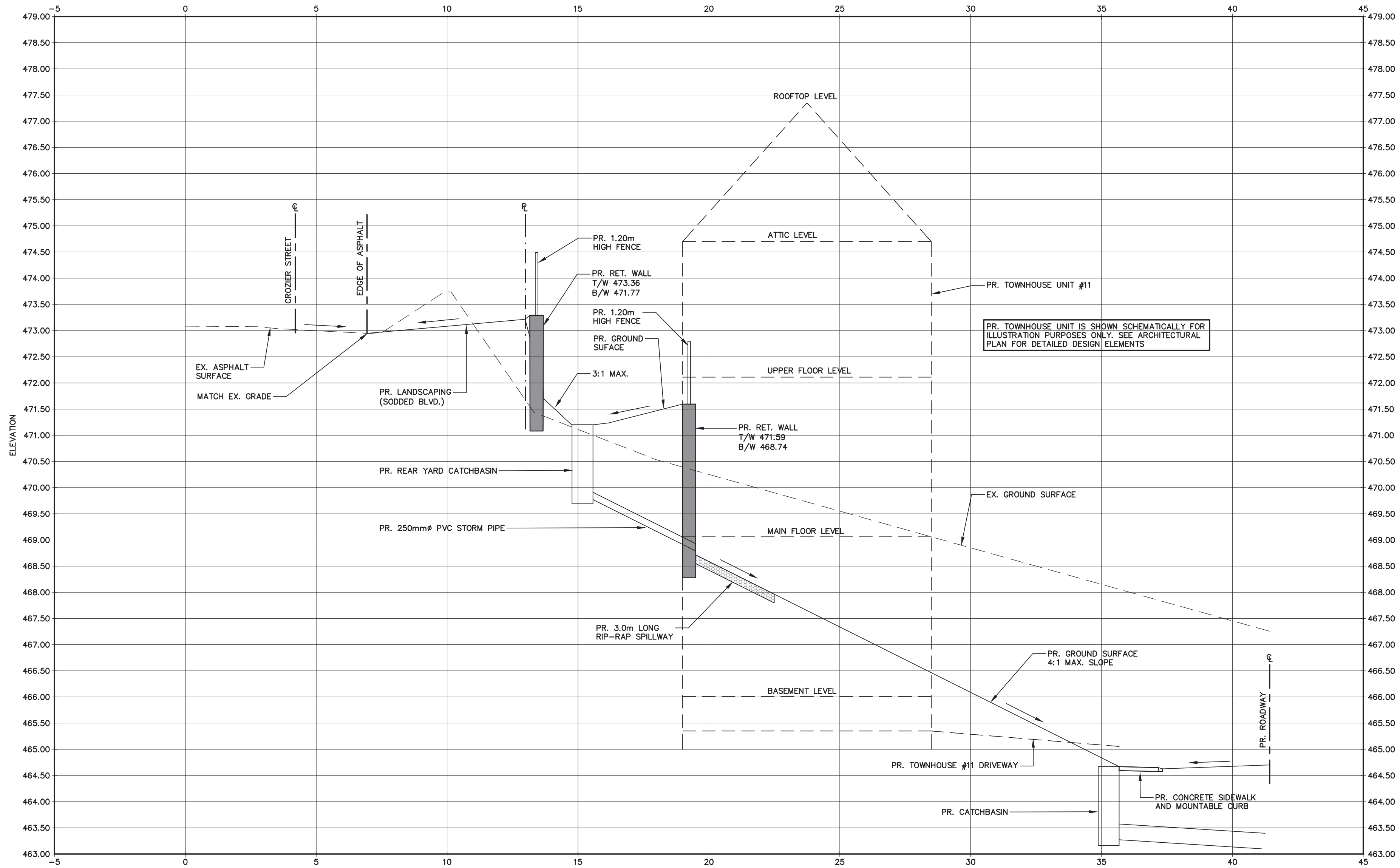
Stamp | Stamp
PRELIMINARY

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

Drawn: M.I.M	Design: B.W.	Project No.	1559-5037
Check: S.C.	Check: K.J.F./J.K.	Scale: 1:500	Dwg. FIG 4

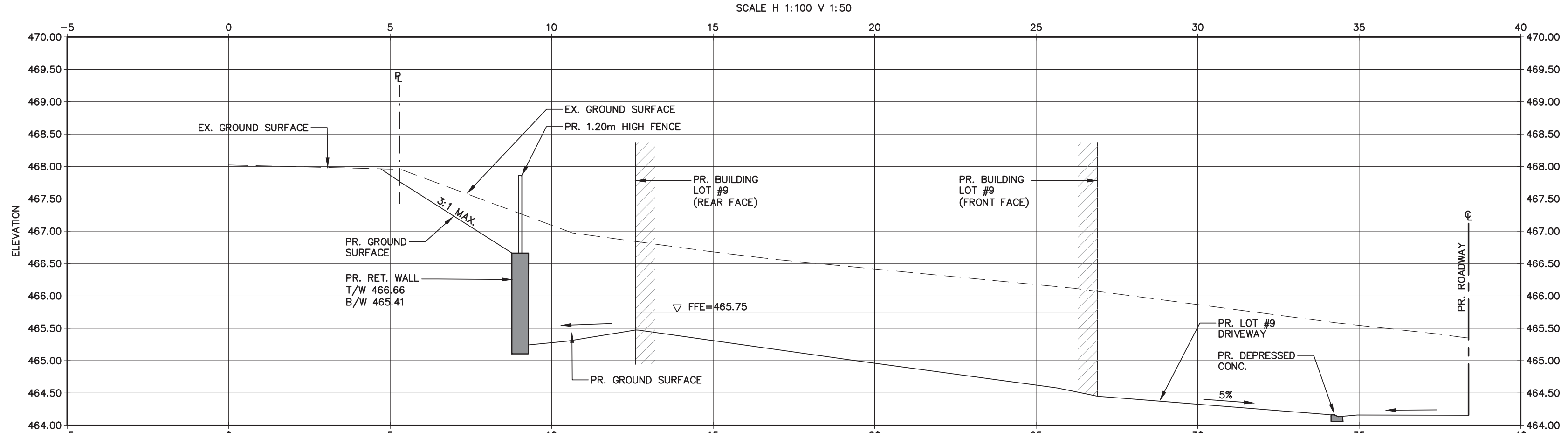
SECTION B

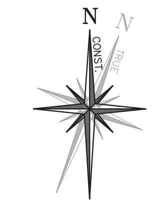
SCALE H 1:100 V 1:50

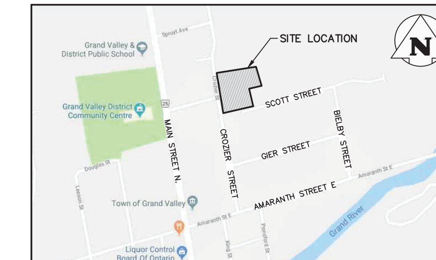


SECTION C

SCALE H 1:100 V 1:50







KEY PLAN
SCALE: N.T.S.

LEGEND

— - —	PROPERTY LINE
▮	PROPOSED RETAINING WALL

NOTE:

ALL PROPOSED RETAINING WALLS ARE SUBJECT TO DETAILED STRUCTURAL ENGINEERING DESIGN. CONSTRUCTION TO BE COMPLETED PER MANUFACTURER'S SPECIFICATIONS AND DETAILS.

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Project

PROPOSED RESIDENTIAL DEVELOPMENT
20 SCOTT STREET
TOWN OF GRAND VALLEY

Drawing

PRELIMINARY SERVICING PLAN

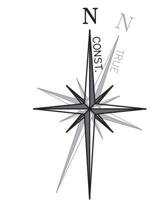
NOT FOR CONSTRUCTION

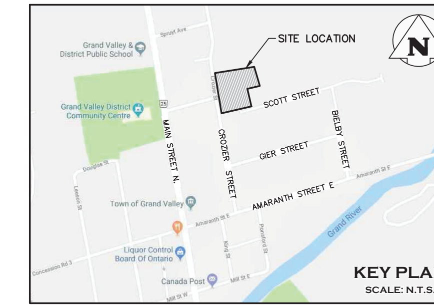
Stamp | Stamp

PRELIMINARY

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

Drawn	Design	Project No.	
M.I.M	B.W.	1559-5037	
Check	**Check**	**Scale**	**Dwg.**
S.C.	K.J.F./J.K.	H 1:100 V 1:50	FIG 5



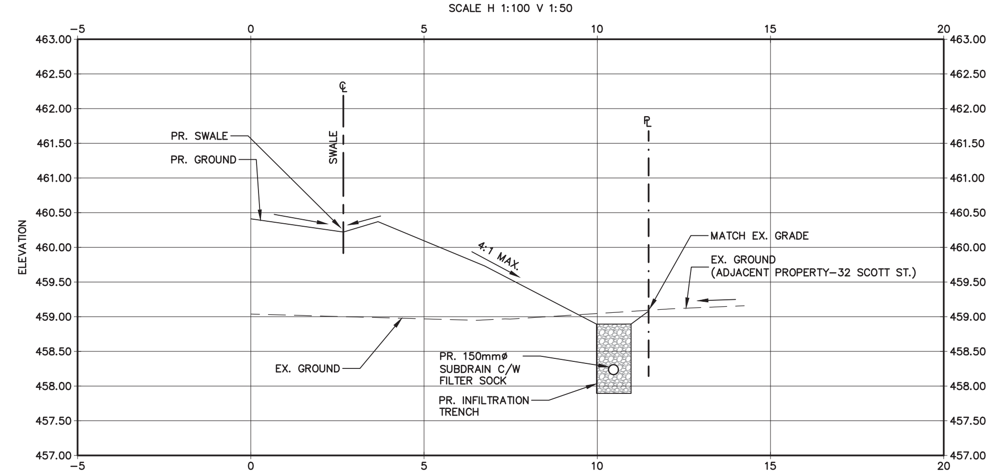


KEY PLAN
SCALE: N.T.S.

LEGEND

— — · — —	PROPERTY LINE
═══	PROPOSED RETAINING WALL

SECTION D
SCALE H 1:100 V 1:50



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NOT FOR CONSTRUCTION

Stamp | Stamp

PRELIMINARY

Project
PROPOSED RESIDENTIAL DEVELOPMENT
20 SCOTT STREET
TOWN OF GRAND VALLEY

Drawing
PRELIMINARY SERVICING PLAN

CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
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WWW.CFCROZIER.CA

Drawn M.I.M	Design B.W.	Project No.	1559–5037
Check S.C.	Check K.J.F./J.K.	Scale	Dwg. FIG 6