



IBI GROUP
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Memorandum

To/Attention	John Sevigny City of Ottawa	Date	July 20, 2022
From	Lance Erion	Project No	103291.5.3.1
cc			
Subject	RSDC Phase 15-1A Redevelopment of Block 196 Solarium Avenue		

Block 196 is located east of River Road and is located between Solarium Avenue and Lunar Glow Crescent in the RSDC Phase 15-1A subdivision. During the design and construction of municipal services for the development the 0.99-hectare Block 196 was designated Institutional and a water, storm and sanitary service was stubbed from Solarium Avenue opposite the Pantomime Avenue intersection to service the site, this was installed in 2018. The block has now changed from institutional to residential and a total of 35 townhouse units fronting on Solarium Avenue and Lunar Glow Crescent are now proposed.

Attached are the revised servicing drawings which show the removal of existing services and the location of the new townhouse services and rear yard catch basins. There is no conflict with hydrants as they are on the opposite sides of the streets. The roads will be reconstructed due to the number of service connections required, both roads are at base course asphalt level and there has been no curb or sidewalk installed. The following is a summary of the changes to the Phase 15-1A Design Brief and municipal services design.

WATER SUPPLY

In the watermain design the water demand for Block 196 was assigned to the 400mm watermain on Solarium, the average daily water demand for 35 townhouse units is 0.19 l/s less than the institutional water demand. There are 18 new water connections to the 200 mm watermain on Lunar Glow Crescent however there is no significant change to the water pressures. In the Phase 15-1A design brief all units require pressure reducing control which will be extended to the new townhouses, the pressure reducing valve symbol has been added to all units on the grading plan. In the design brief a fire flow analysis was conducted with a 10,000 l/min fire demand for single family and townhouses and 15,000 l/min for the institutional lands. All the new townhouses meet the 10,000 l/min requirement of Technical Bulletin ISDTB-2014-02, the side of townhouse units 18 and 35 are more than 10 meters from the rear of the townhouses fronting Big Dipper Street.

SANITARY SEWERS

In the design brief Block 196 was tributary to the 375mm sanitary sewer on Solarium, the peak sanitary flow for the new townhouses is 0.62 l/s higher than the institutional flow. While there are new service connections on Lunar Glow Crescent the increase in flow is accommodated in the excess capacity of the Lunar Glow Crescent sanitary sewers and downstream sewers. Attached is the revised Sanitary Drainage Area Plan and updated Sanitary Sewer Design Sheet.

John Sevigny– December 1, 2020

STORM SEWERS

In the design brief Block 196 was tributary to the 3000 mm storm sewer on Solarium, the new design has the townhouses on Solarium and all of the rear yards draining to the Solarium storm sewer while the front half of the townhouses on Lunar Glow now drain to the streets storm sewers. The runoff coefficients for townhouses ($C=0.68$ front, $C=0.44$ rear) is less than the coefficient for institutional ($C=0.70$) so there is overall less storm runoff, while there is an increase in flow on Lunar Glow Crescent it is accommodated in the excess capacity of the Lunar Glow Crescent storm sewers and downstream sewers. Attached is the revised Storm Drainage Area Plan and updated Storm Sewer Design Sheets.

A stormwater management memo is attached which addresses changes to the hydraulic modeling from the Phase 15-1A Design Brief.

UTILITIES

IBI is working with Hydro Ottawa, Bell Canada, Rogers, Enbridge Gas, and the streetlight designer to obtain new designs to service the townhouses, the Composite Utility Plan will be updated, and a utility circulation will be conducted. Currently on the Lunar Glow Crescent boulevard there are 2 existing streetlights and conduit and on the Solarium Avenue boulevard there are 3 existing streetlights as well a Bell line and vault. The streetlights will be relocated as part of the utility design however the Bell vault located at the southeast corner doesn't conflict with new driveways and can remain pending confirmation from Bell Canada.

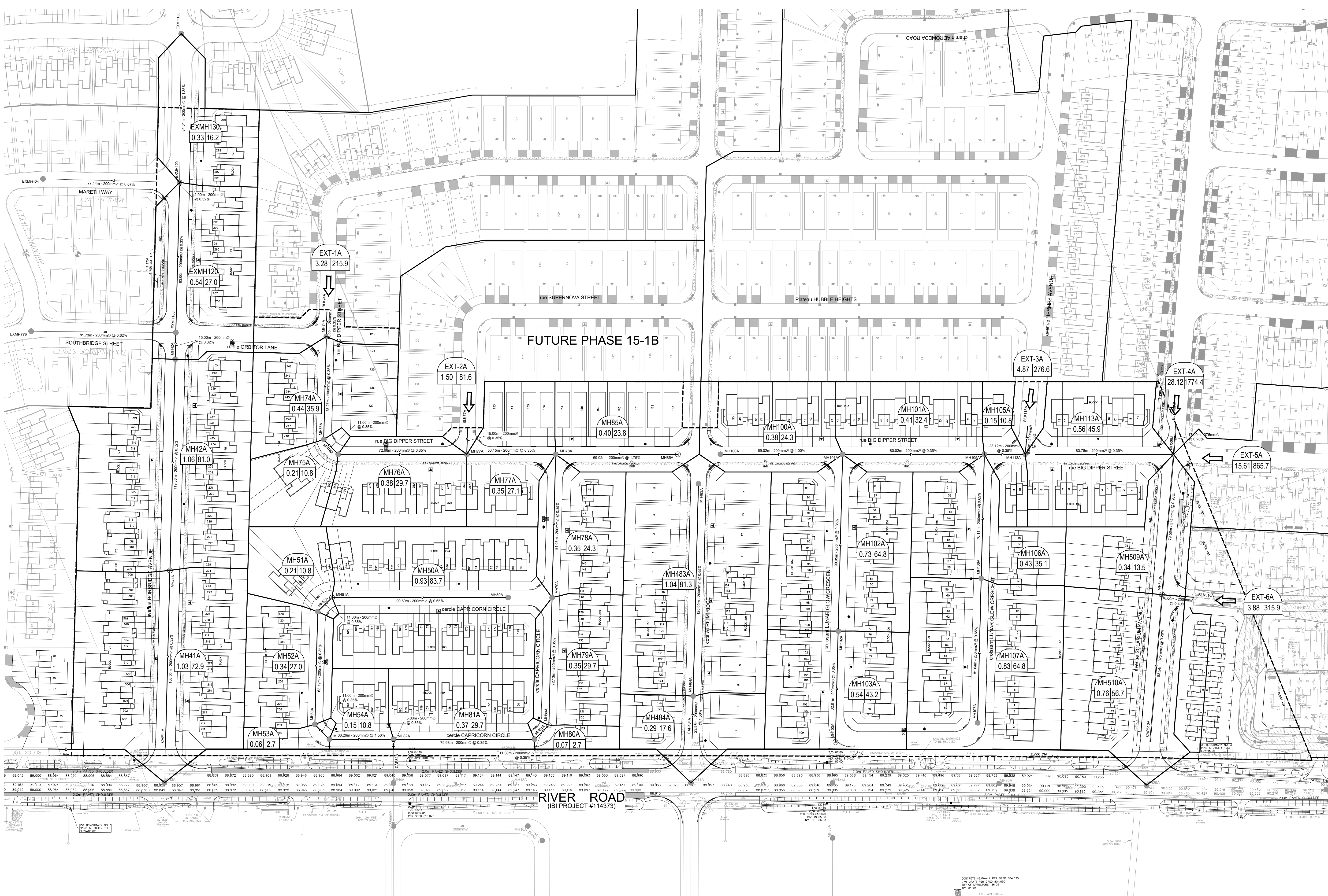
Please contact us if you require any further information or if you have any questions on the information presented.

Regards,



Lance Erion, P. Eng

SANITARY DESIGN SHEET AND DRAINAGE AREA PLAN



LEGEND :

MH78A — AREA IDENTIFICATION
 0.35/24.3 — POPULATION
 — AREA IN HECTARES

135A-1 — AREA IDENTIFICATION
 2.47 — INSTITUTIONAL AREA @ 50 000L/s/ha

POPULATION :

SINGLE FAMILY = 3.4 PPU
 TOWNHOUSE / SEMIS = 2.7 PPU

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS

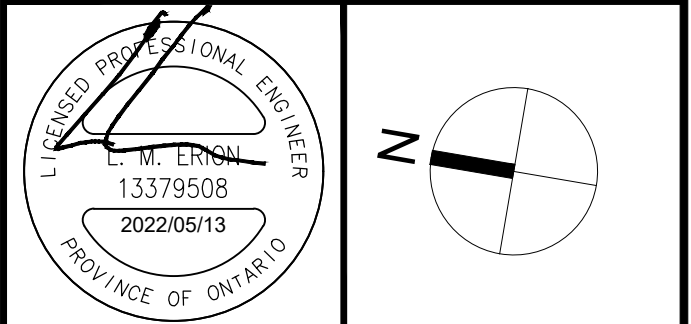


No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
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8			
7			
6	REVISED UNITS ALONG SOLARUM AVE & LUNAR GLOW CRES	L.M.E	2022-05-13
5	MILESTONE REISSUE TO CONTRACTOR	L.M.E	2020-06-12
4	REVISED PER CITY COMMENTS	L.M.E	2018-11-09
3	REVISED PER CITY COMMENTS	L.M.E	2018-10-02
2	ISSUED FOR TENDER	L.M.E	2018-08-31
1	SUBMISSION 1 FOR CITY REVIEW	L.M.E	2018-07-13



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Project Title
RIVERSIDE SOUTH
 PHASE 15 - 1A



Drawing Title
SANITARY DRAINAGE
 AREA PLAN

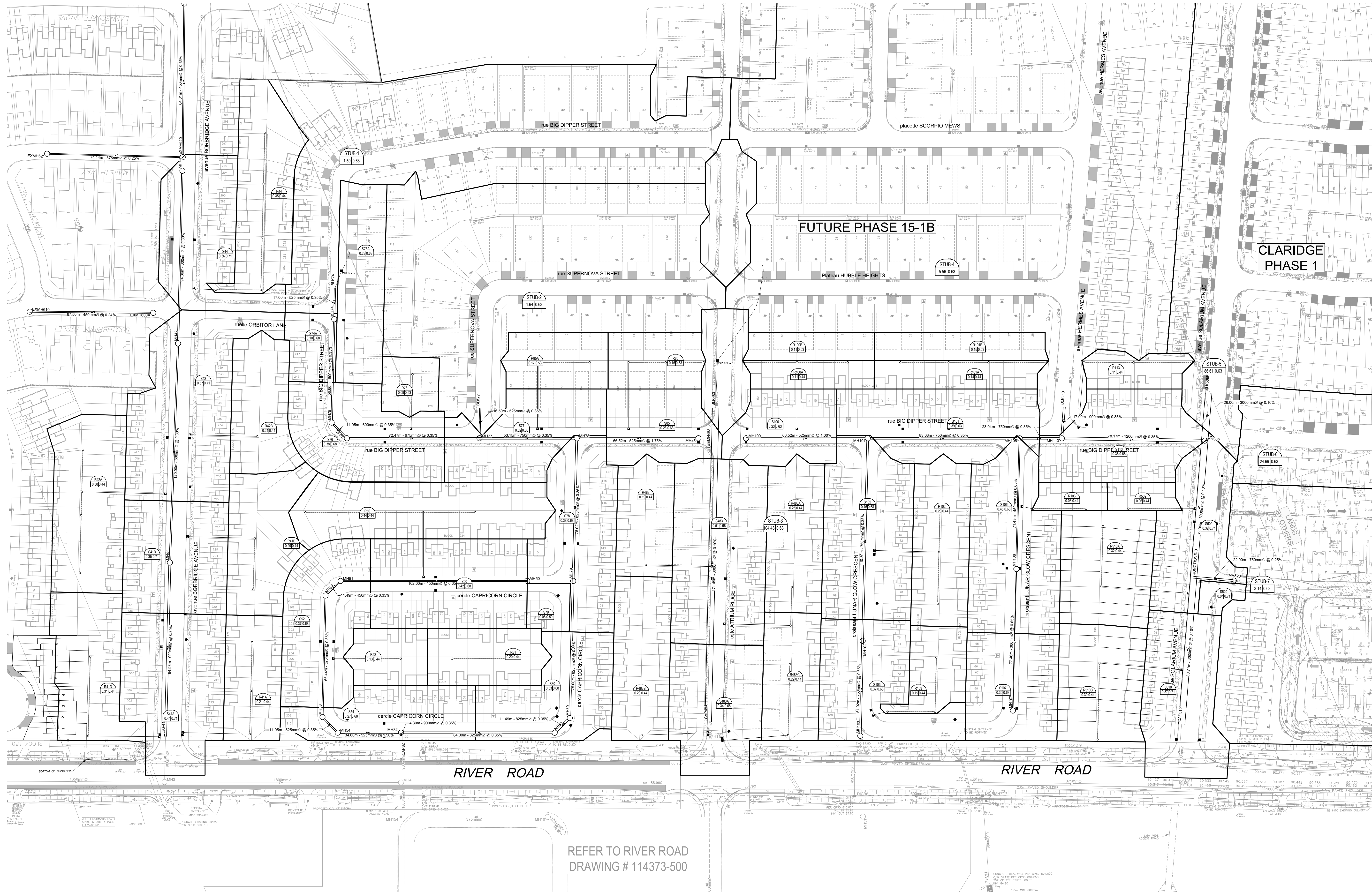
Scale
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Design	L.E.	Date	JULY 2018
Drawn	C.C.	Checked	L.E.
Project No.	103291	Drawing No.	400

J:\10291_Riverside\103291\Drawings\Sanitary\103291_Sanitary_Drainage\Area Plan.dwg
 400 Sanitary Drainage Plot Style: AA STANDARD-HA/C/B Plot Scale: 1:50.0 Printed At: 5/13/2022 2:13 PM User: Saved By: CHRIS.CORMIER Last Saved At: May 13, 22

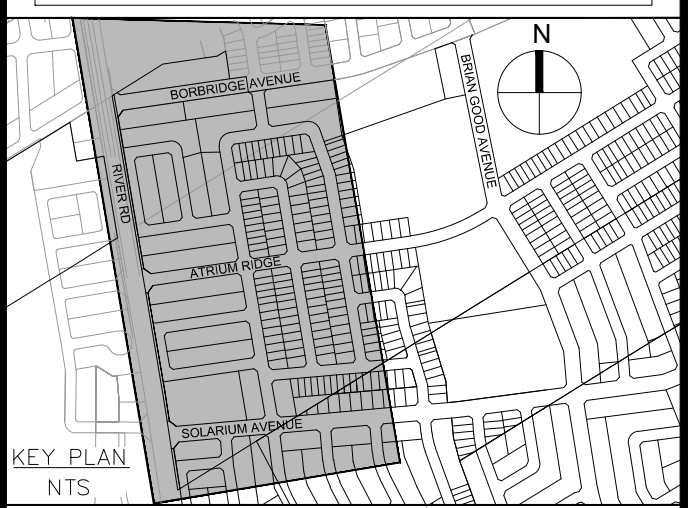
D07-16-17-0023

STORM DESIGN SHEET AND DRAINAGE AREA PLAN



- LEGEND:
- AREA NUMBER
 - RUN OFF COEFFICIENT
 - AREA IN HECTARES
 - AREA BOUNDARY

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS.

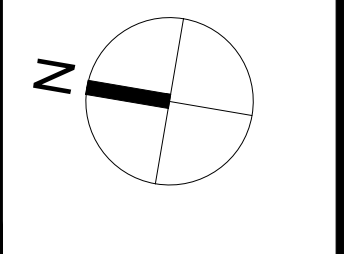
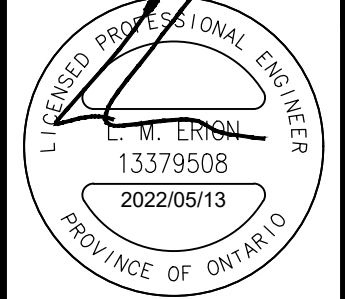


No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	REVISED UNITS ALONG SOLARIUM AVE & LUNAR GLOW CRESCENT	L.M.E.	2022-05-13
6	REVISED UNITS ALONG BORBRIDGE	L.M.E.	2021-05-27
5	MILESTONE REISSUE TO CONTRACTOR	L.M.E.	2020-06-12
4	REVISED PER CITY COMMENTS	L.M.E.	2018-11-09
3	REVISED PER CITY COMMENTS	L.M.E.	2018-10-02
2	ISSUED FOR TENDER	L.M.E.	2018-08-31
1	SUBMISSION 1 FOR CITY REVIEW	L.M.E.	2018-07-13



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Project Title
RIVERSIDE SOUTH
PHASE 15 - 1A



Drawing Title
STORM DRAINAGE
AREA PLAN

Scale
1 : 1000

Design	L.E.	Date	JULY 2018
Drawn	C.C.	Checked	L.E.
Project No.	103291	Drawing No.	500

REFER TO RIVER ROAD
DRAWING # 114373-500

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D07-16-17-0023

STORMWATER MANAGEMENT MEMO



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Memorandum

To/Attention	John Sevigny, City of Ottawa	Date	May 11, 2022
From	Mahsa Ghasri Terry Brule	Project No	103291- 5.2.2.1
cc	Marcel Denomme, Urbandale		
Subject	Assessment of Revised Block 196 Storm and Sanitary Servicing		

1. Background

Blocks 196 is located within Phase 15-1A of the Riverside South development. The municipal servicing of the block was addressed in, “Design Brief, Riverside South – Phase 15-1A,” prepared by IBI Group in October 2018. Subsequent to the approval of the Phase 15-1A detailed design, Urbandale Company has changed the subject block from institutional to residential townhouses. IBI has been engaged to assess the impact of this change on adjacent existing storm and sanitary sewers

2. Stormwater Management

2.1 Objective

The objective of the evaluation is to assess the impact on the dual drainage system of changing Blocks 196 into residential townhouses and the associated impacts to the storm servicing.

2.2 Dual Drainage Design

As per Phase 15-1A design brief, minor storm runoff from Block 196 (identified as drainage area P510) drains to Solarium Avenue, with major flow contained on-site up to and including the 100 year event. Emergency overflow routes to Solarium Avenue. The minor system restriction for the institutional block corresponds to 2 year storm event. The storm drainage area plan (Drawing 701) from the Phase 15-1A submission is enclosed in **Appendix A** for reference. With the proposed adjustments to the storm servicing for the subject block, minor system capture, and major system routing have been re-assessed.

2.3 Hydrological Analysis

Hydrological analysis of the dual drainage system of the subject site has been conducted using PCSWMM, consistent with the simulations completed for the Phase 15-1A design brief.

2.3.1 Storm and Design Parameters

The following storms and design parameters have been used in the evaluation. The main hydrological parameters are summarized in Table 2.1 with a comparison of what was included in the Phase 15-1A evaluation.

- **Design Storms:** The subject site has been evaluated with the following storms, consistent with the Phase 15-1 evaluation:
 - 2, 5 and 100 year 3 hour Chicago storm events (10 minute time step), as per the OSDG and the September 2016 Technical Bulletin;
 - 100 year 3 hour Chicago storm event (10 minute time step) with 20% increase for Climate Change consideration, as per the OSDG;
 - 25 mm 4 hour Chicago storm event consistent with the 2018 Pond 5 Design Brief; and,
 - 100 year 12 hour SCS Type II storm event consistent with the 2018 Pond 5 Design Brief.
- **Area and Imperviousness:** Block 196 (identified as drainage area P510) has been discretized into two drainage area, R510A and R510B. An imperviousness value of 34% has been applied.
- **Infiltration:** Infiltration losses were selected to be consistent with the OSDG. The Horton values are as follows: $f_0 = 76.2$ mm/h, $f_c = 13.2$ mm/h, $k = 0.00115$ s⁻¹.
- **Subcatchment Width:** The catchment width was based on the conveyance route length of the drainage area and multiplied by two. The multiplier of two was only used if the drainage area had runoff contribution from both sides of the drainage area. This approach is consistent with the OSDG.
- **Slope:** The average surface slope was based upon the average slope for both impervious and pervious area. Based on the surface grading of the subject site and for consistency with the ISSU, an average slope of 1% has been used for subcatchment flow routing. It should be noted that the appropriate longitudinal slope of streets was accounted in PCSWMM using a combination of nodes with inverts corresponding to gutter elevations, and links with corresponding road cross-sections.
- **Initial Abstraction (Detention Storage):** Detention storage depths of 1.5 mm and 4.67 mm were used for impervious and pervious areas, respectively. These values are consistent with the OSDG.
- **Manning's roughness:** Manning's roughness coefficients of 0.013 and 0.25 were used for impervious and pervious areas, respectively.
- **Baseflow:** No baseflow components were assumed for any of the areas contributing runoff to the minor system within the PCSWMM model.
- **Minor System Capture:** The minor system capture for the discretized drainage area is set to 2 year storm event and connected to MH 510 on Solarium Avenue.
- **Major System Storage and Routing:** The major flow from the discretized drainage area is routed to River Road side ditch. No on-site storage is proposed.

A summary of parameters is presented in the following table. A summary from the Phase 15-1A detailed design is included to facilitate review.



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Table 2.1 Hydrological Parameters

	Phase 15-1A Design Brief						Current Evaluation					
	Drainage Area ID	Area (ha)	Major System: D/S Segment ID	Minor System: MH ID	IMP	Sub-catchment Width (m)	Drainage Area ID	Area (ha)	Major System: D/S Segment ID	Minor System: MH ID	IMP	Sub-catchment Width (m)
Block 196	P510	0.99	S510 on Solarium Ave	MH510 on Solarium Ave	71.429	218.539	R510A	0.32	River Rd Side Ditch	MH510 on Solarium Ave	34.286	220
							R510B	0.30	River Rd Side Ditch	MH510 on Solarium Ave	34.286	126
S510	S510	0.28	River Rd Side Ditch	MH510 on Solarium Ave	72.857	90.649	S510	0.37	River Rd Side Ditch	MH510 on Solarium Ave	72.857	90.649
S509	S509	0.24	S510 on Solarium Ave	MH509 on Solarium Ave	72.857	98.137	S509	0.32	S510 on Solarium Ave	MH509 on Solarium Ave	72.857	98.137
S106	S106	0.34	S107 on Lunar Glow Crescent	MH106 on Lunar Glow Crescent	68.571	109.419	S106	0.45	S107 on Lunar Glow Crescent	MH106 on Lunar Glow Crescent	68.571	109.419
S107	S107	0.20	S103 on Lunar Glow Crescent	MH106 on Lunar Glow Crescent	68.571	78.721	S107	0.30	S103 on Lunar Glow Crescent	MH106 on Lunar Glow Crescent	68.571	78.721

2.4 Results of Hydrological Modeling

In PCSWMM, the hydraulic grade line (minor system) and major system are simulated simultaneously. The resulting hydraulic grade line is presented in **Section 2.5**. The results of the major system evaluation are summarized in the following sections.

Table 2.2 Minor Flow Capture

Phase 15-1A Design Brief						Current Evaluation					
DRAINAGE AREA ID	CONTINUOUS/SAG	MINOR SYSTEM DESIGN TARGET (BASED ON ROAD TYPE)		100 YEAR ICD (L/S)	ICD Orifice Size (mm dia.)	DRAINAGE AREA ID	CONTINUOUS/SAG	MINOR SYSTEM DESIGN TARGET (BASED ON ROAD TYPE)		100 YEAR ICD (L/S)	ICD Orifice Size (mm dia.)
		MINOR SYSTEM DESIGN STORM	GENERATED FLOW ON INDIVIDUAL SEGMENT SIMULATED (L/S)					MINOR SYSTEM DESIGN STORM	GENERATED FLOW ON INDIVIDUAL SEGMENT SIMULATED (L/S)		
S510	Sag	5	59	83	127	S510	Sag	5	78.67	85	127
S509	Sag	5	51	82	127	S509	Sag	5	66.6	83	127
S106	Sag	2	50	62	108	S106	Sag	2	66.08	63	108
S107	Sag	2	29	46	94	S107	Sag	2	43.04	47	94
P510	Institutional	2	150	151	n/a	R510A	Rear Yard	2	15.52	31	127
						R510B	Rear Yard	2	11.31	32	127

The storage available on-site and its maximum depth and the results of the PCSWMM evaluation for the subject site are presented in **Table 2.3**.

Table 2.3 Summary of On-Site Storage during the Target Minor System Design Storm

Phase 15-1A Design Brief					Current Evaluation				
DRAINAGE AREA ID	MINOR SYSTEM DESIGN STORM	AVAILABLE STATIC Depth (M)	TOTAL STORAGE USED (CU-M)	OVERFLOW (L/S)	DRAINAGE AREA ID	MINOR SYSTEM DESIGN STORM	AVAILABLE STATIC Depth (M)	TOTAL STORAGE USED (CU-M)	OVERFLOW (L/S)
S510	5	0.33	0	0	S510	5	0.33	0	0
S509	5	0.32	0	0	S509	5	0.31	0	0
S106	2	0.25	0	0	S106	2	0.25	0	0
S107	2	0.19	0	0	S107	2	0.19	0	0

The results of the on-site detention analysis show that during the restricted inflow rate of the 2 or 5 year storm event, there is no ponding on the subject site.

Tables 2.4 and 2.5 summarize the cascading overflows for each subcatchment on the subject site for the 100 year 3 hour Chicago storm event and the 100 year Chicago storm increased by 20%, respectively. The cascading overflow is the flow exiting a drainage area when maximum minor system inflow and maximum available ponding has been utilized.

Table 2.4 Summary of Velocity x Depth during the 100 Year 3 Hour Chicago Storm

Phase 15-1A Design Brief						Current Evaluation					
DRAINAGE AREA ID	AVAILABLE STATIC Depth (M)	MAXIMUM DEPTH AT LOW POINT (M) – IF APPLICABLE	Cascading Depth (m)	VELOCITY (M/S)	VELOCITY X DEPTH (M ² /S)	DRAINAGE AREA ID	AVAILABLE STATIC Depth (M)	MAXIMUM DEPTH AT LOW POINT (M) – IF APPLICABLE	Cascading Depth (m)	VELOCITY (M/S)	VELOCITY X DEPTH (M ² /S)
S510	0.33	0.09	0.00	0.00	0.00	S510	0.33	0.13	0.00	0.00	0.00
S509	0.32	0.06	0.00	0.00	0.00	S509	0.31	0.09	0.00	0.00	0.00
S106	0.25	0.16	0.00	0.00	0.00	S106	0.25	0.21	0.00	0.00	0.00
S107	0.19	0.13	0.00	0.00	0.00	S107	0.19	0.19	0.00	0.00	0.00

Table 2.5 Summary of Velocity x Depth during the 100 Year 3 Hour Chicago Storm Increased by 20%

Phase 15-1A Design Brief						Current Evaluation					
DRAINAGE AREA ID	AVAILABLE STATIC Depth (M)	MAXIMUM DEPTH AT LOW POINT (M) – IF APPLICABLE	Cascading Depth (m)	VELOCITY (M/S)	VELOCITY X DEPTH (M ² /S)	DRAINAGE AREA ID	AVAILABLE STATIC Depth (M)	MAXIMUM DEPTH AT LOW POINT (M) – IF APPLICABLE	Cascading Depth (m)	VELOCITY (M/S)	VELOCITY X DEPTH (M ² /S)
S510	0.33	0.14	0.06	0.00	0.00	S510	0.33	0.18	0.00	0.00	0.00
S509	0.32	0.11	0.00	0.00	0.00	S509	0.31	0.14	0.00	0.00	0.00
S106	0.25	0.21	0.00	0.00	0.00	S106	0.25	0.26	0.01	0.13	0.00
S107	0.19	0.17	0.00	0.00	0.00	S107	0.19	0.23	0.04	0.56	0.02

During the 100 year 3 hour Chicago storm, the summation of depth of ponding and depth of cascading flow for all street segments is less than the City guideline of 0.35 m. The product of depth and velocity is also less than the City guideline of 0.6 m²/s.

During the sensitivity analysis applying the 100 year 3 hour Chicago storm increased by 20%, the summation of depth of ponding and depth of cascading flow for all street segments is less than the City guideline of 0.35 m. At all locations, the product of depth and velocity is less than the City guideline of 0.6 m²/s.

2.5 Storm Hydraulic Grade Line Analysis

The evaluation of the hydraulic grade line (HGL) was completed using PCSWMM. As noted previously, the PCSWMM model has been used to simulate both the hydrology and hydraulics for the subject site. The existing overall model for the Riverside South, most recently revised as part of the Phase 17-1B submission (March 2022), was revised to include the revised servicing of Block 196.

PCSWMM simulations were conducted for the 100 year 3 hour Chicago storm to ensure that the HGL is at least 0.3 m below the underside of footing elevations. A sensitivity analysis was also

performed using the 100 year Chicago storm with a 20% increase in intensity to ensure that there is no severe flooding to properties. Hydraulic grade line elevations are presented in the below table for these storms, along with a comparison of underside of footing (USF) elevations. HGL results summary from the Phase 15-1A is enclosed in **Appendix A**.

Table 2.6 Storm Hydraulic Grade Line

PCSWMM MH (SEWER NODE)	USF (M)	STORM HYDRAULIC GRADE LINE			
		100 YEAR 3 HOUR CHICAGO		100 YEAR 3 HOUR CHICAGO + 20%	
		HGL (M)	USF-HGL (M)	HGL (M)	USF-HGL (M)
PH15-1A					
BLK74	89.47	87.55	1.92	87.93	1.54
BLK77	88.75	87.03	1.72	87.42	1.33
CAP41	86.99	85.11	1.88	85.38	1.61
CAP484	87.07	85.46	1.61	85.65	1.42
MH100	88.74	86.95	1.79	87.27	1.47
MH101	88.87	86.94	1.93	87.25	1.62
MH102	88.39	86.97	1.42	87.28	1.11
MH103	88.47	86.97	1.5	87.28	1.19
MH106	88.59	86.98	1.61	87.32	1.27
MH107	88.54	86.87	1.67	87.32	1.22
MH11	87.39	85.4	1.99	85.59	1.8
MH113	89.09	86.77	2.32	87.07	2.02
MH41	87.49	85.24	2.25	85.54	1.95
MH42	87.94	85.68	2.26	86.05	1.89
MH44	88.34	85.77	2.57	86.15	2.19
MH481	n/a	85.99	n/a	86.25	n/a
MH50	88.09	86.49	1.6	86.51	1.58
MH509	88.79	86.64	2.15	86.94	1.85
MH51	88.04	85.93	2.11	86.14	1.9
MH510	n/a	86.47	n/a	86.76	n/a
MH53	87.89	85.56	2.33	85.82	2.07
MH54	87.89	85.45	2.44	85.75	2.14
MH74	89.1	87.46	1.64	87.83	1.27
MH75	89.02	87.23	1.79	87.61	1.41
MH76	88.92	87.16	1.76	87.54	1.38
MH77	88.97	86.93	2.04	87.31	1.66
MH78	88.95	86.5	2.45	86.88	2.07

MH79	88.19	86.11	2.08	86.46	1.73
MH80	87.69	85.79	1.9	86.11	1.58
MH81	87.69	85.68	2.01	86	1.69
MH82	87.89	85.19	2.7	85.47	2.42
MH85	88.8	86.87	1.93	86.94	1.86

A minimum 0.3 m clearance between the USF and HGL is maintained during the 100 year 3 hour Chicago storm and the HGL elevations remain below USF elevations during the sensitivity analysis.

2.6 Conclusion

The storm servicing of Blocks 196 was addressed during the detailed design of Riverside South Phase 15-1A. The purpose of this evaluation is to assess the impact on the dual drainage system due to changing institutional Block 196 to residential townhouses and the associated revisions to the storm servicing.

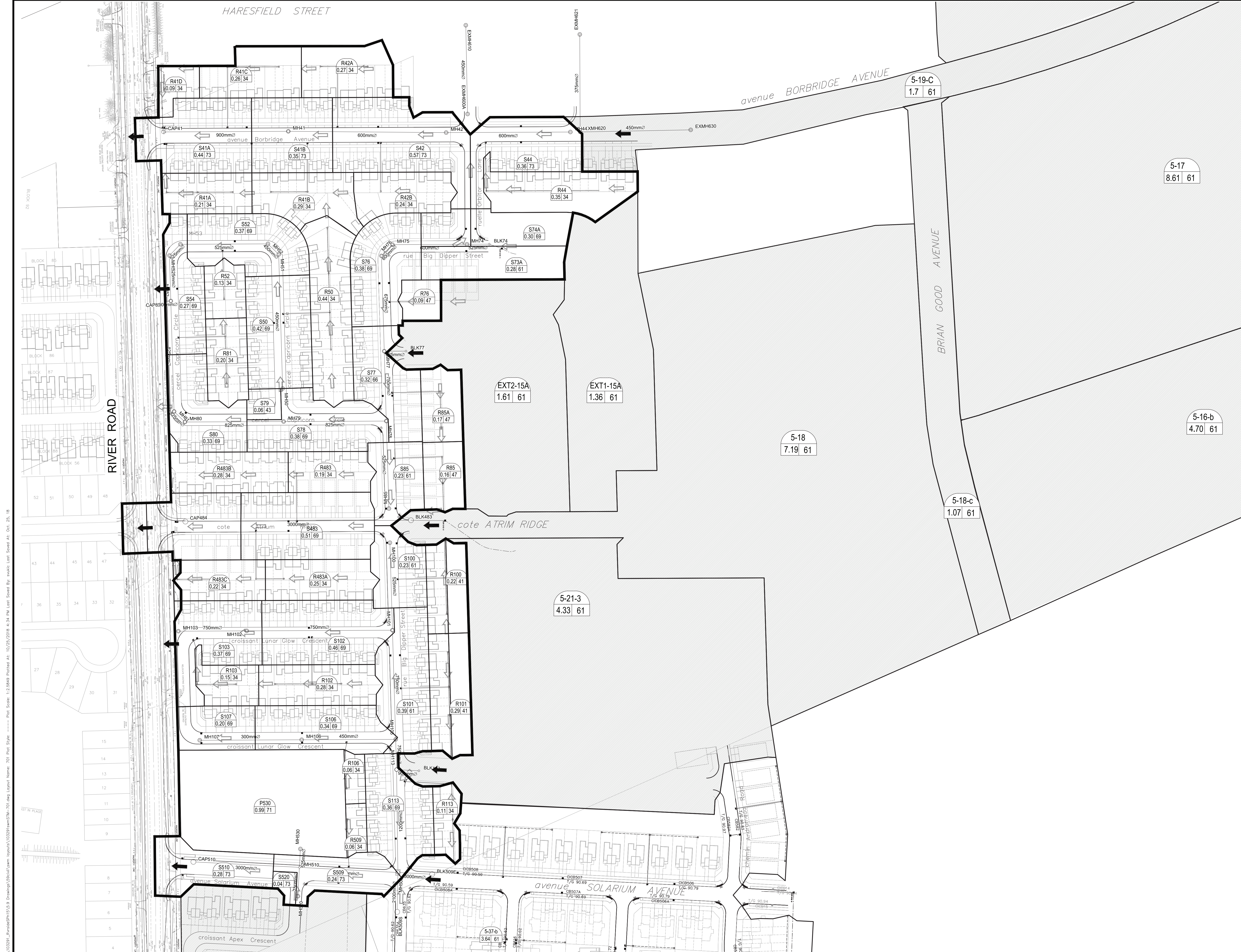
In terms of major flow, the depth and velocity of flow on streets adjacent to the proposed townhouses was evaluated. City guidelines with respect to ponding during the minor system design storm, as well as maximum depth and velocity of flow are maintained.

With respect to minor flow, the hydraulic grade line evaluation was updated with the revised inflow from the proposed townhouses. Results indicate that a minimum 0.3 m clearance between the USF and HGL is maintained during the 100 year 3 hour Chicago storm and the HGL elevations remain below USF elevations during the sensitivity analysis.

It is therefore concluded that the proposed storm servicing to support changes to the institutional block can be accommodated by the existing storm infrastructure.

Appendix A

Supporting Storm Information



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH
Signed _____
Date _____ 2018
Plan Number _____

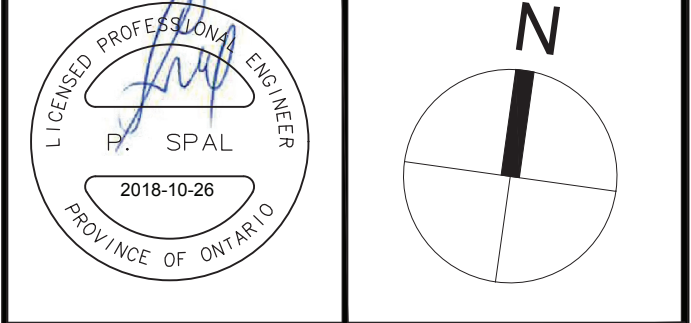
- LEGEND:**
- PHASE 15-1A BOUNDARY
 - DRAINAGE AREAS EXTERNAL TO PHASE 15-1A
 - DRAINAGE AREAS
 - AREA ID
IMPERVIOUS VALUE
AREA (ha)
 - MAJOR FLOW
 - EXTERNAL MAJOR FLOW

14			
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3	SUBMISSION No.3 PER CITY COMMENTS	P.S.	18/10/26
2	SUBMISSION No.2 PER CITY COMMENTS	P.S.	18/09/28
1	SUBMISSION No.1 FOR CITY REVIEW	P.S.	18/07/13
No.	REVISIONS	By	Date



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Project Title
**RIVERSIDE SOUTH
PHASE 15-1A**



Drawing Title
**PCSWMM
STORM DRAINAGE
AREA PLAN
PHASE 15-1A**

Scale
1:1250

Design	S.A.	Date	JUNE 2018
Drawn	S.V.	Checked	P.S.
Project No.	103291	Drawing No.	701

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hour Chicago storm + 20% increase in intensity) was also simulated. The 100 year 12 hour SCS Type II storm was also simulated to assess the receiving SWM facility.

The HGL elevations are presented in the following **Table 5-7**, along with a comparison of under-side of footing (USF) elevations.

Table 5-8 Storm Hydraulic Grade Line for Riverside South Phase 15-1A for the 100 Year 3 Hour Chicago and 100 Year 3 Hour Chicago increased by 20% Storm Events

PCSWMM MH (SEWER NODE)	USF (M)	STORM HYDRAULIC GRADE LINE			
		100 YEAR 3 HOUR CHICAGO		100 YEAR 3 HOUR CHICAGO + 20%	
		HGL (M)	USF-HGL (M)	HGL (M)	USF-HGL (M)
PH15-1A					
BLK74	n/a	87.40	n/a	87.81	n/a
BLK77	n/a	87.19	n/a	87.60	n/a
CAP41	-	85.44	n/a	85.79	n/a
CAP484	n/a	85.81	n/a	86.04	n/a
MH100	88.74	87.64	1.10	88.06	0.68
MH101	88.87	87.62	1.25	88.04	0.83
MH102	88.34	87.64	0.70	88.07	0.27
MH103	88.57	87.64	0.93	88.09	0.48
MH105	89.47	87.55	1.92	87.96	1.51
MH106	88.44	87.62	0.82	88.10	0.34
MH107	88.44	87.62	0.82	88.11	0.33
MH11	n/a	85.64	n/a	85.86	n/a
MH113	89.04	87.49	1.55	87.91	1.13
MH41	87.49	85.56	1.93	86.03	1.46
MH42	87.94	86.10	1.84	86.57	1.37
MH44	88.34	86.19	2.15	86.68	1.66
MH481	n/a	86.75	n/a	87.04	n/a
MH482	n/a	86.34	n/a	86.60	n/a
MH483	-	86.24	n/a	86.50	n/a
MH50	88.14	86.49	1.65	86.77	1.37
MH509	89.27	87.44	1.83	87.86	1.41
MH51	88.14	85.96	2.18	86.40	1.74
MH510	-	87.06	n/a	87.47	n/a
MH52	88.04	85.91	2.13	86.34	1.70
MH53	87.89	85.70	2.19	86.12	1.77

PCSWMM MH (SEWER NODE)	USF (M)	STORM HYDRAULIC GRADE LINE			
		100 YEAR 3 HOUR CHICAGO		100 YEAR 3 HOUR CHICAGO + 20%	
		HGL (M)	USF-HGL (M)	HGL (M)	USF-HGL (M)
MH54	87.89	85.64	2.25	86.06	1.83
MH74	89.10	87.35	1.75	87.76	1.34
MH75	89.02	87.22	1.80	87.63	1.39
MH76	89.02	87.18	1.84	87.59	1.43
MH77	88.92	87.05	1.87	87.46	1.46
MH78	88.95	86.70	2.25	87.10	1.85
MH79	88.18	86.35	1.83	86.75	1.43
MH80	87.69	86.06	1.63	86.46	1.23
MH81	87.69	85.96	1.73	86.34	1.35
MH82	87.89	85.47	2.42	85.79	2.10
MH85	88.80	86.87	1.93	87.14	1.66
North Trunk					
CAP484	n/a	85.81	n/a	86.04	n/a
JPOND5	n/a	83.85	n/a	83.95	n/a
MH11	n/a	85.64	n/a	85.86	n/a
MH482	n/a	86.34	n/a	86.60	n/a
N5-16	n/a	87.95	n/a	88.36	n/a
N5-17	n/a	87.84	n/a	88.23	n/a
N5-18	n/a	87.63	n/a	87.96	n/a
N5-23_2	n/a	85.08	n/a	85.27	n/a
N5-8	n/a	88.13	n/a	88.51	n/a
N-new	n/a	84.50	n/a	84.66	n/a
South Trunk					
BLK506	n/a	87.70	n/a	88.13	n/a
CAP510R	n/a	86.84	n/a	87.24	n/a
MH166	n/a	85.76	n/a	86.23	n/a
N5-32	n/a	89.92	n/a	90.27	n/a
N5-33	n/a	89.35	n/a	89.67	n/a
N5-34	n/a	88.55	n/a	89.01	n/a
N5-35	n/a	88.07	n/a	88.50	n/a
N5-54	n/a	88.13	n/a	88.56	n/a