FUNCTIONAL SERVICING REPORT
IN SUPPORT OF ZONING BY-LAW AMENDMENT
AND DRAFT PLAN APPROVAL

Upper's Grove Block Plan
Residential Development

Rolling Meadows Secondary Plan
City of Thorold, Ontario

counterpoint ENGINEERING

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File Number: 18020

Prepared For:

FARZ Holdings Inc.

1	Issued For 1st Submission	December 11, 2018
No.	**Revision**	**Date**

EXECUTIVE SUMMARY

This Functional Servicing Report has been prepared on behalf of FARZ Holdings Inc**.** for the Zoning By-law Amendment and Draft Plan Approval for a proposed Residential Development.

The purpose of this report is to demonstrate that adequate municipal servicing capacity is in place and to outline the servicing and stormwater management strategy for the proposed residential development.

The servicing strategy for the proposed development is summarized as follows:

Water Servicing:
The proposed development will be serviced by connections to the existing and future watermains in the Rolling Meadows subdivision which is proposed adjacent to the north, west, and south of the subject site.

Three connections will be made to the watermain system – one to the future watermain along Venture Way, one to the existing watermain at Cristallina Drive and Bounty Avenue and one to the future watermain along the proposed Upper's Lane extension.

The proposed development will require a supply of water for a fire flow plus peak hour demand of 14,530 L/min. Based on the original watermain servicing scheme outlined for the secondary plan area and the adjacent development approved to date, it is assumed that the spine servicing has capacity to provide adequate water supply to this development. Water pressure tests have not been completed in support of this report.

Sanitary Servicing:
The proposed development will have two primary drainage areas and will be serviced by connections to the existing 300mm sanitary sewer on Cristallina Drive and the future 450mm sanitary sewer on the proposed Upper's Lane.

The external sanitary sewers have been designed to accommodate the design flows from the subject site. The design flows have also been analysed in the context of the overall Rolling Meadows Secondary Plan Area and the entire Secondary Plan area will yield a design flow rate of 138.0 L/s based on the current design information available. The capacity of the 525mm trunk sewer on Barker Parkway is 175.8 L/s. Therefore, the existing and proposed external sanitary infrastructure has adequate capacity to service the development.

Stormwater Servicing:

The proposed development will have a minor and major system that will collect run-off from the entire site and convey it to north through the future subdivision right-of-way to a proposed downstream stormwater management facility. The site storm sewer network will connect to the future 1650mm storm sewer along Venture Way.

The site will have the capacity to convey the external future residential lands and woodlot through the site and direct it to outlet.

The site will have quantity and quality control provided by the downstream stormwater management facility located in the Rolling Meadows subdivision. This functional design for this facility contemplated a drainage area with a 45% imperviousness. The proposed development will have a slightly higher imperviousness of about 53%. The detailed design of the stormwater management facility will need to be reviewed to ensure adequate capacity is provided to service the site. The SWM facility will control post-development runoff flow rates for the 2-year to the 100-year storm event from this portion of the subdivision to pre-development levels or less as per the Niagara Peninsula Conservation Authority guidelines.

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1.0 INTRODUCTION

1.1 Background

This Functional Servicing Report has been prepared on behalf of FARZ Holdings Inc. in support of the Zoning By-law Amendment and Draft Plan Approval for the proposed 14.94 ha Residential Development within the Rolling Meadows Secondary Plan. The subject site is zoned LI(H) in the City of Thorold Zoning By-law No. 2140(97).

The purpose of this report is to demonstrate that the existing and proposed infrastructure within the surrounding development can accommodate the proposed development.

The subject site lies within the City of Thorold, Ontario and is located on the northwest of the intersection of the future Upper's Lane ROW and Thorold Townline Road. The site is bounded by a Hydro One aerial transmission corridor to the west, the future Upper's Grove road allowance to the south, future residential developments to the north and future residential developments and a woodlot to the east. A TransCanada Pipeline easement bisects the property in a northeast direction. The site is vacant of existing development and is currently farmed. **Figure 1 – Site Location** illustrates the subject site in the context of its surroundings.

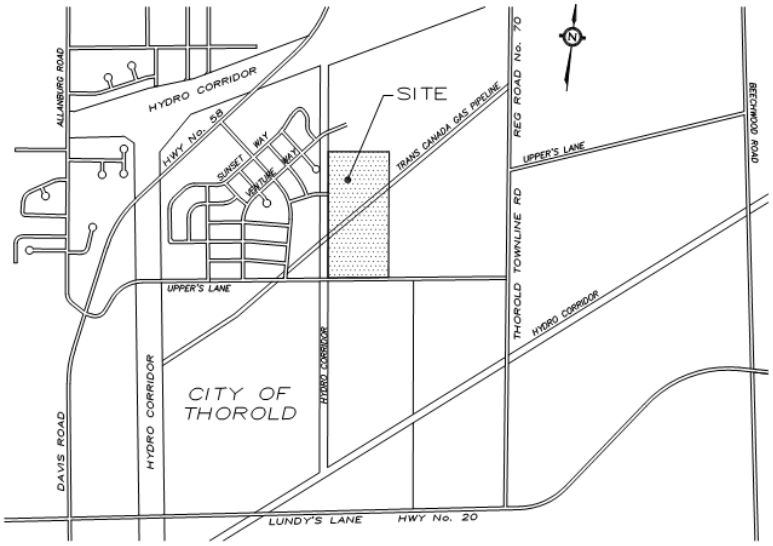


Figure 1 – Site Location

The proposed Residential Development concept consists of 13.015 of public roads and lots; 0.926ha of park block; 0.342ha of public open space and 0.594ha of pipeline easement**.**

The proposed development scheme comprises a mixture of single family lots, small single family lots and freehold townhouse units. The current plan accommodates two (2) roadway connections to the future Upper's Lane extension to the south, the extension of Cristallina Drive to the west, a future connection to the North, which ultimately connects to Venture Way, and a roadway connection to the east to accommodate future development on the east of the site. Refer to the **Draft Plan of Subdivision**, Drawing No. **06k**, dated December 2018, prepared by LARKIN+ Land Use Planners Inc. included in **Appendix A** for the proposed site layout.

The existing site is adjacent to an existing neighbourhood within the Rolling Meadows subdivision containing water, sanitary and storm servicing systems, and stormwater management facilities intended to service the larger area. The subject site will be serviced primarily by connecting to the existing servicing systems in the neighbourhood located west and north of the site, as outlined in the Sub-Watershed Study and Functional Engineering Report prepared by Westlake Inc., 2006 in support of the Rolling Meadows Secondary Plan.

1.2 Study Parameters

This servicing assessment is based on the following background documents and sources:

- Preliminary Stormwater Management Plan – Rolling Hills – Upper Canada Consultants, March 2007
- Neighborhoods of Rolling Meadows Secondary Plan Sub-Watershed Study and Functional Engineering Report – Westlake Inc., June 2006
- City of St. Catharine's Engineering Standards Manual, September 2018
- Niagara Peninsula Conservation Authority Stormwater Management Guidelines, March 2010
- Niagara Region Water-Wastewater Project Design Manual, March 2018
- Design Guidelines for Drinking-Water Systems, MOE, 2008
- Water Supply for Public Fire Protection (Fire Underwriters Survey), 1999
- Stormwater Management Planning and Design Manual, MOE, 2003
- Correspondence with Agency staff
- Record drawings provided by the City and Region
- Geotechnical Subsurface Investigation, prepared by McIntosh Perry dated August 2018.

2.0 WATER SUPPLY

2.1 Existing Water Supply

There are existing municipal watermains installed as part of Phase 6 of the Rolling Meadows subdivision that can be extended to service the subject site. Existing services include the following:

- A 300mm ø watermain at Venture Way and Sunset Way.
- A 150 mm ø watermain at Cristallina Drive and Bounty Avenue.

A future watermain along Upper's Lane extension can provide a connection point to the south of the site to provide a looped watermain system as part of the larger community.

These potential watermain connection locations are shown on **Figure WM-1 –Water Servicing Plan.**

2.2 Proposed Water Supply

The proposed water servicing system will consist of 200mm watermains running along Streets A, B, and E and 150mm watermains running along Streets C, D, F and G. The water servicing system proposes three connections. One connection will be along the extension of Street A on the north of the site that extends through the future ROW and connects to the future watermain on Venture Way. Another connection will be located at the Cristallina Drive extension into Street C to connect to the existing watermain at Cristallina Drive and Bounty Avenue. A third connection will be along Street A at the south boundary of the site that will connect to the future watermain on the Upper's Lane extension. Refer to **Figure WM-1 – Water Servicing Plan** for the existing and proposed watermain layout.

The Niagara Region's Water-Wastewater Project Design Manual states that governing flows shall be the greater of: a) maximum day demand plus fire flow, or b) maximum hour demand. Average Daily Demand design flows of 270 L/cap/day and peaking factors of 2.75 and 4.13 were used to calculate the residential maximum day and maximum hour demand. The calculated daily demands for the proposed development are as follows:

Residential:

- Average Day Demand = 194 L/min = 278,640 L/day
- Maximum Day Demand = 532 L/min = 766,260 L/day
- Peak Hour Demand = 799 L/min = 1,150,783 L/day

Refer to **Appendix B** for supporting water demand calculations.

The Fire Underwriter's Survey (FUS) guidelines were used to calculate the fire flow requirements of the residential site. As per the FUS, a simplified fire flow calculation may be used for residential dwellings, not exceeding two storeys in height. For contiguous buildings a minimum of 8,000 L/min is specified by the FUS. It was calculated that a fire flow of 14,000 L/min is required to service the townhouse dwellings in the site and 5,000 L/min for the single family homes. Refer to **Appendix B** for supporting calculations for the water demand and fire flow requirements.

As per Niagara Region design standards, the proposed development should provide adequate flow at a minimum pressure of 140 kPa/20 psi to satisfy fire flow plus maximum day demand conditions. This flow equates to 532 L/min + 14,000 L/min = ~14,530 L/min. Therefore, the proposed watermain system design shall provide a flow of 14,530 L/min at the minimum pressure threshold of 20 psi. Based on the original watermain servicing scheme outlined for the secondary plan area and the adjacent development approved to date, it is assumed that the spine servicing has capacity to provide adequate water supply to this development. Water pressure tests have not been completed in support of this report.

Coordination with the adjacent land owner and the City of Thorold will be required to extend the necessary connections from the adjacent lands to the proposed development. Crossing agreements with Ontario Hydro and Trans-Canada Pipeline will also be necessary.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Servicing

There are existing municipal sanitary mains installed as part of the Phase 6 of the Rolling Meadows subdivision. The existing sanitary infrastructure is summarized as follows:

- An existing 300mm (8") sanitary sewer draining east to west along Cristallina Drive, with a future 300mm extension further east approximately 45m to the west of the site.
- An existing 450mm (18") sanitary sewer draining east to west along Upper's Lane approximately 110m to the west of the site.

The existing Rolling Meadows development collects drainage along Barker Parkway which conveys flows north and ultimately west to an existing pump station.

These existing sanitary sewer locations provide connections to service the subject site, which are identified in **Figure SAN-1 –Sanitary Drainage Plan**.

3.2 Proposed Sanitary Servicing

The proposed development will have two sanitary service connection points – one connecting to the existing sanitary sewer on Cristallina Drive and one connecting to the future sanitary sewer running along the Upper's Lane extension to the south of the site. The site will be divided into two main drainage areas which are divided at the existing Enbridge pipeline multi-use trail block. The area north of the pipeline trail will drain west to the outlet connecting to the sanitary sewer on Cristallina Drive, while the area south of the trail will drain south to the future sanitary sewer on Upper's Lane extension. This drainage divide is consistent with the drainage plans prepared by Upper's Canada Consultants in the Rolling Meadows subdivision design. Both drainage areas fall below the area accounted for as illustrated in the Rolling Meadows sanitary drainage plan. The north drainage area is 7.10 ha and is accommodated within the 10.43ha in the overall Rolling Meadows sanitary drainage plan accommodated in the Cristallina Drive 300mm sanitary sewer. The south drainage area for the site is 7.80 ha and is included in the

27.52 ha drainage area in the overall Rolling Meadows sanitary drainage plan accommodated by the Upper's Lane 450mm sanitary sewer.

Refer to **Figure SAN-1 – Sanitary Drainage Plan** for the existing and proposed sanitary sewer layout.

The proposed peak sanitary design flow from the subject site to the existing 200mm sanitary sewer on Cristallina Drive is **9.12 L/s**. When adding the other external flows relating to the subdivision, the development will result in a total flow of **10.02 L/s** to the downstream 300mm sanitary sewer along Cristallina drive. The existing local sewer network has been designed to accommodate this flow from the subject site. Refer to **Appendix C** for sanitary design sheet calculations confirming the local sewer capacity.

The proposed peak sanitary design flow from the subject site to the existing 450mm sanitary sewer on Upper's Lane is **11.22 L/s**. The local 450mm trunk sewer along Upper's Lane will be designed to accommodate this flow from the subject site. Refer to **Appendix C** for sanitary design sheet calculations confirming the local sewer capacity.

The overall secondary plan area, including the design flows from the subject site will result in a total design flow of **138.04 L/s** to the downstream 525mm sanitary sewer along Barker Parkway. This is lower in comparison to the original Secondary Plan design, which contemplated a sanitary design flow of **142.38 L/s** and the capacity of **175.8 L/s** for the trunk sanitary sewer on Barker Parkway.

Therefore, the design of the subject site can be accommodated by the existing and proposed sanitary sewer infrastructure for the overall secondary plan and there are no anticipated capacity constraints for sanitary discharge from the site to the existing Rolling Meadows sanitary network. Further discussion with Region of Niagara staff will determine if there are capacity issues related to the development. Refer to **Appendix C** for the Rolling Meadows

sanitary design sheet from the approved report and supporting calculations shown on the sanitary sewer design sheet.

Coordination with the adjacent land owner and the City of Thorold will be required to extend the necessary connections from the adjacent lands to the proposed development. Crossing agreements with Ontario Hydro and Trans-Canada Pipeline will also be necessary.

4.0 STORMWATER SERVICING

4.1 Existing & Future Stormwater Drainage

The existing site is currently cleared agricultural land that is comprised of one main drainage area, where the topography drains in one general direction from the southeast to the northwest of the site.

There are existing municipal storm sewers installed as part of the Phase 6 of the Rolling Meadows subdivision can be extended to service the subject site. The existing storm infrastructure is summarized as follows:

- An existing 375mm (15") storm sewer draining east to west along Cristallina Drive to the west of the site.

Future trunk storm sewers will provide additional service connection points to service the subject site. The future storm infrastructure is summarized below:

- A future 1650mm (65") storm sewer with a storm service stub draining east to west along Venture Way to the north west of the site.

A future offsite stormwater management pond will provide quantity and quality control for the site's drainage. The pond will eventually outlet to a tributary of Beaverdams Creek. The offsite pond previously approved through the Preliminary Stormwater Management Plan is yet to be constructed and is proposed on the adjacent lands. Coordination with the adjacent land owner and the City of Thorold will be required to construct the proposed facility and extend the necessary connections from the adjacent lands to the proposed development. Crossing agreements with Ontario Hydro and Trans-Canada Pipeline will also be necessary.

External areas draining into the subject site from the east will also need to be considered. This includes 4.14 ha of future residential development and a 5.39 ha woodlot.

These existing storm sewer locations provide connections to service the subject site, which are identified in **Figure STM-1 –Storm Drainage Plan**. Existing storm drainage conditions can be seen in the Preliminary Stormwater Management Plan by Upper's Canada Consultants.

4.2 Proposed Stormwater Servicing

For design calculation purposes, the development is shown to have two main drainage areas separated at the existing Enbridge pipeline multi-use trail. The proposed development, however, will collect drainage from the entire site direct the runoff to the north outlet of the site. The minor system will connect to a storm system along a future ROW and connect into the future 1650mm storm sewer along Venture Way. The overland flow route will also drain from south to north along the roadways and outlet to the entrance on the north side of the site. Refer to **Appendix D** for the Storm Sewer Design Sheet. Refer also to **Figure GR-1** – Conceptual Grading Plan for the site grading and overland flow directions.

Refer to **Figure STM-1 – Storm Drainage Plan** for the existing and proposed stormwater sewer layout.

4.3 Proposed Stormwater Management

According to Niagara Region design standards, developments shall control post-development peak run-off rates resulting from the 2-year to the 100-year storm events to the corresponding pre-development peak run-off rates. As this development is within a subdivision, the stormwater quantity and quality controls will be provided by the stormwater management facility downstream of the site in the Rolling Meadows subdivision to the northwest of the subject site. Refer to the Preliminary Stormwater Management Plan by Upper's Canada Consultants for the overall subdivision stormwater management approach.

Based on the Preliminary Stormwater Management Plan, the functional design for this stormwater management facility accounted for a drainage area with an imperviousness of 45%. The drainage areas in the subject site have an imperviousness of 52% and 53% based on the

coefficients provided by the City of St. Catharines. Therefore, there is an increase of imperviousness compared to the design in the Preliminary Stormwater Management Plan. The stormwater management facility capacity will need to be reviewed to ensure it can accommodate the drainage from the proposed imperviousness. See **Appendix E** for the storm drainage plan from the Preliminary Stormwater Management Plan. The ultimate design and construction of this offsite facility will need to be coordinated with the adjacent land owner and their development team. Coordination will include confirmation of design capacity and schedule to ensure the downstream facility is operational to support the proposed development.

The downstream sewer has the capacity to convey the total flows coming from the site in addition to the external areas. Therefore, no conveyance capacity issues are anticipated for the storm sewer system. Refer to **Appendix D** for the storm sewer design sheet.

5.0 TRANS-CANADA PIPELINE CROSSING

There is an existing Trans-Canada pipeline that crosses the site from southwest to northeast separating the property into approximately two halves. The proposed development accommodates for the right-of-way as a linear park with a single municipal road crossing.

Information provided by Trans-Canada indicates that there are 2 pipelines within the right-of-way. The north pipe is an NPS 36" pipeline and the south pipe is an NPS 20" pipeline. The alignment based on preliminary information is accurate to within approximately +/- 5m. Through the design process the proposed pipeline crossing will need to be verified through field locates coordinated with Trans-Canada Pipeline.

6.0 ROAD GRADING AND CROSS-SECTIONS

The overall road layout and grading design must consider the following boundary conditions:

- Existing property line elevations;
- Existing and future land use adjacent to the site;
- Elevation and of the downstream stormwater management facility and its impact on the storm sewer elevation to ensure road grades provide adequate cover;
- Elevation of sanitary sewer connection options to ensure road grades provide adequate cover.

In the detailed design of the site, vertical profiles of the roads should be within 0.5% and 6.0% and sewer slopes should range between 0.15% and 5.0%. The grading and servicing concepts outlined in this report demonstrate that the site can be designed with road and sewer grades that are within these recommended tolerances. High points and proposed road grades are shown on **Figure GR-1 – Conceptual Grading Plan**. Vertical curves required in the road profiles will provided for all grade changes that exceed 1.5%. It is noted that the proposed grading concept will require the import of fill material to the site.

7.0 SOIL CONDITION

As per the geotechnical investigation completed in 2018 by McIntosh Perry 9 boreholes were advanced across the site. The site averages 0.20m to 0.25m of topsoil over a layer of fill approximately 0.5m in depth, consistent with agricultural operations. Below the fill layer to depths of 2.7m to 6.4m are various silt to clayey silt layers. All boreholes were dry upon completion, it is not anticipated that groundwater will be of concern for the proposed development. At depth of 2.7m to 4.6m bedrock was encountered in the southern portion of the site.

Based on the existing site conditions the soil fills and loose native soils are classified as Type 3, while the compact to dense native till is considered Type 2. The soils are suitable for conventional strip and/or spread footings. Where footings are to be placed over engineered fill all existing fill should be removed. The existing materials are also suitable for reuse in site grading and backfilling service trenches.

The proposed asphalt structures are as follows.

Pavement Layer	Compacted Thickness	
	Local	Collector
HL-3 asphalt	50mm	50mm
HL-8 asphalt	50mm	75mm
20mm crusher run limestone	150mm	150mm
50mm crusher run limestone	350mm	400mm

8.0 FUTURE DEVELOPMENT

As mentioned throughout the report the subject site will be dependent on future servicing to be completed by adjacent land owners and/or front-ended and built through adjacent future development land. The phasing and construction of the subject site and the servicing within the ROWs of future development areas will need to be coordinated with the adjacent land owner(s) with respect to both design and cost sharing during the detailed design stage. Key services to be coordinated with future development proposals are summarized as follows:

- Along Venture Way to the north of the site, there will be a future 300mm watermain that will be extended from the existing 300mm watermain stub. The subject site will connect to the future Venture Way watermain through the continuation of Street A through the adjacent development lands to the north.
- An existing storm service stub has also been provided to allow for a 1650mm storm sewer network to be built along Venture Way (by others) that will provide a storm sewer connection to the site through the extension of Street A north of the subject site to Venture Way. This network will eventually direct the flows to the stormwater management facility within the subdivision.
- Along Cristallina Drive to the west of the site, a future manhole and sanitary sewer will provide a connection point to accommodate for the sanitary sewer line along Street C.
- Future storm, sanitary, and watermain servicing within the proposed Uppers Lane Extension will be required to service the subject site.

To accommodate the 2.63ha of development lands to the east and the existing woodlot drainage to the east of the site, two storm inlets are proposed and these drainage areas have been considered in the storm sewer design of the subject site.

9.0 CONCLUSIONS

Based on the assessment provided above, the existing adjacent infrastructure can accommodate the proposed change in lands use as follows:

Water Servicing:
The proposed development will be serviced by connections to the existing and future watermains in the Rolling Meadows subdivision which is proposed adjacent to the north, west, and south of the subject site.

Three connections will be made to the watermain system – one to the future watermain along Venture Way, one to the existing watermain at Cristallina Drive and Bounty Avenue and one to the future watermain along the proposed Upper's Lane extension.

The proposed development will require a supply of water for a fire flow plus peak hour demand of 14,530 L/min. Based on the original watermain servicing scheme outlined for the secondary plan area and the adjacent development approved to date, it is assumed that the spine servicing has capacity to provide adequate water supply to this development. Water pressure tests have not been completed in support of this report.

Sanitary Servicing:
The proposed development will have two primary drainage areas and will be serviced by connections to the existing 300mm sanitary sewer on Cristallina Drive and the future 450mm sanitary sewer on the proposed Upper's Lane.

The external sanitary sewers have been designed to accommodate the design flows from the subject site. The design flows have also been analysed in the context of the overall Rolling Meadows Secondary Plan Area and the entire Secondary Plan area will yield a design flow rate of 138.0 L/s based on the current design information available. The capacity of the 525mm trunk sewer on Barker Parkway is 175.8 L/s. Therefore, the existing and proposed external sanitary infrastructure has adequate capacity to service the development.

Stormwater Servicing:

The proposed development will have a minor and major system that will collect run-off from the entire site and convey it to north through the future subdivision right-of-way to a proposed downstream stormwater management facility. The site storm sewer network will connect to the future 1650mm storm sewer along Venture Way.

The site will have the capacity to convey the external future residential lands and woodlot through the site and direct it to outlet.

The site will have quantity and quality control provided by the downstream stormwater management facility located in the Rolling Meadows subdivision. This functional design for this facility contemplated a drainage area with a 45% imperviousness. The proposed development will have a slightly higher imperviousness of about 53%. The detailed design of the stormwater management facility will need to be reviewed to ensure adequate capacity is provided to service the site. The SWM facility will control post-development runoff flow rates for the 2-year to the 100-year storm event from this portion of the subdivision to pre-development levels or less as per the Niagara Peninsula Conservation Authority guidelines.

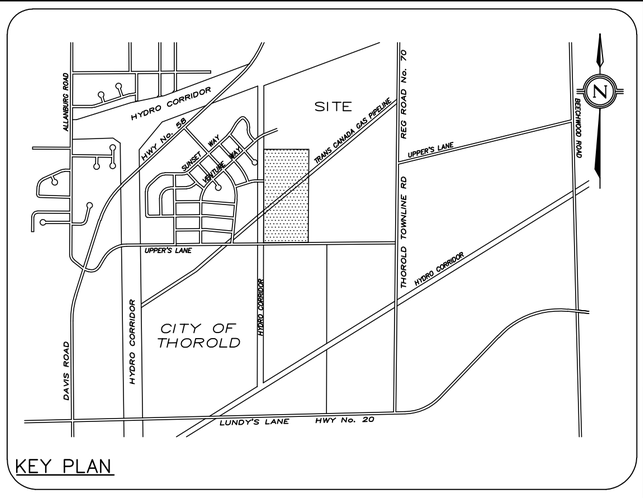
We trust the information provided in the report meets with your requirements. Should there be any questions or comments, please feel free to contact the undersigned.

Sincerely,

Counterpoint Engineering Inc.

Patrick Turner
905-326-3075
pturner@counterpointeng.com

Figures



KEY PLAN

N

SUNSET WAY

TO STORMWATER MANAGEMENT FACILITY

EXISTING HYDRO TOWER

EXT 05
A=16.51
I= 0.45

CINNAMON STREET

1650mm STM @ 0.15% (BY OTHERS)

55.0m @ 0.15%

OBV: 178.59

OBV: 178.52

CONNECT TO FUTURE STORM PIPE

Ex. 525mm STM @ 0.75%

Ex. 300mm STM @ 0.75%

VENTURE WAY

Ex. 375mm STM @ 1.00%

Ex. 375mm STM @ 0.44%

BOUNTY AVENUE

Ex. 300mm STM @ 0.83%

EXISTING HYDRO TOWER

FUT. 300mm STM @ 0.35%

Ex. 375mm STM @ 0.30%

CRISTALLINA DRIVE

Ex. 300mm STM @ 0.30%

Ex. 300mm STM @ 0.30%

EXISTING RESIDENTIAL DEVELOPMENT

HYDRO ONE EASEMENT

BARKER PARKWAY

EXISTING HYDRO TOWER

H.E.P.C.

FUTURE STORM TRENCH

FUTURE ROW (BY OTHERS)

FUTURE RESIDENTIAL

0.15%

OBV: 178.73

95.5m @ 0.2%

TEMPORARY TURNING CIRCLE

C/L OF DITCH

STREET A

STREET B

STREET C

STREET D

STREET E

STREET F

STREET G

89.0m @ 0.4%

OBV: 179.25

77.0m @ 0.4%

OBV: 179.56

79.0m @ 0.4%

OBV: 178.90

01
A=7.10
I= 0.52

79.0m @ 0.5%

79.0m @ 0.5%

96.5m @ 0.4%

OBV: 179.55

61.0m @ 1.0%

OBV: 180.19

OBV: 180.02

79.0m @ 0.5%

OBV: 179.22

96.5m @ 0.5%

OBV: 180.51

96.4m @ 0.4%

OBV: 180.45

65.0m @ 0.6%

OBV: 179.61

OBV: 179.97

90.0m @ 0.6%

Open Space (HEDGEROW)

(HEDGEROW)

MULTI USE TRAIL

EXISTING PIPELINE (NPS 36)

EXISTING PIPELINE (NPS 20)

35.0m @ 1.0%

OBV: 181.15

90.0m @ 0.4%

Open Space (HEDGEROW)

PARK

Open Space

92.5m @ 0.5%

OBV: 180.66

85.0m @ 0.5%

46.0m @ 0.5%

OBV: 181.35

OBV: 180.41

OBV: 180.45

78.0m @ 0.6%

02
A=7.80
I= 0.53

91.0m @ 1.0%

93.5m @ 0.5%

67.0 @ 0.5%

OBV: 181.40

OBV: 181.70

OBV: 181.39

78.0m @ 0.6%

92.5m @ 0.4%

71.0m @ 1.0%

91.0m @ 1.8%

OBV: 181.85

OBV: 182.55

34.5m @ 1.0%

OBV: 183.40

(HEDGEROW)

(HEDGEROW)

OBV: 181.75

OPEN SPACE (HEDGEROW)

EXT 04
A=5.39
I= 0.25

EXT 03
A=2.63
I= 0.60

BREAK LINE

EXISTING WOODLOT

EXISTING TREE LINE

P.L.P.

PROPOSED UPPERS LANE EXTENSION

UNCONFIRMED UPPERS LANE EXTENSION

FUTURE RESIDENTIAL

LEGEND

01
A=7.10
I= 0.52

DRAINAGE AREA ID
DRAINAGE AREA (HA)
IMPERVIOUSNESS

PROPOSED STORM SEWER
EXISTING STORM SEWER
FUTURE STORM SEWER

counterpoint ENGINEERING

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8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

APPLICANT:

KETTLEBECK DEVELOPMENTS
1 SUNSET WAY
THOROLD, ONTARIO
PHONE: 905-320-7233

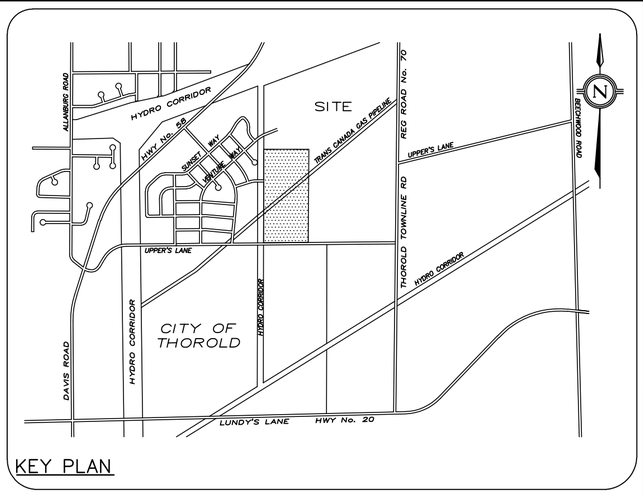
SITE LOCATION:

UPPER GROVE RESIDENTIAL DEVELOPMENT
UPPERS LANE
THOROLD, ONTARIO
SITE PLAN FILE No.:

STORM DRAINAGE PLAN

DATE: OCTOBER 2018
PROJECT NO. 18020
SCALE: 1:1000m (0m, 20m, 40m, 60m)
FIGURE NO. STM-1

REGION FILE No.:



KEY PLAN

N

SUNSET WAY

CINNAMON STREET

VENTURE WAY

BOUNTY AVENUE

CRISTALLINA DRIVE

BARKER PARKWAY

EXISTING RESIDENTIAL DEVELOPMENT

EXISTING HYDRO TOWER

EXISTING HYDRO TOWER

EXISTING HYDRO TOWER

FUT. 200mm SAN @ 1.00%

EX. 200mm SAN @ 0.40%

EX. 200mm SAN @ 1.50%

EX. 200mm SAN @ 0.40%

EX. 200mm SAN @ 1.00%

EX. 200mm SAN @ 0.40%

EX. 200mm SAN @ 0.15%

EX. 200mm SAN @ 0.25%

EX. 525mm SAN @ 0.15%

EX. 525mm SAN @ 0.25%

EX. 300mm

EX. 525mm SAN @ 0.15%

EX. 525mm SAN @ 0.15%

EX. 525mm SAN @ 0.15%

A84b
A= 19.85
P= --
COMMERCIAL FLOWS

A84a
A= 20.42
P= 875

FUTURE ROW
(BY OTHERS)

FUTURE RESIDENTIAL

TEMPORARY TURNING CIRCLE

A81
A= 1.30
P= 36

CONNECT TO EXISTING MH CK

CONNECT TO FUTURE SAN MH

91.0m @ 0.50%

OBV: 174.88

OBV: 175.60

STREET A

STREET C

31.8m @ 1.00%

95.4m @ 0.50%

77.8m @ 1.00%

OBV: 177.65

OBV: 176.71

OBV: 176.39

79.0m @ 0.50%

OBV: 176.00

STREET D

86.6m @ 0.50%

75.1m @ 1.00%

A84al
A= 7.10
P= 456

STREET C

97.3m @ 0.50%

99.4m @ 0.50%

OBV: 177.43

85.0m @ 1.00%

OBV: 176.58

OBV: 176.09

79.0m @ 0.50%

STREET A

59.4m @ 0.50%

OBV: 175.90

OBV: 179.80

50.2m @ 1.00%

STREET B

EXISTING WOODLOT

EXISTING TREE LINE

Open Space (HEDGEROW)

(HEDGEROW)

(HEDGEROW)

(HEDGEROW)

MULTI USE TRAIL

EXISTING PIPELINE (NPS 36)

EXISTING PIPELINE (NPS 20)

PARK

STREET E

83.2m @ 0.50%

77.2m @ 0.50%

OBV: 180.12

OBV: 178.91

69.3m @ 0.50%

OBV: 176.24

77.8m @ 0.50%

Open Space

Open Space

Open Space

STREET A

STREET B

OBV: 177.98

OBV: 177.63

34.8m @ 1.00%

A69a
A= 7.80
P= 576

STREET F

95.8m @ 0.50%

81.5m @ 0.50%

78.0m @ 0.50%

OBV: 178.52

STREET A

78.0m @ 0.50%

OBV: 177.24

STREET G

99.4m @ 0.50%

66.6m @ 0.50%

OBV: 178.07

106.7m @ 1.00%

STREET B

A69b
A= 2.63
P= 79

35.9m @ 0.50%

OBV: 177.06

OPEN SPACE (HEDGEROW)

OBV: 179.57

(HEDGEROW)

(HEDGEROW)

HYDRO ONE EASEMENT

H.E.P.C.

CLOSED ROAD ALLOWANCE

EXISTING HYDRO TOWER

CONNECT TO MH BN

PROPOSED UPPERS LANE EXTENSION

MH BN

FUTURE SANITARY

A69b
A= 19.02
P= 571

A68e
A= 44.88
P= 1726

UNCONFIRMED UPPERS LANE EXTENSION

LEGEND

01A
A= 7.10
P= 456

DRAINAGE AREA ID
DRAINAGE AREA (HA)
POPULATON

PROPOSED SANITARY SEWER
EXISTING SANITARY SEWER
FUTURE SANITARY SEWER

counterpoint ENGINEERING
COUNTERPOINT ENGINEERING INC.
8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

APPLICANT:

KETTLEBECK DEVELOPMENTS
1 SUNSET WAY
THOROLD, ONTARIO
PHONE: 905-320-7233

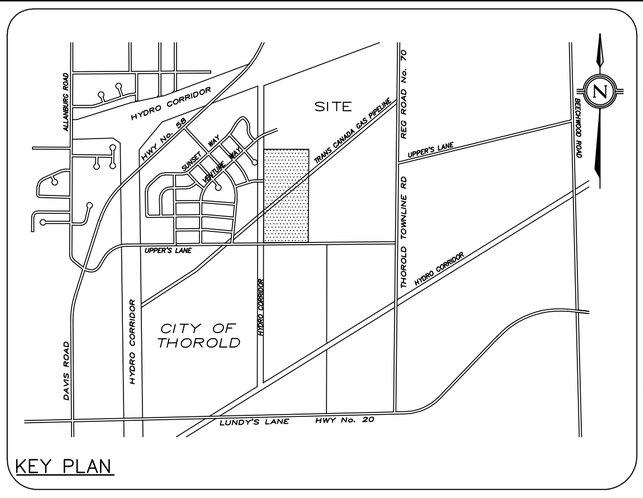
SITE LOCATION:

UPPER GROVE RESIDENTIAL DEVELOPMENT
UPPERS LANE
THOROLD, ONTARIO
SITE PLAN FILE No.:

SANITARY DRAINAGE PLAN

DATE: OCTOBER 2018
PROJECT NO. 18020
SCALE: 1:1000m (0m, 20m, 40m, 60m)
FIGURE NO. SAN-1

REGION FILE No.:



KEY PLAN

N

SUNSET WAY

CINNAMON STREET

VENTURE WAY

BOUNTY AVENUE

CRISTALLINA DRIVE

BARKER PARKWAY

EXISTING RESIDENTIAL DEVELOPMENT

EXISTING HYDRO TOWER

EXISTING HYDRO TOWER

EXISTING HYDRO TOWER

FUTURE 300mm W/M

FUTURE ROW (BY OTHERS)

FUTURE RESIDENTIAL

CONNECT TO EXISTING WATERMAIN

CONNECT TO EXISTING WATERMAIN

TEMPORARY TURNING CIRCLE

EX. 150mm W/M

EX. 300mm W/M

EX. 150mm W/M

EX. 150mm W/M

EX. 300mm W/M

EX. 150mm W/M

EX. 300mm W/M

EX. 150mm W/M

EX. 300mm W/M

EX. 300mm W/M

FUT. 300mm W/M

EX. 300mm W/M

EX. 300mm W/M

FUT. 300mm W/M

HYDRO ONE EASEMENT

H.E.P.C.

CLOSED ROAD ALLOWANCE

STREET A

STREET A

STREET A

STREET C

STREET C

STREET C

STREET D

STREET B

STREET B

STREET E

STREET F

STREET G

PARK

Open Space (HEDGEROW)

Open Space

Open Space

Open Space (HEDGEROW)

(HEDGEROW)

(HEDGEROW)

(HEDGEROW)

(HEDGEROW)

OPEN SPACE (HEDGEROW)

EXISTING WOODLOT

EXISTING TREE LINE

EXISTING PIPELINE (NPS. 36)

EXISTING PIPELINE (NPS. 20)

MULTI USE TRAIL

C/L OF DITCH

C/L OF DITCH

C/L OF DITCH

C/L OF DITCH

BREAK LINE

BREAK LINE

BREAK LINE

BREAK LINE

BREAK LINE

BREAK LINE

150mm W/M

150mm W/M

150mm W/M

150mm W/M

200mm W/M

200mm W/M

200mm W/M

200mm W/M

200mm W/M

200mm W/M

FUTURE W/M

PROPOSED UPPERS LANE EXTENSION

UNCONFIRMED UPPERS LANE EXTENSION

LEGEND

PROPOSED WATERMAIN

EXISTING WATERMAIN

FUTURE WATERMAIN

counterpoint ENGINEERING

COUNTERPOINT ENGINEERING INC.

8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

APPLICANT:

KETTLEBECK DEVELOPMENTS
1 SUNSET WAY
THOROLD, ONTARIO
PHONE: 905-320-7233

SITE LOCATION:

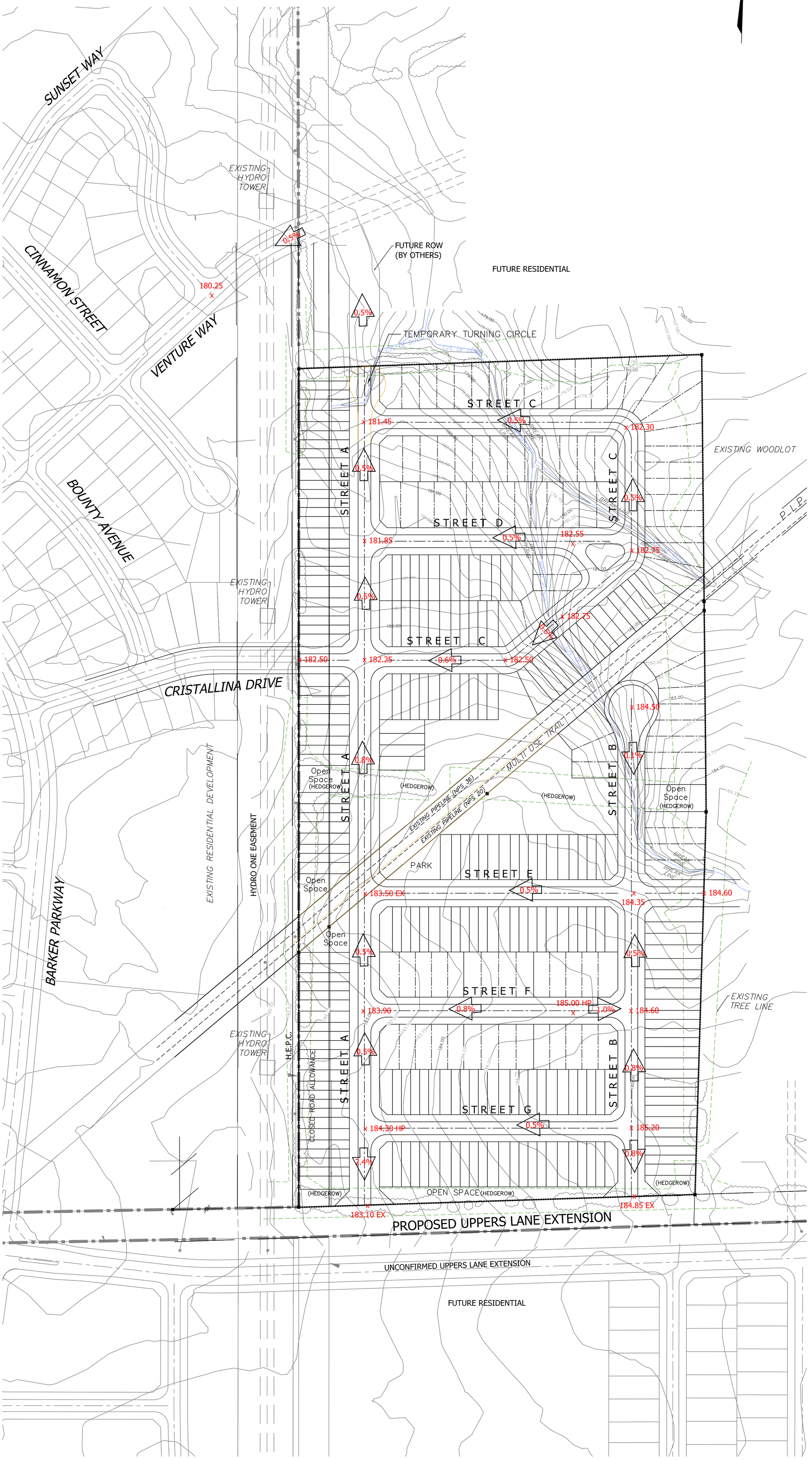
UPPER GROVE RESIDENTIAL DEVELOPMENT

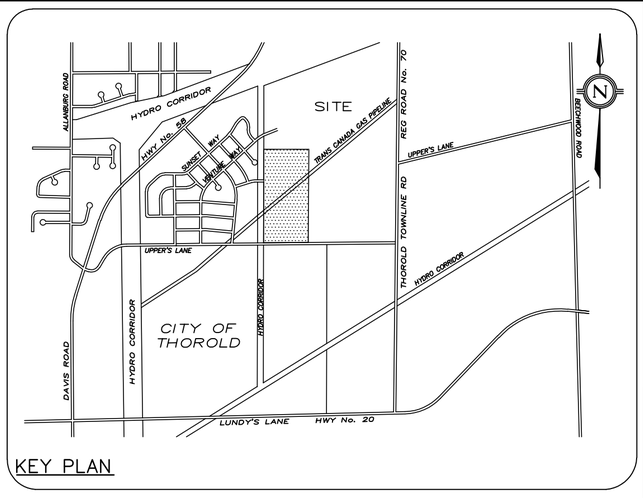
UPPERS LANE
THOROLD, ONTARIO
SITE PLAN FILE No.:

WATER SERVICING PLAN

DATE:	OCTOBER 2018
PROJECT NO.	18020
SCALE: 1:1000m (0m, 20m, 40m, 60m)	
FIGURE NO.	WM-1

REGION FILE No.:





KEY PLAN

LEGEND

x 185.20	PROPOSED ELEVATION
x 184.85 EX	EXISTING ELEVATION
1.0%	PROPOSED GRADE

counterpoint ENGINEERING

COUNTERPOINT ENGINEERING INC.

8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

APPLICANT:

KETTLEBECK DEVELOPMENTS
1 SUNSET WAY
THOROLD, ONTARIO
PHONE: 905-320-7233

SITE LOCATION:

UPPER GROVE RESIDENTIAL DEVELOPMENT
UPPERS LANE
THOROLD, ONTARIO
SITE PLAN FILE No.:

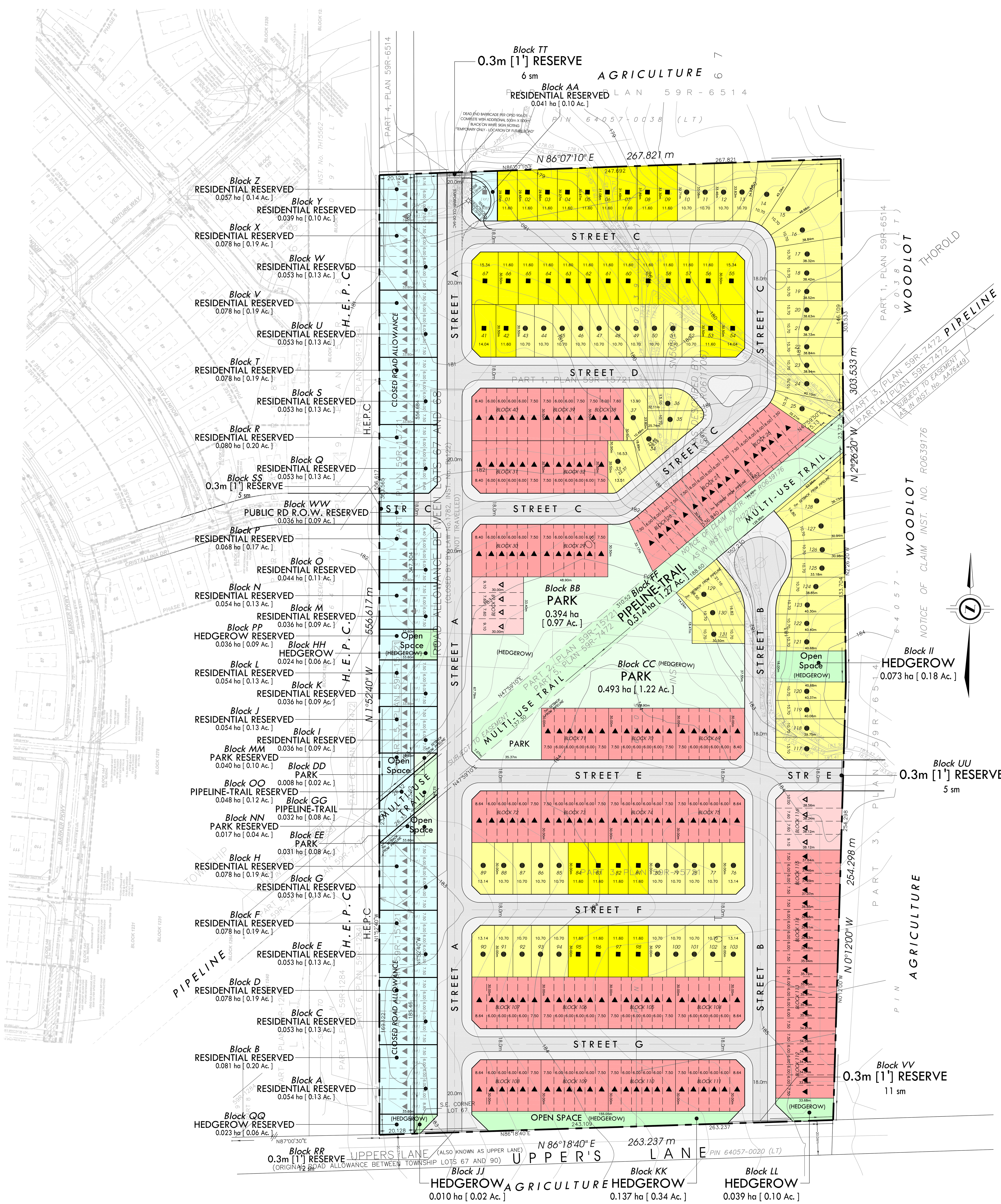
CONCEPTUAL GRADING PLAN

DATE:	OCTOBER 2018
PROJECT NO.	18020
SCALE: 1:1000m (0m, 20m, 40m, 60m)	
FIGURE NO.	GR-1

REGION FILE No.:

Appendix A

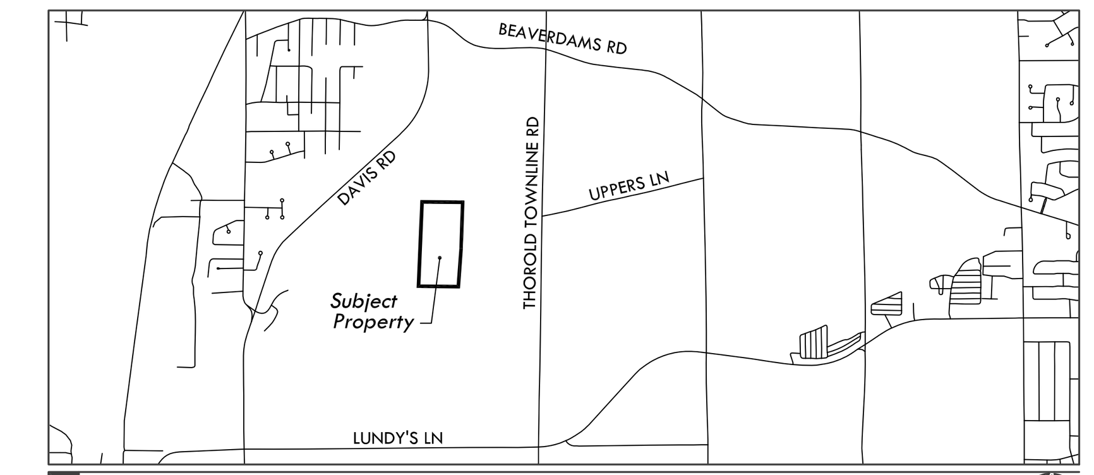
Draft Plan of Subdivision, dated December 2018, prepared by LARKIN+ Land Use Planners Inc.



Upper's Grove Community

DRAWING

FARZ 2018-12-10



Key Plan

1:50000

Schedule of Land Use

PROPOSED LAND USE	Legend	REFERENCE Lots / Blocks / Streets	YIELD Units	YIELD Blocks	AREA ha	AREA [Ac.]	AREA %
1) Single Detached Lots 11.6m (38') min.	■	Lots 01-09, 41-42, 53-67, 81-84, 95-98.	34	.	1.235	[3.06]	8.3
2) Single Detached Lots 10.7m (35') min.	●	Lots 10-25, 33-37, 43-52, 76-80, 85-94, 99-103, 117-131.	66	.	2.646	[6.54]	17.7
3) Street Townhouse Lots 7.6m (25') min.	△	Blocks 68, 116.	8	2	0.230	[0.57]	1.5
4) Street Townhouse Lots 6.0m (20') min.	▲	Blocks 26-32, 38-40, 69-75, 104-115.	166	29	3.381	[8.36]	22.6
5) Residential Reserved		Blocks A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z,AA.	(70)	27	1.573	[3.86]	10.5
6) Open Space - Park		Blocks BB, CC, DD, EE.	.	4	0.926	[2.29]	6.2
7) Open Space - Pipeline-Trail		Blocks FF, GG.	.	2	0.546	[1.35]	3.7
8) Open Space - Hedgerows		Blocks HH, II, JJ, KK, LL.	.	5	0.283	[0.70]	1.9
9) Park Reserved		Blocks MM, NN.	.	2	0.057	[0.14]	0.4
10) Pipeline-Trail Reserved		Block OO.	.	1	0.048	[0.12]	0.3
11) Hedgerow Reserved		Blocks PP, QQ.	.	2	0.059	[0.15]	0.4
12) 0.3m (1') Reserves		Blocks RR, SS, TT, UU, VV.	.	5	0.004	[0.01]	0.0
13) Public Road R.O.W.		Collector A + Locals B, C, D, E, F, G.	.	.	3.914	[9.67]	26.2
14) Public Road R.O.W. Reserved		Block WW.	.	1	0.036	[0.09]	0.3
TOTALS			344	80	14.938	[36.91]	100

Additional Information

REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a Shown on Draft Plan and Surveyor's Certificate
b Shown on Draft and Key Plans
c Shown on Key Plan
d Land to be used in accordance with Land Use Schedule
e Shown on Draft Plan
f Shown on Draft Plan
g Shown on Draft and Key Plans
h Municipal Water Supply will be provided
i Soil is Greyish Brown to Brown Clayey Silt Till
j Shown on Draft Plan
k Full Municipal Services will be provided
l Shown on Draft Plan

Owner's Authorization

I/We, being the Registered Owner of the Subject Lands, hereby Authorize LARKIN+ Land Use Planners Inc. to prepare and submit this Draft Plan of Subdivision for Approval.

Signed ______________________ Date ______________
LAIQ SIDDIQUI
Farz Holdings Inc.

Surveyor's Certificate

I hereby Certify that the Boundaries of the Subject Lands and their relationship to the Adjacent Lands are accurately and correctly shown on this Plan.

Signed [signature] Date Dec. 11, 2018
DASHA PAGE, O.L.S.
Matthews, Cameron, Heywood - Kerry T. Howe Surveying Ltd.

No.	PLAN	REVISION	BY	DATE
01	06k	Submission.	mvs	2018-12-12

REVISIONS

SOURCES:

Base information comprised of
Plan of Survey prepared by Matthews, Cameron, Heywood - Kerry T. Howe Surveying Ltd. (J.D. Barnes Limited) ref no.: 16-16-720-00; dated: December 8, 2016, and
Topographic Survey prepared by Matthews, Cameron, Heywood - Kerry T. Howe Surveying Ltd. (J.D. Barnes Limited) ref no.: 18-16-004-00; dated: February 2, 2018.

DRAFT PLAN of Subdivision

PART OF LOT 67 and PART OF ROAD ALLOWANCE BETWEEN LOTS 67 AND 68
CITY OF THOROLD
REGIONAL MUNICIPALITY OF NIAGARA

0 50 100m
1 : 1250

seal north

ROBERT WALTERS REGISTERED PROFESSIONAL PLANNER R.P.P. ONTARIO PROFESSIONAL PLANNERS INSTITUTE INSTITUT DES PLANIFICATEURS PROFESSIONNELS DE L'ONTARIO

prepared for: FARZ
approved by: RWW
design by: MVS
drawn by: MVS/ELV

LARKIN+ land use planners inc.
849 Gorham Street
Newmarket, ON
Canada L3Y 1L7
905-895-0554 / 888-854-0044
www.larkinplus.com

DATE: DEC 2018
PROJECT: FARZ
SCALE: 1:1000
DRAWING: 06k

Appendix B

Water Demand and FUS Calculations

Counterpoint Engineering Inc.

RESIDENTIAL WATER DEMAND CALCULATIONS

Project: Uppers Glen
Project No: 18020
Client: Kettlebeck Development
Location: Thorold, Ontario

Prepared by: PW
Checked by:
Date: 20-Nov-18

Average Daily Demand:	270	L/(cap*d)	
Maximum Day Peaking Factor:	2.75		(See Note 1)
Peak Hour Peaking Factor:	4.13		(See Note 2)
Population Density (Singles)	3	ppu	(See Note 3)
Population Density (Towns)	3	ppu	(See Note 3)

Modelled Area	Number of Units	Population	Average Day Demand (L/min)	Maximum Day Demand (L/min)	Maximum Hour Demand (L/min)
Singles	101	303	57	156	235
Street & Condominium Towns	243	729	137	376	565
Total	**344**	**1032**	**194**	**532**	**799**
Total (L/day)	**344**	**1032**	**278,640**	**766,260**	**1,150,783**
Total (gpm)	**344**	**1032**	**51.1**	**140.6**	**211.1**

Notes:

1. For population between 500 - 1000 per 2008 MOE Watermain Design Guidelines, Table 3-1.
2. For population between 500 - 1000 per 2008 MOE Watermain Design Guidelines, Table 3-1.
3. Assumed Persons per unit for singles and townhouses.

Counterpoint Engineering Inc.

REQUIRED FIRE FLOW WORKSHEET - PROPOSED RESIDENTIAL DEVELOPMENT
Fire Underwriters Survey

Project : **Thorold**
Project No: **18020**

Guide for Determination of Required Flow Copyright I.S.O

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

F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).
= 0.6 for fire-resistive construction (fully protected frame, floors, roof).
A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

Type of Construction		Class Factor
WF	Wood Frame	1.5
OC	Ordinary Construction	1.0
NC	Non-Combustible	0.8
FC	Fire-Resistive	0.6

Contents		% Reduction
NC	Non-Combustible	25
LC	Limited Combustible	15
C	Combustible	0
FB	Free Burning	15
RB	Rapid Burning	25

Area Notes for Fire Resistive Buildings (from FUS manual, 1999):

If Vertical Openings are inadequately protected (less than 1-hour fire rating): Area is the total of the two largest adjoining floors (above ground level) plus 50% of the area of each of the next 8 adjoining floors above that.

If Vertical Openings are adequately protected (at least 1-hour fire rating): Area is the total of the largest floor (above ground level) plus 25% of the area of each of the next 2 immediately adjoining floors above that.

1) Fire Flow

Type of Construction:	WF		
C=	1.5		
A*=	900	m^2	*Estimated area assuming two floors
F=	**9,900**	**L/min**	

Note: Assuming a fire rated partition per OBC requirements will be provided building area exceeds approximate 900 m2.

2) Occupancy Reduction/Surcharge

Contents Factor:		LC			
Reduction/Surcharge of		-15%		=	-1,485 L/min
F=	9900L/min +	-1485	L/min	=	8,415 **L/min**

3) System Type Reduction

NFPA 13 Sprinkler:		NO	0%		
Standard Water Supply:		YES	10%		
Fully Supervised:		NO	0%		
Total			10%		
Reduction of		10%	L/min	=	842 L/min
F=	8415L/min -	842	L/min	=	7,574 **L/min**

4) Separation Charge

Building Face	Dist(m)	Charge	
North	20	15%	*Estimated distances
East	3	25%	
South	20	15%	
West	3	25%	
Total		75%	**of** 8415 **L/min = 6,311 L/min**

(max exposure charge can be 75%)

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

F= 7574L/min + 6311L/min = 13,885 **L/min** (2,000L/min<F<45,000L/min)

F=	14,000	**L/min** (round to the nearest 1,000L/min)
F=	233	**L/s**
F=	3,698	**gpm**

Appendix C

Sanitary Design Sheet & Rolling Meadows Subdivision Design Calculations

Counterpoint Engineering Inc.

SANITARY SEWER DESIGN SHEET (METRIC)

PROJECT: **Uppers Glen**
PROJECT No.: **18020**
MUNICIPALITY: **Thorold, Ontario**

DESIGNED BY: PW
CHECKED BY:
MANNINGS "n": 0.013
DATE: 11/05/2018 (Rev 1)

	RESIDENTIAL				COMMERCIAL			INDUSTRIAL	INSTITUTIONAL	FLOW IN LITRES PER SECOND						PROPOSED SEWER				PRESENT CONDITION
MAINTENANCE No.	GROSS AREA (ha)	POP. DENSITY UNITS	POP.	PEAK FLOW FACTOR	LOT AREA (ha)	FLOOR SPACE INDEX (See Note 7)	FLOOR AREA (ha)	LOT AREA (ha)	LOT AREA (ha)	RESIDENTIAL FLOW INFIL. * 0.26 l/s	RESIDENTIAL FLOW SEWAGE 0.0042 l/s	COMM. 2.08 l/s	INDUS. 2.08 l/s	INSTIT. 1.30 l/s	TOTAL FLOW l/s	PIPE SIZE (Nom) (mm)	SLOPE %	CAPACITY Q (Act Pipe) l/s	VELOCITY V (Act Pipe) m/s	SURCHARGED %
Area 84e																				
Singles	7.10	57	171																	
Townhouses		95	285																	
MH CK	**7.10**		**456**	**3.80**						**1.85**	**7.28**				**9.12**	**200**	**0.50**	**24.48**	**0.75**	**37%**
Cristalina Drive	1.30	12	36																	
MH BY	**8.40**		**492**	**3.80**						**2.18**	**7.85**				**10.04**	***300***	***0.25***	***50.23***	***0.69***	***20%***
Area 69a																				
Singles	7.80	44	132																	
Townhouses		148	444																	
Uppers Lane	**7.80**		**576**	**3.80**						**2.03**	**9.19**				**11.22**	**200**	**0.50**	**24.48**	**0.75**	**46%**
Area 69b	19.02	30	571																	
Area 68a		38.5			3.64	0.50	1.82													
Area 68e	44.88	38.5	1,726																	
Area 69a(Ext)	2.63	30	79																	
MH BN	**74.33**		**2,952**	**3.45**	**3.64**		**1.82**			**19.33**	**42.75**	**3.79**			**65.86**	**450**	**0.15**	**114.11**	**0.70**	**58%**
Area 68b	16.02	38.5	616																	
Area 68d	12.14	38.5	467																	
Area 68c	13.55	38.5	521																	
Area 68f	25.58	38.5	984																	
MH BN	**67.29**		**2,588**	**3.50**						**17.50**	**38.00**				**55.50**	**450**	**0.15**	**114.11**	**0.70**	**49%**
Area 51-67	6.78		312																	
Area 71-82	7.00		347		4.78	0.50	2.39		2.04											
MH BY-BZ	**163.80**		**6,691**	**3.13**	**4.78**		**2.39**		**2.04**	**42.59**	**87.83**	**4.97**		**2.65**	**138.04**	**525**	**0.15**	**175.75**	**0.78**	**79%**

NOTES:

Refer to Upper Canada Consultants Rolling Meadows Project No. 0695 drawing 0695SAN (Rev 1) for external sanitary drainage areas

INFILTRATION	0.26L/s - 22.5 m3/ha/day
	0.52 L/s - 45.0 m3/ha/day
INDUSTRIAL	1.04L/s - 90.0 m3/ha/day
FLOW RATES	2.08L/s - 180 m3/ha/day

UPPER CANADA CONSULTANTS
1-261 MARTINDALE RD
ST.CATHARINES, ONTARIO, L2W
DESIGN FLOWS

DESIGN: J. SCHOOLEY
DATE: DECEMBER 2010

RESIDENTIAL	340 L/Capita/Day (AVERAGE DAILY	COMMERCIAL	#### L/ha/Day (AVERAGE DAILY	COMMERCIAL & INSTITUTIONAL PEAK	1.5
INFILTRATION RATE	0.18 L/s/Hectare (MOE FLOW ALLOWANCE IS BETWEEN 0.10 & 0.28	INDUSTRIAL	#### L/ha/Day (AVERAGE DAILY		
POPULATION PER UNIT	3	INSTITUTIONA	#### L/ha/Day (AVERAGE DAILY		

MUNICIPALITY: CITY OF THOROLD
PROJECT: ROLLING MEADOWS (PHASE
PROJECT NO.: 0695

SANITARY SEWER DESIGN SHEET

		MANHOLES		AREA (hectares)									POPULATION			ACCUMULATED PEAK FLOW							DESIGN FLOW	
DRAINAGE AREA ID	DESCRIPTION	FROM M.H.	TO M.H.	RESIDENTIAL INCR	RESIDENTIAL ACCUM	COMM. INCR	COMM. ACCUM	INDUST. INCR	INDUST. ACCUM	INST. PEAKING	INST. INCR	INST. ACCUM	RES.POP DENS. p.p.ha	RES. POP. INCR	RES. POP. SERVED	PEAK. FACT.	RESID. FLOW (L/s)	C+I+I FLOW (L/s)	INFILT. FLOW (L/s)	TOTAL PEAK FLOW (mm)	DIA. PIPE (%)	SLOPE (m/s)	VEL. (L/s)	CAP. APACITY	PERCENT FULL FLOW
A68	EXTERNAL LANDS	STUB	BN	112.17	112.17	3.64	3.64			3.50			38.5	4314	4314	3.73	63.36	0.63	20.85	84.84	450	0.15	0.70	115.24	73.6%
A69	EXTERNAL LANDS	STUB	BN	29.45	29.45								30.0	884	884	4.50	15.65	0.00	5.30	20.95	450	0.15	0.70	115.24	18.2%
A70	BARKER PARKWAY	BN	BQ	0.16	148.56		4.32			3.50			0.0	0	5510	3.55	77.06	0.75	27.52	105.33	525	0.15	0.78	173.83	60.6%

Print Date: 2018-03-29

UPPER CANADA CONSULTANTS
1-261 MARTINDALE RD
ST.CATHARINES, ONTARIO, L2W
DESIGN FLOWS

DESIGN: J. SCHOOLEY
DATE: DECEMBER 2010

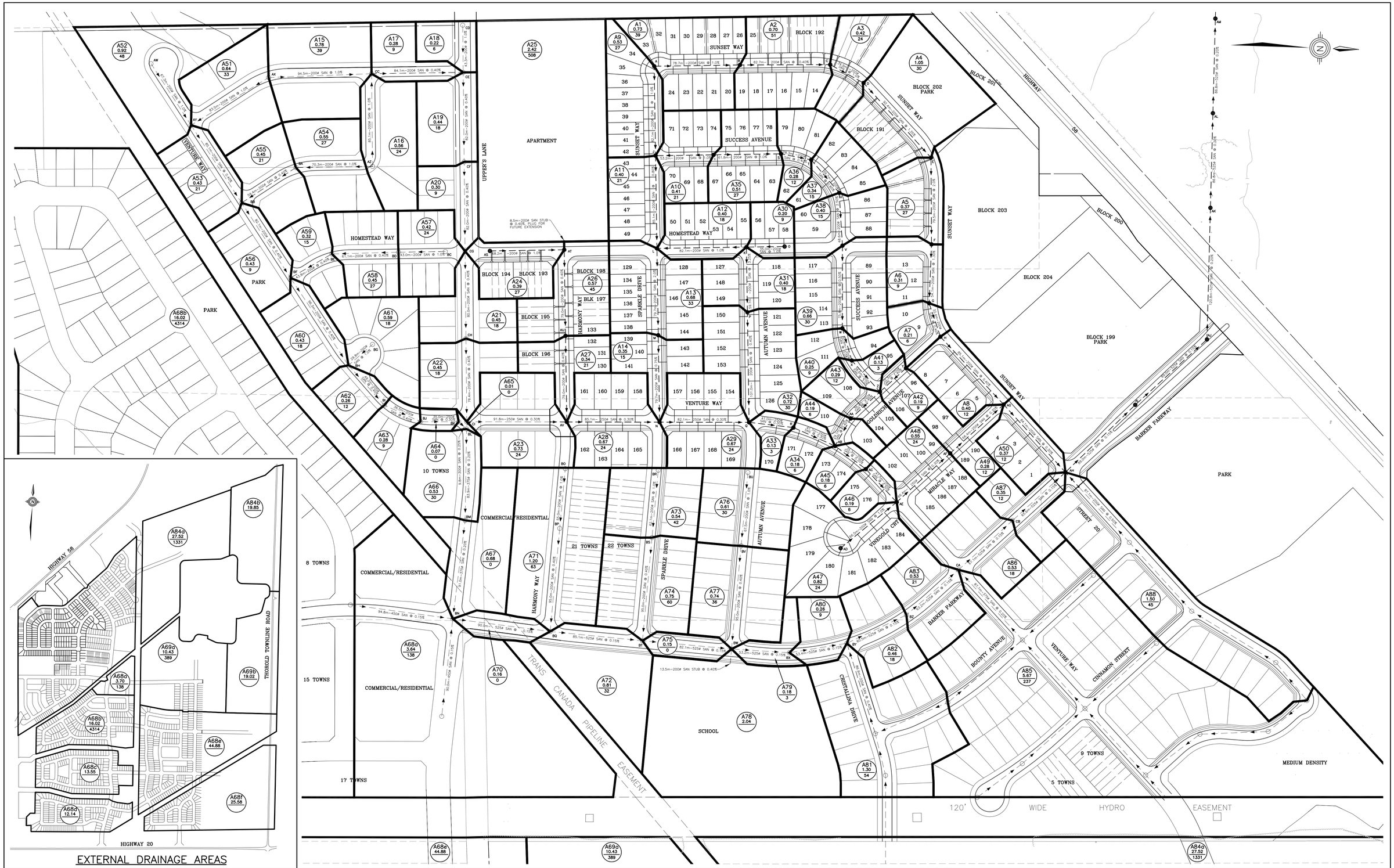
RESIDENTIAL	340 L/Capita/Day (AVERAGE DAILY	COMMERCIAL	#### L/ha/Day (AVERAGE DAILY	COMMERCIAL & INSTITUTIONAL PEAK 1.5
INFILTRATION RATE	0.18 L/s/Hectare (MOE FLOW ALLOWANCE IS BETWEEN 0.10 & 0.28	INDUSTRIAL	#### L/ha/Day (AVERAGE DAILY	
POPULATION PER UNIT	3	INSTITUTIONA	#### L/ha/Day (AVERAGE DAILY	

MUNICIPALITY: CITY OF THOROLD
PROJECT: ROLLING MEADOWS (PHASE
PROJECT NO.: 0695

SANITARY SEWER DESIGN SHEET

DRAINAGE AREA ID	DESCRIPTION	MANHOLES FROM M.H.	MANHOLES TO M.H.	AREA (hectares) RESIDENTIAL INCR	RESIDENTIAL ACCUM	COMM. INCR	COMM. ACCUM	INDUST. INCR	INDUST. ACCUM	INST. PEAKING	INST. INCR	INST. ACCUM	POPULATION p.p.ha	RES.POP. DENS.	RES. POP. SERVED	PEAK. FACT.	ACCUMULATED PEAK FLOW RESID. FLOW (L/s)	C+I+I FLOW (L/s)	INFILT. FLOW (L/s)	TOTAL PEAK FLOW (mm)	DIA. PIPE (%)	SLOPE (m/s)	VEL. (L/s)	DESIGN FLOW CAP. APACITY	PERCENT FULL FLOW
A84	EXTERNAL LANDS			27.52	27.52	19.85	19.85			3.50			48.4	1331	1331										
A85	VENTURE WAY	STUB	CA	5.67	33.19		19.85			3.50			41.8	237	1568	4.50	27.77	3.45	9.55	40.76	375	0.20	0.72	81.83	49.8%
A86	BARKER PARKWAY	CA	CB	0.53	189.81		24.63			3.50		2.04	34.0	18	7464	3.34	98.24	4.98	38.97	142.19	525	0.15	0.78	173.83	81.8%
A87	BARKER PARKWAY	CB	AH	0.35	190.16		24.63			3.50		2.04	34.3	12	7476	3.34	98.37	4.98	39.03	142.38	525	0.15	0.78	173.83	81.9%

Print Date: 2018-03-29



EXTERNAL DRAINAGE AREAS

No	REVISIONS	DATE	BY
1	REVISED TO EXPAND PHASE 1	SEPT 2/08	J.S.
0	ISSUED FOR APPROVAL	MAY 2/08	J.S.

LEGEND:

- A14 / 0.50 / 30 — DRAINAGE AREA NUMBER, DRAINAGE AREA (ha), NUMBER OF PEOPLE
- DRAINAGE AREA BOUNDARY

STAMP: LICENSED PROFESSIONAL ENGINEER — D. P. SCHOOLEY — Sept/08 — PROVINCE OF ONTARIO

City of Thorold — Where Ships Climb The Mountain...

CITY OF THOROLD
OPERATIONS DEPARTMENT

UPPER CANADA CONSULTANTS
ENGINEERS/PLANNERS
261 Martindale Road
Unit #1
St. Catharines, Ontario
L2W 1A1
Phone:(905)688-9400
Fax: (905)688-5274

PROJECT NAME: ROLLING MEADOWS

OWNER: ROLLING MEADOWS LAND DEVELOPMENT CORPORATION
2908 CATARACT ROAD, R.R.#1
FONTHILL, ONTARIO
L0S 1E6

DRAWING TITLE: SANITARY DRAINAGE AREA PLAN

DESIGN:	DRAFTING:
M.H.	T.Groot

DATE: SEPTEMBER 2, 2008
SCALE: 1:1500
DRAWING No: 0695SAN
REV.: 1

Appendix D

Storm Sewer Design Sheet

Counterpoint Engineering Inc.

STORM SEWER CALCULATION SHEET (RATIONAL METHOD) WITH 100-YEAR EXTERNAL AREA CAPTURE

Project: Uppers Glen
Project No: 18020
Client: Kettlebeck Developments
Location: Thorold, ON
Prepared by: JL
Date: November 22, 2018

Rainfall Data: A, B, C Values

	5-YEAR	100-YEAR
A	664.000	980.000
B	4.7	3.7
C	0.744	0.732

$R=A/(T+B)^C$
R= RAINFALL RATE (mm/hr)
T= TIME (min)

Manning's Roughness Coefficient (All pipes)= 0.013
Design Return Frequency (years)= 5

1	2	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Street/Area	**From Node**	**To Node**	**Diam. (nominal)**	**Length Pipe**	**Slope Pipe**	**Area**	**C**	**A x C**	**Accum AxC**	**Rainfall Intensity**	**Time of Conc. (Tc)**	**Area Flow Q**	**Other Flows**	**Total Flow**	**Diameter Actual**	**Pipe Area**	**Hydraulic Radius**	**Pipe Mat.**	**Pipe Capacity**	**Velocity**	**Time of Flow**	**Ratio Q/Q full**	**Cap. Check**
			(mm)	(m)	(%)	(ha)		(ha)	(ha)	mm/hr	(min)	(l/s)	(l/s)	(l/s)	(m)	(sq.m)	(m)		(l/s)	(m/s)	(min)		
EXT 03	EXT 03	Area 02	750	45	0.50%	2.63	0.25	0.66	0.66	144.3	10.00	263.5	0.0	263.5	0.762	0.46	0.191	CONC	821.2	1.80	0.416	0.32	OK
02	Area 02	Area 01	1050	230	0.55%	7.80	0.57	4.45	5.10	88.0	10.42	1248.0	0.0	1248.0	1.067	0.89	0.267	CONC	2112.7	2.36	1.622	0.59	OK
EXT 04	EXT 04	Area 01	600	250	0.50%	5.39	0.25	1.35	1.35	89.9	10.00	336.4	0.0	336.4	0.610	0.29	0.152	CONC	452.9	1.55	2.685	0.74	OK
01	Area 01	FUT MH	1650	450	0.15%	7.10	0.54	3.83	10.29	81.6	12.04	2331.5	0.0	2331.5	1.676	2.21	0.419	CONC	3682.6	1.67	4.495	0.63	OK
EXT 05	EXT 05	FUT MH	1650	100	0.15%	16.51	0.45	7.43	17.71	68.4	16.53	3364.3	0.0	3364.3	1.676	2.21	0.419	CONC	3682.6	1.67	0.999	0.91	OK

*Sized for 100-year pre-development flow

Definitions:

Q = 2.78 AIR, where

Q = Peak Flow in Litres per second (L/s)

Tc= Time of concentration

A = Areas in hectares (ha)

I = Rainfall Intensity (mm/h)

$I = a / (Td + b)^c$ (see above for regression contants)

C = Runoff Coefficient

SWM DESIGN CALCULATIONS
Drainage Areas and Runoff Coefficient Calculations for 2 to 100-year Storms

Project Name: Uppers Glen
Municipality: Thorold, ON
Project No.: 18020
Date: 22-Nov-18

Prepared by: J.L.
Checked by:
Last Revised: 22-Nov-18

Imperviousness:

Park:	0.25
Single Family:	0.45
Townhouse	0.65

Imperviousness Coefficients based on City of St. Catherines Guidelines

Area 01:

Pervious	Impervious				
Park (m^2)	Single Family (m^2)	Townhouse (m^2)	Total Imperviousness	Total Area (m^2)	Total Area (ha)
7800	31673	31527	0.52	71000	7.10

Area 02:

Pervious	Impervious				
Park (m^2)	Single Family (m^2)	Townhouse (m^2)	Total Imperviousness	Total Area (m^2)	Total Area (ha)
11197	23400	43403	0.53	78000	7.80

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

Appendix E

Rolling Meadows Subdivision Storm Drainage Plans

BLACKHORSE CORNERS

30.8m CONCRETE BOX CULVERT
(2.8m x 2.2m) @ 0.5%
E.INV. = 174.72
W.INV. = 174.57

ALLANBURG ROAD

ALLANBURG ROAD

UPPERS LANE

TRANS CANADA GAS PIPELINE

Hydro One Easement

49.8m CONCRETE BOX CULVERT
(2.8m x 1.3m) @ 0.5%
E.INV. = 176.07
W.INV. = 175.79

Highway No. 58

49.3m CONCRETE BOX CULVERT
(2.8m x 1.5m) @ 0.5%
E.INV. = 175.27
W.INV. = 175.03

BEAVERDAMS CREEK

Highway No. 20

Hydro One Easement

Hydro One Easement

TRANS CANADA GAS PIPELINE

173.431
O.P.G. (FLOOD)
CONTOUR

BEAVERDAMS CREEK

Beaverdams Road

Thorold Townline Road

A	162.8	5.0%
B	70.8	5.0%
C	78.3	5.0%
D	36.5	2.0%
E	5.6	5.0%
F	17.7	5.0%
G	6.1	5.0%
H	13.6	5.0%

KEY PLAN
N.T.S.

LEGEND

x 180.00 — PROPOSED ELEVATION

EXISTING STORM DRAINAGE BOUNDARY

A — EXISTING OUTLET LOCATION

1 — DRAINAGE AREA No.

10.0 — AREA IN HECTARES

5.0% — (%) IMPERVIOUSNESS

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

BENCHMARK:
CITY OF THOROLD BENCHMARK.

DESCRIPTION: C.N.Ry. BRIDGE (No.10), OVER WELLAND SHIP CANAL. TABLET IN EAST CURVED RETAINING WALL AT NORTH SIDE OF BRIDGE, 16.4 FEET WEST OF STEPS AT EAST END OF WALL, 43 FEET NORTH OF NORTH SIDE OF BRIDGE, 0.9 FOOT FROM EDGE OF CANAL.

ELEVATION: 174.314 m

REVISIONS				
No.	Revision	Date	By	Approved

REGIONAL MUNICIPALITY OF NIAGARA
CITY OF THOROLD

NEIGHBOURHOODS OF ROLLING MEADOWS

EXISTING STORM DRAINAGE PLAN

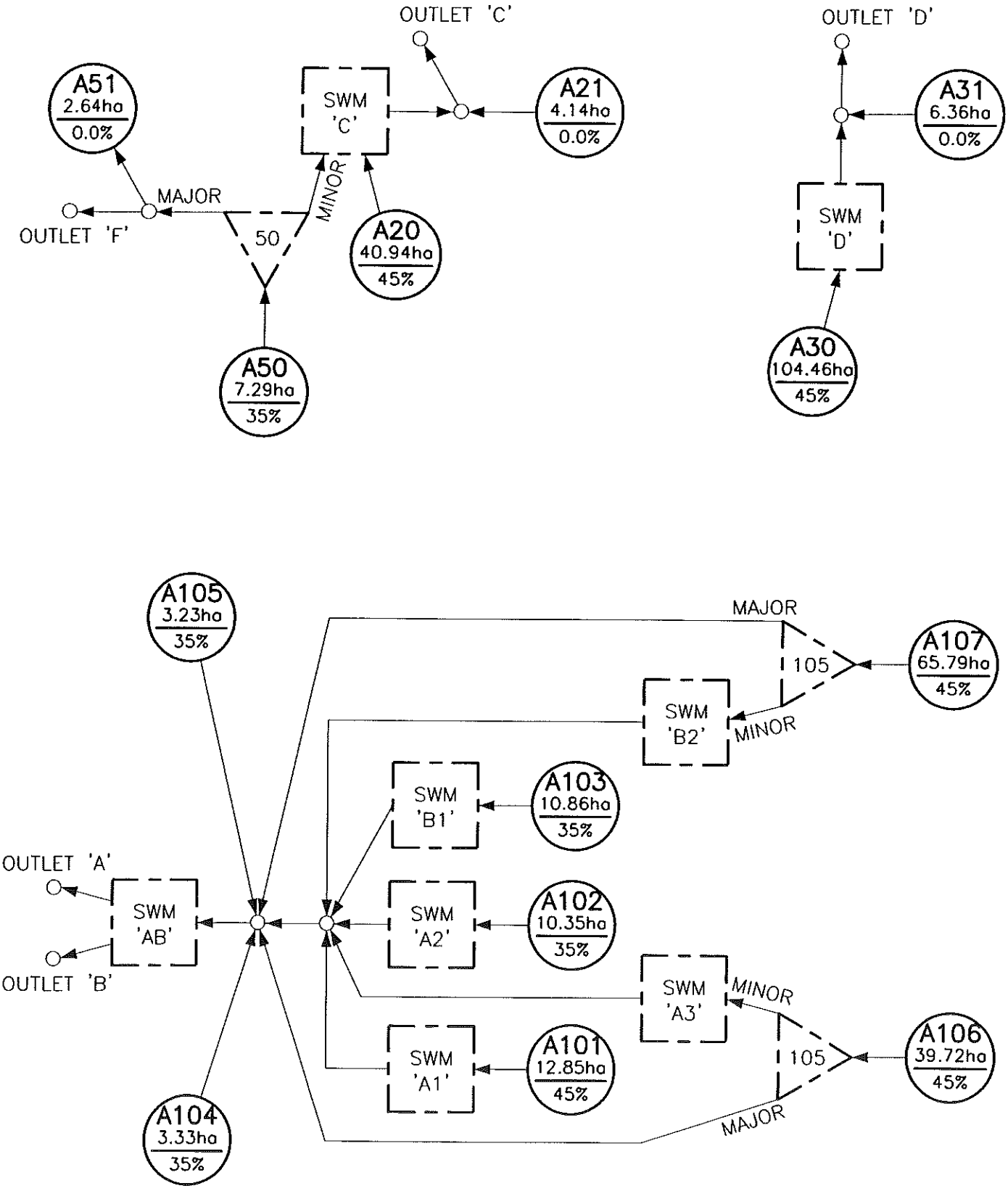
WESLAKE INC.
CIVIL ENGINEERS, MUNICIPAL AND ENVIRONMENTAL PLANNERS
120 LANCING DRIVE
UNIT No. 10
HAMILTON, ONTARIO
L8W 3A1

40 0 160
METRES

SCALE: 1:4,000
DRAWN BY: M.G.
DESIGNED BY: M.G.
CHECKED BY: T.D.B.
DATE: MAY 2006
PROJECT No. 1495
FIGURE No. 8

NOT FOR CONSTRUCTION UNTIL SIGNED, STAMPED AND DATED

X-REF:F:\1495\1495-Base500.DWG



ROLLING MEADOWS

CITY OF THOROLD

SCHEMATIC OF FUTURE STORMWATER MODELLING
FULL SWM PONDS

UPPER CANADA CONSULTANTS
ENGINEERS/PLANNERS
261 Martindale Road, Unit #1
St. Catharines
Ontario L2W 1A1
Phone:(905)688-9400
Fax: (905)688-5274

DWG. No: FIGURE 4