



Riverfront Community

Infrastructure Requirements

Stormwater, Wastewater, and Water Servicing

City of Niagara Falls

Prepared for:

GR (CAN) Investment Co. Ltd.

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Project No. TP115026

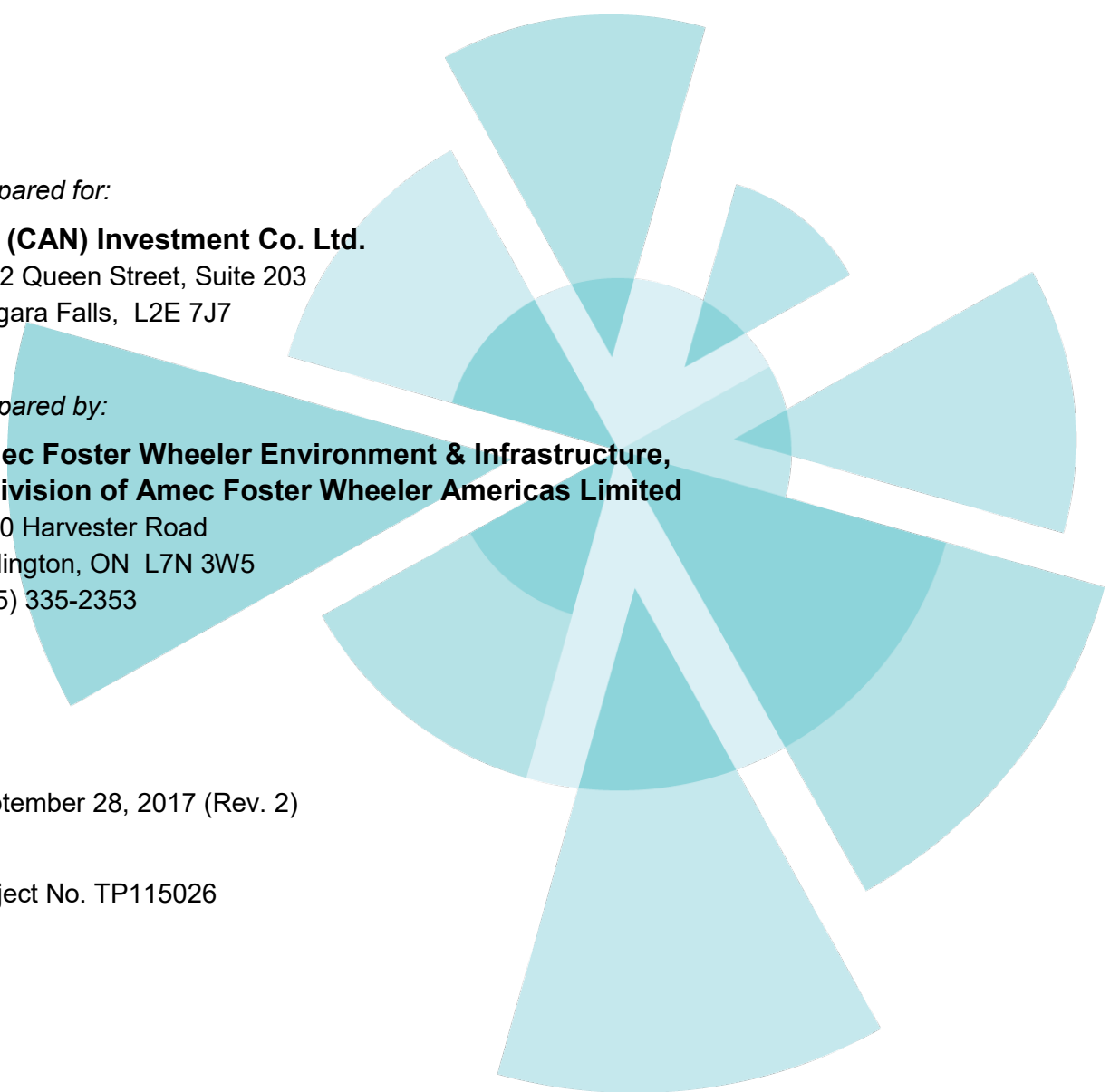


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1 INTRODUCTION & PLANNING CONTEXT

GR (CAN) Investment Co. Ltd. [GR (CAN)] controls approximately 484 acres [195.9 ha (+/-)] of land adjacent to the Thundering Waters Golf Course (the "Thundering Waters" Lands) in the City of Niagara Falls.

The proposed development (Riverfront Community) includes a mix of commercial, residential, park lands (green space) and other employment uses. The subject lands are currently in the Secondary Planning process.

The following study (FSS 2016) forms the basis of this memorandum:

- **Niagara Falls Thundering Waters Development - Functional Servicing Study (FSS)**, (Amec Foster Wheeler, June 2016).

The FSS 2016 was prepared in support of the full area development as part of the Secondary Planning process. Pursuant to submission of the FSS, preliminary comments were provided by the City of Niagara Falls, Niagara Peninsula Conservation Authority (NPCA), and the Region of Niagara.

GR (CAN) is currently advancing a new development in these areas. The proposed development boundary and associated land uses were provided by GR (CAN) and are included in **Appendix D**.

The proposed development covers approximately 48.6 hectares (+/-). The proposed development consists primarily of low density residential land uses, with some medium and higher density residential land uses including condominium development, and commercial land uses. The planned land use with commercial and residential number of units envisioned for the proposed development is presented in **Appendix D**.

The intent of this scope of work is not to provide any formal update to the Functional Servicing Study (FSS) completed by Amec Foster Wheeler June 2016, but rather to use the servicing framework which was established as part of the FSS, to identify the interim and ultimate servicing requirements for the proposed development limits, as defined by GR (CAN).

Through this assessment, it has been necessary to consider a combination of permanent (ultimate) servicing infrastructure, as well as various interim or temporary works. The objective has been to ensure that any potential unnecessary infrastructure is not advanced at this stage, and that the overall servicing system is fully optimized, working towards the ultimate Master Servicing Strategy.

As all parties are aware, there remain a number of unknowns for which the current Riverfront Community development is not able to address at this time; these include:

- **Material Management** - currently there is a need to remove contaminated material, as well as consolidation through engineering means (ref. Geotechnical Report, Amec Foster Wheeler, 2016). The extent and limit of this work is unknown.
- **Grading Plan** - A detailed site preparation and grading plan has not been prepared, this may impact on the ultimate servicing configuration.
- **Wetlands boundary** - The ultimate status and limits of the wetlands, including their associated protection framework, remains under study. The stormwater management system to date has been based upon the current wetland limits defined in the plan submitted with the FSS. In the event of any changes to the limits, the stormwater management plan can also potentially change.
- The comments provided on the FSS by the regulators have to date been of a preliminary nature only. It is anticipated that more formal and comprehensive comments will be forthcoming at some time in the future.

2 STORMWATER SERVICING

The preliminary stormwater management plan for the development of the Riverfront Community (Thundering Waters) site is presented in FSS 2016. The ultimate stormwater management plan is noted to comprise of the following:

- i. Two (2) wet ponds designed to provide stormwater quality control to a "Normal" standard of treatment as a minimum, for the future development within the portion of the Riverfront Community lands located south of the railway.
- ii. Oil/grit separators designed to provide stormwater quality control to a "Normal" standard of treatment as a minimum, for the future development within the portion of the Riverfront Community lands north of the railway and east of the Eastern Watercourse.
- iii. Low Impact Development Best Management Practices (LID BMPs) designed to provide stormwater quality control to a "Normal" standard of treatment as a minimum, for the future development within the portion of the Riverfront Community lands contributing to the preserved and protected wetlands and as a method to enhance water quality and promote on-site infiltration and achieve water balance.
- iv. Retention and enhancement of the Conrail Drain and portions of the Eastern Watercourse to serve as conveyance systems.
- v. Hydraulic structures crossing the Conrail Drain and the Eastern Watercourse, designed in accordance to current standards for freeboard and clearance.
- vi. Hydraulic structures conveying localized drainage directly to the Power Canal, Welland River, or between preserved wetlands designed to convey the 100 year storm event at or below full flow conditions.
- vii. A closed conduit or local creek realignment at the north limit of the Eastern Watercourse, designed to a 100 year design standard, in order to capture runoff from the golf course and convey it to the Eastern Watercourse east of the site.
- viii. Urban major and minor system within the development area (5 year and 100 year standard).
- ix. A third pipe dedicated system to capture runoff from the central wetland (i.e. future land use subcatchments: 109a, 110a, and 111a and convey it to the Eastern Watercourse (i.e. future land use subcatchments: 108c, 110b, and 111b, or catchbasins along the central wetland connected to the storm sewer system with lateral outlets from the storm sewers adjacent to the Eastern Watercourse in order to maintain the supply of water.

In addition, the ultimate development of the Riverfront Community site includes a cleanwater pumping system, which would draw water from the Welland River and pump it to the internal headwater of the Conrail Drain within the Riverfront Community lands to support proposed enhancements to the Conrail Drain.

Stormwater Management

The limits of the Riverfront Community development area have been overlaid and compared with the stormwater management plan presented in FSS 2016 to determine opportunities to integrate the stormwater management plan for the Riverfront Community with the ultimate stormwater management plan, as well as any requirements for interim stormwater management (ref. Drawing 4, Appendix B). Based upon a comparison of the plans, it is noted that both wet ponds are located within the limits of the Riverfront Community, and that the contributing drainage area to each facility (as depicted), within the limits of the Riverfront Community, represent a portion of the ultimate drainage area to each facility (i.e. additional lands, outside of Riverfront Community, would be serviced by each facility under the ultimate development condition for the site). It is further noted that Riverfront Community includes lands south of the railway which are also proposed to be serviced by LID BMPs, and lands north of the railway which are proposed to be serviced by oil/grit separators.

Conrail Drain and Hydraulic Structures

The Riverfront Community encompasses the lower reach of the Conrail Drain, which is, as part of the overall plan, proposed to be enhanced using natural channel design principles. Furthermore, three (3) hydraulic structures are located at the limits of the development area (ref. structures C1, C2 and C8 as per Drawing 5 in Appendix B) and two (2) additional structures (ref. structures C9 and C5 as per Drawing 5 in Appendix B) are located downstream of Riverfront Community.

Stormwater Management Plan

The stormwater management plan for Riverfront Community is depicted on Drawings 4 and 6 in Appendix B, and is recommended to coincide with the ultimate stormwater management strategy. Although the wet ponds may be constructed in a phased manner (sized for Riverfront Community development only), it is recommended (and preferred) that they be constructed to the ultimate design configuration to avoid future disturbance to the facilities which would result from a phased implementation approach. The wet pond facility outlets are noted to discharge south toward and beneath Chippewa Parkway, hence easements across the lands south of Riverfront Community and structures across Chippewa Parkway would be required in order to accommodate Riverfront Community development.

The LID BMPs and oil/grit separators within Riverfront Community are recommended to be sited and designed to accommodate the development; given that these types of facilities represent source controls for stormwater quality management, the siting and design of these facilities outside Riverfront Community development which require these types of facilities, as part of the ultimate strategy outlined in the FSS 2016, may be completed as subsequent development phases are established (i.e. as part of draft plans / site plans).

It is further recommended that the reach of the Conrail Drain which extends through the Riverfront Community be constructed using natural channel design principles to the ultimate channel form, and that hydraulic structures C1, C2, and C8 be constructed to the ultimate configuration. Although not explicitly required, it is further recommended that hydraulic structures C9 and C5 also be constructed to the ultimate configuration, in order to remove capacity constraints from the proposed development; this would require coordination with the reconstruction of Chippewa Parkway.

3 WASTEWATER SERVICING

The Riverfront Community development will require the construction and implementation of the following:

- New 825 mm Sewer on Dorchester Road extending to the existing 825 mm sewer on Dorchester Road;
- Sewage Pumping Station and Forcemain discharging to the new sewer on Dorchester Road;
- Collection System within the development.

The overall wastewater servicing concept is presented in Drawing No. 2, **Appendix A**. It provides an overview of the elements described in this section.

As described in FSS 2016 the ultimate system includes:

- New 825 mm Sewer on Dorchester Road extending to the existing 825 mm sewer on Dorchester Road;
- Sewage Pumping Station and Forcemain discharging to the new sewer on Dorchester Road;
- Collection System within the proposed development;
- The collection system is designed to allow for future external flows from the South of the development.

The Riverfront Community demands were re evaluated for the purpose of allowing GR (CAN) to provide a firm capacity requirement to Niagara Region associated with the proposed development.

3.1 Design Criteria

Design Criteria, as utilized in the original 2016 report, have been updated based on the Niagara Region 2016 Water & Wastewater Master Plan (GM Blue Plan 2017).

Table 3-1 Design Criteria for the Wastewater Collection System for Riverfront Community

Design Criteria for the Wastewater Collection System for Riverfront Community		
Dry Weather Flow		
Residential Population	275 L/person-day	Niagara Region – 2016 Water Wastewater Master Plan
Employment Population	275 L/person-day	
Diurnal Variation / Daily Peaks	Harmon Peaking factor	Niagara Region – 2016 Water Wastewater Master Plan & City of Niagara Falls
Wet Weather Flow		
Design Inflow Infiltration Allowance	0.286 L/s-ha	Niagara Region – 2016 Water Wastewater Master Plan & City of Niagara Falls

Based on these parameters, the following demands are expected from the Riverfront Community Development:

Table 3-2 Demands from Riverfront Community Development

	Peak Wet Weather Flow (Conveyance)	Average Day DWF (Treatment)
Riverfront Community	63 L/s	1.3 MLD
Ultimate Build-Out	143 L/s	3.4 MLD

3.2 Existing Collection System

The Niagara Region Collection system is accessible via the South Side High Lift Pumping Station (HLPS). According to the 2016 Master Plan Update the South Side HLPS has a firm capacity of 760 L/s and a 2014 baseline demand of 436.3 L/s.

The Riverfront Community development can connect into the South Side HLPS via an existing 825 mm sewer located on Dorchester Road at an invert of approximately 175.49m.

This sewer drains into a 1350 mm diameter sewer that crosses the Power Canal and enters the South Side HLPS.

The existing sewer capacities are evaluated in two reaches below:

Table 3-3 Existing Sewer Region of Niagara – Sewer Capacities Downstream of Riverfront Community

Source – As constructed drawings & GIS information received	
Sewer Reach	Full Flow Capacity
Dorchester Road 825 mm Sewer @ 0.15%	556 L/s
Oldfield Road 1350 mm Sewer @ 0.16%	2135 L/s

South Side High Lift Sewage Pumping Station

The South Side High Lift Pumping Station has a 2014 baseline Peak Wet Weather Flow demand of 436.3 L/s and a capacity of 760 L/s.

3.3 Wastewater Treatment Capacity

The South Side HLPS service area is pumped to the Niagara Falls WWTP. The capacity of the WWTP is 68.3 MLD.

The demand on the Niagara Falls WWTP from the Riverfront Community development is approximately 1.3 MLD (Based full day dry weather flow). This represents approximately 1.9% of the capacity of the wastewater treatment plant.

3.4 Design Flows

The Riverfront Community population estimate utilized for the wastewater collection system is given in [Table 3-4](#). It is noted that this may differ slightly from the planning estimates. The estimate is based on the buildings and proposed land uses and provides a factor of safety to ensure that the system is designed to meet extreme conditions. The population estimates are as follows

Table 3-4 System Design Population

	Units	Construction Area (sq.ft)	Population factor	Pouulation
Residential:				
Total Bungalows	567		3	1701
Total Condo/Apartments	312		2.5	780
Total Hotel-Condos	400		2.5	1000
Total Residential:				3481
Employment:				
Retirement Facility / Long Term Care	238		2.5	595
Boutique Hotel		50,000	2 persons/1000 sq.ft	100
Commercial Centre		280,000	2 persons/1000 sq.ft	560
Total Employment:				1255

4 WATER SUPPLY

The Riverfront Community development will require the construction and implementation of the following:

- New 300 mm connection to the existing 300 mm watermain on Dorchester Road;
- New 300 mm connection to the existing 300 mm watermain on Don Murie Street Sewer on Dorchester Road;
- Internal distribution system within Riverfront Community including 300 mm and 200 mm watermains;

Niagara Region's updated design criteria have been reviewed since the completion of the FSS 2016. The proposed concept in FSS 2016 supports the level of service required under the Niagara Region Water and Wastewater Master Plan (GM Blue Plan 2017) for the Riverfront Community Lands. Future services proposed in FSS 2016 are as follows:

- New 300 mm connection to the existing 300 mm watermain at progress Street;
- Internal distribution system within the future phases Riverfront Community including 300 mm and 200 mm watermains;

The proposed watermains in this report are based on boundary conditions being maintained in the 1050 mm trunk watermain on Oldfield Road. Note that Niagara Region's Water and Wastewater Master Plan (GM Blue Plan 2017) indicates the need for a future trunk watermain to service the south side of Niagara Falls. There is an opportunity to coordinate these projects with the Riverfront Community development.

5 SERVICING COSTS FOR STORMWATER, WATER & SANITARY SERVICES

The estimated servicing costs for the Storm, Sanitary and Water Services for the Riverfront Community development are as follows:

Stormwater Servicing Costs - \$12.94 M

Water Servicing Costs – \$5.69 M

Wastewater Servicing Costs - \$6.39 M

A detailed breakdown is provided in **Appendix C**.

Note that these cost estimates do not include other costs associated with the implementation of the Riverfront Community including but not limited to:

- Pre Servicing Costs associated with materials management, site grading, import/export of fill, dewatering;
- Roads.

6 CONCLUSIONS

This report outlines the background related to the provision of municipal services for the Riverfront Community development for water, wastewater and stormwater management services. As noted in the Introduction, the Riverfront Community development limits are currently understood to be provisional until such time the City, Region, and Provincial regulators can come to a consensus on the firm limits of development. Significant changes to the development limits can potentially influence the means of servicing and the need for interim or ultimate services.

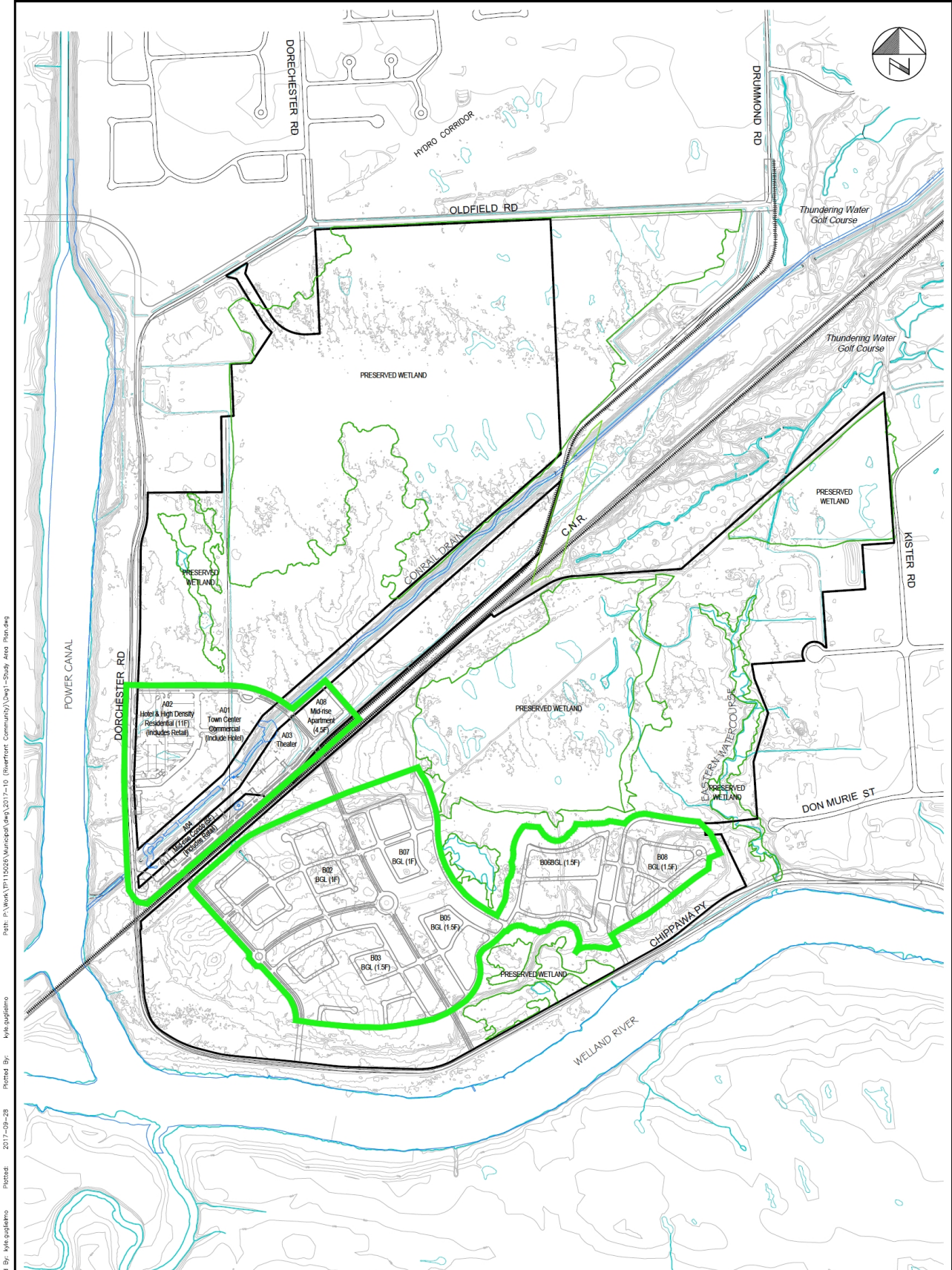
The anticipated peak wet weather flow on Niagara Region's System associated with this development is 63 L/s.

Pre Servicing Assessments, site grading and material management plans are required to confirm the stormwater, water and wastewater system configurations as proposed in this memo and in FSS2016.

Appendix A

Water & Wastewater Drawings





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Last Saved By: kyle.augliano
Last Saved: 2017-09-28

LEGEND	
	PROPERTY FABRIC
	WATERCOURSE
	WETLAND BOUNDARY
	CONTOUR (1m)
	LANDS OWNED BY GR(CAN) INVESTMENTS
	RIVERFRONT COMMUNITY LANDS

LAND USE INFORMATION SOURCE:
RTKL, MAY 19 2016

RIVERFRONT COMMUNITY
SERVICING
CITY OF NIAGARA FALLS

STUDY AREA PLAN

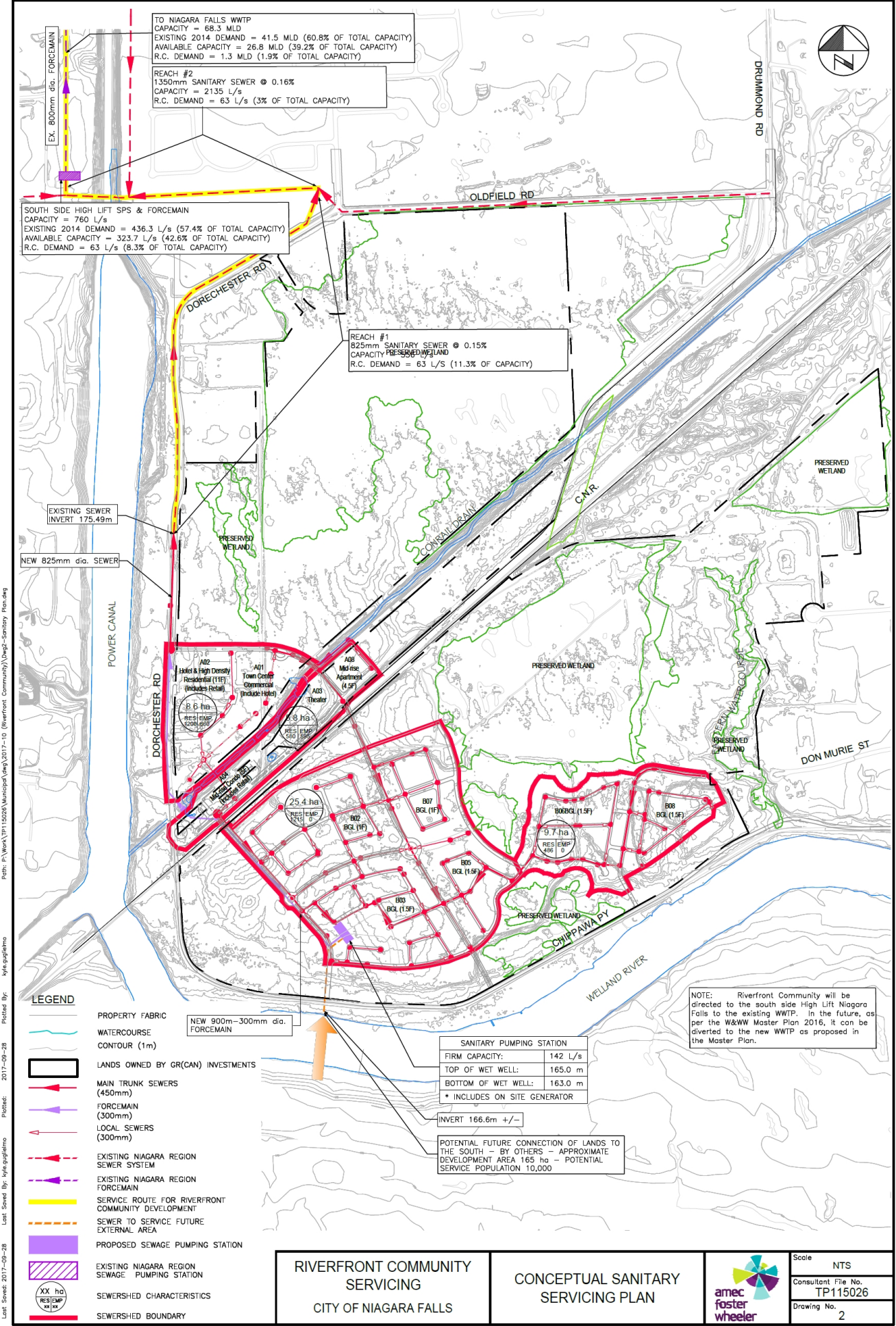


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Drawing No.
1



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TO NIAGARA FALLS WWTP
 CAPACITY = 68.3 MLD
 EXISTING 2014 DEMAND = 41.5 MLD (60.8% OF TOTAL CAPACITY)
 AVAILABLE CAPACITY = 26.8 MLD (39.2% OF TOTAL CAPACITY)
 R.C. DEMAND = 1.3 MLD (1.9% OF TOTAL CAPACITY)

REACH #2
 1350mm SANITARY SEWER @ 0.16%
 CAPACITY = 2135 L/s
 R.C. DEMAND = 63 L/s (3% OF TOTAL CAPACITY)

SOUTH SIDE HIGH LIFT SPS & FORCEMAIN
 CAPACITY = 760 L/s
 EXISTING 2014 DEMAND = 436.3 L/s (57.4% OF TOTAL CAPACITY)
 AVAILABLE CAPACITY = 323.7 L/s (42.6% OF TOTAL CAPACITY)
 R.C. DEMAND = 63 L/s (8.3% OF TOTAL CAPACITY)

REACH #1
 825mm SANITARY SEWER @ 0.15%
 CAPACITY = 1350 L/s
 R.C. DEMAND = 63 L/s (11.3% OF CAPACITY)

EXISTING SEWER
INVERT 175.49m

NEW 825mm dia. SEWER

POWER CANAL

AG2 Medium Density Residential (11E) (Includes Retail)
 8.6 ha RES EMP 2000
 AG1 Town Centre Commercial (Include Hotel)
 3.8 ha RES EMP 1000
 AG3 Midrise Apartment (4.5F)
 25.4 ha RES EMP 1000
 AG4 Theatre
 9.7 ha RES EMP 400
 B01 BGL (1.5F)
 B02 BGL (1.5F)
 B03 BGL (1.5F)
 B04 BGL (1.5F)
 B05 BGL (1.5F)
 B06 BGL (1.5F)
 B07 BGL (1.5F)
 B08 BGL (1.5F)

LEGEND

- PROPERTY FABRIC
- WATERCOURSE CONTOUR (1m)
- LANDS OWNED BY GR(CAN) INVESTMENTS
- MAIN TRUNK SEWERS (450mm)
- FORCEMAIN (300mm)
- LOCAL SEWERS (300mm)
- EXISTING NIAGARA REGION SEWER SYSTEM
- EXISTING NIAGARA REGION FORCEMAIN
- SERVICE ROUTE FOR RIVERFRONT COMMUNITY DEVELOPMENT
- SEWER TO SERVICE FUTURE EXTERNAL AREA
- PROPOSED SEWAGE PUMPING STATION
- EXISTING NIAGARA REGION SEWAGE PUMPING STATION
- SEWERSHED CHARACTERISTICS
- SEWERSHED BOUNDARY

NEW 900m-300mm dia. FORCEMAIN

SANITARY PUMPING STATION	
FIRM CAPACITY:	142 L/s
TOP OF WET WELL:	165.0 m
BOTTOM OF WET WELL:	163.0 m
* INCLUDES ON SITE GENERATOR	
INVERT 166.6m +/-	

POTENTIAL FUTURE CONNECTION OF LANDS TO THE SOUTH - BY OTHERS - APPROXIMATE DEVELOPMENT AREA 165 ha - POTENTIAL SERVICE POPULATION 10,000

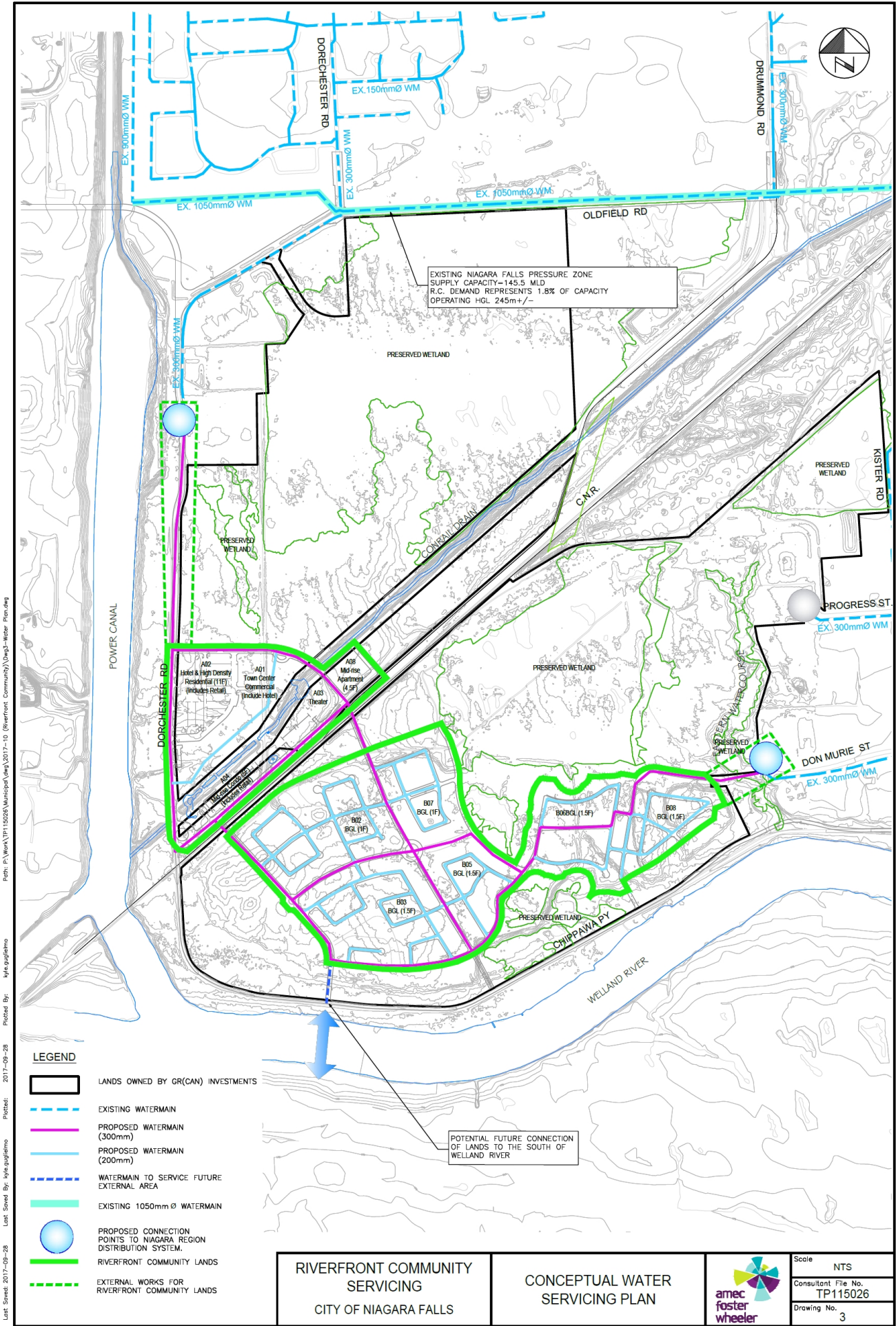
NOTE: Riverfront Community will be directed to the south side High Lift Niagara Falls to the existing WWTP. In the future, as per the W&WW Master Plan 2016, it can be diverted to the new WWTP as proposed in the Master Plan.

RIVERFRONT COMMUNITY
 SERVICING
 CITY OF NIAGARA FALLS

CONCEPTUAL SANITARY
 SERVICING PLAN



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Plotted: 2017-09-28

Project: 2017-09-28

Last Saved By: kyle.guglielmo

Last Saved: 2017-09-28

LEGEND

- LANDS OWNED BY GR(CAN) INVESTMENTS
- EXISTING WATERMAIN
- PROPOSED WATERMAIN (300mm)
- PROPOSED WATERMAIN (200mm)
- WATERMAIN TO SERVICE FUTURE EXTERNAL AREA
- EXISTING 1050mm Ø WATERMAIN
- PROPOSED CONNECTION POINTS TO NIAGARA REGION DISTRIBUTION SYSTEM.
- RIVERFRONT COMMUNITY LANDS
- EXTERNAL WORKS FOR RIVERFRONT COMMUNITY LANDS

RIVERFRONT COMMUNITY
SERVICING
CITY OF NIAGARA FALLS

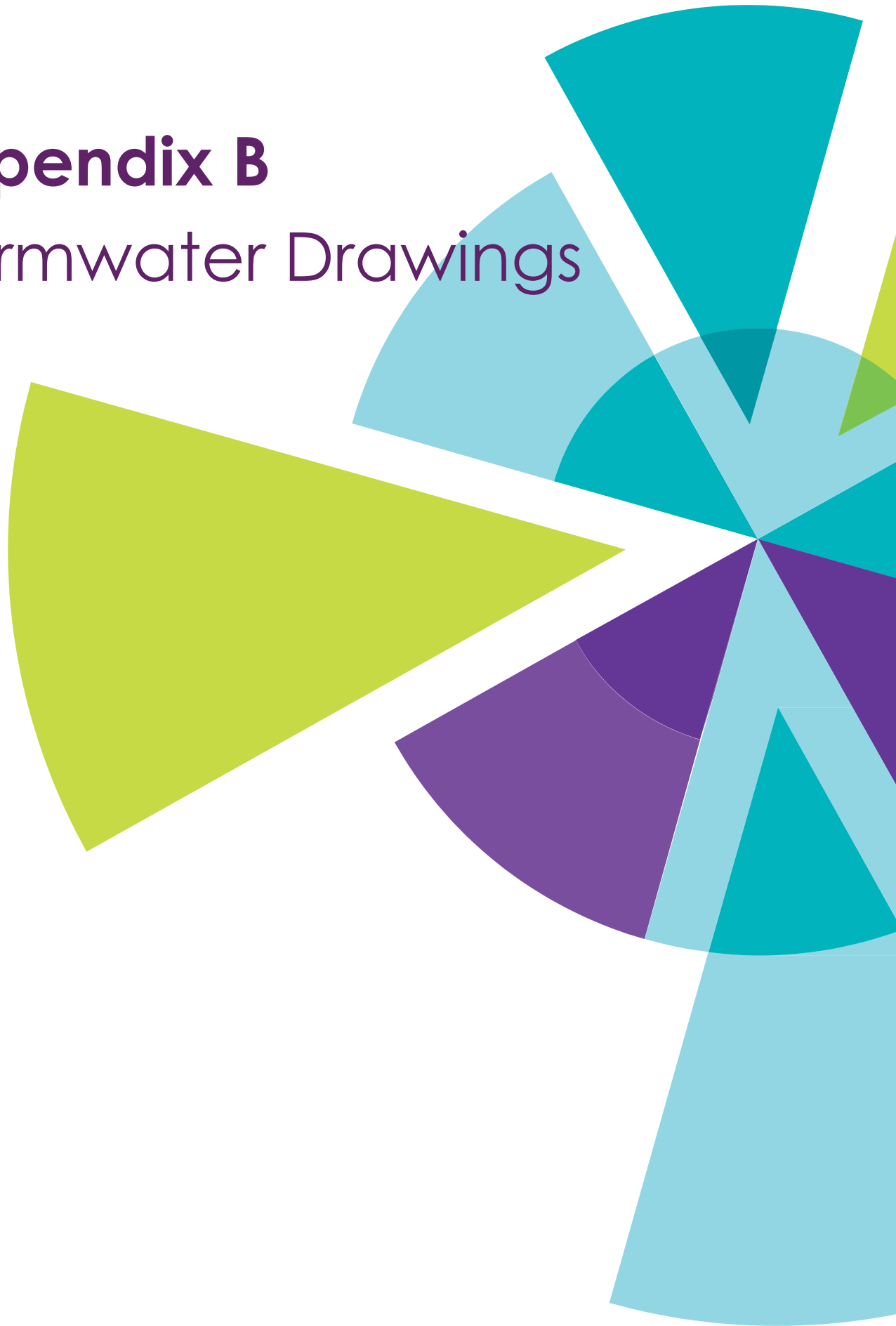
CONCEPTUAL WATER
SERVICING PLAN



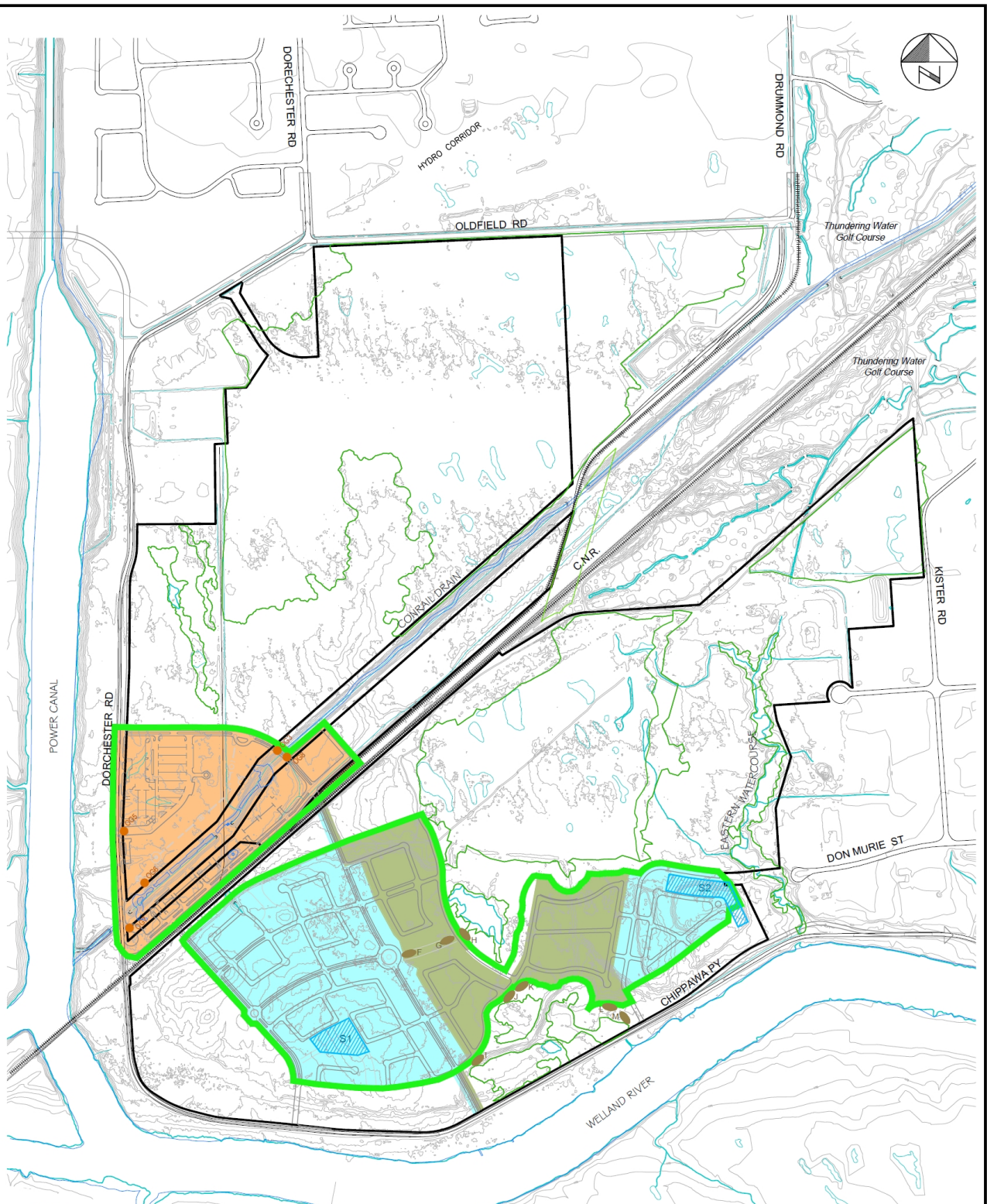
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Appendix B

Stormwater Drawings



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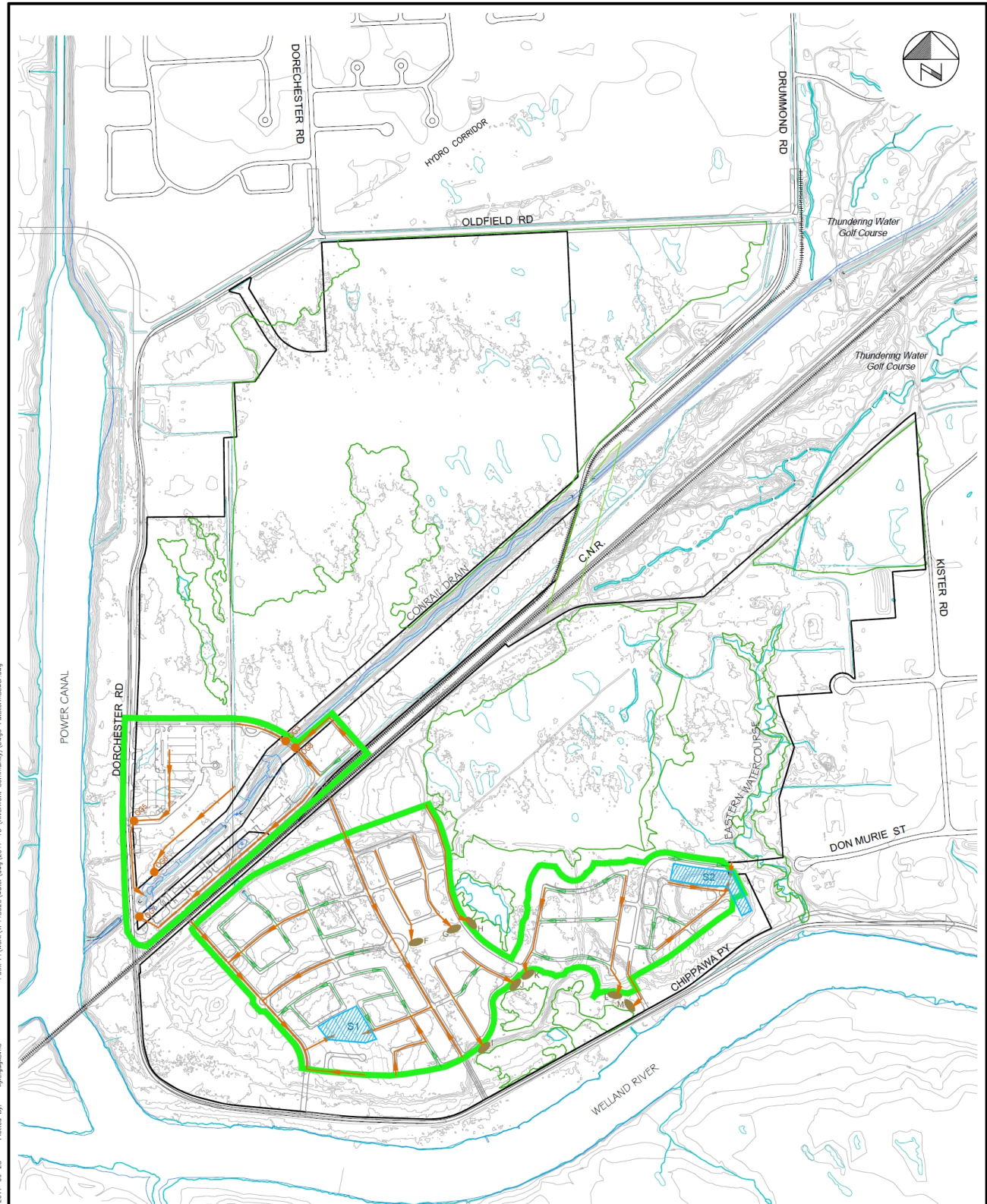
LEGEND	
	PROPERTY FABRIC
	WATERCOURSE
	WETLAND BOUNDARY
	CONTOUR (1m)
	RIVERFRONT COMMUNITY BOUNDARY
	LANDS OWNED BY GR(CAN) INVESTMENTS
	OIL/GRIT SEPARATOR AND REFERENCE ID#
	LID BMP APPROXIMATE LOCATION
	PROPOSED STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#
	TREATMENT VIA LID BMP
	TREATMENT VIA WETPOND
	TREATMENT VIA OIL/GRIT SEPARATOR

**RIVERFRONT COMMUNITY
 SERVICING**
 CITY OF NIAGARA FALLS

**STORMWATER QUALITY
 MANAGEMENT PLAN**



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- LEGEND**
- PROPERTY FABRIC
 - WATERCOURSE
 - WETLAND BOUNDARY
 - CONTOUR (1m)
 - RIVERFRONT COMMUNITY BOUNDARY
 - LANDS OWNED BY GR(CAN) INVESTMENTS
 - TRUNK STORM SEWER WITH FLOW DIRECTION
 - OIL/GRIT SEPARATOR AND REFERENCE ID#
 - LID BMP APPROXIMATE LOCATION
 - SECONDARY STORM SEWER WITH FLOW DIRECTION
 - PROPOSED STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

**RIVERFRONT COMMUNITY
SERVICING**
CITY OF NIAGARA FALLS

**FUNCTIONAL
STORM SEWER LAYOUT
(MINOR SYSTEM)**

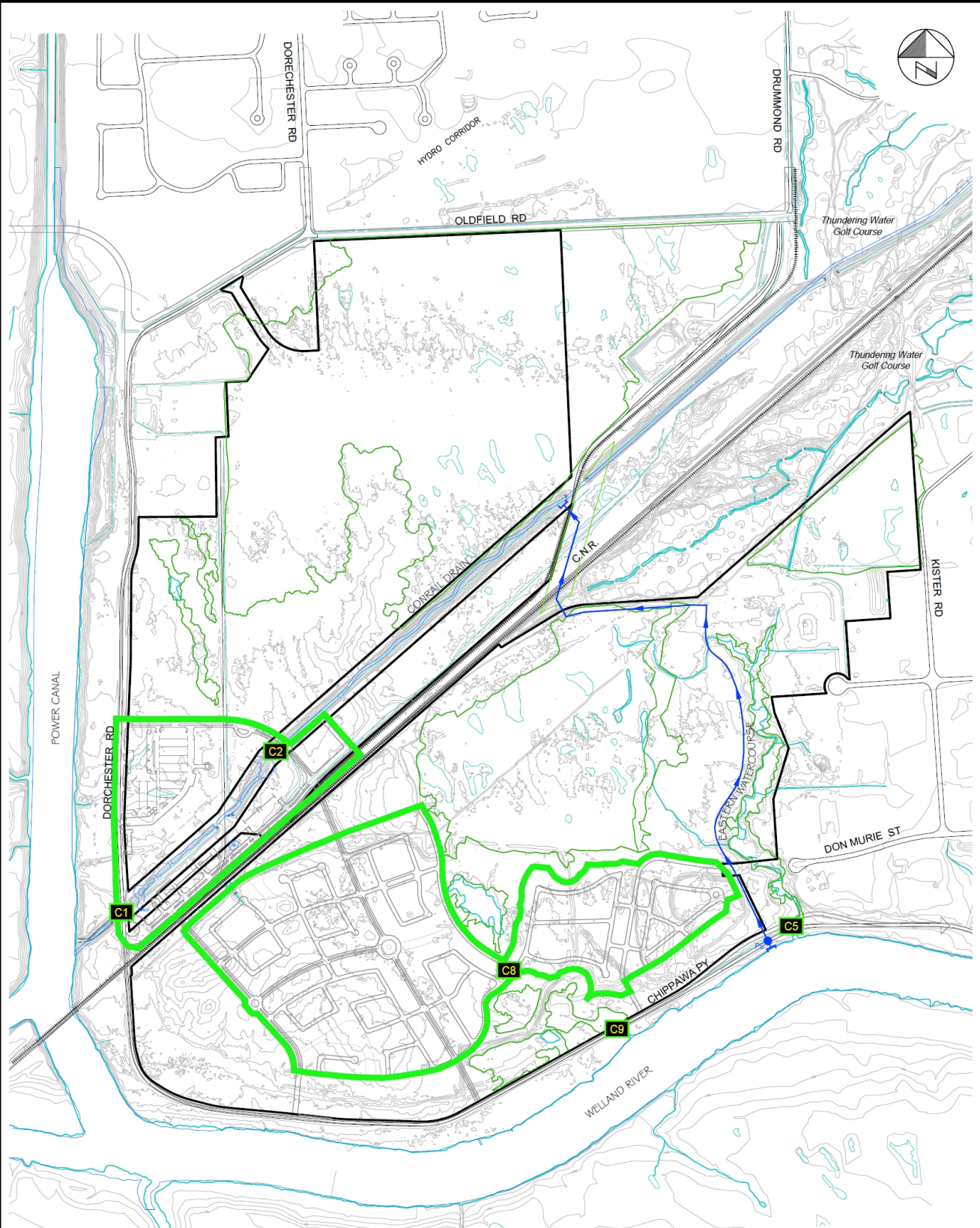


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Drawing No.
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- LEGEND**
- PROPERTY FABRIC
 - WATERCOURSE
 - WETLAND BOUNDARY
 - CONTOUR (1m)
 - RIVERFRONT COMMUNITY BOUNDARY
 - LANDS OWNED BY GR(CAN) INVESTMENTS
 - PROPOSED HYDRAULIC STRUCTURE LOCATION AND REFERENCE ID#
 - CLEANWATER FORCEMAIN
 - CLEANWATER PUMPING STATION

PROPOSED HYDRAULIC STRUCTURES

STRUCTURE NUMBER	CONFIGURATION (SIZE, SHAPE, MATERIAL)
C1	8.0m x 3.7m CONSPAN
C2	8.0m x 4.4m CONSPAN
C5	3.5m x 1.1m CONSPAN
C8	3.0m x 1.0m CONCRETE BOX CULVERT
C9	6.0m x 1.0m CONCRETE BOX CULVERT

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RIVERFRONT COMMUNITY SERVICING
CITY OF NIAGARA FALLS

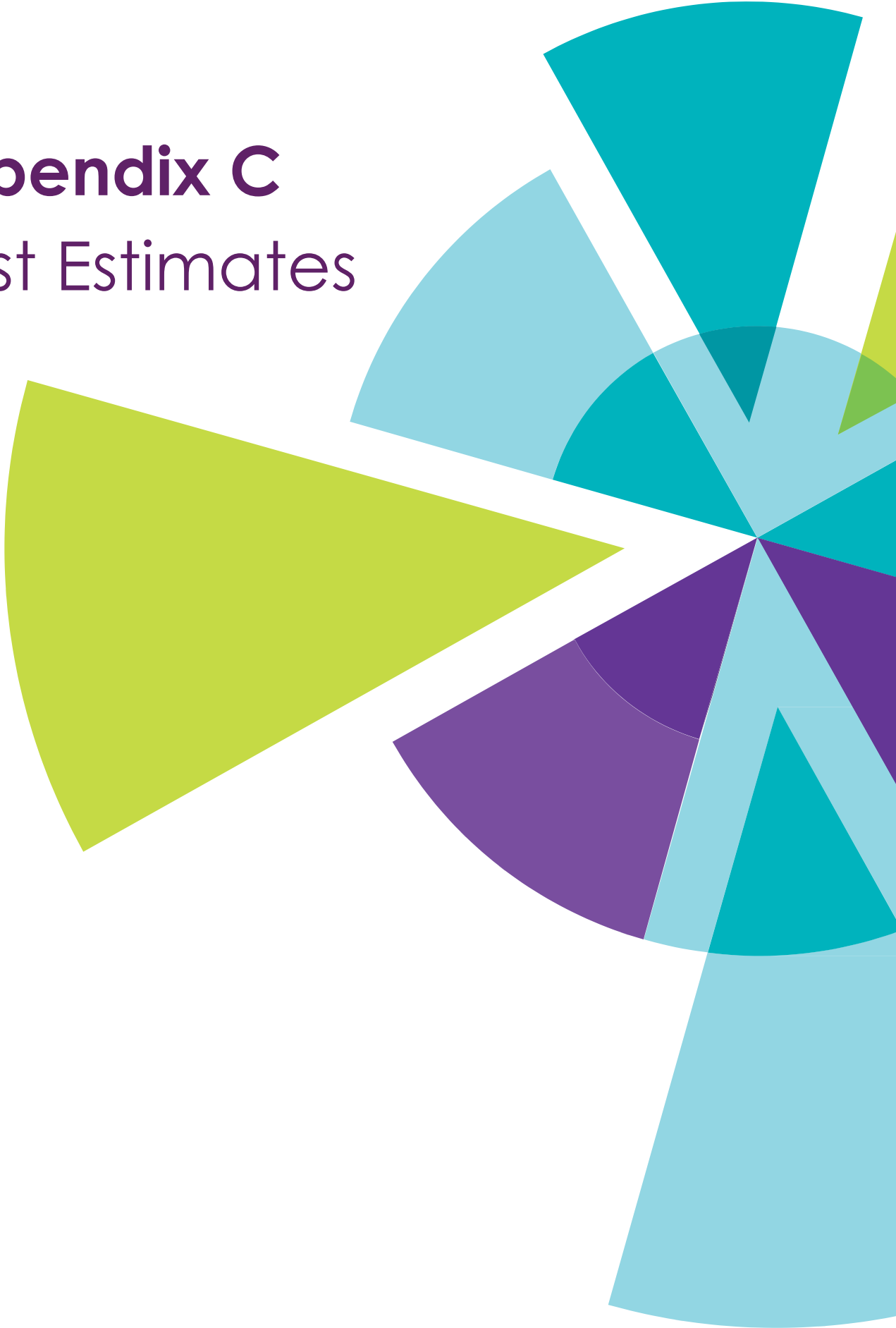
PROPOSED HYDRAULIC STRUCTURE AND CLEANWATER PUMPING SYSTEM LOCATION PLAN



Scale 1:4000
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 Consultant File No. TP115026
 Drawing No. 5

Appendix C

Cost Estimates



Riverfront Community Servicing Costs

Item	Estimated Quantity	Unit	Unit Price	Estimated Cost (CAD\$)	Amount
Sanitary Servicing:					\$ 6,390,000
300mm dia. Forcemain	908 m	m	\$ 325	\$ 295,100	
825mm dia. Trunk Sewer at assumed depth 3m	263 m	m	\$ 575	\$ 151,225	
450mm dia. Trunk Sewer at assumed depth 3m	2832 m	m	\$ 250	\$ 708,000	
300mm dia. Local Sewer at assumed depth 3m	5798 m	m	\$ 200	\$ 1,159,600	
100mm dia. Service Connection	3969 m	m	\$ 175	\$ 694,575	
1200mm dia. MH	128	ea	\$ 5,000	\$ 640,000	
Pumping Station	1	ea	\$ 1,467,000	\$ 1,467,000	
				Subtotal:	\$ 5,115,500
				Contingency & Engineering Allowance (25%)	\$ 1,278,875
Water Servicing:					\$ 5,690,000
300mm dia. Watermain	5235	m	\$ 300	\$ 1,570,500	
200mm dia. Watermain	5765	m	\$ 275	\$ 1,585,375	
20mm dia. Service Connection (including corporation stop and curb valve and box)	567	ea	\$ 2,000	\$ 1,134,000	
Hydrant (including secondary valve and box)	40	ea	\$ 6,500	\$ 260,000	
				Subtotal:	\$ 4,549,875
				Contingency & Engineering Allowance (25%)	\$ 1,137,469
Storm Servicing:					\$ 12,940,000
SWM Facilities				\$ 372,000	
LID BMP's				\$ 84,024	
OGS's				\$ 317,222	
Culverts				\$ 2,950,000	
Conrail Drain				\$ 331,000	
Storm Sewers				\$ 6,297,860	
				Subtotal:	\$ 10,352,106
				Contingency & Engineering Allowance (25%)	\$ 2,588,026.50
Total Cost Estimate:					\$ 25,020,000