



**UPPER CANADA
CONSULTANTS**
ENGINEERS / PLANNERS

Upper Canada
Planning &
Engineering Ltd.
3-30 Hannover Drive
St. Catharines, ON
L2W 1A3
Phone 905-688-9400
Fax 905-688-5274

FUNCTIONAL SERVICING REPORT

**401 CANAL BANK STREET
(FORMERLY DAIN CITY COMMUNITY)**

CITY OF WELLAND

Prepared by:

**Upper Canada Consultants
30 Hannover Drive, Unit 3
St. Catharines, Ontario
L2W 1A3**

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- Overall Site Grading Plan – DWG# **0585-FSR GP**
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References

- Design Guidelines for Sewage Works 2008 – PIBS 6879
Ontario Ministry of the Environment (2008)
- Existing 2014 Consolidated Regional Official Plan
Regional Municipality of Niagara (2014)
- City of Welland Municipal Standards
City of Welland (February 2013)
- *Memorandum* - “Empire Homes Development – Water Distribution System Review”
GHD (December 2019)
- Welland City Water and Wastewater Servicing – Preliminary Capacity Assessment
WSP (March 2020)



EXECUTIVE SUMMARY

Upper Canada Consultants has been retained by Empire Communities to prepare a Functional Servicing Report for the 72.1 hectare, 1405 unit (maximum) development of 401 Canal Bank Street, in the City of Welland.

Water Servicing

A Water Distribution System Review was prepared by GHD for the City of Welland. The GHD study identified that the existing ground elevation within the site would result in water pressures lower than the minimum of 40 psi and provided possible alternatives. The preferred of these alternatives will be to limit the ground elevation to 185.00m, which will result in pressures above the minimum of 40 psi. To service the site, the existing 400mm diameter cast iron watermain shall be redirected and replaced within the site with a new 400mm diameter PVC watermain.

Sanitary Servicing

A sanitary analysis including the Forks Road sanitary sewers and the 450mm diameter trunk sanitary sewer which begins on Crescent Drive and outlets to the Dain City pumping station concluded that the Forks Road sanitary sewers will need to be upgraded to 375mm diameter sewers, but the existing invert elevations and slopes would be adequate to convey peak sanitary flows to the 450mm diameter Crescent Drive sewers.

WSP prepared a study of the existing Welland wastewater infrastructure. The Niagara Region and City of Welland have advised that remediation projects have been undertaken to improve the available capacity at the Dain City pumping station. Following the completion of these projects, the existing infrastructure is expected to have adequate capacity to service the proposed development.

Stormwater Management

Stormwater quality improvements are to be provided to an MECP *Normal* level for stormwater discharging from the site into either the Welland Canal or to the Old Welland Canal. Quantity controls up to the 100 year design storm event have been requested for site stormwater flows discharging to the Welland Canal but are not considered necessary for the Old Welland Canal.

To provide the required MECP *Normal* quality improvement levels prior to discharge into the Welland Canal, a stormwater management wet pond facility is proposed. To provide the requested quantity controls prior to discharge into the Welland Canal, the proposed wet pond facility shall control peak stormwater flows up to the 5 year design storm event and a dry detention facility located will provide quantity controls during major storms exceeding the 5 year design storm. To provide the required quality controls prior to discharging ultimately to the Old Welland Canal, a Hydroworks HG4 oil/grit separator, or approved equivalent is proposed.



INTRODUCTION

This report is to address the servicing needs for the 1,405 unit (maximum), mixed residential development of 401 Canal Bank Street. The site is located within the City of Welland, bound to the east by the Welland Canal, south of the Canadian National Railway lands, north of Forks Road, and east of the former John Deere lands. The site is currently vacant land with an existing hydro corridor located at the northern extent of the site.

The site is 72.1 hectares and shall consist of a maximum of 1,405 units ranging from single detached, semi-detached and town home dwellings as shown in the enclosed Draft Plan of Subdivision. The site shall include associated asphalt roads with a proposed structure of 450mm of Granular 'A' roadway base on finished subgrade, 75mm of HL8 base course asphalt, and 40mm of HL3 surface course asphalt. Additionally, the site shall include concrete curb, catch basins, storm sewers, sanitary sewers, watermain and associated utilities in a joint trench installation. See Appendix A for the proposed 18m, 21m, and 23m internal right of way cross sections.

The development is planned to be phased and constructed starting from south to north to ensure downstream servicing is constructed first, providing the permanent outlets for the following phases.

A study was prepared by WSP regarding the Welland City Water and Wastewater Servicing and should be read in conjunction with this report (WSP, 2020).

The objectives of this study are as follows:

1. Identify domestic and fire protection water service needs for the site.
2. Identify sanitary servicing needs for the site.
3. Provide a summary of the stormwater management plan for the site.
4. Provide a summary of the preliminary grading plan for the site.

WATER SERVICING

An analysis of the proposed 401 Canal Bank Street water demand was conducted by GHD for the City of Welland in December of 2019. The study analysed existing and future conditions for the existing infrastructure (the Welland Water Treatment Plant, Bemis Park Elevated Tank, etc.) and concluded that the existing infrastructure could provide adequate domestic and fire supply for the 401 Canal Bank Street development in addition to future development at the former John Deere facility (GHD, 2019).



The GHD study referenced a total future population of 13,173 persons between the future developments (GHD, 2019). The 401 Canal Bank Street (referred to as Dain City Residential) was allocated 2,990 persons. Based on the proposed draft plan, the total population for the 401 Canal Bank Street development would be a maximum of 4,662 persons using the same population density. However, the future development of the former John Deere facility is in a conceptual design stage and does not have a firm number of lots allocated to them. Therefore, GHD's conclusions regarding the capacities of the existing infrastructure remain valid as it pertains to the 401 Canal Bank Street development. Further analysis of the existing infrastructure will be required as part of future draft plan submissions for the future development.

The study prepared by GHD concluded that the existing maximum ground elevation of 189.00m within the development may result in watermain pressures dropping below the minimum 40 psi in specific areas of the site. To ensure adequate watermain pressure is maintained within the entire site, GHD recommended three alternatives:

- Modifying the Welland Water Treatment Plant (WTP) operating procedures,
- Limiting the ground elevation of the site to a maximum of 185.00m,
- Installing a local booster pump station.

The ground elevation within the site will be lowered to generate fill for future developments, therefore, limiting the site to a maximum elevation of 185.00m is the preferred alternative. As shown in the enclosed Overall Site Grading Plan, a maximum elevation of 185.00m has been maintained within the site.

Based on the findings of this study, the following conclusions are offered:

- The existing 400mm diameter watermain is expected to be of sufficient size to meet domestic and fire supply demands.
- The ground elevation within the proposed development will be limited to 185.00m to ensure watermain pressures remain above the minimum 40 psi within the site.
- The existing 400mm diameter cast iron watermain shall be rerouted and replaced within the development with a new 400mm diameter PVC trunk watermain. The proposed trunk watermain shall connect at the intersection of Forks Road and Crescent Drive, route through the development and reconnect at the north western extent of the site. See the enclosed Overall Watermain Distribution Plan for reference.
- The sections of the existing 400mm diameter cast iron watermain where flow has been redirected shall be decommissioned and abandoned per discussions with City of Welland staff.



- The proposed development will be serviced with internal watermain ranging from 150mm to 400mm in diameter.
- Further analysis of the existing infrastructure will need to be undertaken as part of the design for the future John Deere development to ensure there is adequate capacity to accommodate the projected populations.

An Overall Watermain Distribution Plan has been provided with this report for reference.

SANITARY SERVICING

An analysis of the receiving sanitary sewer system has been conducted as part of this servicing report to determine the impact of the proposed development on the system. The scope of the analysis included the entirety of the 1,405 unit (maximum) development as well as the adjacent the 14 existing lots and approved 86 dwelling development fronting the south side of Forks Road. For the analysis, a general density of 3 persons per unit has been used to approximate the total sanitary flows. The Niagara Region Official Plan, Table 4-1, projects a density of 2.40 persons per unit for the City of Welland in 2021 (Niagara Region, 2014).

The City of Welland has provided GIS data, showing the existing sanitary maintenance hole rim elevations and sanitary sewer inverts along Crescent Drive to the Dain City Sewage Pumping Station. The receiving existing 450mm diameter trunk sanitary sewers have been installed at depths ranging from 4.9m and 6.9m below the existing road surface and an overall slope of approximately 0.30% over the 961m run from the intersection of Forks Road and Crescent Drive to the Dain City Sewage Pumping Station. Therefore, the overall trunk sanitary sewer is expected to have adequate capacity to service the proposed development.

Based on the findings of this analysis, the following conclusions are offered:

- The existing 250mm diameter sanitary sewer on Forks Road, east of Crescent Drive has inadequate capacity for the development area of Dain City Community and should be upgraded up to the entrance at Street A.
- The existing 450mm diameter trunk sanitary sewer on Crescent Drive has adequate capacity to convey sanitary flows from the proposed development to the Dain City Sewage Pumping Station.



The above conclusions lead to the following recommendations:

- That the gravity sanitary sewers on Forks Road, east of Crescent Drive be upgraded from 250mm to 375mm diameter sewers up to the entrance at Street A as shown in the enclosed Overall Sanitary Drainage Area Plan. The existing inverts and grade of the existing 250mm diameter sewer are adequate to convey the peak sanitary flows with the upgraded sanitary sewer size.
- That the development area of Dain City Community shall require sanitary sewers from 200mm to 375mm diameter to allow gravity flow throughout the site.

The Overall Sanitary Drainage Area Plan used in this analysis has been provided with this report for reference.

The Welland City Water and Wastewater Servicing Assessment prepared by WSP (WSP, 2020) provides an analysis of the existing sanitary infrastructure within the City of Welland such as the Wastewater Treatment Plant and the receiving Dain City and Ontario Street Sewage Pumping Stations. Based on the Region of Niagara Wastewater Master Servicing Plan, WSP assessed the existing and future (2041) capacities for the existing infrastructure to determine the impact of the proposed 401 Canal Bank Street development on the overall sanitary system.

The WSP analysis concluded that the existing Wastewater Treatment Plant will operate at under 80% of the total capacity with the 2041 projections, including the proposed development.

Following discussions with the City of Welland and the Niagara Region, the analysis also notes that a separate study prepared by BluePlan Engineering for the City of Welland concluded that the Dain City pumping station is experiencing greater wet weather flows than estimated within the Niagara Region Wastewater Master Servicing Plan, exceeding the ECA firm capacity for the pumping station in a 10 year storm event (WSP, 2020). The Niagara Region is planning “state of good repair upgrades” for the Dain City pumping station and WSP has advised the maximum expected population for the 401 Canal Bank Street development be incorporated with the pumping station upgrades (WSP, 2020). Other efforts proposed by the City of Welland are expected to alleviate the excess of wet weather flows to the Dain City pumping station even further (WSP, 2020).

The referenced BluePlan Engineering study also advises that the increase in sanitary flows from the proposed development does not trigger a requirement for upgrades at the Ontario Street pumping station (WSP, 2020).

Therefore, based on the findings of the WSP study (WSP, 2020), following the upgrades to the Dain City pumping station tentatively planned by the Niagara Region in 2020, there will be adequate capacity in the existing infrastructure to service the proposed development.



Further analysis of the existing infrastructure will need to be undertaken as part of the design for the future John Deere development to ensure there is adequate capacity to accommodate the projected population.

STORMWATER MANAGEMENT

A detailed Stormwater Management Plan has been prepared to address the overall stormwater management strategy for the site and has been submitted along with this Functional Servicing Report. The following shall summarize the findings of this detailed Stormwater Management Plan.

The overall drainage areas for the site convey peak stormwater flows to the Welland Canal and the Old Welland Canal through multiple drainage outlets. Based on the design criteria provided by the MECP and the City of Welland, it is proposed to provide stormwater quality control for site stormwater flows discharging to the Welland Canal. Per discussions with the St. Lawrence Seaway Management Corporation (SLSMC), quantity controls up to the 100 year design storm event have been requested for site stormwater flows discharging to the Welland Canal. Only **quality** controls will be provided for stormwater flows discharging ultimately to the Old Welland Canal, since the peak flows have been reduced to this outlet as a result of the proposed development.

To provide the quality controls required by the City of Welland and MECP and quantity controls requested by the SLSMC, both a wet pond and a dry detention facility are proposed. The wet pond facility will provide a *Normal* level (70% TSS Removal) of stormwater quality control in accordance with MECP guidelines and provide quantity controls up to the 5 year design storm event. For major storms in excess of the 5 year design storm event, stormwater flows shall surcharge from the internal storm sewers and travel overland through the proposed internal roadways to the proposed park land between Streets B and G. Within the park land, a dry detention facility shall provide a controlled outlet for the major storm events. This dry detention facility will only receive stormwater flows during storms in excess of the 5 year design event.

To provide the required quality controls for stormwater discharging from the Forks Road right of way and ultimately to the Old Welland Canal, a Hydroworks HG4 Oil/Grit Separator, or approved equivalent, is proposed to improve stormwater quality levels to MECP *Normal* levels (70% TSS Removal).

An Overall Storm Drainage Area Plan has been provided with this report for reference. Based on the preliminary storm sewer design sheet, the site can be serviced with mainline storm sewers ranging from 300mm to 1650mm in diameter.



PRELIMINARY GRADING PLAN

An Overall Site Grading Plan has been provided with this report to demonstrate the preliminary grading strategy for the 401 Canal Bank Development.

The majority of the site has been graded to create major overland flow paths for the conveyance of stormwater flows to the proposed park lands between Street B and Street G. There are small portions on the southern and northern limits of the site for which an overland flow path cannot be graded to the park areas. Flows conveyed overland within Street C are directed southerly to Forks Road, where they will outlet to the existing ditches along Forks Road. The portion north from Streets R and N have been graded to convey the overland flows to the existing cut-off ditch at the northern extent of the site. Based on the preliminary road grades shown in the accompanying drawing, the road slopes range from approximately 0.5% to 3.2% within the overall site.

In accordance with the recommendations stated within the GHD Water Distribution Study (GHD, 2019), the maximum ground elevation within the site has been limited to 185.00m.

A noise berm has been proposed along the western limit of the site, due to the adjacent Gio Rail tracks. The berm has a varying peak elevation in accordance with the noise requirements and side slopes of approximately 2.5:1 on the western side and 3:1 on the eastern side.

CONCLUSIONS AND RECOMMENDATIONS

The following shall summarize the conclusions and recommendations found above:

Water Servicing

- The existing 400mm diameter cast iron watermain on the western limit of the site shall be rerouted within the proposed roadways with a new 400mm diameter PVC watermain. The proposed watermain will have connections at the Forks Road and Crescent Drive intersection and the north western limit of the site as shown in the enclosed Overall Watermain Distribution Plan. The portions of the cast iron watermain where flow has been rerouted shall be decommissioned and abandoned per discussions with the City of Welland.
- The site shall be limited to a maximum ground elevation of 185.00m to ensure a minimum water pressure of 40 psi is maintained within the entire site.
- Further analysis of the existing infrastructure will need to be undertaken as part of the design for the future John Deere development to ensure there is adequate capacity to accommodate the projected population.
- The site shall be serviced with watermain ranging from 150mm to 400mm in diameter.



Sanitary Servicing

- The gravity sanitary sewers on Forks Road, east of Crescent Drive shall be upgraded from 250mm to 375mm diameter sewers up to the entrance at Street A. The existing inverts and grade of the existing 250mm diameter sewer are adequate to convey the peak sanitary flows with the upgraded sanitary sewer size.
- The existing 450mm diameter trunk sanitary sewer on Crescent Drive has adequate capacity to convey sanitary flows from the proposed development to the Dain City Sewage Pumping Station.
- The site shall be serviced with sanitary sewers ranging from 200mm to 375mm in diameter.
- Following the upgrades to the Dain City pumping station, there will be adequate capacity within the existing infrastructure to service the site.
- Further analysis of the existing infrastructure will need to be undertaken as part of the design for the future John Deere development to ensure there is adequate capacity to accommodate the projected population.

Stormwater Management

- A stormwater management wet pond and dry detention facility are proposed to provide stormwater quality and quantity controls for the site prior to discharging to the Welland Canal. Per the requirements of the City of Welland and the MECP, quality controls shall be provided to an MECP Normal level (705 TSS Removal). Per the requirements of the SLSMC, quantity controls shall be provided up to the 100 year design storm event.
- Per the requirements of the City of Welland and the MECP, a Hydroworks HG4 oil/grit separator, or approved equivalent, has been proposed to provide stormwater quality controls to an MECP Normal level (70% TSS Removal) prior to discharging ultimately to the Old Welland Canal. Since the peak flows have been reduced as a result of the proposed development, stormwater quantity controls are not considered necessary for the storm sewers discharging ultimately to the Old Welland Canal.
- The site can be serviced by mainline storm sewers ranging from 300mm to 1650mm in diameter.

Preliminary Grading

- The site will be graded such that the majority of the site overland flows are conveyed within the roadways to the park lands located between Streets B and G, with road slopes ranging from approximately 0.5% approximately 3.2%.



- A maximum grade of 185.00m has been maintained within the site per the water servicing requirements.

Based on the above and the accompanying Servicing Plans, we are of the opinion that there exists adequate municipal servicing for this development. We trust the above comments are satisfactory for approval. If you have any questions or require additional information, please do not hesitate to contact our office.

Prepared By:

Brendan Kapteyn, E.I.T.

Reviewed By:

Adam Keane, P.Eng.

Encl.



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ENGINEERS / PLANNERS

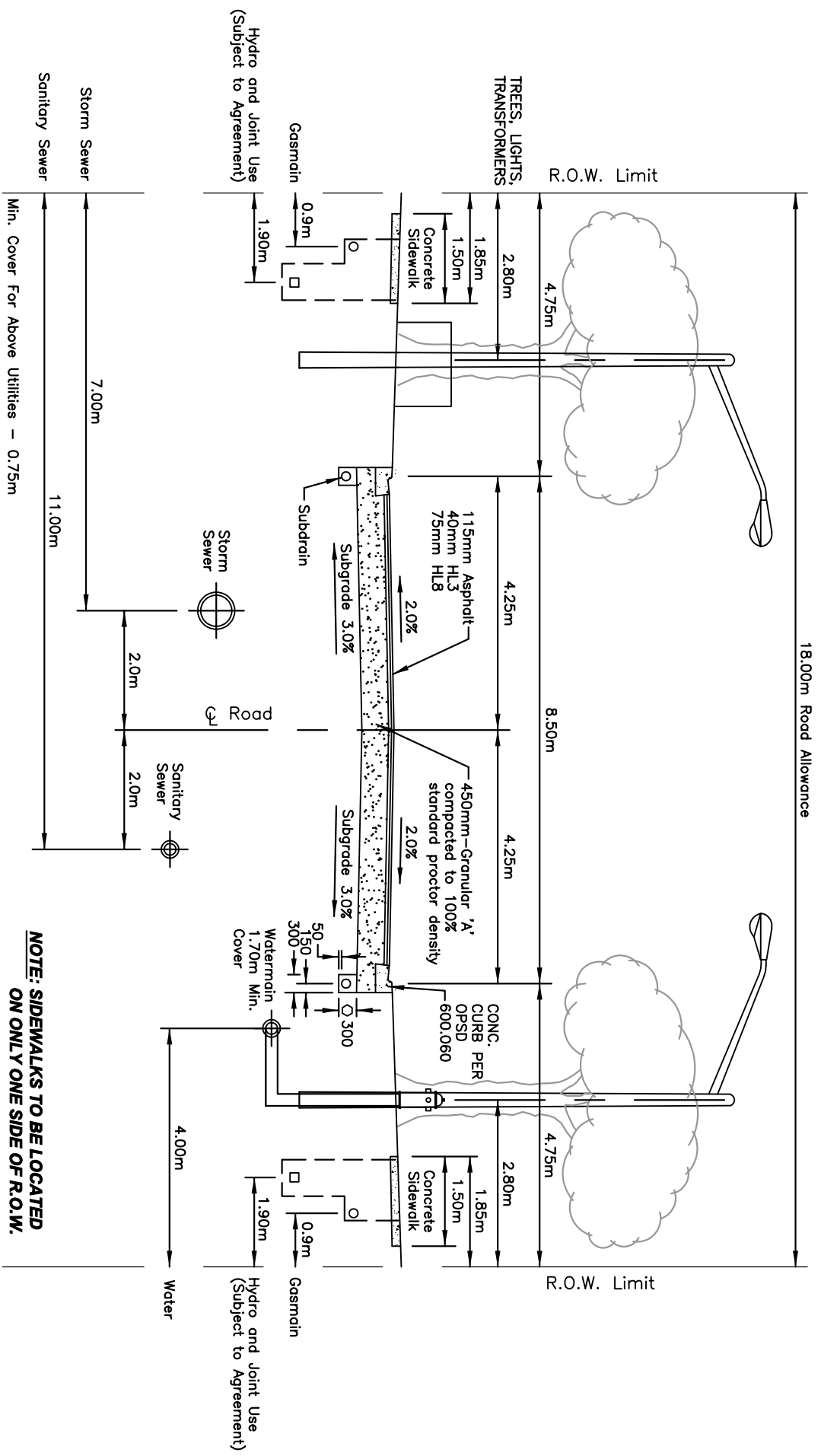
APPENDICES



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APPENDIX A

Proposed Typical 18m R.O.W. Cross Section
Proposed Typical 21m R.O.W. Cross Section
Proposed Typical 21m R.O.W. Cross Section w/ Storm Outlet Pipe
Proposed Typical 23m R.O.W. Cross Section



18.00m Road Allowance

R.O.W. Limit

R.O.W. Limit

TREES, LIGHTS, TRANSFORMERS

Hydro and Joint Use (Subject to Agreement)

Hydro and Joint Use (Subject to Agreement)

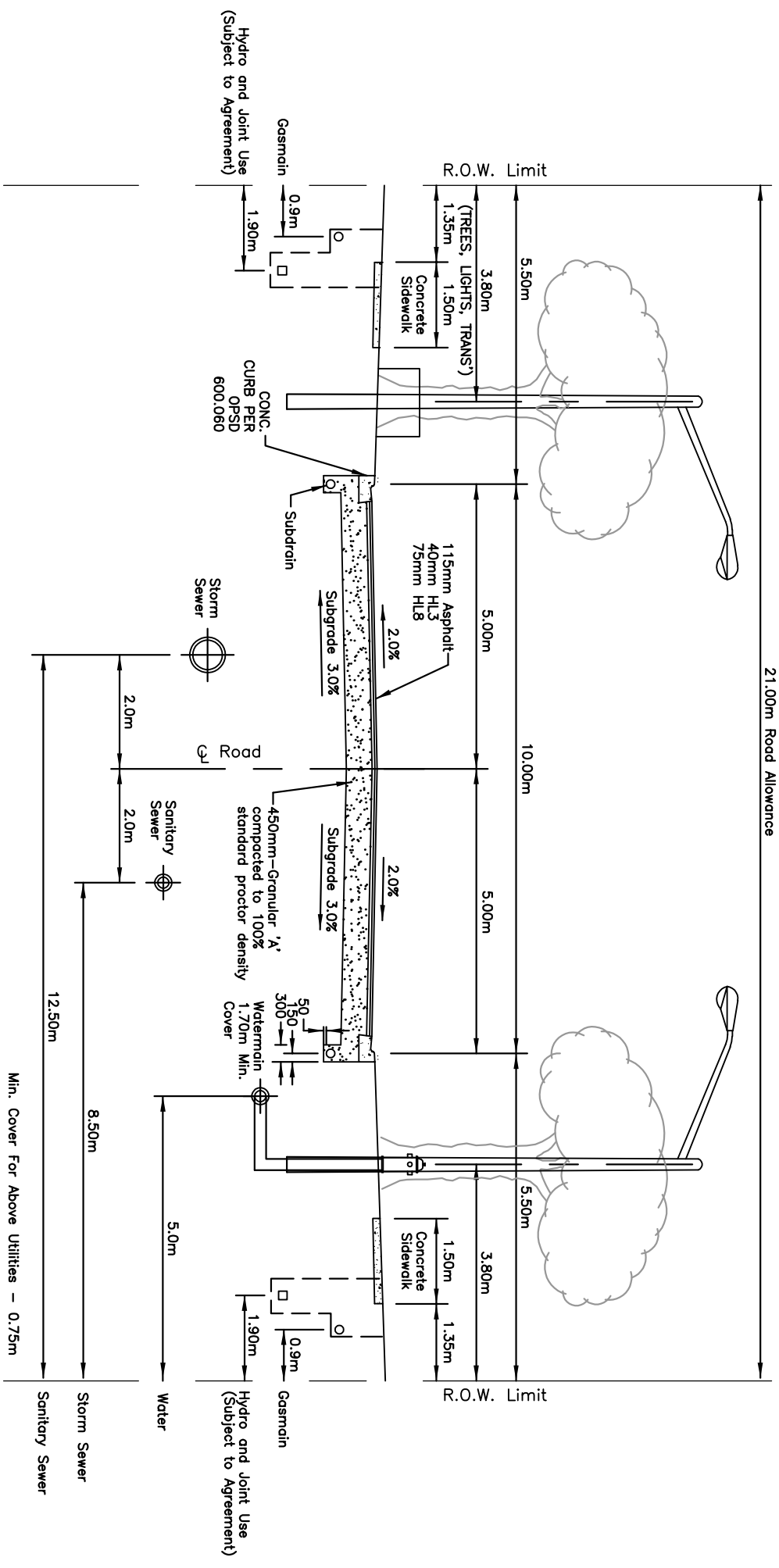
Storm Sewer
Sanitary Sewer

7.00m
11.00m
Min. Cover For Above Utilities - 0.75m

NOTE: SIDEWALKS TO BE LOCATED ON ONLY ONE SIDE OF R.O.W.

ROAD SECTION-UTILITY LOCATIONS-18.0m R.O.W.

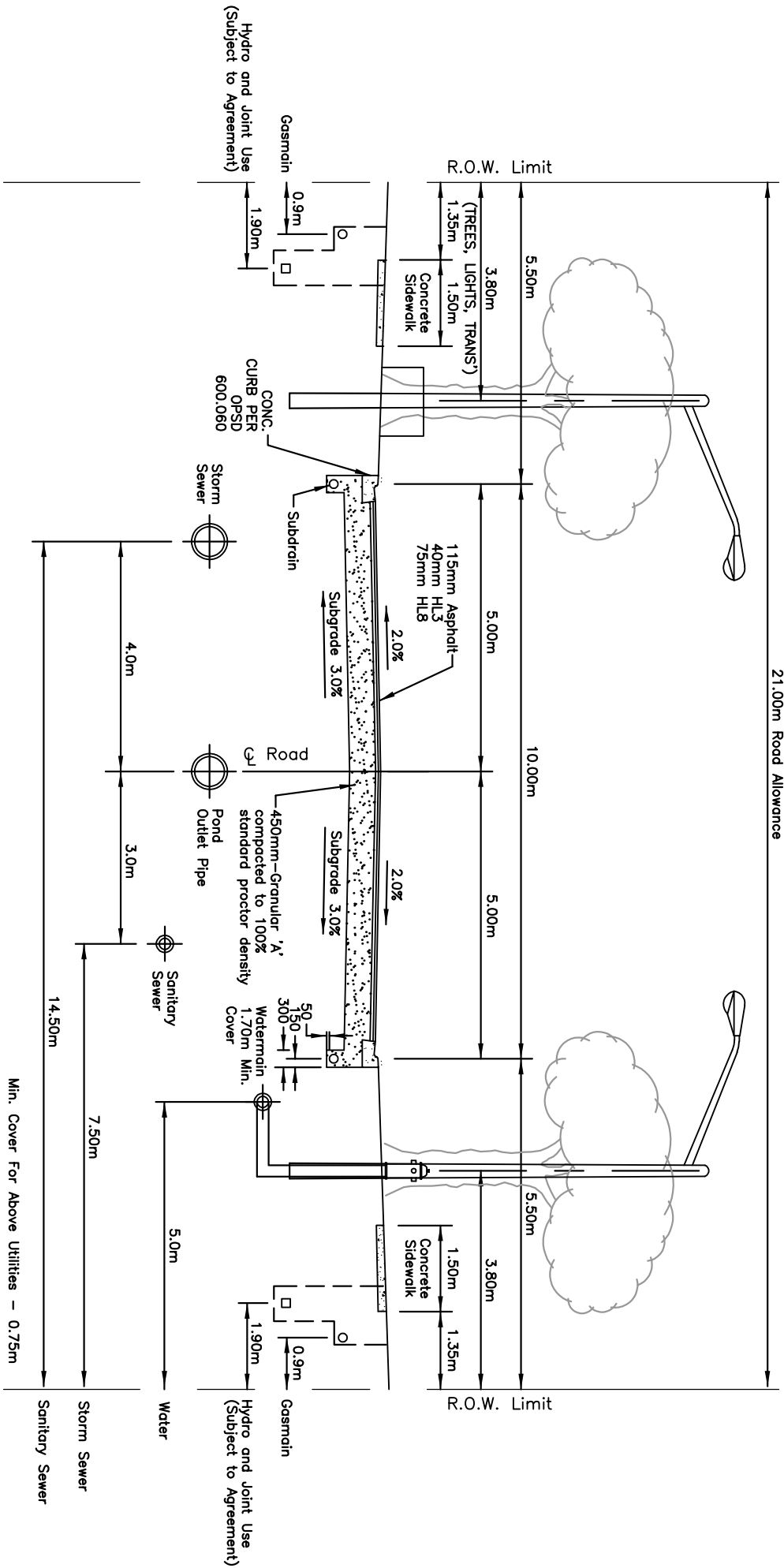
N.T.S.



ROAD SECTION-UTILITY LOCATIONS-21.0m R.O.W.

N.T.S.

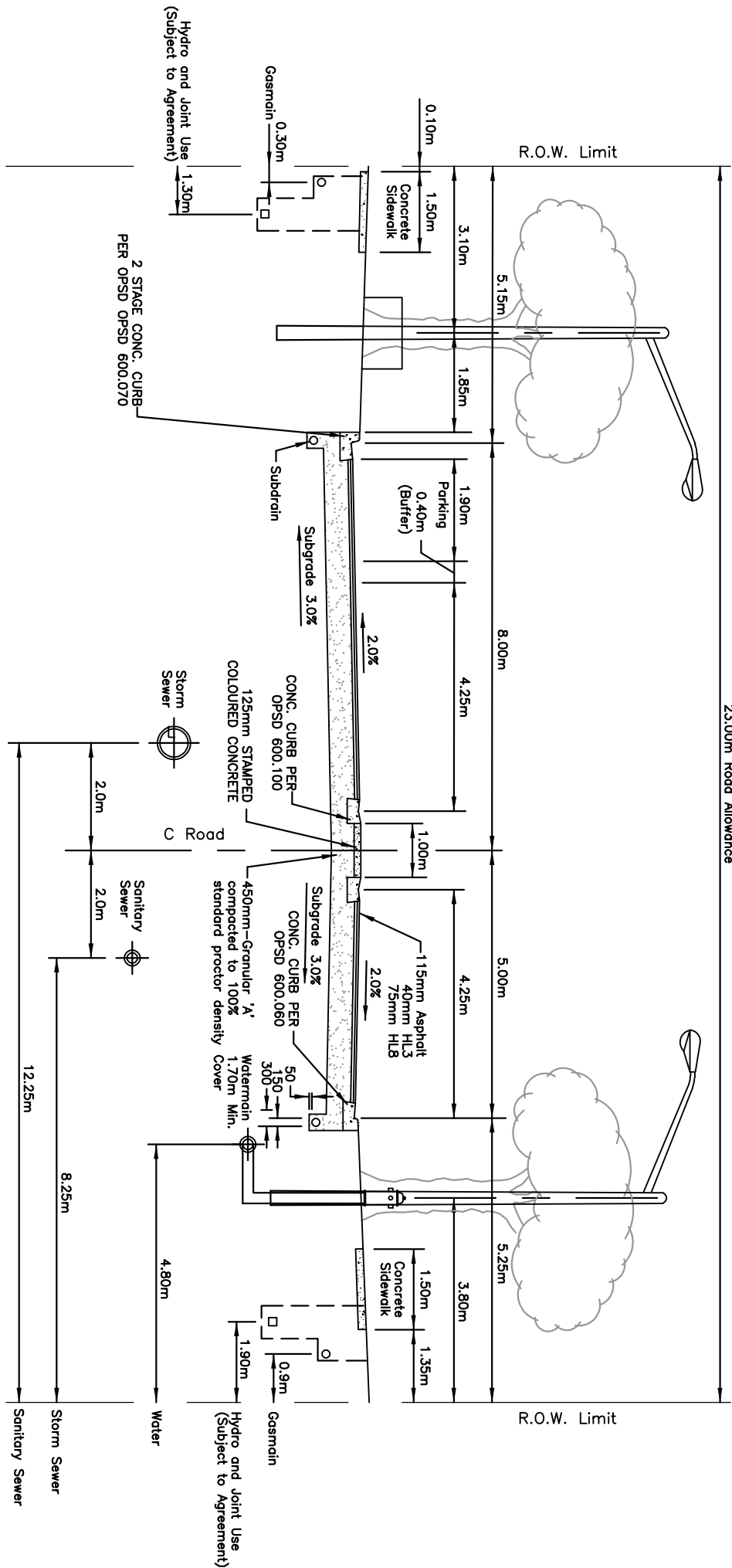
21.00m Road Allowance



ROAD SECTION-UTILITY LOCATIONS-21.0m R.O.W. WITH POND OUTLET PIPE

N.T.S.

23.00m Road Allowance



ROAD SECTION-UTILITY LOCATIONS-23.0m R.O.W.

N.T.S.



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APPENDIX B

GHD Memorandum – Dated December 3, 2019



Memorandum

December 3, 2019

To: Marvin Ingebrigsten, P.Eng Ref. No.: 11155923

From: Samantha McCauley, P.Eng *SM* Tel: 905-346-3857

CC:

Subject: Empire Homes Development – Water Distribution System Review

1. Introduction

GHD was retained by the City of Welland to review the impacts of the proposed Empire Homes Development on the Welland water distribution system. Figure 1.1, attached at end, shows the location of the proposed development, which is broken up into three areas – Dain City Residential, Former John Deere, and Canal Bank/Dain Avenue.

Results of the completed analysis are described herein.

2. Model Set Up

2.1 Existing Model

The City of Welland's existing InfoWater all pipe water model was used as the base for the completion of this analysis. A model review was last conducted in 2018 with recent watermain construction projects incorporated, and updates made to the Welland Water Treatment Plant (WTP), including addition of pump curves for recently replaced pumps, and modification of base operational settings (on/off pump settings) to match settings determined from a review of 2017 SCADA data.

The City of Welland's existing InfoWater model also includes future development scenarios (average day and maximum day extended period simulations). These future development scenarios incorporate planned developments previously reviewed. These developments include:

- GE Plant (Built)
- Canal View Heights (Built/In construction)
- Hunter's Pointe Development Area (Future)
- Northern Reach Land Development (Future)
- Sauer Avenue, Louise Street, and Station Street (Future)

The review of the Empire Homes Development was completed using the future development scenarios.



2.2 Empire Homes Development Demands

Populations were provided by WSP for the proposed Empire Homes Development. Average day demands (ADD) were calculated using a per capita demand of 320 L/cap-day, a value which the City previously selected for use for development reviews. Maximum day demands (MDD) were calculated using a peaking factor of 1.5, which is the peaking factor used in the model established from historical demand data. The peak hour demand (PHD) peaking factor, which is based on the model MDD EPS demand pattern, is 1.87 (2.81 x ADD). Similar to the MDD peaking factor, the PHD peaking factor is based on historical demand data. Table 2.1 summarizes the demands assigned to the model for the Empire Homes Development, along with the resulting PHD.

Table 2.1 Empire Homes Development Demands

Location	Population	ADD (L/s)	MDD (L/s)	PHD (L/s)
Former John Deere	3200	11.85	17.78	33.25
Dain City Residential	2990	11.07	16.61	31.06
Canal Bank/Dain Avenue	6983	25.86	38.79	72.54
Total	13173	48.78	73.18	136.85

In addition to the demands noted above, a fire flow was also required to be used to assess the MDD + Fire Flow condition. The proposed development includes a mix of land uses, including single and multi-family units. The City's single family residential fire flow requirement is 67 L/s, while the City's requirement for multi-family units and some commercial properties is 133 L/s. A fire flow of 133 L/s was selected for the purpose of this analysis as it is a better representation of the fire flow needs for the development as a whole. This fire flow is applied at hour 7:00 of the MDD EPS scenario.

2.3 Development Servicing

Watermains and junctions were added to the model to represent the Empire Homes Development. Since a proposed servicing plan was not provided, watermain locations were assumed, with only watermains forming the assumed backbone of the servicing scheme (i.e. watermains connecting to the existing distribution network) included. Elevations were assigned to the junctions added to the model using the City's 1 m contours with the highest elevation for each area assigned. Figure 2.1 shows the watermains and junctions added to the model, including watermain sizing and assigned junction ground elevations. All pipes were assigned a C-Factor of 135, consistent with the C-Factor for plastic pipe established when the City's model was calibrated.

3. Review of Storage Requirements

Prior to completing the hydraulic analysis for the Empire Homes Development, a review of the City of Welland's overall storage capacity and existing and future storage requirements was completed. Per the MECP Design Guidelines for Drinking Water Systems, storage requirements for a water distribution system are as follows:

- Equalization Storage (A) = 25% of Maximum Day Demand
- Fire Storage (B) = 378 L/s for 6 hours (Based on MECP Equivalent Population Fire Flow Requirement)
- Emergency Storage (C) = 25% of A+B



The additional storage required for Empire Homes is 2.0 ML.

The total existing storage capacity was determined from the Region of Niagara Master Plan (2016). Table 3.1 summarizes the existing storage capacity, the existing and future storage requirement calculated in the master plan, and the existing and future storage requirement with and without the Empire Homes Development, calculated using the model demands and the procedure outlined above. As shown, the master plan appears to have included sufficient demand to account for the Empire Homes Development. Both the master plan and the model based calculations indicate that there is sufficient storage in the existing system to support the addition of the Empire Homes Development.

Table 3.1 Review of Storage Requirements

Description	Storage (ML)
Total Available Storage	37.0
Existing Required Storage – Master Plan	18.5
2041 Required Storage – Master Plan	21.6
Future Required Storage without Empire Homes Development – Model Demands	18.4
Future Required Storage with Empire Homes Development – Model Demands	20.4

4. Hydraulic Analysis

4.1 Design Criteria

In reviewing the impact of the Empire Homes Development on the existing distribution system, the following design criteria, as per City of Welland design standards and the MECP Design Guidelines for Drinking Water Systems, were used:

- Preferred system pressure between 350 to 550 kPa (50 to 80 psi)
- Minimum system pressure during normal operating conditions to be greater than 275 kPa (40 psi)
- Maximum system pressure during normal operating conditions to be less than 700 kPa (100 psi)
- System pressure with a 133 L/s fire flow during MDD to be greater than 140 kPa (20 psi)

4.2 Normal Operating Condition

Table 4.1 summarizes the minimum pressure during the ADD and MDD EPS scenarios within the proposed development with the existing water treatment plant pumping scheme.

Table 4.1 Empire Homes Development Normal Operating Pressures

Junction ID	Location	Junction Elevation	Minimum ADD EPS Pressure	Minimum MDD EPS Pressure
435701WJ01	Former John Deere	177 m	375 kPa (54 psi)	364 kPa (53 psi)
J-EH-1	Former John Deere	177 m	373 kPa (54 psi)	358 kPa (52 psi)
J-EH-2	Canal Bank/Dain Avenue	178 m	361 kPa (52 psi)	324 kPa (47 psi)
J-EH-3	Canal Bank/Dain Avenue	178 m	364 kPa (53 psi)	364 kPa (53 psi)
J-EH-4	Dain City Residential	189 m	257 kPa (37 psi)	243 kPa (35 psi)
J-EH-5	Canal Bank/Dain Avenue	177 m	373 kPa (54 psi)	347 kPa (50 psi)



As shown, pressures meet the design criteria at all locations with the exception of the Dain City Residential area, which does not meet the minimum 275 kPa (40 psi) requirement. The lower pressures in the Dain City Residential area are predominately due to the high ground elevation (maximum of 189 m) in this area in comparison to the hydraulic grade line of the system.

The top water level of the Bemis Elevated Tank, which represents the maximum hydraulic grade line of the system, is 219m – based on this top water level, and before accounting for any losses, the maximum pressure in the Dain City Residential area (at an elevation of 189 m) would, therefore, only be 294 kPa (43 psi). The low pressures in this area are further exacerbated by the current operating procedures at the WTP, where high lift pumps are shut down mid-morning, coinciding with periods of higher demand. Table 4.2 summarizes the minimum and maximum WTP flow and the minimum and maximum tank percent full with and without the Empire Homes Development. Note that both with and without the Empire Homes Development, the minimum percent full for the Bemis Tank coincides with the mid-morning WTP shutdown, while the maximum WTP flow coincides with the filling period that occurs when the WTP pumps turn back on after this mid-morning shutdown.

Table 4.2 Minimum and Maximum WTP Flow and Bemis Elevated Tank Volume

Parameter	Without Empire Homes Development		With Empire Homes Development	
	Minimum	Maximum	Minimum	Maximum
ADD EPS WTP Flow	0 L/s	326 L/s	0 L/s	328 L/s
ADD EPS Bemis Tank % Full	77%	100%	65%	100%
MDD EPS WTP Flow	0 L/s	789 L/s	0 L/s	799 L/s
MDD EPS Bemis Tank % Full	72%	100%	63%	100%

As shown in Table 4.2, with the addition of the Empire Homes development, there is an increase in the amount of drawdown that occurs at the Bemis Tank during the WTP mid-morning shutdown. The tank percent full of 63% that occurs during MDD EPS with the addition of the Empire Homes Development, corresponds to an HGL of 215.4 m, which is significantly lower than what it is needed to supply 275 kPa (40 psi) to the Dain City Residential area.

Modifying the WTP operating procedures, so that pumps are no longer off during mid-morning higher demand periods, would increase the minimum pressure in this area to above the MECP minimum; however, this strategy is not preferred since it relies exclusively on the operations of the WTP and limits the effective operating range of the Bemis Tank. Alternatively, limiting the ground elevation in the Dain City Residential area to 185 m would also increase the pressure to above 275 kPa (40 psi) without any modifications to the existing pumping scheme. Installation of a small booster pumping station to supply this area could also be considered as an alternative. Replacing the old cast iron watermain on Forks Road and increasing the size of the proposed watermain in this area was also reviewed as an alternative to limit headloss, however this would not increase the pressure to above 275 kPa (40 psi) due to the issue with the Bemis Tank HGL discussed above.

In addition to the pressures within the proposed Empire Homes Development, the pressures of the existing system were also reviewed. The addition of the Empire Homes Development results in a minor drop in pressure for the remainder of the system. The average drop to ADD pressure is 12 kPa (1.7 psi) and the average drop to MDD pressure is 17 kPa (2.5 psi). All system pressures in the existing network remain above 275 kPa (40 psi).



4.3 Fire Flow

Table 4.3 summarizes the available fire flow at each of the junctions added to the model to represent the Empire Homes Development. As shown, the existing system is capable of supplying greater than 133 L/s of fire flow (during MDD) to this development.

Table 4.3 Empire Homes Available Fire Flow

Junction ID	Location	Available Fire Flow during MDD (L/s)
435701WJ01	Former John Deere	248
J-EH-1	Former John Deere	174
J-EH-2	Canal Bank/Dain Avenue	173
J-EH-3	Canal Bank/Dain Avenue	191
J-EH-4	Dain City Residential	143
J-EH-5	Canal Bank/Dain Avenue	136

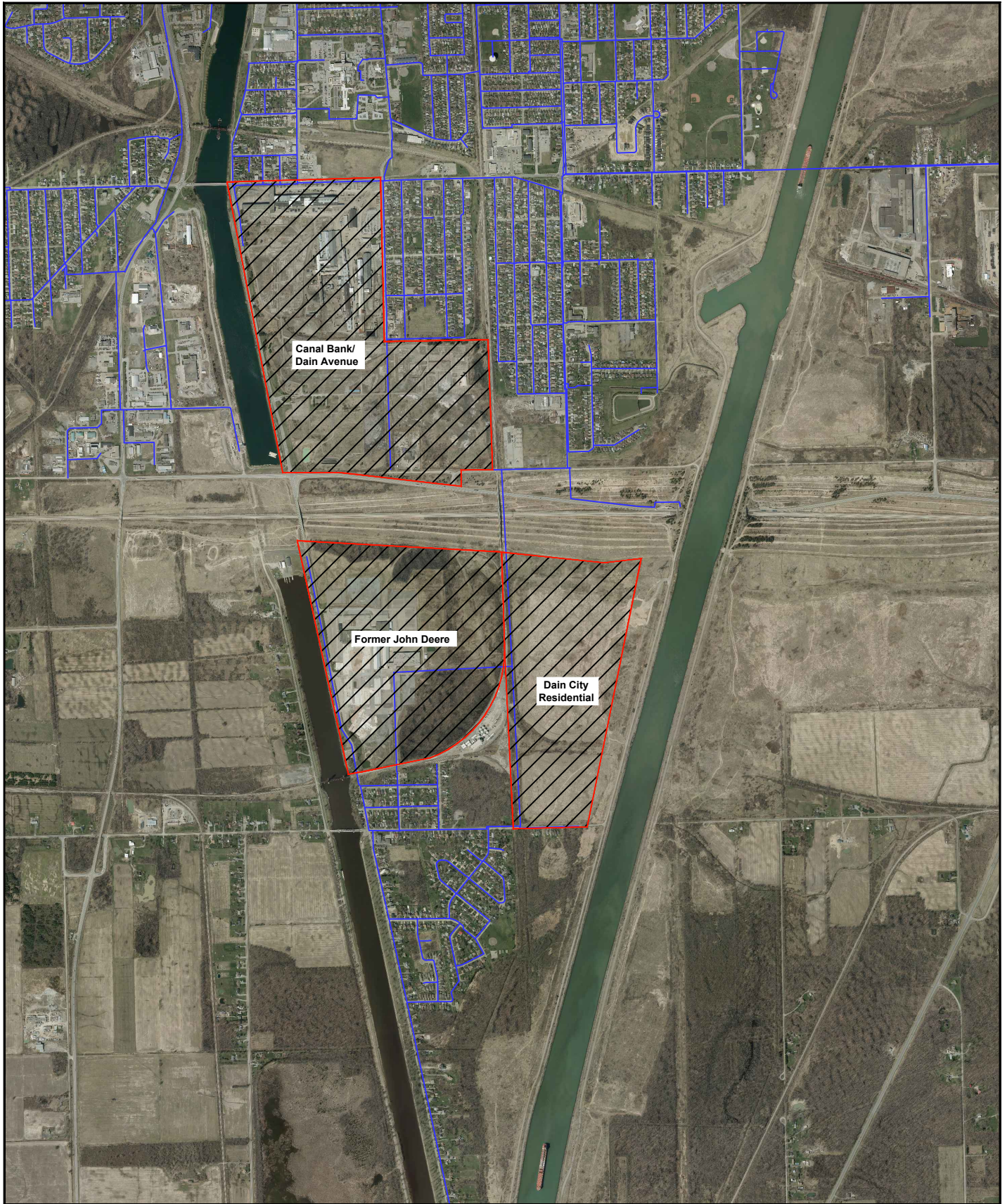
Additionally, the impact of the Empire Homes Development on the available fire flow within the existing system is minor, with many of the hydrants in the vicinity of the development having improved fire flow due to increased looping within the system. For hydrants within the existing system that do experience a drop in available fire flow with the addition of the Empire Homes Development, the average drop is approximately 1.3 L/s and does not change the NFPA 291 classification of the hydrant.

5. Conclusions and Recommendations

The City of Welland's water distribution system can supply water demand and fire flow to the proposed Empire Homes Development. This development will result in minor reductions in existing system pressure and available fire flow; however existing pressures will remain within MECF requirements.

During normal operating procedures, adequate pressure can be supplied to the Former John Deere and Canal Bank/Dain Avenue development areas without any modifications to the existing system operating procedures. However, the elevation in the Dain City Residential area (maximum elevation of 189m) results in pressures below the MECF recommendation of 275 kPa (40 psi) during high demand periods while the WTP is offline (mid-morning). Although these low pressures can be mitigated through changes to the operations of the WTP (eliminating mid-morning shut down), this strategy is not preferred since it relies exclusively on the operations of the WTP and limits the effective operating range of the Bemis Tank. Instead, the City should consider limiting the elevation of this portion of the development to a maximum of 185 m. Alternatively, a small booster station for this area could be considered.

Once a site servicing plan is developed, the Empire Homes Development should be reassessed to confirm required watermain sizing and connection locations to the existing system. Phasing plans should also be reviewed once available to confirm that suitable pressure and fire flow can be supplied not only during full buildout but during all interim phases.



Source: City of Welland 2013 Ortho Mosaic

NTS

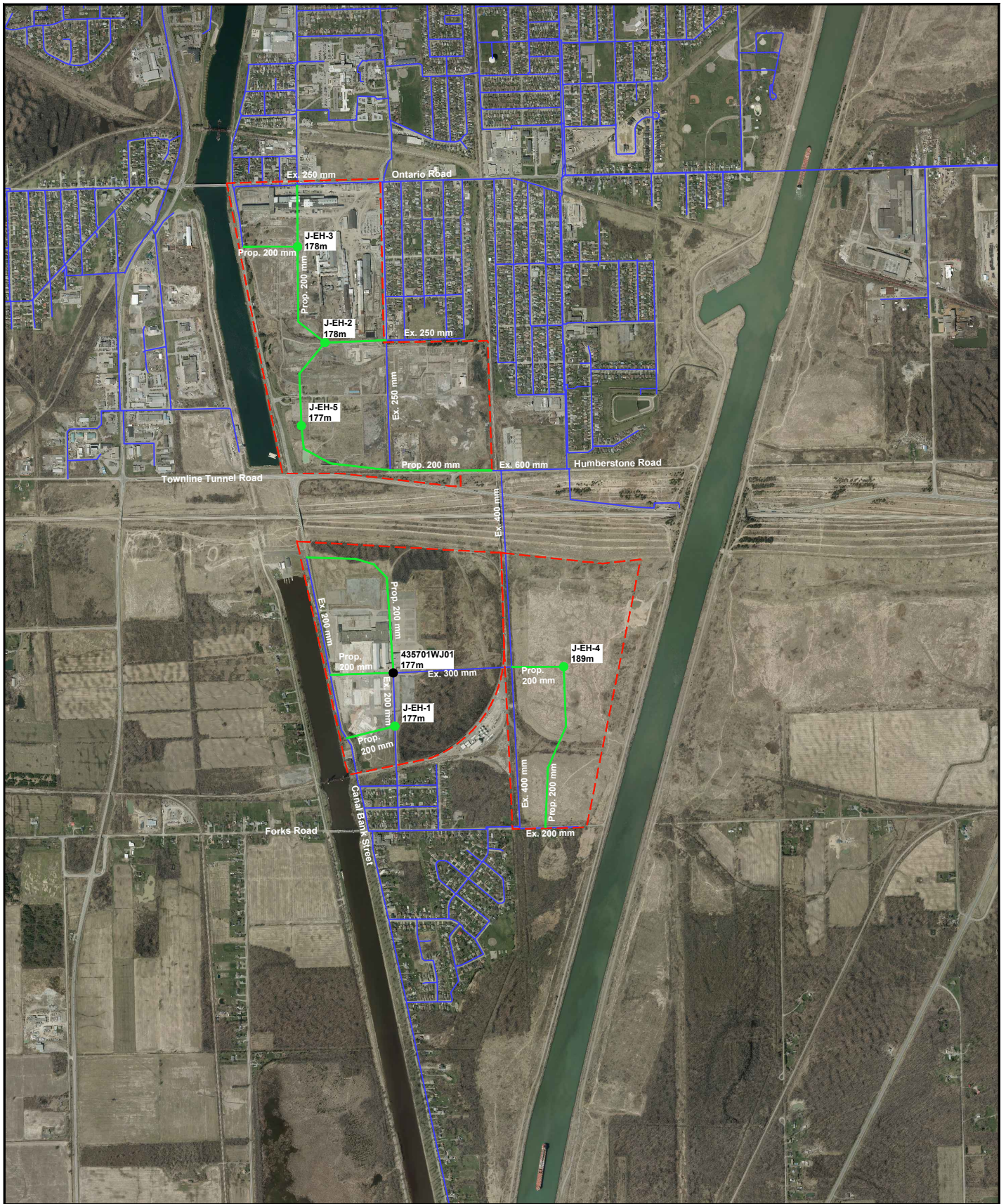


CITY OF WELLAND
EMPIRE HOMES DEVELOPMENT

11155923

LOCATION PLAN

FIGURE 1.1



Source: City of Welland 2013 Ortho Mosaic

NTS

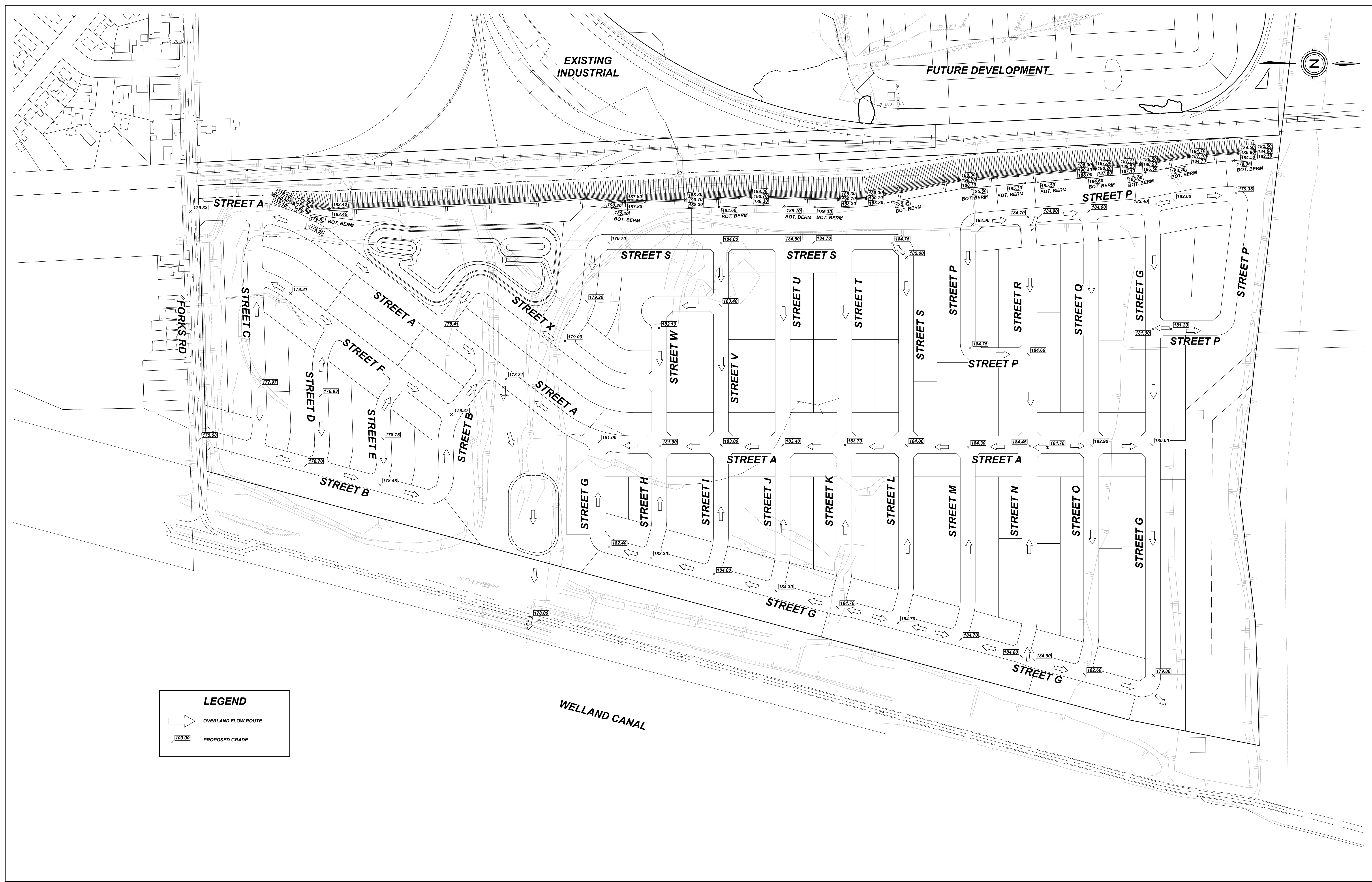


CITY OF WELLAND
EMPIRE HOMES DEVELOPMENT


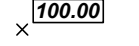
11155923

WATER SERVICING

FIGURE 2.1



LEGEND

 OVERLAND FLOW ROUTE
 PROPOSED GRADE

NOTES:


1. THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWER, AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS 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.
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3. ALL CONSTRUCTION MUST COMPLY WITH THE NIAGARA PENINSULA STANDARD CONTRACT DOCUMENT.

DRAFTING
JC

DESIGN
JC

CHECKED BY
JC

APPROVED BY
JC


Welland
 Ontario Canada


UPPER CANADA CONSULTANTS
 ENGINEERS / PLANNERS

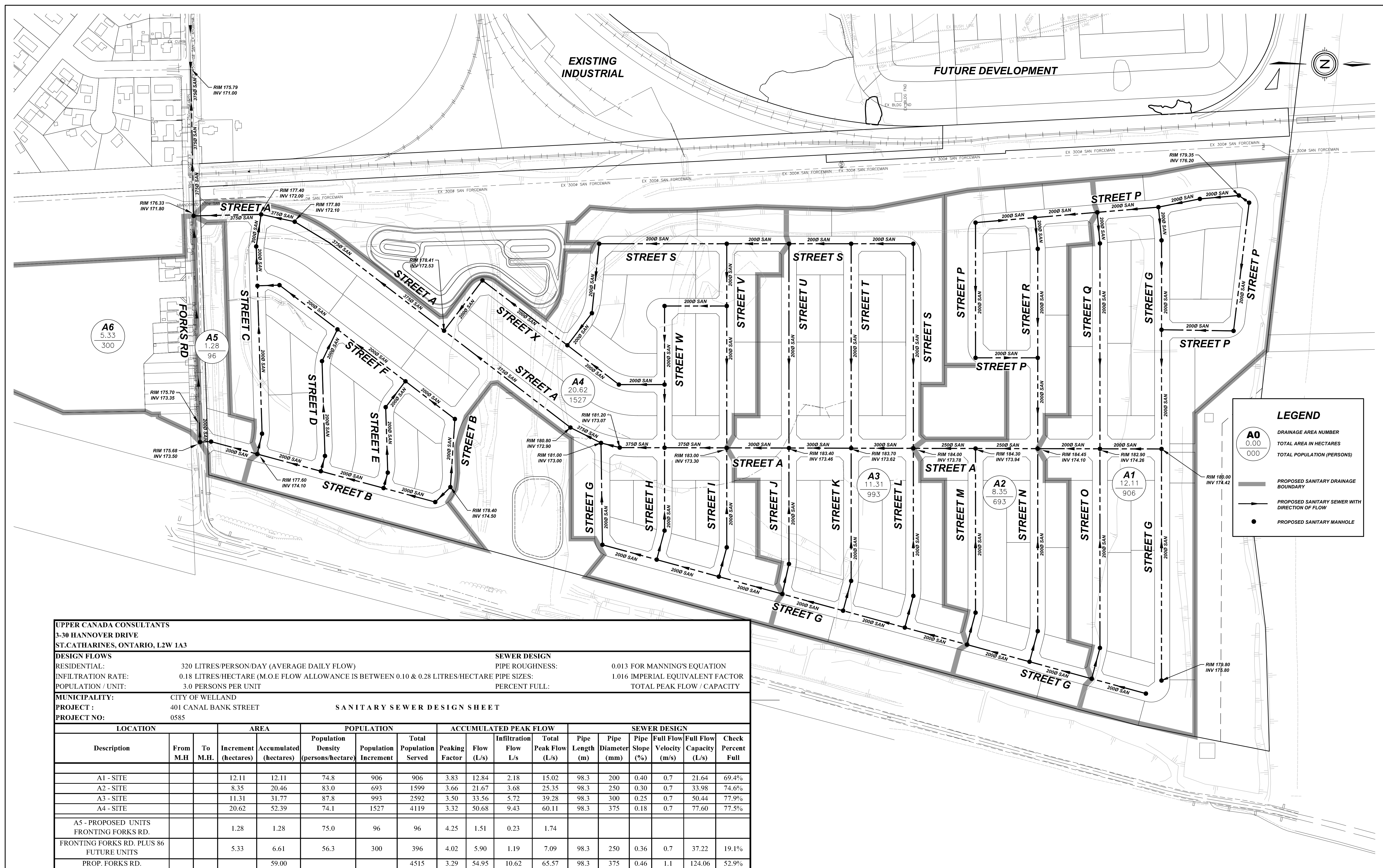
OWNER
EMPIRE COMMUNITIES

401 CANAL BANK STREET

CITY OF WELLAND

OVERALL SITE GRADING PLAN
FUNCTIONAL SERVICING REPORT

CONSULTANT FILE No.	0585
DATE	2020-02-26
PRINTED	2020-02-26
SCALE	1:2000 m
REF No.	
DWG No.	0585-FSR GP
REV	0



LEGEND

A0
0.00
000

— PROPOSED SANITARY DRAINAGE BOUNDARY

→ PROPOSED SANITARY SEWER WITH DIRECTION OF FLOW

● PROPOSED SANITARY MANHOLE

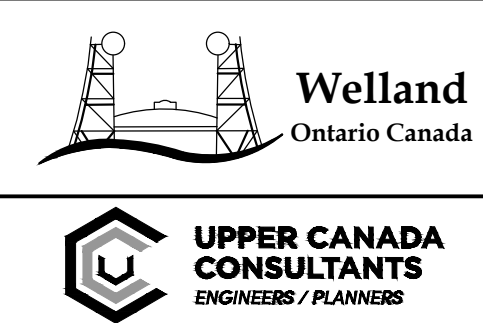
UPPER CANADA CONSULTANTS 3-30 HANNOVER DRIVE ST. CATHARINES, ONTARIO, L2W 1A3				SEWER DESIGN			
DESIGN FLOWS				PIPE ROUGHNESS: 0.013 FOR MANNING'S EQUATION			
RESIDENTIAL:	320 LITRES/PERSON/DAY (AVERAGE DAILY FLOW)			PIPE SIZES: 1.016 IMPERIAL EQUIVALENT FACTOR			
INFILTRATION RATE:	0.18 LITRES/HECTARE (M.O.E FLOW ALLOWANCE IS BETWEEN 0.10 & 0.28 LITRES/HECTARE)			PERCENT FULL: TOTAL PEAK FLOW / CAPACITY			
POPULATION / UNIT:	3.0 PERSONS PER UNIT						
MUNICIPALITY:	CITY OF WELLAND			SANITARY SEWER DESIGN SHEET			
PROJECT:	401 CANAL BANK STREET						
PROJECT NO:	0585						

LOCATION	AREA		POPULATION		ACCUMULATED PEAK FLOW				SEWER DESIGN				Check Percent Full					
	Description	From M.H.	To M.H.	Increment (hectares)	Accumulated (hectares)	Population Density (persons/hectare)	Population Increment	Total Population Served	Peaking Factor	Flow (L/s)	Infiltration Flow L/s	Total Peak Flow (L/s)		Pipe Length (m)	Pipe Diameter (mm)	Pipe Slope (%)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)
A1 - SITE				12.11	12.11	74.8	906	906	3.83	12.84	2.18	15.02	98.3	200	0.40	0.7	21.64	69.4%
A2 - SITE				8.35	20.46	83.0	693	1599	3.66	21.67	3.68	25.35	98.3	250	0.30	0.7	33.98	74.6%
A3 - SITE				11.31	31.77	87.8	993	2592	3.50	33.56	5.72	39.28	98.3	300	0.25	0.7	50.44	77.9%
A4 - SITE				20.62	52.39	74.1	1527	4119	3.32	50.68	9.43	60.11	98.3	375	0.18	0.7	77.60	77.5%
A5 - PROPOSED UNITS FRONTING FORKS RD.				1.28	1.28	75.0	96	96	4.25	1.51	0.23	1.74						
FRONTING FORKS RD. PLUS 86 FUTURE UNITS				5.33	6.61	56.3	300	396	4.02	5.90	1.19	7.09	98.3	250	0.36	0.7	37.22	19.1%
PROP. FORKS RD.					59.00			4515	3.29	54.95	10.62	65.57	98.3	375	0.46	1.1	124.06	52.9%

NOTES:

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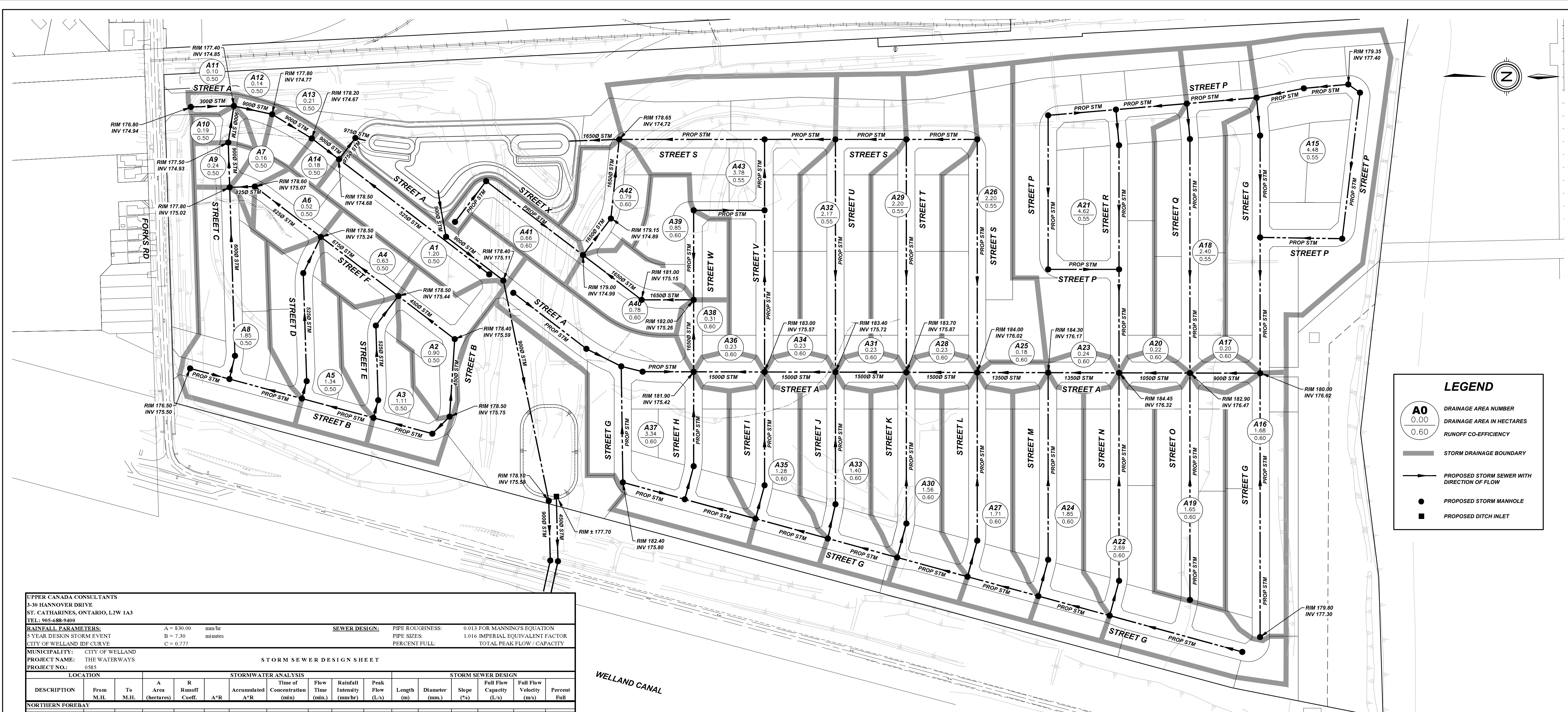
DRAFTING: JC
DESIGN:
CHECKED BY:
APPROVED BY:



OWNER:
EMPIRE COMMUNITIES

401 CANAL BANK STREET
CITY OF WELLAND
OVERALL SANITARY DRAINAGE AREA PLAN
FUNCTIONAL SERVICING REPORT

CONSULTANT FILE No. 0585
DATE: 2020-03-05
PRINTED: 2020-03-05
SCALE: 1:2000 m
REF No.
DWG No. **0585-FSR SAN**
REV: 0



LEGEND

- A0** DRAINAGE AREA NUMBER
- 0.00** DRAINAGE AREA IN HECTARES
- 0.60** RUNOFF CO-EFFICIENCY
- STORM DRAINAGE BOUNDARY
- PROPOSED STORM SEWER WITH DIRECTION OF FLOW
- PROPOSED STORM MANHOLE
- PROPOSED DITCH INLET

UPPER CANADA CONSULTANTS
 3-30 HANNOVER DRIVE
 ST. CATHARINES, ONTARIO, L2W 1A3
 TEL: 905-688-9400

RAINFALL PARAMETERS:
 A = 830.00 mm/hr
 B = 7.30 minutes
 C = 0.777

SEWER DESIGN: PIPE ROUGHNESS: 0.013 FOR MANNING'S EQUATION
 PIPE SIZES: 1.016 IMPERIAL EQUIVALENT FACTOR
 PERCENT FULL: TOTAL PEAK FLOW / CAPACITY

MUNICIPALITY: CITY OF WELLAND
 PROJECT NAME: THE WATERWAYS
 PROJECT NO.: 0585

STORM SEWER DESIGN SHEET

DESCRIPTION	LOCATION		STORMWATER ANALYSIS					STORM SEWER DESIGN								
	From M.H.	To M.H.	A Area (hectares)	R Runoff Coeff.	A*R	Accumulated A*R	Concentration (mg/l)	Flow Time (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Length (m)	Diameter (mm)	Slope (%)	Full Flow Capacity (L/s)	Full Flow Velocity (m/s)	Percent Full
NORTHERN FOREBAY																
A15			4.48	0.55	2.464	2.464	15.49	5.49	73.1	500.5	400.0	825	0.20	669.7	1.2	74.7%
A16			1.68	0.60	1.008	1.008	14.69	4.69	75.2	210.6	276.0	600	0.20	286.5	1.0	73.5%
A17			0.20	0.60	0.120	3.592	20.99	1.01	61.8	616.9	78.0	900	0.20	844.6	1.3	73.0%
A18			2.40	0.55	1.320	1.320	15.57	5.57	72.9	267.4	355.0	675	0.20	392.2	1.1	68.2%
A19			1.65	0.60	0.990	0.990	14.02	4.02	77.0	211.8	237.0	600	0.20	286.5	1.0	73.9%
A20			0.22	0.60	0.132	6.034	22.00	0.87	60.2	1908.5	74.0	1050	0.20	1274.0	1.4	79.2%
A21			4.62	0.55	2.541	2.541	14.75	4.75	75.0	529.6	346.0	825	0.20	669.7	1.2	79.1%
A22			2.69	0.60	1.614	1.614	16.25	6.25	71.3	319.6	398.0	675	0.20	392.2	1.1	81.5%
A23			0.24	0.60	0.144	10.333	22.86	0.73	58.8	1688.3	74.0	1350	0.20	2490.2	1.7	67.8%
A24			1.85	0.60	1.110	1.110	15.30	5.30	73.6	227.0	312.0	600	0.20	286.5	1.0	79.2%
A25			0.18	0.60	0.108	11.551	23.59	0.73	57.7	1852.5	74.0	1350	0.20	2490.2	1.7	74.4%
A26			2.20	0.55	1.210	1.210	13.81	3.81	77.6	260.8	243.0	675	0.20	392.2	1.1	66.5%
A27			1.71	0.60	1.026	1.026	14.94	4.94	74.5	212.4	291.0	600	0.20	286.5	1.0	74.1%
A28			0.23	0.60	0.138	13.925	24.33	0.68	56.7	2193.0	74.0	1500	0.20	3298.0	1.8	66.5%
A29			2.20	0.55	1.210	1.210	15.38	5.38	73.4	246.7	317.0	600	0.20	286.5	1.0	86.1%
A30			1.56	0.60	0.936	0.936	14.60	4.60	75.4	196.1	271.0	600	0.20	286.5	1.0	68.5%
A31			0.23	0.60	0.138	16.209	25.01	0.68	55.8	2510.7	74.0	1500	0.20	3298.0	1.8	76.1%
A32			2.17	0.55	1.194	1.194	15.38	5.38	73.4	243.3	317.0	600	0.20	286.5	1.0	84.9%
A33			1.40	0.60	0.840	0.840	14.25	4.25	76.4	178.3	250.0	600	0.20	286.5	1.0	62.2%
A34			0.23	0.60	0.138	18.381	25.69	0.68	54.9	2801.2	74.0	1500	0.20	3298.0	1.8	84.9%
A35			1.28	0.60	0.768	0.768	14.32	4.32	76.2	162.5	233.0	525	0.20	200.6	0.9	81.0%
A36			0.23	0.60	0.138	19.287	26.37	0.25	54.0	2892.9	27.0	1500	0.20	3298.0	1.8	87.7%
A37			3.34	0.60	2.004	2.004	12.54	2.54	81.4	453.3	213.0	750	0.30	636.1	1.4	71.3%
A38			0.31	0.60	0.186	21.477	26.62	0.65	53.7	3203.0	75.0	1650	0.20	4252.3	1.9	75.3%
A39			0.85	0.60	0.510	0.510	11.73	1.73	84.1	119.2	93.0	525	0.20	200.6	0.9	59.4%
A40			0.78	0.60	0.468	22.455	27.27	1.13	52.9	3300.0	131.0	1650	0.20	4252.3	1.9	77.6%
A41			0.66	0.60	0.396	0.396	13.72	3.72	77.9	85.7	181.0	450	0.20	133.0	0.8	64.4%
A42			0.79	0.60	0.474	23.325	28.40	1.13	51.6	3343.0	131.0	1650	0.20	4252.3	1.9	78.6%
A43			3.78	0.55	2.079	2.079	15.78	5.78	72.4	418.2	395.0	750	0.20	519.4	1.1	80.5%
		HW				25.404	29.54	0.45	80.4	3553.6	52.0	1650	0.20	4252.3	1.9	83.6%

WELLAND CANAL

UPPER CANADA CONSULTANTS
 3-30 HANNOVER DRIVE
 ST. CATHARINES, ONTARIO, L2W 1A3
 TEL: 905-688-9400

RAINFALL PARAMETERS:
 A = 830.00 mm/hr
 B = 7.30 minutes
 C = 0.777

SEWER DESIGN: PIPE ROUGHNESS: 0.013 FOR MANNING'S EQUATION
 PIPE SIZES: 1.016 IMPERIAL EQUIVALENT FACTOR
 PERCENT FULL: TOTAL PEAK FLOW / CAPACITY

MUNICIPALITY: CITY OF WELLAND
 PROJECT NAME: THE WATERWAYS
 PROJECT NO.: 0585

STORM SEWER DESIGN SHEET

DESCRIPTION	LOCATION		STORMWATER ANALYSIS					STORM SEWER DESIGN								
	From M.H.	To M.H.	A Area (hectares)	R Runoff Coeff.	A*R	Accumulated A*R	Concentration (mg/l)	Flow Time (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Length (m)	Diameter (mm)	Slope (%)	Full Flow Capacity (L/s)	Full Flow Velocity (m/s)	Percent Full
SOUTHERN FOREBAY																
A1			1.20	0.50	0.600	0.600	13.66	3.66	78.1	130.1	197.0	525	0.20	200.6	0.9	64.8%
A2			0.90	0.50	0.450	0.450	13.19	3.19	79.4	99.3	155.0	450	0.20	133.0	0.8	74.7%
A3			1.11	0.50	0.555	0.555	14.18	4.18	76.6	118.1	225.0	525	0.20	200.6	0.9	58.8%
A4			0.63	0.50	0.315	1.320	14.18	1.55	76.6	280.8	99.0	675	0.20	392.2	1.1	71.6%
A5			1.34	0.50	0.670	0.670	14.66	4.66	75.3	140.1	251.0	525	0.20	200.6	0.9	69.8%
A6			0.52	0.50	0.260	2.250	15.73	0.96	72.5	453.4	70.0	825	0.20	669.7	1.2	67.7%
A7			0.16	0.50	0.080	2.230	16.69	0.55	70.3	454.8	40.0	825	0.20	669.7	1.2	67.9%
A8			1.85	0.50	0.925	0.925	14.75	4.75	75.0	192.8	280.0	600	0.20	286.5	1.0	67.3%
A9			0.24	0.50	0.120	3.375	17.24	0.58	69.0	647.3	45.0	900	0.20	844.6	1.3	76.0%
A10			0.19	0.50	0.095	3.470	17.82	0.53	67.8	653.5	41.0	900	0.20	844.6	1.3	77.4%
A11			0.10	0.50	0.050	0.050	11.10	1.10	86.4	12.0	50.0	300	0.30	55.3	0.8	21.7%
A12			0.14	0.50	0.070	3.590	18.36	0.60	66.7	665.2	46.0	900	0.20	844.6	1.3	79.8%
A13			0.21	0.50	0.105	3.695	18.95	0.54	65.5	672.5	42.0	900	0.20	844.6	1.3	79.0%
A14			0.18	0.50	0.090	3.785	19.50	0.45	64.5	678.0	35.0	900	0.20	844.6	1.3	80.3%
						4.385	19.95	0.34	63.7	775.3	28.0	975	0.20	1045.6	1.4	74.2%
		HW				4.385	20.29	0.14	63.0	767.8	11.0	975	0.20	1045.6	1.4	73.4%

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#	REVISION	DATE	INIT

DRAFTING: JC
 DESIGN: JC
 CHECKED BY: JC
 APPROVED BY: JC

Welland
 Ontario Canada

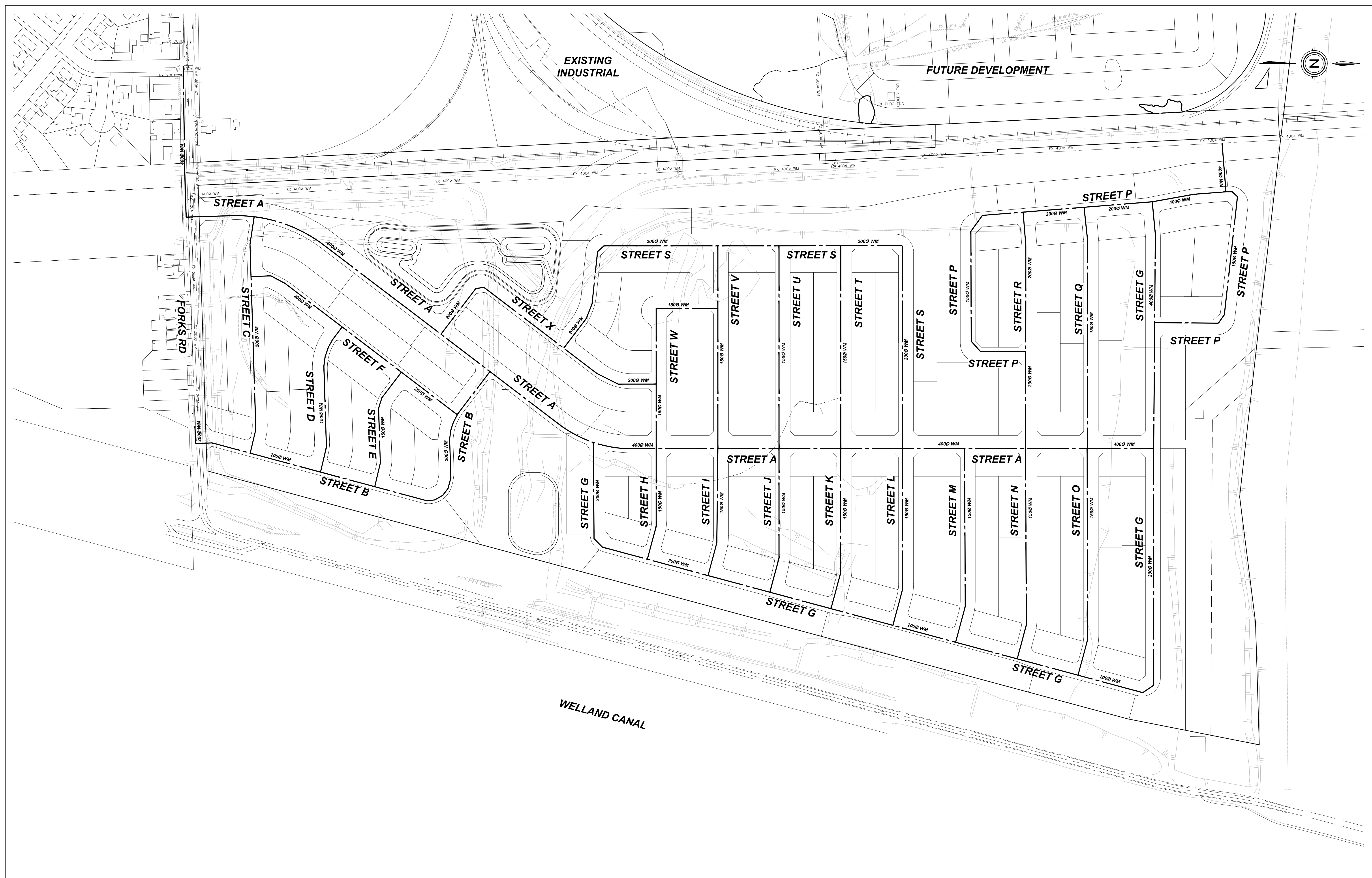
UPPER CANADA CONSULTANTS
 ENGINEERS / PLANNERS

OWNER:
EMPIRE COMMUNITIES

401 CANAL BANK STREET
 CITY OF WELLAND

OVERALL STORM DRAINAGE AREA PLAN
FUNCTIONAL SERVICING REPORT

CONSULTANT FILE No. 0585
 DATE: 2020-02-28
 PRINTED: 2020-02-28
 SCALE: 1:2000 m
 REF No.:
 DWG No.:
0585-FSR STM REV 0

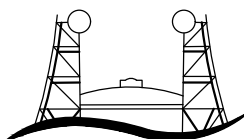


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DRAFTING	JC
DESIGN	
CHECKED BY	
APPROVED BY	



Welland
Ontario Canada

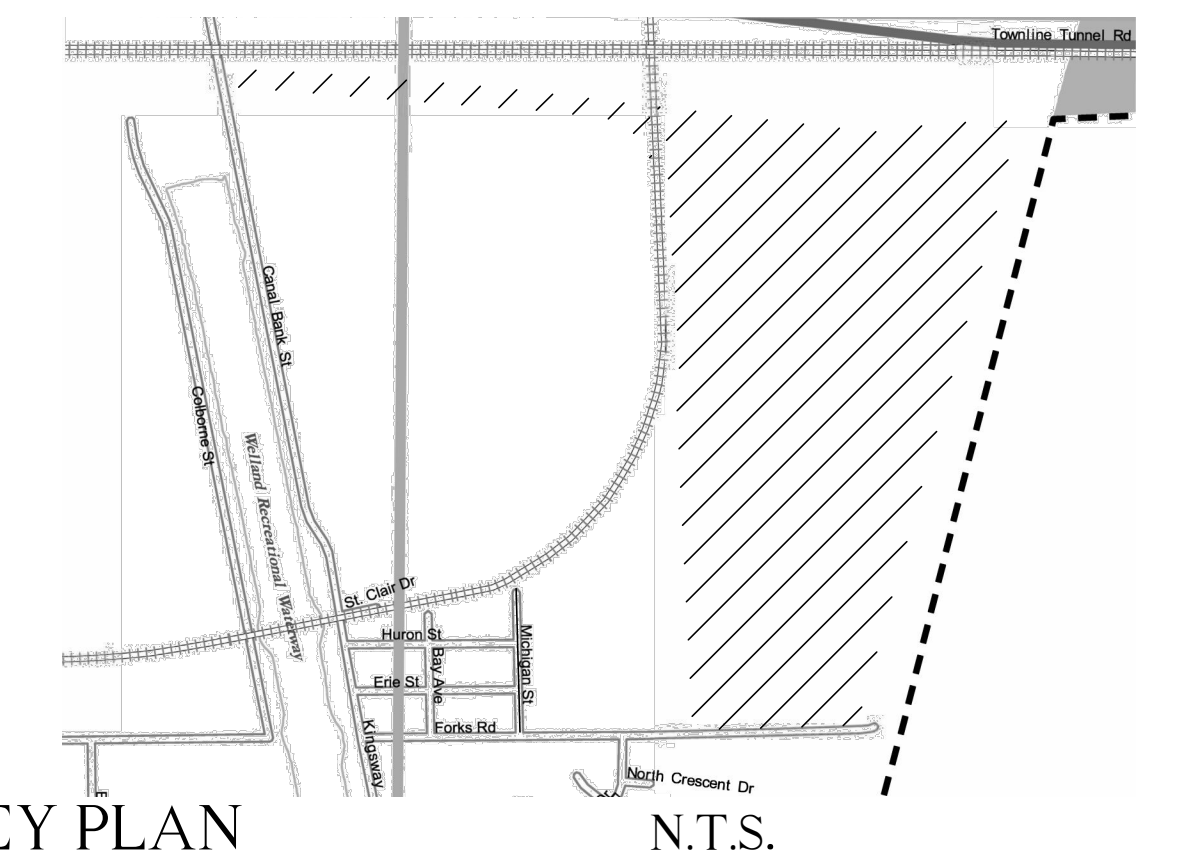


UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

OWNER
EMPIRE COMMUNITIES

401 CANAL BANK STREET
CITY OF WELLAND
OVERALL WATERMAIN DISTRIBUTION PLAN
FUNCTIONAL SERVICING REPORT

CONSULTANT FILE No.	0585
DATE	2020-02-26
PRINTED	2020-02-26
SCALE	1:2000 m
REF No.	
DWG No.	0585-FSR WM
REV	0



KEY PLAN N.T.S.

ADDITIONAL INFORMATION
 Required Under Section 51(17)
 Of The Planning Act, R.S.O. 1990 c.P.13

0. SHOWN ON DRAFT PLAN
 1. SHOWN ON DRAFT AND KEY PLANS
 2. SHOWN ON KEY PLAN
 3. LAND TO BE USED IN ACCORDANCE WITH LAND USE SCHEDULE
 4. SHOWN ON DRAFT PLAN
 5. SHOWN ON DRAFT PLAN
 6. SHOWN ON DRAFT PLAN AND KEY PLAN
 7. MUNICIPAL DRAINAGE WATER TO BE PROVIDED
 8. SOIL IS SILTY CLAY
 9. SHOWN ON DRAFT PLAN
 10. ALL MUNICIPAL SERVICES TO BE PROVIDED
 11. SHOWN ON DRAFT PLAN

SCHEDULE OF LAND USE

Proposed Land Use	Units	Reference	Area (Ha.)
TOTAL SITE AREA - 72.132 ha			
Residential Singles 10.0m	360	Blocks 1-2,4,5,7,19, 21,22,24, 29,54,58,59, 60,69,92-94,98,101-105, 109	12,015
Residential Singles 8.0m	725	Blocks 3,6,8,10-14,16,18, 20,23,25,26,28,30,32,33, 36-41,44,45,48-53,55,57, 61,62,64-66,68,70,72-74, 76-78,80-82,84-88,90,91, 95-97,99,100,106,108, 110-111,113-16,118, 120-124	18,864
Residential Townhomes 5.5m	320	Blocks 9,15,17,27,31,34, 35,42,43,46,47,56,63,67, 71,75,79,83,89,107,112, 117,119	6,273
Park		Blocks 125-127	3,639
Stormwater Management Pond		Block 128	2,078
Open Space		Blocks 129-130	13,338
ROADS			
21m - 23m R.O.W. (Street A)			2,665
18m R.O.W. (Streets B-X)			13,260
TOTAL	1405		72.132

Proposed Summary Yield

Proposed Unit Mix	Unit Count with Alternate 5.50m Townhouse Units	Unit Count with Alternate 5.50m Semi-Detached Units
Residential Singles 10.0m	360	360
Residential Singles 8.0m	725	725
Residential Townhomes 5.5m	320	
Residential Semi-Detached 5.5m		284
TOTAL	1405	1369

5		
4		
3		
2		
1		
No.	REVISION	DATE

REVISIONS

OWNER'S CERTIFICATE
 WE, BEING THE REGISTERED OWNER OF THE SUBJECT LANDS HEREBY AUTHORIZE ARMSTRONG PLANNING AND PROJECT MANAGEMENT TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

SIGNED _____ DATE _____

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 _____ DATE FEBRUARY 20, 2020

DAIN CITY EAST DRAFT PLAN OF SUBDIVISION

PART LOTS 20, 21, 22 AND 23, CONCESSION 5, PART OF THE ROAD ALLOWANCE BETWEEN LOTS 20 AND 21, CONCESSION 5, AND PART OF THE ROAD ALLOWANCE BETWEEN LOT 22 AND 23, CONCESSION 5, (CLOSED BY BY-LAW 855, INST NO. HU8243) GEOGRAPHIC TOWNSHIP OF HUMBERSTONE) THE CITY OF WELLAND REGIONAL MUNICIPALITY OF NIAGARA



DESIGN:	DRAWN:	SCALE: 1:2000
APPROVED:	DATE: February 20, 2020	PROJECT No. 19.2681.00
DRAWING No. Dain City East Subdivison.dwg		PHASES 1-3