Report Project: 135925-6.4.3

BARRETT LANDS - BLOCK 178 SERVICING BRIEF



Prepared for BARRETT CO-TENANCY by IBI GROUP

February 2023

Table of Contents

1	INTRO			
	1.1	Guidelines and Standards		
	1.2	Pre-Consultation Meeting		
	1.3	Enviro	nmental Issues	2
	1.4	Geote	chnical Concerns	2
2	WATE	R DISTI	RIBUTION	3
	2.1	Existin	ng Conditions	
	2.2	Desigr	n Criteria	
		2.2.1	Water Demands	3
		2.2.2	System Pressures	3
		2.2.3	Fire Flow Rate	4
		2.2.4	Boundary Conditions	4
		2.2.5	Hydraulic Model	4
	2.3	Propos	sed Water Plan	4
		2.3.1	Hydraulic Analysis	4
		2.3.2	Summary of Results	5
		2.3.3	SUC Zone Re-configuration	5
3	WAST	EWATE	ER	6
	3.1	Existin	ng Conditions	6
		3.1.1	Verification of Existing Sanitary Sewer Capacity	6
	3.2	Propos	sed Sewers	6
		3.2.1	Design Flow:	6
		3.2.2	Population Density:	6
4	SITE S	STORM	WATER MANAGEMENT	7
	4.1	Objective		
	4.2	Existing Conditions		
	4.3	Desigr	n Criteria	7
	4.4	Systen	n Concept	8
		4.4.1	Dual Drainage Design	8
		4.4.2	Proposed Minor System	8
	4.5	Storm	water Management	8
		4.5.1	Water Quality Control	8

		4.5.2	Water Quantity Control	9
		4.5.3	2 Year Ponding	
		4.5.4	100 year + 20% Stress Test	
		4.5.5	Open-Channel Drainage Corridor	11
	4.6	Storm I	Hydraulic Grade Line	12
5	SOUR	CE CON	ITROLS	13
	5.1	Genera	al	13
	5.2	Lot Gra	ading	13
	5.3	Roof Le	eaders	13
	5.4	Vegeta	tion	13
6	CONVI	EYANCE	E CONTROLS	14
	6.1	Genera	al	14
	6.2	Flat Ve	getated Swales	14
	6.3	Catchb	pasins	14
	6.4	Perviou	us Landscaped Area Drainage	14
7	SEDIM		ND EROSION CONTROL PLAN	15
	7.1	Genera	al	15
	7.2	Trench	Dewatering	15
	7.3	Bulkhe	ad Barriers	15
	7.4	Seepa	ge Barriers	15
	7.5	Surface	e Structure Filters	15
	7.6	Stockp	ile Management	16
8	ROAD		NOISE ATTENUATION	17
	8.1	Aircraft	t Sound Levels	17
9	SOILS			
10	RECO	MMEND	ATIONS	19

List of Appendices

APPENDIX A	
------------	--

135925-001	AOV Plan of Subdivision for the Barrett Lands Phase 3 Site Plan for Barrett Block 178 General Plan of Services City of Ottawa Pre-Consultation Meeting Notes
APPENDIX B	Water Distribution Model
APPENDIX C	
135925-400	Sanitary Sewer Design Sheet Sanitary Drainage Plan Barret Lands Phase 3 Sanitary Design Sheet Barret Lands Phase 3 Sanitary Drainage Area Plan
APPENDIX D	
135925-500 135925-600	Storm Sewer Design Sheet Storm Drainage Plan Ponding Plan Barret Lands Phase 3 Storm Design Sheet Barret Lands Phase 3 Storm Drainage Area Plan Modified Rational Method on-site SWM calculations On-site Underground Storage System Storm HGL Calculations Barret Lands Phase 3 HGL Reference Overflow Depth/Capacity Calculation Temporary Orifice Sizing Sample Runoff Coefficient Calculations Minor system release rate (Barrett Lands Phase 3)

APPENDIX E

135925-900	Erosion and Sediment Control Plan
135925-200	Grading Plan

1 INTRODUCTION

Barrett Lands Block 178 is located in the northern portion of the Leitrim Development Area (LDA) and is part of the Barrett Lands subdivision. IBI Group Professional Services Inc. (IBI Group) has been retained by Barrett Co-Tenancy to provide professional engineering services for Block 178. The subject site is approximately 1.28 ha and consists of 50 townhouse units. The site consists of freehold frontage onto an 8.5m and a 6.0m wide private lane. There will be a common elements agreement in place for the shared elements of the site.

Block 178 is bounded by Barrett Farm Drive to the North, Barrett Lands Phase 3 lands to the west, Cemetery lands to the south and a future commercial to the east. Refer to key plan below for block location.



The proposed servicing design conforms to current City of Ottawa and MECP design criteria, and no pre-consultation meetings were requested from the South Nation Conservation (SNC) or the Ontario Ministry of Environment, Conservation and Parks (MECP).

1.1 Guidelines and Standards

This evaluation takes into consideration the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), and the February 2014 Technical Bulletin ISDTB-2014-01, the September 2016 Technical Bulletin PIEDTB-2016-01, the June 2018 Technical Bulletin ISTB-2018-04, October 2019 Technical Bulletin 2019-01, and the July Technical Bulletin 2019-02.

It also considers the City of Ottawa Water Distribution Design Guidelines (OWDDG), and the 2010 Technical Bulletin 2010-02, the 2014 Technical Bulletin 2014-02, the 2018 Technical Bulletin 2018-02 and the 2020 Technical Bulletin 2020-02.

All specifications are as per current City of Ottawa standards and specifications, and Province of Ontario (OPSS/D) standards, specifications and drawings.

1.2 Pre-Consultation Meeting

The City of Ottawa hosted a virtual pre-consultation meeting on August 18th, 2021. Notes of the meeting are provided in **Appendix A**. There were no major engineering concerns flagged in this meeting. The City of Ottawa Servicing Study Checklist has also been included in **Appendix A**.

1.3 Environmental Issues

There are no environmental issues related to this site, as all environmental concerns were dealt with as part of the applicants Barrett Lands Phase 3 subdivision approval.

All existing watercourses or drainage features associated with this site have been addressed through SNCA permit number 2021-GLO-R234.

1.4 Geotechnical Concerns

Golder was retained by Barrett Co-Tenancy to review the grading plan to ensure that the recommendations with its original report for the subject area. There were no particular design concerns for this development.

2 WATER DISTRIBUTION

2.1 Existing Conditions

There is an existing 250mm watermain in Barrett Farm Drive in Barrett Lands Phase 3 to the north of the site, which is proposed to continue east on Barrett Farm Drive in Barrett Phase 3 to the northeast of the site. The proposed development was considered in the water model for the Barrett Phase 2 and 3 developments.

2.2 Design Criteria

2.2.1 Water Demands

Block 178 consists of 50 townhouse units. Per unit population density and consumption rates are taken from **Tables 4.1** and **4.2** of the Ottawa Design Guidelines – Water Distribution and are summarized as follows:

•	Semi Detach/Townhouse	2.7 person per unit
•	Average Day Demand	280 l/cap/day
•	Peak Daily Demand	700 l/cap/day
•	Peak Hour Demand	1,540 l/cap/day

A water demand calculation sheet is included in **Appendix B** and the total water demands are summarized as follows:

•	Average Day	0.44 l/s
•	Maximum Day	1.10 l/s
•	Peak Hour	2.42 l/s

2.2.2 System Pressures

The 2010 City of Ottawa Water Distribution Guidelines states that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 552 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in the guidelines are as follows:

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi).
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code the maximum pressure should not exceed 552 kPa (80 psi) in occupied areas. Pressure reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.2.3 Fire Flow Rate

A Fire Underwriters Survey has been carried out on a representative block to determine the fire flow for the site. The calculations result in a fire flow of 12,000 l/min; a copy of the FUS calculation is included in **Appendix B**.

2.2.4 Boundary Conditions

The City of Ottawa has provided hydraulic boundary conditions two locations in Barrett Lands Phase 3. The City has provided existing condition and SUC Zone reconfiguration boundary conditions. The existing condition has the highest maximum HGL value and is used in the analysis to determine maximum pressure while the SUC Zone reconfiguration value has the lower values for peak hour and fire and is used in the analysis. A copy of the Boundary Condition is included in **Appendix B** and summarized as follows:

		HYDRAULIC HEAD		
с	RITERIA	CONNECTION 1 Private Lane 1 @ Barrett Farm Drive	CONNECTION 2 Private Lane 1 @ Barrett Farm Drive	CONNECTION 3* Private Lane 2 @ Barrett Farm Drive
	Max HGL (Basic Day)	154.6 m	154.6 m	154.6 m
Existing	Peak Hour	144.7 m	144.7 m	144.7 m
Conditions	Max Day + Fire (12,000 l/m)	118.3 m	121.5 m	119.0 m
	Max HGL (Basic Day)	147.5 m	147.5 m	
SUC	Peak Hour	145.8m	145.8 m	
Reconfiguration	Max Day + Fire (12,000 l/m)	130.2 m	132.3 m	

*Connection 3 if required; hydraulic heads are interpolated.

2.2.5 Hydraulic Model

A computer model for the Block 178 water distribution system has been developed using the InfoWater SA program. The model includes the boundary conditions provided by the City of Ottawa and a portion of Barrett Lands Phase 3 watermains.

2.3 Proposed Water Plan

2.3.1 Hydraulic Analysis

The hydraulic model was run under basic day conditions with the existing boundary condition to determine the maximum pressure for the site. The minimum pressure for the site is determined in the peak hour analysis using the SUC Zone reconfiguration boundary condition. There are two fire hydrants on this site, and they are represented by nodes S11-515 and S11-520 in the model; the model was run under the max day plus fire (12,000 l/min) SUC Zone Reconfiguration Boundary condition to determine the design fire flow at the hydrant locations. Results of the analysis for the Block 178 site are summarized in Section 2.3.2 and the water model schematic and model results are included in **Appendix B**.

2.3.2 Summary of Results

Results of the hydraulic analysis for Block 178 are summarized as follows:

SCENARIO	EXISTING*	SUC		
Basic Day Pressure (kPa)	509.56 - 527.20	439.98 – 451.74		
Peak Hour Pressure (kPa)	412.54 – 430.18	423.32 - 435.08		
Minimum				
Residual Pressure (kPa)	138.09	187.41		
*Includes a 3 rd connection and 250mm diam watermain on Private Lane No. 1				

A comparison of the results and design criteria is summarized as follows:

Maximum Pressure	All nodes have basic day pressure below 552 kPa for existing conditions; therefore, pressure reducing control is not required for this site.
Minimum Pressure	All nodes exceed the minimum requirement of 276 kPa during peak hour conditions for the SUC Zone configuration.
Fire Flow	The model was run with a fire flow of 12,000 l/min under the SUC Zone Reconfiguration. The residual pressures at fire hydrant locations all exceed the minimum requirement of 140 kPa under the SUC Reconfiguration.

2.3.3 SUC Zone Re-configuration

In advance of the SUC Zone Re-configuration, a third connection has been added to Barrett Farm Drive and the watermain size on Private Lane No.1 has been increased to 250mm diameter as discussed with the City of Ottawa. These design changes are necessary to meet the minimum residual pressures during a fire flow event as per City of Ottawa criteria under the existing conditions. Prior to construction, IBI is to follow up with the City of Ottawa Water group regarding the timelines of the SUC Zone Re-configuration. Should the SUC Zone Re-configuration take place prior to commence work notice, the third connection would not be necessary and the watermain size on Private Lane No. 1 will be reduced to 200mm diameter as noted on the civil drawings.

3 WASTEWATER

3.1 Existing Conditions

The Leitrim Pump Station is the wastewater outlet for all developed lands within the LDA, including the subject property. In 2002, the City constructed the station, associated forcemains and outlet sewers in Bank Street and Conroy Road. Sewage from the LDA outlets to the Conroy Road Trunk Sewer eventually discharging to a sewage treatment plant located near the Ottawa River. The Barrett Lands Phase 1 report prepared by IBI Group dated March 2017 confirmed that the existing 375mm sewer in Kelly Farm Drive has sufficient capacity for the Barret Lands at Findlay Creek property inclusive of the proposed development.

3.1.1 Verification of Existing Sanitary Sewer Capacity

There is an existing 200mm sanitary sewer in Barrett Farm Drive, which connects to the 375 mm diameter sub-trunk sewer in Kelly Farm Drive. In the previous Barrett Lands Phase 3 report, the design for Block 178 was for 84 apartment units, with an allocated population of 159.6 people, a site area of 1.28 and a total flow of 2.26 L/s, see **Appendix C** for excerpts from the Phase 3 report.

For the subject development, it is proposed to build a total of 50 units – 14 townhomes and 36 back-to-back townhouse units and a future commercial site. The new total proposed population is 126.0 people, area 1.28 Ha and a total flow of 1.88L/s. This represents a total peaking flow decrease of **0.38L/s** when compared to the Phase 3 allocation. The decrease in flow on the existing system from the subject development is considered to have no negative impacts on downstream infrastructure.

3.2 Proposed Sewers

All on-site sewers have been designed to City of Ottawa and MOE design criteria which include but are not limited to the below listed criteria. A copy of the detailed sanitary tributary area plan 400 and the sanitary sewer design sheets are included in **Appendix C** illustrate the population densities and sewers which provide the necessary outlets.

3.2.1 Design Flow:

3.2.2	Population Density:		
Μ	inimum Pipe Size	-	200mm diameter
In	filtration Allowance	-	0.33 l/sec/Ha
Pe	eak Residential Factor	-	Harmon Formula
A	verage Residential Flow	-	280 l/cap/day

Semi-Detached & Townhouse - 2.7 person/uni

4 SITE STORMWATER MANAGEMENT

4.1 Objective

The purpose of this evaluation is to prepare the dual drainage design, including the minor and major system, for the Block 178 development. The design includes the assignment of inlet control devices, on-site storage, maximum depth of surface ponding and hydraulic grade line analysis. The evaluation takes into consideration the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), the February 2014 Technical Bulletin ISDTB-2014-01, the September 2016 Technical Bulletin PIEDTB-2016-01 and the June 2018 Technical Bulletin ISTB-2018-04.

4.2 Existing Conditions

The subject development is tributary to the Barrett Farm Drive storm sewer, which was approved for construction for the Barrett Lands Phase 3 development. Subsequent to the approval of Phase 3, the stormwater management analysis for Barrett Lands Phase 3 included an updated to the subject site's tributary allocation into the Barrett Farm Drive storm sewer. As part of that approval, a 675mm diameter storm sewer was approved for the subject block. The subject block is referenced as "R11304" in the Barrett Lands Phase 3 design. A copy of the design sheet, and approved drainage area plan for Phase 3 have been included in **Appendix D**.

Additionally, the Barrett Lands Phase 3 stormwater management identified a minor system restriction for this site to be the 5-year modelled flow of **234 I/s**. An excerpt from the Phase 3 report has been included in **Appendix D**.

4.3 Design Criteria

The stormwater system was designed following the principles of dual drainage, making accommodations for both major and minor flow.

Some of the key criteria include the following:

Design Storm

1:2-year return (Ottawa)

(It should be noted that the overall Barrett Lands Site utilized 1:5 year return storm for minor system release from the subject site, further details are provided in Section 4.4 and 4.5.2)

Rational Method Sewer Sizing

•	Initial Time of Concentration	10 minutes
•	Runoff Coefficients	
	- Front Yards	C = 0.77
	- Rear Yards	C = 0.52
•	Pipe Velocities	0.80 m/s to 3.0 m/s
•	Minimum Pipe Size	250 mm diameter (200 mm CB Leads)

A sample calculation of run-off coefficients has been provided in Appendix D. The runoff coefficients used are based on the actual footprint in the site plan. Zoning setbacks do not apply to the site plan. The values calculated are lower than the values used, thus a conservative approach has been provided in this analysis.

4.4 System Concept

According to the Barrett Lands Phase 3 report prepared by IBI Group dated April 2022, the development of the adjacent downstream properties included the expected stormwater servicing needs of the subject property. The existing storm sewers constructed adjacent to the site were oversized to provide the needed capacity for minor storm runoff from the subject site. Minor storm runoff from the subject site will connect to the existing 675mm Ø sewer stub that connects to the existing 1050mmØ trunk storm sewer in Barrett Farm Drive.

4.4.1 Dual Drainage Design

The dual drainage system proposed for the subject site will accommodate both major and minor stormwater runoff. Minor flow from the subject site will be conveyed through the storm sewer network and discharge into the existing 675mm \emptyset sewer stub that connects to the existing 1050mm \emptyset trunk storm sewer in Barrett Farm Drive.

The balance of the surface flow not captured by the minor system will be conveyed via the major system. Where possible, storage will be provided in surface sags or low points within the roadway. Storage will also be provided within oversized storm pipes. Once the maximum storage is utilized, the excess flow will cascade to the next downstream street sag. Based on Phase 3 information, the 100-year overflow allocation related to the subject development lands is 350 l/s and the 100 year + 20% stress test allocation is 476 l/s. Major flow from street segments will overflow to the major flow block connecting to adjacent Barrett Lands Phase 3 at Delphinium Crescent to the west and to Barrett Farm Drive to the North, once on-site surface ponds have reach capacity.

4.4.2 Proposed Minor System

Using the criteria identified in Section 4.3, the proposed on-site storm sewers were sized accordingly. A detailed storm sewer design sheet and the associated storm sewer drainage area plan is included in **Appendix D**. The general plan of services, depicting all on-site storm sewers can be found in **Appendix A**.

The owner of the site will be responsible for regular maintenance of the on-site sewers, catch basins and inlet control devices (ICDs). Maintenance includes but is not limited to the cost of regular cleaning of the structures and ICDs as necessary. The site owner will also be responsible for replacement of damaged or missing catch basin structures, grates or ICDs as needed.

4.5 Stormwater Management

4.5.1 Water Quality Control

The subject site is part of the larger development referred to as the Leitrim Development Area. The stormwater management strategy was outlined in the following reports:

- Addendum to Leitrim Development Area Stormwater Management Environmental Study Report and Pre-Design Volumes 1 and II (IBI Group, July 2005);
- Design Brief and Amendment to MOE Certificate of Approval Findlay Creek Village Stormwater Facility (IBI Group, July 2005);
- Final Serviceability Report Leitrim Development Area City of Ottawa (IBI Group, March 2007).
- 2016 Final Updated Serviceability Report (Class EA OPA76 Areas 8a, 9a and 9b) Leitrim Development Area (IBI Group, September 2016)

The subject site is part of the drainage area which ultimately discharges into the existing Findlay Creek Village Stormwater Facility. The Findlay Creek Village Stormwater Facility was constructed

in 2006 and provides water quality control to an Enhanced Level of Protection according to MOE Stormwater Management Planning and Design Guidelines (March 2003).

4.5.2 Water Quantity Control

The subject site will be limited to a maximum minor system release rate of **234 L/s** based on the Barrett Lands Phase 3 Servicing Brief, reference information is provided within **Appendix D**. This will be achieved through a combination of inlet control devices (ICD's) at inlet locations, surface storage where possible and underground storage in oversized storm pipes where required.

The restricted flows on the private residential site and future commercial site were calculated based on their respective areas. The following assumptions were used for the future commercial block: assume site storage of 12m3 and runoff coefficient of 0.8.

QrestrictedPrivate = 234 L/s x (A_{Private} / (A_{Private} + A_{Commercial})) QrestrictedPrivate = 234 L/s x (1.06 ha / (1.06 + 0.16) ha) QrestrictedPrivate = 203.31 L/s QrestrictedCommercial = 30.19 L/s

There are 2 small locations where water is left to discharge uncontrolled from the subject property. The uncontrolled release can be calculated as follows:

Uncontrolled Release, where Quncontrolled = 2.78(C x i100yr x Auncontrolled)

Quncontr	rolled	=23.83 L/s
C Tc i100yr Aunc	=Runoff Coefficient =Time of Concentration =100yr intensity (1735.688 / (Tc + 6.014) ^{0.820} =Area uncontrolled	=0.80 =10min =178.56 =0.06Ha

The Maximum allowable release rate from the site can be determined by subtracting the Uncontrolled release rate from the minor system restricted flow rate.

Qmax = Qrestricted - Quncontrolled Qmax = 203.31 L/s - 23.83L/s Qmax = **179.48 L/s**

Surface flows in excess of the site's allowable release rate will be stored on site in strategic surface storage areas or oversized underground pipes and gradually released into the minor system to respect the site's allowable release rate. The maximum surface retention depth located within the developed areas will be limited to 300mm during a 1:100-year event as show on the ponding plan located in **Appendix D** and grading plans located in **Appendix E.** Overland flow routes will be provided in the grading to permit emergency overland flow.

The modified rational method was used to evaluate the on-site stormwater management. There are two uncontrolled areas on this site. The flows are calculated above. Therefore, the total restricted flow rate through the minor system will be the design flow rate of **179.48** I/s. This will be achieved by the used of Inlet Control Devices (ICD's) placed in all on-site catchbasins. A summary of the ICD's, their corresponding storage requirements, storage availability, and associated drainage areas has been provided below.

DRAINAGE AREA	ICD RESTRICTED FLOW (L/s)	100 YEAR STORAGE REQUIRED (m ³)	SURFACE STORAGE PROVIDED (m ³)	SUB-SURFACE STORAGE PROVIDED (m ³)	100yr OVERFLOW (m³)
S20A	15.00	18.68	20.59	0.00	0.00
S10	33.00	21.75	0.32	0.00	21.43*
S4	26.00	48.04	1.16	0.00	46.88
S20B	10.00	5.45	1.41	0.00	4.04
FUT COM	30.69	29.79	12.00	0.00	17.79
S5	25.00	78.31	1.32	0.00	76.99
S6	50.00	138.36	9.71	0.00	128.65
R6	20.00	163.78	4.38	6.98	152.42*
TOTAL	179.00				173.85

*Overflow only during major storm events, directed to Delphinium Crescent and Barrett Farm Drive with no negative impact on downstream storm sewer system

4.5.3 2 Year Ponding

A review of the 2-year ponding has been completed using the modified rational method. A minimum Tc of 10min has been used. Where volumes are calculated as a negative value, 0.0m3 has been shown. A summary of each drainage area has been provided below.

DRAINAGE AREA	Total 2-Year Ponding Volume (m3)	Comment
S4	0.0	-
S5	0.0	-
S6	0.75	Negligible volume of ponding during 2-year event
S10	0.0	-
S20A	0.22	Negligible volume of ponding during 2-year event
S20B	0.0	-
R6	8.98	This area is controlled at RYCB7, and there is 6.98m3 of sub- surface storage provided in this area. The required ponding is provided underground, not on the street. A 50% reduction to the release rate was considered for this area.

Based on the above, there will be no surface ponding in the 2-year event.

4.5.4 100 year + 20% Stress Test

A cursory review of the 100yr event + 20% has been performed using the modified rational method. The Peak flow from each area during a 100-year event has been increased by 20%. The calculations have been included in **Appendix D**.

A summary of the require storage volumes, and overflow balances is provided below.

DRAINAGE AREA	ICD RESTRICTED FLOW (L/s)	100yr20 STORAGE REQUIRED (m³)	SURFACE STORAGE PROVIDED (m ³)	100yr20 OVERFLOW (m³)
S20A	15.00	25.11	20.59	4.52
S10	33.00	34.18	0.32	33.86*
S4	26.00	69.58	1.16	68.42

FUT COM	30.69	40.90	12.00	28.90
S20B	10.00	7.26	1.41	5.85
S5	25.00	111.93	1.32	110.61
S6	50.00	195.06	9.71	185.35
R6	20.00	230.61	4.38	219.25*
TOTAL	179.00			253.11

*Overflow from S10 to Barrett Farm Drive, and from R6 to Delphinium Crescent.

DRAINAGE AREA	100yr20 OVERFLOW (m³)	Time of Concentration	100yr20 OVERFLOW (l/s)	DEPTH (m)
S20A	4.52	15.00	5.02	0.02
S10	33.86*	9.00	62.70*	0.05
FUT COM	28.90	14.00	34.41	0.00
S4	68.42	14.00	81.45	0.05
S20B	5.85	6.00	16.24	0.03
S5	110.61	16.00	115.22	0.06
S6	185.35	18.00	171.62	0.05
R6	219.25*	26.00	140.55*	0.09
TOTAL	253.11		203.25	

As noted above, the overland flow from the rear yards (R6) is directed to Barrett Lands Phase 3 lands at Delphinium Crescent to the West. The volume of overflow is 253.11m3. Based on a Tc of 26minutes, this volume can be reverse calculated to 203.25 L/s. Channel cross section was used to determine the depth of flow for each area. Refer to calculation sheet in **Appendix D**.

The stress test overflow from S10 will follow the intended overflow route as identified in the Phase 3 grading design drawings. The volume of overflow is 33.86m3. Based on the Tc of 9minutes, this volume can be reverse calculated to 62.70 L/s. Channel cross section was used to determine the depth of flow for each area. Refer to calculation sheet in **Appendix D**.

4.5.5 Open-Channel Drainage Corridor

A summary of the various channel depths of flow is provided below. The cross-sections used for the calculations are shown on drawing 011 as section A-A and section B-B. A V-shape ditch was assumed for the open-channel drainage corridor, with a 22% side slope. Refer to calculation sheet in Appendix D.

POND ID	100yr OVERFLOW (L/s)	100yr20 OVERFLOW (L/s	100yr Depth (m)	100yr20 Depth (m)
S4	55.81	81.45	0.13	0.14
S10	39.68	62.70	0.11	0.13
S20	0	5.02	0.00	0.04
S20A	11.22	16.24	0.07	0.08
S5	80.20	115.22	0.14	0.16
S6 (Open- Channel)	119.12	171.62	0.02	0.06
R6	97.70	140.55	0.09	0.10

4.6 Storm Hydraulic Grade Line

The Barrett Lands Phase 3 report indicates that the 100-year hydraulic grade line (HGL) in Bulkhead 11307N **93.68**, refer to **Appendix D** for the excerpt from the Barrett Lands Phase 3 HGL analysis. The HGL has been extended through the subject site have been calculated as follows:

LOCATION	MH #	USF ELEV (M)	STORM HGL (M)	FREEBOARD (M)
Unit 1-2	MH10	99.36	98.410	0.950
Unit 3	MH 9	99.53	98.460	1.070
Unit 4-18;23-27	MH 8	99.98	98.460	1.520
Unit 19-22;28-37	MH 5	100.43	99.020	1.410
Unit 38-46	MH 4	100.51	99.150	1.360
Unit 47-50	MH 2	100.65	99.340	1.310

All underside of footing elevations have been designed to provide a minimum of 300mm separation between the greater of governing pipe obvert or governing HGL. A copy of the storm HGL analysis for Block 178 is provided in **Appendix D**.

5 SOURCE CONTROLS

5.1 General

On site level or source control management of runoff will be provided to provide quality control for the subject lands. Such controls or mitigative measures are proposed for the development not only for final development but also during construction and build out. Some of these measures are:

- flat lot grading;
- split lot drainage;
- Roof-leaders to vegetated areas;
- vegetation planting; and
- groundwater recharge.

5.2 Lot Grading

There is an elevation difference of approximately 2m from southwest to northeast in Block 178. In accordance with local municipal standards, the parking lots will be graded northeast between 1.5% and 5.0%. Most landscaped area drainage will be directed into a swale drainage system and connects to the storm sewer system. Typically, swales will have slopes larger than 1.5% with subdrains. Copies of the grading plans have been included in **Appendix E**.

5.3 Roof Leaders

This development will consist of stacked homes and apartments. It is proposed that roof leaders from these units be constructed such that runoff is directed to grass areas adjacent to the units. This will promote water quality treatment through settling, absorption, filtration and infiltration and a slow-release rate to the conveyance network.

5.4 Vegetation

As with most subdivision agreements, the developer will be required to complete a vegetation and planting program. Vegetation throughout the development including planting along roadsides and within public parks provides opportunities to re-create lost natural habitat.

6 CONVEYANCE CONTROLS

6.1 General

Besides source controls, the development also proposes to use several conveyance control measures to improve runoff quality. These will include:

- flat vegetated swales;
- catchbasin and maintenance hole sumps; and
- pervious rear yard drainage.

6.2 Flat Vegetated Swales

The development will make use of relatively flat vegetated swales where possible to encourage infiltration and runoff treatment.

6.3 Catchbasins

All catchbasins within the development, either rear yard or street, will be constructed with minimum 600 mm deep sumps. These sumps trap pollutants, sand, grit and debris which can be mechanically removed prior to being flushed into the minor pipe system. Both rear yard and street catchbasins will be fabricated to OPSD 705.010 or 705.020. All storm sewer maintenance holes servicing local sewers less than 900 mm diameter shall be constructed with a 300 mm sump as per City standards.

6.4 Pervious Landscaped Area Drainage

Some of the landscaped area swales make use of a filter wrapped perforated drainage pipe constructed below the rear yard swale. This perforated system is designed to provide some ground water recharge and generally reduce both volumetric and pollutant loadings that enter the minor pipe system.

7 SEDIMENT AND EROSION CONTROL PLAN

7.1 General

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, it is proposed to introduce a number of mitigative construction techniques to reduce unnecessary construction sediment loadings. These will include:

- groundwater in trench will be pumped into a filter mechanism prior to release to the environment;
- bulkhead barriers will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewer;
- seepage barriers will be constructed in any temporary drainage ditches; and
- silt sacks will remain on open surface structure such as manholes and catchbasins until these structures are commissioned and put into use.

7.2 Trench Dewatering

During construction of municipal services, any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed including sediment removal and disposal and material replacement as needed.

7.3 Bulkhead Barriers

At the first manhole constructed immediately upstream of an existing sewer, a $\frac{1}{2}$ diameter bulkhead will be constructed over the lower half of the outletting sewer. This bulkhead will trap any sediment carrying flows, thus preventing any construction –related contamination of existing sewers. The bulkheads will be inspected and maintained including periodic sediment removal as needed.

7.4 Seepage Barriers

These barriers will consist of both the Light Duty Straw Bale Barrier as per OPSD 219.100 or the Light Duty Silt Fence Barrier as per OPSD 219.110 and will be installed in accordance with the sediment and erosion control drawing. The barriers are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

7.5 Surface Structure Filters

All catchbasins, and to a lesser degree manholes, convey surface water to sewers. However, until the surrounding surface has been completed these structures will be covered to prevent sediment from entering the minor storm sewer system. Until rear yards are sodded or until streets are asphalted and curbed, all catchbasins and manholes will be equipped with geotextile filter socks. These will stay in place and be maintained during construction and build until it is appropriate to remove them.

7.6 Stockpile Management

During construction of any development similar to that being proposed both imported and native soils are stockpiled. Mitigative measures and proper management to prevent these materials entering the sewer systems is needed.

During construction of the deeper municipal services, water, sewers and service connections, imported granular bedding materials are temporarily stockpiled on site. These materials are however quickly used up and generally before any catchbasins are installed. Street catchbasins are installed at the time of roadway construction and rearyard catchbasins are usually installed after base course asphalt is placed.

Contamination of the environment as a result of stockpiling of imported construction materials is generally not a concern since these materials are quickly used and the mitigative measures stated previously, especially the use of filter fabric in catchbasins and manholes help to manage these concerns.

The roadway granular materials are not stockpiled on site. They are immediately placed in the roadway and have little opportunity of contamination. Lot grading sometimes generates stockpiles of native materials. However, this is only a temporary event since the materials are quickly moved off site.

The construction of this development will involve a substantial rock blasting, breaking and crushing operation. Given the existing topography, a substantial cut and fill operation is required in order to construction a development that meets City Standards. As part of this operation, materials will be manipulated onsite, and provided the sediment and erosion control measures are in place, are generally inconsequential to the surrounding environment.

8 ROADS AND NOISE ATTENUATION

Vehicular access to Block 178 is provided by two private entrances from Barrett Farm Drive.

There are no sidewalks or pathways proposed within the development. Pedestrian access to the site will be via the private roadway.

The site has been designed in order to provide curbside municipal waste disposal.

There are no bus routes proposed within Block 178.

There are no collector streets or nearby noise sources that would trigger an environmental noise assessment.

8.1 Aircraft Sound Levels

As stated in Section 2.1, the site is within the Airport Vicinity Development Zone (AVDZ), the limit of the AVCZ is shown on Figure 2. The site however is outside of the 25 NEF/NEP contour line so the building components and ventilation requirements of Part 6 Prescribed Measures for Aircraft Noise of the Guidelines do not apply. A warning clause is required for the residential units inside the AVDZ.

Warning clause for aircraft noise is as follows:

"Purchasers/tenants are advised that due to the proximity of the airport, noise from the airport and individual aircraft may at times interfere with outdoor or indoor activities".

9 SOILS

Golder Associates Ltd. was retained to prepare a geotechnical investigation for the proposed mixed use development for the Barrett Lands Phase 3. The objectives of the investigation were to prepare a report to:

- Determine the subsoil and groundwater conditions at the site by means of test pits and boreholes and;
- To provide geotechnical recommendations pertaining to design of the proposed development including construction considerations.

The geotechnical report 20442530-100 was prepared by Golder Associates Ltd. in February 2022. The report contains recommendations which include but are not limited to the following:

- The maximum permissible grade raise is 3.5m
- In areas where finished grade exceeds grade raise limits, geotechnical reviews are required
- Fill placed below the foundations to meet OPSS Granular 'A' or Granular 'B' Type II placed in 300 mm lifts compacted to 98% SPMDD.
- Fill for roads to be suitable native material in 300mm lifts compared to 95% SPMDD

Pavement Structure:

LOCAL ROAD	THICKNESS
Asphaltic Concrete	90mm
OPSS Granular A Base	150mm
OPSS Granular B Type II Subbase	400mm

• Pipe bedding and cover; bedding to be minimum 150 mm OPSS Granular 'A' up to spring line of pipe. Cover to be 300 mm OPSS A (PUC and concrete pipes) or sand for concrete pipes. Both bedding and cover to be placed in maximum 225 mm lifts compacted to 95% SPMDD.

In general the grading plan for Block 178 adheres to the grade raise constraints noted above. A copy of the grading plans is included in **Appendix E**. The site does not pose any significant grade raise; thus a grading plan review letter is not required for this development.

10 RECOMMENDATIONS

Water, wastewater and stormwater systems required to develop Barrett Lands Block 178 will be designed in accordance with MOE and City of Ottawa's current level of service requirements.

The use of lot level controls, conveyance controls and end of pipe controls outlined in the report will result in effective treatment of surface stormwater runoff from the site. Adherence to the proposed sediment and erosion control plan during construction will minimize harmful impacts on surface water.

Final detail design will be subject to governmental approval prior to construction, including but not limited to the following:

- Block 178 Commence Work Order: City of Ottawa
- ECA for Sewage Works: MOECP Transfer of Review by City of Ottawa
- Block 178 Watermain Approval: City of Ottawa
- Block 178 Commence Work Order (utilities): City of Ottawa

Report prepared by:



Demetrius Yannoulopoulos, P.Eng. Director

Rynny

Ryan Magladry, C.E.T. Project Manager

Chef At

Anton Chetrar, P.Eng. Civil Engineer

https://ibigroup.sharepoint.com/sites/Projects1/135925/Internal Documents/6.0_Technical/6.04_Civil/03_Tech-Reports/Submission #1/CTR-Servicing Brief_2022-05.docx

APPENDIX A

AOV Plan of Subdivision for Barrett Lands Phase 3 Site Plan for Barrett Lands Block 178 135925-001 - General Plan of Services City of Ottawa Pre-Consultation Meeting Notes



 I	PLAN 4M-
SIB(SG) 15.99 174 5557 28684 8684 87 87 87 78	I CERTIFY THAT THIS PLAN IS REGISTERED IN THE LAND REGISTRY OFFICE FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON No.4 AT O'CLOCK ON THE DAY OF, 2022 AND ENTERED IN THE PARCEL REGISTER FOR PROPERTY IDENTIFIER, AND THE REQUIRED CONSENTS ARE REGISTERED AS PLAN DOCUMENT NUMBER OC
APPROVED UNDER SECTION 51 OF THE PLANNING ACT BY THE CITY OF OTTAWA THIS DAY OF,20,20,20	REPRESENTATIVE FOR LAND REGISTRAR
STEPHEN WILLIS, MCIP, RPP, GENERAL MANAGER PLANNING, REAL ESTATE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA	PLAN OF SUBDIVISION of PART OF LOT 16 CONCESSION 4 (RIDEAU FRONT) (GEOGRAPHIC TOWNSHIP OF GLOUCESTER)
CURVE SCHEDULE	CITY OF OTTAWA Scale 1:1000 20 0 20 40 60 METRES METRIC CONVERSION DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES
LOT/BLOCK RADIUS ARC CHORD BEARING 9 18.00 10.62 10.47 N60*50'05"W 10 18.00 10.26 10.13 N85*55'45"E 11 18.00 3.25 3.25 N64*25'10"E	AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048
21 18.00 5.17 5.15 N51*01'10"E 22 18.00 12.04 11.82 N23*38'00"E 23 18.00 6.78 6.74 N19*53'40"W 27 75.00 7.46 7.46 N27*50'10"W	DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999946.
29 75.00 7.19 7.19 N05'06'50''W 30 274.00 25.13 25.12 N86'47'15''W 42 274.00 2.56 2.56 N86'47'15''W 43 274.00 11.05 11.05 N60'06'15''E 43 274.00 11.05 11.05 N60'06'15''E 44 274.00 13.31 N70'22'55''E 62 274.00 13.31 13.31 N70'22'55''E 62 244.00 11.75 11.75 N70'23'40''E 63 274.00 12.59 12.59 N73'05'30''E 63 244.00 11.21 11.21 N73'05'30''E 64 274.00 12.59 12.59 N75'43'25''E 64 274.00 12.59 12.59 N75'43'25''E 64 274.00 11.21 11.21 N75'43'25''E 65 274.00 11.21 11.21 N75'43'25''E	BEARINGS ARE GRID, DERIVED FROM CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76° 30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL). 19773035 N:5006060.42 E:324888.04 19680191 N:5033564.26 E:388064.94
65 244.00 11.72 11.72 N78'25'00"E 66 274.00 13.16 13.16 N81'10'05"E 66 244.00 11.72 11.72 N81'10'05"E 66 244.00 11.72 11.72 N81'10'05"E 67 274 00 10.45 10.45 N83'38'10"E	OBSERVED REFERENCE POINTS DERIVED FROM THE CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76° 30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL). COORDINATES TO URBAN ACCURACY PER SEC 14(2) OF O.REG. 216/10
67 244.00 13.24 13.24 N84*05'55"E 67 93.00 9.28 9.28 N05*13'25"W	ORP ID NORTHING EASTING
6893.0013.4913.48N12*14'20"W6993.0013.0112.99N20*24'00"W	A 5021294.73 374944.42 B 5021182.72 375523.14
7093.0010.1910.19N27*32'47"W74298.0022.8222.81N60*36'30"E7918.003.313.30N25*25'25"W	COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.
10.100 11.150 11.54 N0127'40"W 80 18.00 11.75 11.54 N0127'40"W 81 18.00 12.27 12.03 N36'45'50"E 82 18.00 0.95 0.95 N57'48'05"E 96 298.00 6.74 6.74 N68'51'15"E 97 298.00 10.67 10.67 N70'31'40"E 98 298.00 10.71 10.71 N74'38'15"E 100 298.00 10.74 10.74 N76'41'55"E 101 298.00 12.37 12.37 N78'55'15"E 106 75.00 1.13 1.13 N30'15'45"W 107 75.00 16.71 16.67 N23'27'00"W 108 298.00 25.03 25.02 N66'03'00"E 119 93.00 7.88 7.88 N28'15'55"W 120 93.00 11.60 11.59 N22'15'50"W 155 18.00 11.29 11.11 N12'43'00"W <td< th=""><th>LEGEND Image: Denotes FOUND MONUMENTS Image: Denotes SET MONUMENTS (IB) Image: Denotes UNLESS OTHERWISE STATED IB IRON BAR IBØ ROUND IRON BAR SIB STANDARD IRON BAR SSIB SHORT STANDARD IRON BAR CC CUT CROSS CP CONCRETE PIN WIT WITNESS PIN PROPERTY IDENTIFICATION NUMBER MEAS MEASURED PROP PROPORTIONED OU ORIGIN UNKNOWN SG STANTEC GEOMATICS LTD. ORP OBSERVED REFERENCE POINT P1 PLAN 4R-28684 P2 REGISTERED PLAN 4M-1676</th></td<>	LEGEND Image: Denotes FOUND MONUMENTS Image: Denotes SET MONUMENTS (IB) Image: Denotes UNLESS OTHERWISE STATED IB IRON BAR IBØ ROUND IRON BAR SIB STANDARD IRON BAR SSIB SHORT STANDARD IRON BAR CC CUT CROSS CP CONCRETE PIN WIT WITNESS PIN PROPERTY IDENTIFICATION NUMBER MEAS MEASURED PROP PROPORTIONED OU ORIGIN UNKNOWN SG STANTEC GEOMATICS LTD. ORP OBSERVED REFERENCE POINT P1 PLAN 4R-28684 P2 REGISTERED PLAN 4M-1676
	OWNER'S CERTIFICATE ALL OF PIN 04328-5557

1. LOTS 1 to 175, BOTH INCLUSIVE, BLOCKS 176, 177 and 178, THE STREETS, NAMELY promenade Barrett Farm Drive, croissant Bouvardia Crescent, croissant Delphinium Crescent, voie Nemesia Way and placette Solidago Mews WALKWAYS, NAMELY BLOCKS 179 and 180, ACCESS BLOCKS, NAMELY BLOCKS 181 and 182, RESERVES, NAMELY BLOCKS 183 and 186 and STREET WIDENINGS, NAMELY BLOCKS 184 and 185 HAVE BEEN LAID OUT IN ACCORDANCE WITH OUR INSTRUCTIONS.

2. THE STREETS AND STREET WIDENINGS AND LANES ARE HEREBY DEDICATED TO THE CITY OF OTTAWA AS PUBLIC HIGHWAYS.

CHRIS TAGGART, PRESIDENT FINDLAY CREEK PROPERTIES (NORTH) LTD. TARTAN HOMES (NORTH LEITRIM) INC. TARTAN LAND (NORTH LEITRIM) INC.

I HAVE THE AUTHORITY TO BIND THE CORPORATION

SURVEYOR'S CERTIFICATE I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.

THE SURVEY WAS COMPLETED ON THE DAY OF , 2022



DRAWN: ME CHECKED: * PM: FL FIELD: *

Stantec Geomatics Ltd. CANADA LANDS SURVEYORS ONTARIO LAND SURVEYORS 1331 CLYDE AVENUE, SUITE 300 OTTAWA, ONTARIO, K2C 3G4 TEL. 613.722.4420 FAX. 613.722.2799 stantec.com

PROJECT No.: 161614242-132

FRANCIS LAU

ONTARIO LAND SURVEYOR







		CLIENT
	Project North	BARRETT CO-TENANCY
		COPYRIGHT This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by IBI Group is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and IBI Group shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to IBI Group for general conformance before proceeding with fabrication. IBI Group Professional Services (Canada) Inc.
		ISSUES
÷.		NO.DESCRIPTIONDATE1SUBMISSION NO.1 FOR CITY REVIEW2022-05-102SUBMISSION NO.2 FOR CITY REVIEW2022-11-253SUBMISSION NO.3 FOR CITY REVIEW2023-01-094ADD WM CONNECTION AND NOTES2023-02-2256788
		SEE 010, 011 FOR NOTES, LEGEND, CB TABLE, STREET SCHONS AND DETAILS
		/ 22, 2023 11:22:02 AM by Marian Milne
		SEAL SEAL 2023/02/22 1:500 0 5 15 25m 25m SEAL 25m SEAL 2023/02/22 15 25m 15 15 25m 15 15 25m 15 15 15 15 15 15
		OT WOE OL ONLINE.
		IBI GROUP Suite 400 – 333 Preston Street Ottawa ON K1S 5N4 Canada tel 613 225 1311 / 613 241 3300 fax 613 225 9868 ibigroup.com PROJECT
		BARRETT BLOCK 178
		PROJECT NO: 135925 DRAWN BY: CHECKED BY: M.M. A.C. PROJECT MGR: APPROVED BY:
		R.M. J.I.M. SHEET TITLE GENERAL PLAN
		SHEET NUMBER ISSUE 4

Blk 118, Bank Street at Barrett Farm

Meeting Summary Notes July 27, 2021, Online Teams Meeting *Revised Aug 18, 2021*

Attendees:

- Melissa Cote, Tartan
- Yvonne Mitchell, Planning Student, City of Ottawa
- Tracey Scaramozzino (File Lead, Planner, City of Ottawa)

Not in Attendance:

- Mark Young, Urban Design
- Burl Walker,
- John Sevigny
- Mark Richardson
- Matthew Hayley
- Mike Giampa
- James Holland, SNation

Issue of Discussion:

- Vacant site, within Plan of subdivision, Block 118
- PUD, 14 townhouse units, 38 back to back towns;
- Density of 40units/net ha (only half of CDP recommendation of 80 units/ha). The Developer doesn't have a product that provides the recommended density as they are no longer producing the Java product.
- Private laneways of 6m and 8.5m for servicing, utilities, and municipal garbage
- Site plan, Plan of Condo and Private Road Naming Applications are req'd
- The subdivision contemplated 90 units in this area and only 52 are being proposed. Therefore transportation/services should not be an issue



- 1. Official Plan, Current: General Urban Area
- 2. **Official Plan, Draft:** Suburban Transect, no overlays, no designations, Bank St in this area is a minor corridor
 - a. "Recognize this as suburban pattern, but to support the evolution to 15min n'hood"
- 3. Leitrim CDP (from 2005): Mixed Use (intended to be part of core retail along Bank st smaller parcels to provide n'hood uses; larger retail is focused south at existing commercial plaza
 - a. The CDP is not being converted into a secondary plan in the new OP and will remain in effect.



4. Zoning Information: GM12 - General Mixed Use permits residential (apt, PUD, townhouse etc) and non-residential (animal hospital, bank, community centre etc) Subzone 12 permits additional non-residential uses such as bar, cinema, gas bar, theatre, sports arena.

5. Infrastructure/Servicing (John Sevigny):

a. Servicing will be reviewed during Phase 3 of the subdivision, which as of July 26, hasn't been submitted.

6. Initial Planning Comments (Tracey Scaramozzino):

- a. Can density be increased as per the CDP (40u/ha is being provided; 80 u/ha was contemplated in the CDP).
- b. Possibly design open space along Bank St to have sitting area/plantings/soft surfaces, similar to POPS.
- c. Units in general should have higher floor-ceiling hts on ground floor to allow the conversion to commercial units over time.
- d. The 'empty' parcels along Barrett Farm should be nicely designed with trees and perennials and soft surfaces.
- e. The plan of subdivision does not provide guidance for development of this site.
- f. Within Airport Bird Hazard zone
- g. Follow up discussions between Tracey and Melissa:

May 28, 2021, from Melissa: I think there will be a lot of opportunity for trees and other soft landscaping along with a nice sitting area. I will wait to hear what Mark suggests and I'm following up with Tamarack regarding other product type suitable for possible conversion later on.

May 27, 2021 from Tracey: I was also thinking some more about the green spaces on your proposal and am wondering if the green areas fronting Barrett Farm Drive might be nice with a few trees and some perennials - soft surfaces to help with climate change and heat-island effect. The green location on the corner might be nice with a mixture of plantings, sitting areas and soft area - that may or may not be open to the general public like a POPS.....

- h. The almost-approved Glenview project on the east side of Bank St. at Rotary Way has back to back, stacked towns with the ability for future ground floor conversions to commercial (due to higher floor-ceiling hts) and were able to meet the req'd density for 'apts'.
- i. Tracey sent Melissa an example of a design brief, and details from Glenview PUD across the street at Rotary Way that is near approval, as per images below.



Document 7, Elevations sl@wing potential business signage





7. Urban Design Comments (Mark Young):

- 1. A design brief is required. Please see attached terms of reference.
- 2. Early consideration needs to be given to the allowance of street trees, both public and private. The proposed private roadway width of 6.0 m combined with a 4.0 m front yard setback, may present a challenge in the provision of trees. This should be addressed.
- 3. Please provide direction regarding the proposed "Green Space". Is this intended to be public or private?
- 4. Is any visitor parking proposed? Lay-by parking should be considered for visitors within the private development.
- 5. What is the purpose of the 9.0 m block abutting the southern property line? Is this for servicing and a walkway? Please advise.

8. Parks (Burl Walker):

a. Parks issues are being reviewed through the associated subdivision file.

9. Trees (Mark Richardson):

- a. Preserve and protect the healthy trees to create a visual buffer along southern property line.
- b. Tree permit is required prior to any tree removal on site
- c. Submit a TCR with application.

10. Environment (Matthew Hayley): (added August 18, 2021)

- a) They will need to have their TCR address butternut trees (or provide an EIS). Mark R will comment on tree conservation but I would point out that there is an excellent opportunity for tree retention along the southern property line.
- b) Landscaping OP Section 4.9 has some policies addressing energy conservation through design - in partic as ular for this area, I would recommend considering shading along the southern property line adjacent to that lane. This will combat urban heat island and to provide some screening from the adjacent use. Street trees are also important and should be provided.
- c) Integrated Environmental Review (IER) if they are providing a planning rational the IER can be contained within that document as per the TOR for the Planning Rational, otherwise they should have an IER provided.

11. Conservation Authority (James Holland, South Nation):

a. All issues are being reviewed through the associated subdivision file.

12. Transportation (Mike Giampa):

a. Comments are outstanding at this time, likely dealt with during the plan of subdivision.

13. Waste Collection

- a. Residential properties will receive City collection on the private streets.
- b. 6m ROW is acceptable for waste collection.

14. General Information

a. Ensure that all plans and studies are prepared as per City guidelines – as available online...

https://ottawa.ca/en/city-hall/planning-and-development/informationdevelopers/development-application-review-process/developmentapplication-submission/guide-preparing-studies-and-plans

Response to August 1, 2021 Questions from Melissa:



1. Front yard? Corner yard? Rear yard? Side yard?

Response: Based on my interpretation of the <u>definitions</u> of each in the zoning bylaw:

- Front yard = Bank Street
- Corner yard = Barrett Farm Drive
- Rear yard = empty residential lot
- Side yard = cemetery lands

2. Do I need a landscape buffer along the entire length of Barret Farm Drive?

Response: Yes, but this buffer can be <u>passed by</u> driveways or roads. The full landscape buffer requirements under the <u>zoning (GM12)</u> are as follows:

(h) Minimum width of landscaped area	(i) abutting a street	3 m
	(ii) abutting a residential or institutional zone	3 m
	(iii)other cases	No minimum

Based on the above requirement for the GM zone, a 3m landscape buffer would be required around the entire site, as it borders on streets, residential and institutional zones.

- 3. Do I need a landscape buffer or setback of the laneway from the cemetery lands? Response: As per previous question and Table 187 of the applicable <u>zoning (GM12)</u>, a landscape buffer of 3m is required abutting an institutional zone. Regarding setbacks, the interior lot line setback would not apply from the lot line to the laneway but from the proposed townhomes as follows:
 - (d) Minimum interior side yard setbacks
 - (iii) For a residential use building
 - 1. For a building equal or lower than 11m in height = 1.2m
 - 2. For a building higher than 11m in height = 3m

APPENDIX B

Water Distribution Model

Boundary Conditions 3100 Leitrim Road

Provided Information

	Demand	
Scenario	L/min	L/s
Average Daily Demand	26.4	0.44
Maximum Daily Demand	66	1.1
Peak Hour	145.2	2.42
Fire Flow Demand # 1	10000	166.7
Fire Flow Demand # 2	12000	200

Location



Results – Existing Conditions (Pressure Zone 3SW)

Connection 1 – Barrett Farm Drive West

Domand Saanaria	Head	Brocourci (noi)
Demand Scenario	(m)	Pressure (psi)
Maximum HGL	154.6	76.5
Peak Hour	144.7	62.4
Max Day plus Fire #1	122.2	30.4
Max Day plus Fire #2	118.3	24.8

¹ Ground Elevation = 100.8 m
Connection 2 – Barrett Farm Drive East

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	154.6	72.7
Peak Hour	144.7	58.6
Max Day plus Fire #1	124.5	29.8
Max Day plus Fire #2	121.5	25.6

¹ Ground Elevation = 103.49 m

Results – Future Conditions (Pressure Zone SUC)

Connection 1 – Barrett Farm Drive West

Demand Secondria	Head	
Demand Scenario	(m)	Pressure [®] (psi)
Maximum HGL	147.5	66.4
Peak Hour	145.9	64.0
Max Day plus Fire #1	138.2	53.2
Max Day plus Fire #2	135.1	48.8

¹ Ground Elevation = 100.8 m

Connection 2 – Barrett Farm Drive East

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	147.5	62.6
Peak Hour	145.8	60.1
Max Day plus Fire #1	140.5	52.6
Max Day plus Fire #2	138.3	49.4

¹ Ground Elevation = 103.49 m

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

	IBI GROUP		WATERMAIN DEMAND CALCULATION SHEET		
IBI	333 PRESTON STREET			FILE:	135925
GROUP	OTTAWA, ON	PROJECT :	BLOCK 178	DATE PRINTED:	22-Nov-22
	K1S 5N4	LOCATION :	CITY OF OTTAWA	DESIGN:	AC
		DEVELOPER :	TAGGART	PAGE :	1 OF 1

		RESIDENTIAL			NON-RESIDENTIAL AVERAGE DAILY			MAXIMUM DAILY			MAXIMUM HOURLY			FIRE			
NODE		UNITS			INDTRL	COMM.	INST.] <u> </u>	DEMAND (l/s)		D	EMAND (I	/s)		DEMAND (I/s)		
NODE	SF SD & TH OTHER		POP'N	(ha.)	(ha.)	(ha.)	Res.	Non-res.	Total	Res.	Non-res.	Total	Res.	Non-res.	Total	(l/min)	
Findlay Creek																	
J20		13		35				0.11	0.00	0.11	0.28	0.00	0.28	0.63	0.00	0.63	
J26		10		27				0.09	0.00	0.09	0.22	0.00	0.22	0.48	0.00	0.48	
J16		8		22				0.07	0.00	0.07	0.18	0.00	0.18	0.39	0.00	0.39	
J18		8		22				0.07	0.00	0.07	0.18	0.00	0.18	0.39	0.00	0.39	
J22		7		19				0.06	0.00	0.06	0.15	0.00	0.15	0.34	0.00	0.34	
J24		4		11				0.04	0.00	0.04	0.09	0.00	0.09	0.19	0.00	0.19	
TOTALS		50		135						0.44			1.10			2.42	

		ASSUMPTIONS			
RESIDENTIAL DENSITIES	AV	/G. DAILY DEMAND		MAX. HOURLY DEMAND	
- Single Family (SF)	<u>3.4</u> p/p/u -R	Residential	<u>280</u> I / cap / day	- Residential	<u>1,540</u> I / cap / day
	- 10	CI	<u>50,000</u> I / ha / day	- ICI	<u>135,000</u> I / ha / day
- Semi Detached (SD) & Townhouse (TH)	<u>2.7</u> p/p/u				
				FIRE FLOW	
- Apartment (APT)	<u>1.8</u> p/p/u M4	AX. DAILY DEMAND		- SF, SD, TH & ST	<u>10,000</u> I / min
	- R	Residential	700 I / cap / day		l / min
-Other	<u>66</u> u/p/ha -l0	CI	<u>75,000</u> I / ha / day	- ICI	<u>13,000</u> I / min





	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	J16	0.18	102.20	154.60	513.48	0.00
2	J18	0.18	102.32	154.60	512.30	0.00
3	J20	0.28	102.60	154.60	509.56	0.00
4	J22	0.15	102.60	154.60	509.56	0.00
5	J24	0.09	102.60	154.60	509.56	0.00
6	J26	0.22	102.60	154.60	509.56	0.00
7	J28	0.00	101.41	154.60	521.22	0.00
8	S11-515	0.00	100.80	154.60	527.20	0.00
9	S11-520	0.00	102.80	154.60	507.60	0.00

Date: Thursday, February 09, 2023, Time: 16:50:41, Page 1



	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	J16	0.39	102.20	144.70	416.46	0.00
2	J18	0.39	102.32	144.70	415.29	0.00
3	J20	0.63	102.60	144.70	412.54	0.00
4	J22	0.40	102.60	144.70	412.54	0.00
5	J24	0.19	102.60	144.70	412.55	0.00
6	J26	0.48	102.60	144.70	412.54	0.00
7	J28	0.00	101.41	144.70	424.21	0.00
8	S11-515	0.00	100.80	144.70	430.18	0.00
9	S11-520	0.00	102.80	144.70	410.59	0.00

Date: Thursday, February 09, 2023, Time: 16:53:54, Page 1

Peak Hour HGL - Pipe Report

	ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)	Status	Flow Reversal Count	Water Age (hrs)
1	P117	RES9000	S11-515	17.33	204.00	110.00	0.89	0.03	0.00	0.01	Open	0	0.00
2	P119	S11-515	J20	23.92	250.00	110.00	0.89	0.02	0.00	0.00	Open	0	0.00
3	P121	J16	J18	31.72	250.00	110.00	-0.29	0.01	0.00	0.00	Open	0	0.00
4	P123	J18	J22	35.97	250.00	110.00	-0.42	0.01	0.00	0.00	Open	0	0.00
5	P125	J16	J24	54.00	204.00	110.00	-0.33	0.01	0.00	0.00	Open	0	0.00
6	P127	J20	J26	72.93	250.00	110.00	0.26	0.01	0.00	0.00	Open	0	0.00
7	P129	J22	S11-520	35.69	250.00	110.00	-0.82	0.02	0.00	0.00	Open	0	0.00
8	P131	J24	J18	69.58	204.00	110.00	0.26	0.01	0.00	0.00	Open	0	0.00
9	P133	J26	J16	34.42	250.00	110.00	-0.22	0.00	0.00	0.00	Open	0	0.00
10	P135	S11-520	RES9002	13.77	204.00	110.00	-0.82	0.02	0.00	0.01	Open	0	0.00
11	P139	J24	J28	17.48	204.00	110.00	-0.78	0.02	0.00	0.01	Open	0	0.00
12	P141	J28	RES9004	7.28	204.00	110.00	-0.78	0.02	0.00	0.01	Open	0	0.00



Max Day + Fire HGL - Fireflow Design Report

	ID	Total Demand (L/s)	Hydrant Available Flow (L/s)	Critical Node ID for Design Run	Critical Node Pressure at Available Flow (kPa)	Critical Node Pressure at Fire Demand (kPa)	Critical Pressure for Design Run (kPa)	Hydrant Design Flow (L/s)	Hydrant Pressure at Design Flow (kPa)
1	J16	200.18	279.13	J16	139.96	152.12	139.96	279.13	139.96
2	J18	200.18	293.45	J18	139.96	153.75	139.96	293.45	139.96
3	J20	200.28	189.61	J20	139.96	138.09	139.96	189.61	139.96
4	J22	200.15	278.89	J22	139.96	151.72	139.96	278.89	139.96
5	J24	200.09	249.11	J24	139.96	146.51	139.96	249.12	139.96
6	J26	200.22	204.66	J26	139.96	140.78	139.96	204.66	139.96
7	S11-515	200.00	302.12	J20	128.63	144.38	139.96	232.63	153.29
8	S11-520	200.00	329.30	S11-520	139.96	155.88	139.96	329.30	139.96

SUC ZONE RECONFIGURATION - BASIC DAY (MAX HGL) PRESSURES



SUC Zone Reconfiguration - Basic Day (MAX HGL) Pressure

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	J16	0.07	102.20	147.50	443.90	0.00
2	J18	0.07	102.32	147.50	442.73	0.00
3	J20	0.11	102.60	147.50	439.98	0.00
4	J22	0.06	102.60	147.50	439.98	0.00
5	J24	0.04	102.60	147.50	439.98	0.00
6	J26	0.09	102.60	147.50	439.98	0.00
7	S11-515	0.00	101.40	147.50	451.74	0.00
8	S11-520	0.00	102.80	147.50	438.02	0.00



	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	J16	0.39	102.20	145.80	427.23	0.00
2	J18	0.39	102.32	145.80	426.06	0.00
3	J20	0.63	102.60	145.80	423.32	0.00
4	J22	0.40	102.60	145.80	423.32	0.00
5	J24	0.19	102.60	145.80	423.32	0.00
6	J26	0.48	102.60	145.80	423.32	0.00
7	S11-515	0.00	101.40	145.80	435.08	0.00
8	S11-520	0.00	102.80	145.80	421.36	0.00

Peak Hour HGL - Pipe Report

	ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)	Status	Flow Reversal Count	Water Age (hrs)
1	P117	RES9000	S11-515	7.01	204.00	110.00	1.27	0.04	0.00	0.02	Open	0	0.00
2	P119	S11-515	J20	34.25	204.00	110.00	1.27	0.04	0.00	0.02	Open	0	0.00
3	P121	J16	J18	31.72	204.00	110.00	-0.24	0.01	0.00	0.00	Open	0	0.00
4	P123	J18	J22	35.97	204.00	110.00	-0.81	0.02	0.00	0.01	Open	0	0.00
5	P125	J16	J24	54.11	204.00	110.00	0.01	0.00	0.00	0.00	Open	0	0.00
6	P127	J20	J26	72.93	204.00	110.00	0.64	0.02	0.00	0.00	Open	0	0.00
7	P129	J22	S11-520	40.51	204.00	110.00	-1.21	0.04	0.00	0.02	Open	0	0.00
8	P131	J24	J18	58.07	204.00	110.00	-0.18	0.01	0.00	0.00	Open	0	0.00
9	P133	J26	J16	34.42	204.00	110.00	0.16	0.01	0.00	0.00	Open	0	0.00
10	P135	S11-520	RES9002	10.06	204.00	110.00	-1.21	0.04	0.00	0.02	Open	0	0.00





SUC ZONE RECONFIGURATION - Max Day + Fire HGL - Fireflow Design Report

	ID	Total Demand (L/s)	Hydrant Available Flow (L/s)	Critical Node ID for Design Run	Critical Node Pressure at Available Flow (kPa)	Critical Node Pressure at Fire Demand (kPa)	Critical Pressure for Design Run (kPa)	Hydrant Design Flow (L/s)	Hydrant Pressure at Design Flow (kPa)
1	J16	200.18	300.52	J16	139.96	216.65	139.96	300.52	139.96
2	J18	200.18	308.02	J18	139.96	219.43	139.96	308.02	139.96
3	J20	200.28	368.62	J20	139.96	231.95	139.96	368.62	139.97
4	J22	200.15	354.66	J22	139.96	233.82	139.96	354.66	139.96
5	J24	200.09	249.51	J24	139.96	187.41	139.96	249.51	139.96
6	J26	200.22	290.94	J26	139.96	209.69	139.96	290.94	139.96
7	S11-515	200.00	803.38	J20	150.93	265.49	139.96	803.38	139.96
8	S11-520	200.00	682.46	J22	163.39	270.46	139.96	682.46	139.96

Anton Chetrar

From:	Cassidy, Tyler <tyler.cassidy@ottawa.ca></tyler.cassidy@ottawa.ca>
Sent:	Thursday, February 9, 2023 10:08 AM
To:	Anton Chetrar
Cc:	Ryan Magladry
Subject:	RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration
Follow Up Flag:	Follow up
Flag Status:	Completed

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Hi Anton,

We have discussed the possible water servicing scenarios in length and I've reviewed the various scenarios with our Water Resources team. Considering there are no other water demands or junctions on the City network between your connection points the HGL will remain constant within the watermain on Barrett Farm. In the interest of time, please feel free to extrapolate the various demand pressure(s) for the third connection, taking into account the road grade of Barrett Farm. Please note you can attach this email with the latest boundary conditions to the servicing report for confirmation. I will maintain ownership of this file.

If you do not wish to do that, I can submit a request for another set of boundary conditions, however it will trigger another 10 business day period to obtain the results. Please let me know how you wish to proceed.

Thank you,

Tyler Cassidy, P.Eng Infrastructure Project Manager, Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique - South Branch City of Ottawa | Ville d'Ottawa 110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1 613.580.2424 ext./poste 12977, <u>Tyler.Cassidy@ottawa.ca</u>

From: Anton Chetrar <Anton.Chetrar@ibigroup.com>
Sent: February 09, 2023 9:29 AM
To: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Cc: Ryan Magladry <rmagladry@ibigroup.com>
Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Tyler,

Understood. Just wanted to confirm that we should be expecting new boundary conditions to include the 3rd connection.

Please let us know.

Thanks, Anton Chetrar | P.ENG. Cell 613-882-8197

Suite 500, 333 Preston Street Ottawa ON K1S 5N4 Canada tel +1 613 225 1311 ext 64072

IBI Group is now proudly a part of Arcadis

NOTE: This email message/attachments may contain privileged and confidential information. If received in error, please notify the sender and delete this e-mail message NOTE: Ce courriel peut contenir de l'information privilégiée et confidentielle. Si vous avez recu ce message par erreur, veuillez le mentionner immédiatement à l'expéditeur et effacer ce courriel

From: Cassidy, Tyler <tyler.cassidy@ottawa.ca> Sent: Wednesday, February 8, 2023 4:01 PM To: Anton Chetrar <anton.chetrar@ibigroup.com> Cc: Ryan Magladry <rmagladry@ibigroup.com> Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Hi Anton,

Thank you for investigating these options and coordinating with the City beforehand. It certainly makes the review process more straightforward on our end once the submission comes in. Unfortunately, the residual pressure(s) during max day + fire flow need to be above 20 psi at every point in the distribution system. It appears as if the third connection is indeed necessary to meet this condition under the existing pressure configuration. Please finalize your water network with a design that satisfies that criteria.

Thank you,

Tyler Cassidy, P.Eng Infrastructure Project Manager, Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique - South Branch City of Ottawa | Ville d'Ottawa 110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1 613.580.2424 ext./poste 12977, Tyler.Cassidy@ottawa.ca

From: Anton Chetrar < Anton. Chetrar@ibigroup.com> Sent: February 06, 2023 4:24 PM To: Cassidy, Tyler <tyler.cassidy@ottawa.ca> Cc: Ryan Magladry <rmagladry@ibigroup.com> Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Tyler,

Below are the results of the water model using the updated boundary conditions. A 250mm watermain outside loop meets the residual pressures at all locations except for one. Also noticed that on the provided Boundary Conditions, Connection 1 is located further West of the proposed connection to Block 178.

Please let us know if the results using a 250mm watermain outside loop are acceptable.



Thanks, Anton Chetrar | P.ENG. Cell 613-882-8197

Suite 500, 333 Preston Street Ottawa ON K1S 5N4 Canada tel +1 613 225 1311 ext 64072 IBI Group is now proudly a part of Arcadis.

NOTE: This email message/attachments may contain privileged and confidential information. If received in error, please notify the sender and delete this e-mail message. NOTE: Ce courriel peut contenir de l'information privilégiée et confidentielle. Si vous avez recu ce message par erreur, veuillez le mentionner immédiatement à l'expéditeur et effacer ce courriel.

From: Cassidy, Tyler <<u>tyler.cassidy@ottawa.ca</u>>
Sent: Friday, February 3, 2023 2:14 PM
To: Anton Chetrar <<u>anton.chetrar@ibigroup.com</u>>
Cc: Ryan Magladry <<u>rmagladry@ibigroup.com</u>>
Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. *** Hi Anton,

Please find attached the Boundary Conditions for the proposed development at 3100 Leitrim Drive. Note that the City's water model has been updated between your first boundary condition request and this one. Please review your proposed water network with the latest boundary conditions – it appears as if a 3rd connection is not necessary, and it may be possible to revert to the 200 mm dia. watermain design, please confirm.

Thank you,

Tyler Cassidy, P.Eng Infrastructure Project Manager, Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique - South Branch City of Ottawa | Ville d'Ottawa 110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1 613.580.2424 ext./poste 12977, Tyler.Cassidy@ottawa.ca

From: Cassidy, Tyler
Sent: January 25, 2023 3:21 PM
To: Anton Chetrar <<u>Anton.Chetrar@ibigroup.com</u>>
Cc: Ryan Magladry <<u>rmagladry@ibigroup.com</u>>
Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

Hi Anton,

I've submitted your request for Boundary Conditions to the Water Resources group. Please allow for up to 10 business days for them to return the results.

Thank you,

Tyler Cassidy, P.Eng Infrastructure Project Manager, Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique - South Branch City of Ottawa | Ville d'Ottawa 110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1 613.580.2424 ext./poste 12977, <u>Tyler.Cassidy@ottawa.ca</u>

From: Anton Chetrar <<u>Anton.Chetrar@ibigroup.com</u>> Sent: January 25, 2023 7:39 AM To: Cassidy, Tyler <<u>tyler.cassidy@ottawa.ca</u>> Cc: Ryan Magladry <<u>rmagladry@ibigroup.com</u>> Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Good morning Tyler,

Thanks for looking into this option.

We can confirm that we have no objections to the proposal below, and would like to proceed with requesting the new boundary conditions with an additional connection as per attached markup.

As well attached the water demands and FUS calculations:

- Daily average demand 0.44 l/s
- Maximum daily demand 1.10 l/s
- Maximum hourly demand 2.42 l/s

Based on the attached calculations, the Fire Flow Demand remains as was previously submitted - 12,000 L/min or 200 L/s

Please let us know if you need anything else from us.

Regards, Anton Chetrar | P.ENG. Cell 613-882-8197

Suite 500, 333 Preston Street Ottawa ON K1S 5N4 Canada tel +1 613 225 1311 ext 64072

IBI Group is now proudly a part of Arcadis.

NOTE: This email message/attachments may contain privileged and confidential information. If received in error, please notify the sender and delete this e-mail message. NOTE: Ce courriel peut contenir de l'information privilégiée et confidentielle. Si vous avez recu ce message par erreur, veuillez le mentionner immédiatement à l'expéditeur et effacer ce courriel.

From: Cassidy, Tyler <<u>tyler.cassidy@ottawa.ca</u>>
Sent: Tuesday, January 24, 2023 12:39 PM
To: Anton Chetrar <<u>anton.chetrar@ibigroup.com</u>>
Cc: Ryan Magladry <<u>rmagladry@ibigroup.com</u>>
Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. *** Hi Anton,

Thank you for your patience on this issue as I was getting back to you.

I can confirm the City will support your proposal in this situation to upsize parts of the private watermain network to a 250 mm dia. main and adding a third connection to Barrett Farm Drive. Please note that upsizing to a 250mm dia. does

go against Technical Bulletin ISTB-2014-02, however we do not feel it is fair to hold up development based on a reconfiguration project that has been delayed several times when you have offered a working solution.

One option we would like to keep open is the possibility of reverting the design back to the 200mm dia. main in the event the pressure zone reconfiguration goes ahead of schedule. I'm proposing we add a condition to the DAR that prior to commence work, your consultancy confirms with the City that the pressure zone reconfiguration has not gone ahead and there is still a need to implement the design with the 250mm dia. loop. We will issue the CWN with the drawings for whichever design is suitable at that moment in time.

Please confirm the above, and then you can proceed with requesting new boundary conditions for your design.

Thank you,

Tyler Cassidy, P.Eng Infrastructure Project Manager, Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique - South Branch City of Ottawa | Ville d'Ottawa 110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1 613.580.2424 ext./poste 12977, <u>Tyler.Cassidy@ottawa.ca</u>

From: Anton Chetrar <<u>Anton.Chetrar@ibigroup.com</u>>
Sent: January 19, 2023 9:59 AM
To: Cassidy, Tyler <<u>tyler.cassidy@ottawa.ca</u>>
Cc: Ryan Magladry <<u>rmagladry@ibigroup.com</u>>
Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Good morning Tyler,

We have taken another look at our water model for this site plan and explored a few other options in order to meet the minimum required residual pressures under the existing conditions.

The option of increasing the watermain size on the outside loop to 250mm and adding an additional connection at Barrett Farm Drive (shown on the attached) seems to work best at giving us the minimum residual pressures. To perform these calculations we interpolated the two existing boundary conditions to obtain an elevation at the proposed 3rd connection.

Let us know if increasing the watermain size to 250mm and adding an additional connection at Barrett Farm Drive is an option the city water group would entertain. If so we would like to go ahead and request updated water boundary conditions.



Please have a look and let us know if any questions/concerns.

Thanks, Anton Chetrar | P.ENG. Cell 613-882-8197

Suite 500, 333 Preston Street Ottawa ON K1S 5N4 Canada tel +1 613 225 1311 ext 64072

IBI Group is now proudly a part of Arcadis.

NOTE: This email message/attachments may contain privileged and confidential information. If received in error, please notify the sender and delete this e-mail message. NOTE: Ce courriel peut contenir de l'information privilégiée et confidentielle. Si vous avez recu ce message par erreur, veuillez le mentionner immédiatement à l'expéditeur et effacer ce courriel.

From: Cassidy, Tyler <<u>tyler.cassidy@ottawa.ca</u>>
Sent: Thursday, January 12, 2023 12:07 PM
To: Anton Chetrar <<u>anton.chetrar@ibigroup.com</u>>
Cc: Ryan Magladry <<u>rmagladry@ibigroup.com</u>>
Subject: RE: Barrett Lands Phase 3 (Block 178) - SUZ Zone Reconfiguration

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. *** Hi Anton,

The City Project Manager for the SUC Zone Reconfiguration in the Leitrim area is Fraser Smith (<u>Fraser.Smith@Ottawa.ca</u>). He will be the best contact for further information into the project. I have inquired with a

APPENDIX C

Sanitary Sewer Design Sheet 135925-400 - Sanitary Drainage Plan Barrett Lands Phase 3 Sanitary Design Sheet Barrett Lands Phase 3 Sanitary Drainage Area Plan



IBI GROUP 400-333 Preston Street Ottawa, Ontario K1S SN4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com

	1.00							RESIDE	INTIAL								ICI A	REAS			INFILT	RATION ALL	OWANCE			TOTAL			PROPO	SED SEWER	DESIGN		
	LUCA	ATION		AREA		UNIT TY	PES		AREA	POPU	LATION	RES	PEAK			ARE	A (Ha)		ICI	PEAK	AR	EA (Ha)	FLOW	FINED F		FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAIL	ABLE
STREET		FROM	TO	w/ Units	05	CD	T 11	ADT	w/o Units	IND	CUM	PEAK	FLOW	INSTITUTIO	ONAL	COMN	IERCIAL	INDUSTRIAL	PEA	K FLOW	IND	CUM	(1.1-)	IND	CUM	(1. (-)	(1.10)	()	((0/)	(full)	CAP	ACITY
SIREEI	AREA ID	MH	MH	(Ha)	ъг	50	10	APT	(Ha)	IND	COW	FACTOR	(L/s)	IND	CUM	IND	CUM	IND CU	M FACT	OR (L/s)	IND	COM	(L/S)	IND	COM	(L/S)	(L/S)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Private Lane No.1	S2A	MH1A	MH2A	0.07			4			9.6	9.6	3.73	0.12		0.00		0.00	0.0	0 1.00	0.00	0.07	0.07	0.02		0.00	0.14	27.59	23.07	200	0.65	0.851	27.45	99.50%
Private Lane No.1	FUTCOM	1 Blkhd	MH2A	0.00						0.0	0.0	3.80	0.00		0.00	0.16	0.16	0.0	0 1.50	0.08	0.16	0.16	0.05		0.00	0.13	27.59	8.12	200	0.65	0.851	27.46	99.53%
Private Lane No.1		MH2A	MH3A							0.0	9.6	3.73	0.12		0.00		0.16	0.0	0 1.50	0.08	0.00	0.07	0.02		0.00	0.22	27.59	8.12	200	0.65	0.851	27.37	99.21%
Private Lane No.1		MH3A	MH4A						0.04	2.4	12.0	3.73	0.14		0.00		0.16	0.0	0 1.50	0.08	0.04	0.11	0.04		0.00	0.26	27.59	31.08	200	0.65	0.851	27.33	99.06%
Private Lane No. 2	S4A-2	MH21A	MH4A	0.15			9			21.6	21.6	3.70	0.26		0.00		0.00	0.0	0 1.00	0.00	0.15	0.15	0.05		0.00	0.31	27.59	39.00	200	0.65	0.851	27.28	98.88%
Private Lane No. 2	S5A-2	MH20A	MH5A	0.24			14			33.6	33.6	3.68	0.40		0.00		0.00	0.0	0 1.00	0.00	0.24	0.24	0.08		0.00	0.48	27.59	64.92	200	0.65	0.851	27.11	98.26%
Private Lane No.1	S5A-1	MH4A	MH5A						0.03	1.8	35.4	3.67	0.42		0.00		0.16	0.0	0 1.50	0.08	0.03	0.29	0.10		0.00	0.59	27.59	35.42	200	0.65	0.851	26.99	97.84%
Private Lane No.1	S6A	MH5A	MH6A						0.03	1.8	70.8	3.63	0.83		0.00		0.16	0.0	0 1.50	0.08	0.03	0.56	0.18		0.00	1.09	27.59	29.87	200	0.65	0.851	26.49	96.03%
Private Lane No.1	S7A	MH6A	MH7A	0.03						0.0	70.8	3.63	0.83		0.00		0.16	0.0	0 1.50	0.08	0.03	0.59	0.19		0.00	1.10	27.59	8.35	200	0.65	0.851	26.48	96.00%
Private Lane No.1	S8A	MH7A	MH8A	0.39			20			48.0	118.8	3.58	1.38		0.00		0.16	0.0	0 1.00	0.05	0.39	0.98	0.32		0.00	1.75	27.59	70.91	200	0.65	0.851	25.83	93.65%
Private Lane No.1	S9A	MH8A	MH9A	0.09			2			4.8	123.6	3.57	1.43		0.00		0.16	0.0	0 1.00	0.05	0.09	1.07	0.35		0.00	1.84	27.59	9.53	200	0.65	0.851	25.75	93.34%
Private Lane No.1	S10A	MH9A	MH10A	0.05			1			2.4	126.0	3.57	1.46		0.00		0.16	0.0	0 1.00	0.05	0.05	1.12	0.37		0.00	1.88	27.59	10.79	200	0.65	0.851	25.71	93.19%
																																	<u> </u>
Block 178	11418A	MH10A	MH11305A							0.0	126.0	3.57	1.46		0.00		0.16	0.0	0 1.00	0.05	0.00	1.12	0.37		0.00	1.88	20.24	16.00	200	0.35	0.624	18.36	90.71%
																																	<u> </u>
																															''		L
Design Parameters:				Notes:								Designed		AC			NO.						Revision								Date		
				1. Mannings	s coefficient (n)	=		0.013									1.					Submission	No. 1 for City	Review							2022-05-09		
Residential		ICI Areas		2. Demand	(per capita):		280	L/day	200	L/day							2.					Submission	No. 2 for City	Review							2022-11-11		
SF 3.2 p/p/u				3. Infiltration	n allowance:		0.33	L/s/Ha				Checked:		RM																			
TH/SD 2.4 p/p/u	INST 2	8,000 L/Ha/day		4. Residenti	al Peaking Fac	tor:																											
APT 1.9 p/p/u	COM 2	8,000 L/Ha/day			Harmon Forn	1 = 1 + (12)	1/(4+(P/10	000)^0.5))0.	8																								
Other 60 p/p/Ha	IND 3	5,000 L/Ha/day	MOE Chart		where K = 0.8	Correction	⊢actor					Dwg. Refe	erence:	135925 - 400																			
	1	7000 L/Ha/day		Commerc	ial and Instituti	onal Peak F	actors ba	sed on tota	l area,			1					F	le Reference:						Date:							Sheet No:		
				1.5 if gr	eater than 20%	o, otherwise	1.0											135925.00						2022-05-09	9						1 of 1		

SANITARY SEWER DESIGN SHEET

Barrett Lands Block 178 CITY OF OTTAWA Barrett Co-Tenancy







IBI GROUP 400-333 Preston Street Ottawa, Ontario K1S SN4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com

	1004710			RESIDENTIAL ICI AREAS INFILTRATION ALLOWANCE EVED EI OW							TOTAL			PROPC	SED SEWER	DESIGN																		
	LOCATIC	DN .		AREA		UNIT	TYPES		AREA	POPU	LATION	RES	PEAK			AREA (H	Ha)			ICI	PEAK	ARE	A (Ha)	FLOW	FIXED F	LOW (L/s)	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVA	ILABLE
070557		FROM	то	w/ Units	05	0.0		4.07	w/o Units		01114	PEAK	FLOW	INSTIT	UTIONAL	COMMER	CIAL	INDUST	RIAL	PEAK	FLOW		0.00	<i>a i</i> ->		0.00	<i>a i</i> ->	<i>a i</i> ->	()	((0/)	(full)	CAF	ACITY
SIREEI	AREA ID	MH	мн	(Ha)	SF	SD	тн	APT	(Ha)	IND	COM	FACTOR	(L/s)	IND	CUM	IND	CUM	IND	CUM	FACTOR	(L/s)	IND	COM	(L/s)	IND	COM	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
	1																																	
Barrett Farm Drive	11305B	MH11306A	MH11305A	0.32						0.0	0.0	3.80	0.00		0.00	4.01	4.01		0.00	1.50	1.95	4.33	4.33	1.43		0.00	3.38	26.50	56.11	200	0.60	0.817	23.13	87.25%
Block 178	11418A	BLK11305AS	MH11305A	1.28				84		159.6	159.6	3.55	1.83		0.00		0.00		0.00	1.00	0.00	1.28	1.28	0.42		0.00	2.26	20.24	16.00	200	0.35	0.624	17.99	88.85%
Barrett Farm Drive	11304A	MH11305A	MH11304A	0.31			4			9.6	169.2	3.54	1.94		0.00		4.01		0.00	1.50	1.95	0.31	5.92	1.95		0.00	5.84	20.24	29.81	200	0.35	0.624	14.40	71.13%
Barrett Farm Drive	11330A	MH11304A	MH11303A	0.26			6			14.4	183.6	3.53	2.10		0.00		4.01		0.00	1.50	1.95	0.26	6.18	2.04		0.00	6.09	20.24	51.17	200	0.35	0.624	14.15	69.92%
Bouvardia Crescent	11334A	MH11316A	MH11334A	0.09	1					3.2	3.2	3.76	0.04		0.00		0.00		0.00	1.00	0.00	0.09	0.09	0.03		0.00	0.07	37.64	12.36	200	1.21	1.161	37.57	99.82%
Block 120 (City Yard)	COM2	BLK11120A	MH11334A	0.00						0.0	0.0	3.80	0.00		0.00	2.02	2.02		0.00	1.50	0.98	2.02	2.02	0.67		0.00	1.65	32.10	50.00	200	0.88	0.990	30.45	94.86%
Bouvardia Crescent	11333A	MH11334A	MH11333A	0.29	4					12.8	16.0	3.71	0.19		0.00		0.00		0.00	1.00	0.00	0.29	0.38	0.13		0.00	0.32	30.60	59.23	200	0.80	0.944	30.29	98.96%
Bouvardia Crescent	11332A	MH11333A	MH11332A	0.54	12					38.4	54.4	3.65	0.64		0.00		2.02		0.00	1.00	0.65	0.54	2.65	0.87		0.00	2.17	39.76	76.44	200	1.35	1.226	37.58	94.54%
Bouvardia Crescent	11331A	MH11332A	MH11331A	0.12	2					6.4	60.8	3.64	0.72		0.00		2.02		0.00	1.00	0.65	0.12	2.77	0.91		0.00	2.29	39.76	17.13	200	1.35	1.226	37.47	94.25%
Bouvardia Crescent	11303A	MH11331A	MH11303A	0.09	1					3.2	64.0	3.63	0.75		0.00		2.02		0.00	1.50	0.98	0.09	2.86	0.94		0.00	2.68	54.96	27.28	200	2.58	1.695	52.28	95.12%
Delphinium Crescent	11/084	MH11408A	MH11407A	0.15	2					6.4	6.4	3 75	0.08		0.00		0.00		0.00	1.00	0.00	0.15	0.15	0.05		0.00	0.13	43.28	20.00	200	1.60	1 335	43 15	00 71%
Delphinium Crescent	11400A	MH11400A	MH11406A	0.15	5					16.0	22.4	3.70	0.00		0.00		0.00		0.00	1.00	0.00	0.15	0.13	0.05		0.00	0.13	43.28	29.00	200	1.00	1.335	43.13	99.04%
Delphinium Crescent	11407A	MH11406A	MH11405A	0.23	7					22.4	44.8	3.66	0.27		0.00		0.00		0.00	1.00	0.00	0.23	0.44	0.15		0.00	0.41	43.28	44.63	200	1.00	1.335	42.07	93.04%
Delphinium Crescent	11405A	MH11405A	MH11404A	0.00	1					32	48.0	3.65	0.57		0.00		0.00		0.00	1.00	0.00	0.00	0.88	0.29		0.00	0.86	43.28	9.12	200	1.60	1.335	42.00	98.02%
Delphinium oreseent	11400/1	WIITT 400/	10111140473	0.11						0.2	40.0	0.00	0.01		0.00		0.00		0.00	1.00	0.00	0.11	0.00	0.20		0.00	0.00	40.20	0.12	200	1.00	1.000	72.72	30.0270
Delphinium Crescent	11404A	MH11404A	MH11403A	0.38	6					19.2	67.2	3.63	0.79		0.00		0.00		0.00	1.00	0.00	0.38	1.26	0.42		0.00	1 21	32.46	71.55	200	0.90	1 001	31.25	96.28%
Bolphinian oroconic	1110 // (0.00	Ű					10.2	07.2	0.00	0.70		0.00		0.00		0.00	1.00	0.00	0.00	1.20	0.12		0.00		02.10	11.00	200	0.00	1.001	01.20	00.2070
Nemesia Way	11350A	MH11351A	MH11350A	0.38	7					22.4	22.4	3.70	0.27		0.00		0.00		0.00	1.00	0.00	0.38	0.38	0.13		0.00	0.39	27.59	48.50	200	0.65	0.851	27.19	98.57%
Nemesia Way	11403A	MH11350A	MH11403A	0.46	10					32.0	54.4	3.65	0.64		0.00		0.00		0.00	1.00	0.00	0.46	0.84	0.28		0.00	0.92	27.59	62.94	200	0.65	0.851	26.67	96.67%
· · · · ·																																		
Block 124 (Cemetery)	CEM, 11352A	BLK11352A	MH11403A	0.00						0.0	0.0	3.80	0.00		0.00	0.00	0.00		0.00	1.00	0.00	0.00	0.00	0.00		0.00	0.00	27.59	42.00	200	0.65	0.851	27.59	100.00%
Delphinium Crescent	11402A	MH11403A	MH11402A	0.41	6					19.2	140.8	3.56	1.62		0.00		0.00		0.00	1.00	0.00	0.41	2.51	0.83		0.00	2.45	20.24	71.56	200	0.35	0.624	17.79	87.88%
Delphinium Crescent	11401A	MH11402A	MH11401A	0.13	1					3.2	144.0	3.56	1.66		0.00		0.00		0.00	1.00	0.00	0.13	2.64	0.87		0.00	2.53	20.24	9.12	200	0.35	0.624	17.71	87.50%
Delphinium Crescent	11400A	MH11401A	MH11400A	0.60	13					41.6	185.6	3.53	2.12		0.00		0.00		0.00	1.00	0.00	0.60	3.24	1.07		0.00	3.19	20.24	79.50	200	0.35	0.624	17.05	84.24%
Delphinium Crescent	11300A	MH11400A	MH11300A	0.24	4					12.8	198.4	3.52	2.26		0.00		0.00		0.00	1.00	0.00	0.24	3.48	1.15		0.00	3.41	20.24	64.94	200	0.35	0.624	16.83	83.15%
																																		_
Barrett Farm Drive	11302A	MH11303A	MH11302A	0.53	9					28.8	276.4	3.47	3.11		0.00		6.03		0.00	1.50	2.93	0.53	10.34	3.41		0.00	9.46	26.50	81.49	200	0.60	0.817	17.05	64.32%
Barrett Farm Drive	11301A	MH11302A	MH11301A	0.19	3					9.6	286.0	3.47	3.22		0.00		6.03		0.00	1.50	2.93	0.19	10.53	3.47		0.00	9.62	32.46	27.85	200	0.90	1.001	22.84	70.36%
0.00											10.0	0.05																10.50			0.10	1 500	10 20	
Solidago Mews	11322A	MH11323A	MH11322A	0.86	15					48.0	48.0	3.65	0.57		0.00		0.00		0.00	1.00	0.00	0.86	0.86	0.28		0.00	0.85	49.58	101.40	200	2.10	1.529	48.73	98.28%
Solidago Mews	11321A	MH11322A	MH11321A	0.10	1					3.2	51.2	3.65	0.61		0.00		0.00		0.00	1.00	0.00	0.10	0.96	0.32		0.00	0.92	41.91	8.88	200	1.50	1.292	40.98	97.80%
Solidago Mews	11320A	MH I 132 IA	MITTISUTA	0.34	0					19.2	70.4	3.03	0.65		0.00		0.00		0.00	1.00	0.00	0.34	1.30	0.43		0.00	1.20	42.60	80.27	200	1.55	1.314	41.34	97.05%
Barrett Farm Drive	112010	MH11301A	MH11300A	0.34	5					16.0	372.4	3 /3	4 14		0.00		6.03		0.00	1 50	2.03	0.34	12 17	4.02		0.00	11.00	26.50	78.01	200	0.60	0.817	15.42	58 17%
Ballett Fallit Dilve	TIZUTA	MITTIOTA	WHITISUUA	0.34	5					10.0	312.4	3.43	4.14		0.00		0.03		0.00	1.50	2.93	0.34	12.17	4.02		0.00	11.09	20.50	76.01	200	0.00	0.017	10.42	30.17 %
Bouwardia Crescent	113154	MH11316A	MH11315A	0.14	1					3.2	3.2	3.76	0.04		0.00		0.00		0.00	1.00	0.00	0.14	0.14	0.05		0.00	0.00	38.26	0.28	200	1.25	1 180	38 17	00 78%
Bouvardia Crescent	11314A	MH11315A	MH11314A	0.14	17					54.4	57.6	3.64	0.68		0.00		0.00		0.00	1.00	0.00	0.14	0.14	0.03		0.00	0.03	53.01	91.45	200	2.40	1.100	52.02	98.13%
Bouvardia Crescent	11313A	MH11314A	MH11313A	0.69	15					48.0	105.6	3.59	1.23		0.00		0.00		0.00	1.00	0.00	0.69	1.63	0.54		0.00	1.77	37.48	91.71	200	1.20	1.156	35.72	95.29%
Bouvardia Crescent	11312A	MH11313A	MH11312A	0.13	1		1		1	3.2	108.8	3.59	1.26		0.00		0.00		0.00	1.00	0.00	0.13	1.76	0.58	1	0.00	1.85	37.48	8.91	200	1.20	1.156	35.64	95.08%
Bouvardia Crescent	11311A	MH11312A	MH11311A	0.64	12					38.4	147.2	3.55	1.70		0.00		0.00		0.00	1.00	0.00	0.64	2.40	0.79		0.00	2.49	34.22	85.85	200	1.00	1.055	31.73	92.73%
Bouvardia Crescent	11310A	MH11311A	MH11300A	0.41	8		1		1	25.6	172.8	3.54	1.98	1	0.00		0.00		0.00	1.00	0.00	0.41	2.81	0.93	T	0.00	2.91	42.32	71.31	200	1.53	1.305	39.42	93.13%
Barrett Farm Drive	11205A	MH11300A	MH11204A	0.51	5		8			35.2	778.8	3.29	8.31		0.00		6.03		0.00	1.50	2.93	0.51	18.97	6.26		0.00	17.50	30.39	2.77	250	0.24	0.600	12.89	42.41%
																		_																
																										<u> </u>								
Design Parameters:				Notes:								Designed:		AC			No.							Revision								Date		
				1. Mannings	s coefficien	t (n) =		0.013								L	1.						Submission I	No. 1 for City	Review							2021-11-10		
Residential		ICI Areas		2. Demand	(per capita):	280) L/day	200) L/day		L					2.						Submission I	No. 2 for City	Review							2022-02-24		
SF 3.2 p/p/u				Infiltration	n allowance	e:	0.33	3 L/s/Ha				Checked:		JIM		L	3.						Submission I	No. 3 for City	Review							2022-04-06		
TH/SD 2.4 p/p/u	INST 28,000	0 L/Ha/day		Residenti	ial Peaking	Factor:			_							L																		
APT 1.9 p/p/u	COM 28,000	0 L/Ha/day			Harmon F	-ormula = 1+	-(14/(4+(P/1	000)^0.5))0.	8			L																						
Other 60 p/p/Ha	IND 35,000	0 L/Ha/day	MOE Chart	1	where K =	= 0.8 Correct	tion Factor					Dwg. Refe	rence:	34731 - TE	BD																			
	1700	0 L/Ha/day		5. Commerci	ial and Inst	itutional Pea	k Factors ba	ased on tota	l area,								File	Reference	:						Date:							Sheet No:		
				1.5 if gr	eater than	20%, otherw	/ise 1.0					1					3	34731-5.7							2021-11-1	0						1 of 1		

SANITARY SEWER DESIGN SHEET

Barrett Lands Phase 3 CITY OF OTTAWA Barrett Co-Tenancy etLands/5.9 Drawings/59civi/loyouts/Phase 3/420-Sanitary Drainage Plan.dwg Layout Name: 420-Sanitary Drainage Plan Plot Style: Ala STANDARD-HALF.CTB Plot Scale: 1:50.8 Plotted At: 2022-02-25 Last Saved By: mmilne Last Saved At: 2022-



SEEE 020.021.02 FOR NOTES. LEGEND. CB TABLE. SEE 020.021.021.021.021.021.021.021.021.021.	LEGEND : 11408A 0.15 6.4 A A	REA NUME RUNOFF CO REA IN HE	BER DEFFI	CIENT RES
ISEE 020. 021 022 FOR NOTES. LEGEND. CB TABLE. TREET SECTIONS AND DETAILS UTIENT ROAD UTIENT ROAD UTIENT ROAD UTIENT ROAD UTIENT ROAD UTIENT REYPLAN NTS 10 10 10 10 10 10 10 10 10 10				
LETRIM FOAD We	SEE 020, 021, 022 FOR NOTES STREET SECTIONS AND DETA	S, LEGEND, CB AILS	TABLE,	
NTS 14				BANK STREET
12 11 10 10 10 10 9 10 10 8 10 10 7 10 10 8 10 10 10 10 10 8 10 10 11 10 10 8 10 10 11 10 10 12 SUBMISSION NO. 2 FOR CITY REVIEW JLM. 2022/02/28 1 SUBMISSION NO. 2 FOR CITY REVIEW JLM. 2022/02/28 1 SUBMISSION NO. 1 FOR CITY REVIEW JLM. 2022/02/28 1 SUBMISSION NO. 2 FOR CITY REVIEW JLM. 2022/02/28 1 SUBMISSION NO. 1 FOR CITY REVIEW JLM. 2022/02/28 1 SUBMISSION NO. 1 FOR CITY REVIEW JLM. 2022/02/28 1 SUBMISSION NO. 1 FOR CITY REVIEW JLM. 2022/02/28 1 SUBMISSION NO. 1 FOR CITY REVIEW JLM. 2022/02/28 1 BARREETT LANDS PHASE 3 PHASE 3 Interview JLM. 2022/02/28 Drawing Title SANITARY DRAINAGE Scale Intervie	NTS 14 13			
9 0 0 0 8 0 0 0 7 0 0 0 6 0 0 0 7 0 0 0 8 0 0 0 0 6 0 0 0 0 9 1 SUBMISSION NO. 2 FOR CITY REVIEW J.I.M. 20220228 1 SUBMISSION NO. 1 FOR CITY REVIEW J.I.M. 2021:11:10 No. REVISIONS By Date BARRETT CO-TENANCY IBI GROUP 400 - 333 Preston Street Ottawa ON K1S SN4 Canada tellio13 225 9868 Digroup.com Project Title BARRETT LANDS PHASE 3 Ottawa ON K1S SN4 Canada tellio13 225 9868 Digroup.com Drawing Title SANITARY DRAINAGE AREA PLAN Scale Out Date Date	12 11 10			
6	9 8 7			
3 1 1 2022.02.28 1 SUBMISSION NO. 1 FOR CITY REVIEW J.M. 2021.11.10 No. REVISIONS By Date BARRETT CO-TENANCY IBI GROUP 400 - 333 Preston Street Ottawa ON K1S 5N4 Canada IBI GROUP 400 - 333 Preston Street Ottawa ON K1S 5N4 Canada Iel 613 225 1311 fax 613 225 9868 IBI GROUP Project Title BARRETT LANDS PHASE 3 Ottawa ON K1S 5N4 Canada I INOFFATT I INOFFATT OTEN INAGE AREA PLAN SANITARY DRAINAGE AREA PLAN Scale Otta Otta Date Date Date Date NOVEMBER 2021 Date Date Date NOVEMBER 2021	6 5 4			
BARRETT CO-TENANCY III GROUP M0-333 Preston Street Otaga ON KIS SN4 Canada to 13 225 1311 fax 613 225 9868 ibigroup.com	3 2 SUBMISSION NO. 2 FOR CI 1 SUBMISSION NO. 1 FOR CI No. REVISION:	TY REVIEW TY REVIEW S	J.I.M. J.I.M. By	2022:02:28 2021:11:10 Date
IBI GROUP 400 - 333 Preston Street Otawa ON K1S SN4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com Project Title BARRETT LANDS PHASE 3 IFORE TO AND	BARF CO-TEI	RETT NANC`	Y	
Project Title BARRETT LANDS PHASE 3	IBIGROU 400 – 333 Ottawa O tel 613 22 ibigroup.	JP 3 Preston Stre N K1S 5N4 25 1311 fax 6 com	eet Canad 13 225	a 5 9868
Drawing Title Scale 0	Project Title BARRET PHA	T LAN	DS	
Drawing Title SANITARY DRAINAGE AREA PLAN Scale $10 0 10 20 1:1000$ Design FHJF Date NOVEMBER 2021 Drawn M.M. Checked J.I.M.	J. I. MOFFATT ROFESSION J. I. MOFFATT REF 2022/02/28 ROLINCE OF ONTAR		Ź	
Scale 10 10 20 1:1000 1:1000 1:1000 Design FHJF Date NOVEMBER 2021 Drawn M.M. Checked J.I.M.	Drawing Title SANITARY	DRAIN	IAG	ЭЕ
Scale 10 0 10 20 1:1000 Design FHJF Date NOVEMBER 2021 Drawn M.M. Checked J.I.M.	AREA	PLAN		
Design Date FHJF NOVEMBER 2021 Drawn Checked M.M. J.I.M.	Scale	10 20		
Drawn Checked J.I.M.	Design FHJF	Date NOVEN	/BER	2021
	Drawn M.M.	Checked	J.I.M.	
Project No. Drawing No. 420	Project No. 34731	Drawing No.	20	

APPENDIX D

Storm Sewer Design Sheet 135925-500 - Storm Drainage Plan 135925-600 - Ponding Plan Barrett Lands Phase 3 Storm Design Sheet Barrett Lands Phase 3 Storm Drainage Area Plan Modified Rational Method on-site SWM calculations On-site Underground Storage System Storm HGL Calculations Barrett Lands Phase 3 HGL Reference Overflow Depth/Capacity Calculation Temporary Orifice Sizing Sample Runoff Coefficient Calculations Minor system release rate (Barrett Lands Phase 3)



IBI GROUP 400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 **ibigroup.com**

	LOCATION						AREA	(Ha)											RA	TIONAL DI	ESIGN FLC	W											SEWER DA	ТА			
STREET		FROM	то	C=	C= (C= C=	C=	C= C	:= C=	C=	C=	IND	CUM	INLET	TIME	TOTAL	. i	i (2)	i (5)	i (10)	i (100)	2yr PEAk	K 5yr PE	AK 10yr P	EAK 100yr	· PEAK FI	XED	DESIGN	CAPACIT	LENGTH		PIPE SIZ	ZE (mm)	SLOPE	VELOCITY	AVA	
SIREEI	AREA ID	FROM	10	0.20	0.30 0	.42 0.50	0.52	0.72 0.	73 0.77	0.85	1.00	2.78AC	2.78AC	(min)	IN PIPE	(min)	(mr	m/hr) (r	(mm/hr)	(mm/hr)	(mm/hr)	FLOW (L/s	s) FLOW	(L/s) FLOW	(L/s) FLOV	N (L/s) FLO	N (L/s)	FLOW (L/s)) (L/s)	(m)	DIA	N	/ Н	(%)	(m/s)	(L/s)	(%)
Private Lane No.1		MH1	MH2									0.00	0.00	10.00	0.48	10.48	76	6.81				0.00				(.00	0.00	26.50	23.74	200			0.60	0.817	26.50	100.00%
Private Lane No.1		MH2	MH3									0.00	0.00	10.48	0.15	10.63	74	4.99				0.00				(.00	0.00	26.50	7.25	200			0.60	0.817	26.50	100.00%
Private Lane No.1	S4	MH3	MH4						0.15			0.32	0.32	10.63	0.65	11.28	74	4.46				23.91				2	6.00	26.00	59.68	31.68	300			0.35	0.818	33.68	56.44%
Private Lane No. 2		MH21	MH4									0.00	0.00	10.00	0.80	10.80	76	6.81				0.00				(.00	0.00	26.50	39.00	200			0.60	0.817	26.50	100.00%
Private Lane No. 2	S20A, S20B	MH20	MH5						0.13			0.28	0.28	10.00	1.36	11.36	76	6.81				21.37				2	5.00	25.00	41.62	66.81	250			0.45	0.821	16.62	39.93%
Private Lane No.1	S5	MH4	MH5						0.14			0.30	0.62	11.28	0.72	12.00	72	2.22				44.84				5	1.00	51.00	100.18	38.17	375			0.30	0.879	49.18	49.09%
Private Lane No.1	S6	MH5	MH6						0.30			0.64	1.54	12.00	0.42	12.42	69	9.89				107.72				12	6.00	126.00	199.52	30.35	450			0.45	1.215	73.52	36.85%
Private Lane No.1	R6	MH6	MH7				0.19					0.27	1.82	12.42	0.11	12.52	68	8.62				124.61				14	6.00	146.00	199.52	7.75	450			0.45	1.215	53.52	26.83%
Private Lane No.1		MH7	MH8									0.00	1.82	12.52	1.02	13.55	68	8.30				124.03				14	6.00	146.00	199.52	74.66	450			0.45	1.215	53.52	26.83%
Private Lane No.1		MH8	MH9									0.00	1.82	13.55	0.08	13.63	65	5.42				118.80				14	6.00	146.00	220.58	6.31	450			0.55	1.344	74.58	33.81%
Private Lane No.1	S10	MH9	MH10						0.14			0.30	2.12	13.63	0.14	13.76	65	5.21				137.96				17	9.00	179.00	220.58	11.09	450			0.55	1.344	41.58	18.85%
Private Lane No.1		MH10	MH11305A							-	_	0.00	2.12	13.76	0.19	13.95	64	4.85				137.19	_			17	9.00	179.00	518.80	16.00	675			0.35	1.404	339.80	65.50%
Definitions:				Notes:										Designed	:	AC					No.							Revision							Date		
Q = 2.78CiA, where:				1. Mann	nings coeff	icient (n) =		0.013													1.					Submissi	on No.1	for City Revi	iew						2022-05-09		
Q = Peak Flow in Litres per	r Second (L/s)							0.024													2.					Submissi	on No.2	for City Revi	iew						2022-11-11		
A = Area in Hectares (Ha)														Checked:		RM																					
i = Rainfall intensity in milli	imeters per hour (mm/hr)																																				
[i = 732.951 / (TC+6.199	9)^0.810]	2 YEAR																																			
[i = 998.071 / (TC+6.053	8)^0.814]	5 YEAR												Dwg. Refe	erence:	135925-5	500																				
[i = 1174.184 / (TC+6.01	4)^0.816]	10 YEAR																				File F	Reference):					Date:						Sheet No:		
[i = 1735.688 / (TC+6.01	4)^0.820]	100 YEAR																				13	5925.00						2022-05-09						1 of 1		

LEGEND

Black text2 year event curve designBlue text5 year event curve designGreen Text100 year design curve

STORM SEWER DESIGN SHEET

Barrett Lands Block 178 City of Ottawa Barrett Co-Tenancy



CLIEN	т]
	BARRETT		
	CO-TENANCY		
COPY	RIGHT		
repro forb Con the jo	This drawing has been prepared solely for the intended use, I douction or distribution for any purpose other than authorized b idden. Written dimensions shall have precedence over scaled tractors shall verify and be responsible for all dimensions and b, and IBI Group shall be informed of any variations from the c	thus any by IBI Group is I dimensions. conditions on limensions and	
cond	tions shown on the drawing. Shop drawings shall be submitte for general conformance before proceeding with fabricat	d to IBI Group ion.	
ISSUE	is a member of the IBI Group of companies	i) inc.	
No. 1	DESCRIPTION SUBMISSION NO.1 FOR CITY REVIEW	DATE 2022-05-10	
2 3	SUBMISSION NO.2 FOR CITY REVIEW SUBMISSION NO.3 FOR CITY REVIEW	2022-11-25 2023-01-09	-
4 5 6			-
7 8			
	· · · · ·		
SEE 0 STRE	10, 011, 012 FOR NOTES, LEGEND, CB TAE ET SECTIONS AND DETAILS	BLE,	
KEY P			
RIVE			
FARM		STREET	
		BANK	
KEY PLA			
CONS	JLTANTS		
			Φ
			rian Miln
			/ by Mar
			19:39 PN
			2023 2:1
			nuary 6,
			riday, Ja
		5m 5m	Plotted: F
SFAI			milne F
02/12	29 PROFESSIONAL ST		22, by m
			er 27, 20
	2023/01/09		: Octobe
	POLINCE OF ONTHR		st Saved
			wg La
			PLAN.d
			e area
			RAINAG
			ORM DF
			s\500 S1
-	B B Ottawa ON K1S 5N4 Canada		vil\Sheet
Ļ	 tel 613 225 1311 / 613 241 3300 fa: ibigroup.com 	x 613 225 9868	n/04_Civ
PROJE		70	13_Desig
	DARREII BLUUK 1/	O	iction/7.C
			0_Produ
PROJE	ECT NO:		_ands\7
1359 DRAW	25 N BY: CHECKED BY	:	BarrettL
M.M.		γ·	135925_
R.M.	J.I.M.	1.	ation: J:\
SHEET	STORM DRAINAGE AF	REA	File Loc
	PLAN		
011			
SHEET			E CHECK
			2CAL
		J. TOOZO	,

CITY FILE No. D07-12-22-0112



IBI Group 400-333 Preston Street Ottawa, Ontario K1S 5N4

Run-off Coefficients

PROJECT: Barrett Block 146 **DATE:** 2022-04-22 CLIENT: Barrett Co-Tennancy FILE: 135925.6.4

								S2&R3		
		B	ACK TO BAC	CK	T	OWNS - REA	٩R	TO	WNS - FRONT	
		GRASS	ROOF	ASPHALT	GRASS	ROOF	ASPHALT	GRASS	ROOF	ASPHALT
		255.00	1121.00		492.00	400.00		380.00	1601.00	
		255.00	4424.00		402.00	400.00		200.00	1601.00	
TOTAL (m ²)		255.00	1121.00		492.00	400.00		380.00	1601.00	
			1376.00			892.00			1981.00	
Rupoff Coofficient (C)		0.2	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0
Ave. Bunoff Coefficient (C):		0.2	0.9	0.9	0.2	0.9	0.9	0.2	0.9	0.9
Ave. Runon Coemcient (C):			0.77			0.51			0.77	
Runoff Coefficient Used(C):			0.77			0.52			0.77	



IBI GROUP

400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com

	LOCATION						AREA (Ha)								RA	ATIONAL D	ESIGN FLO	W						SEWER DATA			
STREET	AREA ID	FROM	то	C=	C=	C= C=	C= C=	C= C=	C= C= II	ND CU	IM INL	ET TIME	TOTAL	i (2)	i (5)	i (10)	i (100)	2yr PEAK 5yr PEAK 10yr PEAk	K 100yr PEAK FIXED	DESIGN	CAPACITY	LENGTH	F	PIPE SIZE (mm) SLOPE	VELOCIT	Y AVAIL	CAP (2yr)
				0.20	0.30	0.42 0.57	0.68 0.72	0.73 0.78	0.80 1.00 2.7	78AC 2.78	BAC (mi	n) IN PIPE	E (min)	(mm/hr)	(mm/hr)	(mm/hr)	(mm/hr)	FLOW (L/s) FLOW (L/s) FLOW (L/s	s) FLOW (L/s) FLOW (L/s) FLOW (L/s)	(L/s)	(m)	DIA	W H (%)	(m/s)	(L/s)	(%)
				-	<u> </u>																						
Temporary	Area 9	DI1	MH11307		().24			0	.28 0.2	28 12.0	0.21	12.21	69.89	94.70	110.96	162.13		45.43	45.43	62.04	15.50	250	1.00	1.224	16.61	26.77%
Barrett Farm Drive	S11306	MH11307	MH11306				0.19		0	0.38 0.6	66 10.0	0.89	10.89	76.81	104.19	122.14	178.56	68.82		114.26	158.41	74.50	375	0.75	1.389	44.15	27.87%
Barrett Family	R11305	DI2	MH11306						4.01 8	8.92 8.9	92 12.0	0.14	12.14	69.89	94.70	110.96	162.13	623.33		623.33	821.24	14.66	750	0.50	1.801	197.92	24.10%
Temporary		DI2	MH11306						See	e Barrett Fa	amily ditch	design in Appe	ndix D							348.22	530.86	14.66	525	1.40	2.376	182.64	34.40%
Temporary	Culvert	Ditch	Ditch						See	e culvert de	esign in Apj	pendix D					1			34.08	109.29	20.00	300	4.00	1.498	75.21	68.82%
Barrett Farm Drive		MH11306	MH11305						0	00 89	$12^{-12^{-1}}$	14 0.43	12 57	69.47	94 12	110 28	161 14	619 59		698.95	1 159 96	54 50	825	0.60	2 102	461.01	39 74%
Barrett Farm Drive	S11305	MH11306	MH11305					0.09	0	0.00 0.0	34 12. ⁴	14 0.43	12.57	69.47	94.12	110.28	161.14	79.36		698.95	1,159.96	54.50	825	0.60	2.102	461.01	39.74%
																					.,						
Barrett Farm Drive	R11304	BLK11305	MH11305						1.28 2	2.85 2.8	35 12.0	0.25	12.25	69.89	94.70	110.96	162.13	198.97		198.97	438.47	18.00	675	0.25	1.187	239.50	54.62%
Barrett Farm Drive		MH11305	MH11304					2.12	0	0.00 11.7	76 12.5	57 0.36	12.92	68.18	92.34	108.18	158.06	802.08		820.82	1,274.02	30.40	1050	0.20	1.425	453.20	35.57%
Barrett Farm Drive	S11305	MH11305	MH11304					0.10	0	0.20 0.2	20 12.5	57 0.36	12.92	68.18	92.34	108.18	158.06	18.74		820.82	1,274.02	30.40	1050	0.20	1.425	453.20	35.57%
Barrett Farm Drive		MH11304	MH11303	-						00 11	76 12 (0.51	13.43	67 15	00.03	106 52	155.62	780.08		017 00	1 4 2 4 4 0	18 54	1050	0.25	1 50/	506 50	35 56%
Barrett Farm Drive	S11304A	MH11304	MH11303					0.25		1.54 1.3	<u>70</u> 12.3 39 12.5	57 0.51	13.43	68.18	92.34	100.32	158.06	127.91		917.90	1 424 40	48.54	1050	0.23	1.594	506.50	35.56%
Ballott I alli Blito								0.20				0.01	10.00	00.10	02.01	100.10	100.00			011.00	1,121.10	10.01	1000	0.20	1.001	000.00	
Bouvardia Crescent	R11334	MH11316	MH11334			0.03	3		0	0.05 0.0	05 10.0	0.17	10.17	76.81	104.19	122.14	178.56	3.65		3.65	62.04	12.72	250	1.00	1.224	58.39	94.11%
Block 120	R11340	BLK11340	MH11334						1.98 4	.40 4.4	40 12.0	0.45	12.45	69.89	94.70	110.96	162.13	307.78		307.78	524.32	48.00	600	0.67	1.796	216.54	41.30%
Bouvardia Crescent	S11334, R11333	MH11334	MH11333			0.08	0.27		0	.67 5.1	12 12.4	45 0.54	12.98	68.54	92.84	108.77	158.92	350.80		350.80	535.93	59.22	600	0.70	1.836	185.14	34.54%
Bouvardia Crescent	R11332, S11333	MH11333	MH11332			0.12	2 0.20		0	0.59 5.7	71 12.9	0.51	13.49	66.98	90.70	106.25	155.22	382.36		382.36	744.26	78.11	600	1.35	2.550	361.90	48.63%
Bouvardia Crescent	R11331, S11331	MH11332	MH11331				0.24 0.25		0	0.95 6.6		49 0.11	13.60	65.57	88.76	103.98	151.88	436.87		436.87	744.26	16.85	600	1.35	2.550	307.39	41.30%
Bouvardia Crescent		IVIE 1 133 1	10111303						0	0.00 0.0	13.0	0.10	13.77	03.27	00.30	103.30	101.10	434.90		434.90	744.20	25.07	600	1.35	2.550	309.30	41.57%
Barrett Farm Drive		MH11303	MH11302						0	0.00 18.4	43 13.7	77 0.57	14.33	64.84	87.76	102.80	150,16	1.194.83		1.360.93	2.206.67	83.97	1050	0.60	2,469	845.73	38.33%
Barrett Farm Drive	S11303A, S11303B	MH11303	MH11302					0.25	0	0.51 1.8	39 13.7	77 0.57	14.33	64.84	87.76	102.80	150.16	166.10		1,360.93	2,206.67	83.97	1050	0.60	2.469	845.73	38.33%
Barrett Farm Drive		MH11302	MH11301						0	0.00 18.4	43 14.3	33 0.20	14.54	63.38	85.77	100.46	146.72	1,168.04		1,330.37	2,206.67	30.00	1050	0.60	2.469	876.29	39.71%
Barrett Farm Drive		MH11302	MH11301						0	0.00 1.8	39 14.3	33 0.20	14.54	63.38	85.77	100.46	146.72	162.33		1,330.37	2,206.67	30.00	1050	0.60	2.469	876.29	39.71%
Calidana Maura	D11000_014000	MU 14 4 0 0 0	NU144000			0.00	0.05					0.07	10.07	70.04	104.40	400.44	470.50	70.00		70.00	140.40	404.00	200	2.10	0.004	70.40	
Solidago Mews	R11323, S11323	MH11323 MH11322	MH11322 MH11321			0.26	0.25		0	0.91 0.9	$\frac{91}{10.0}$	JU U.87	10.87	73.62	104.19	122.14	178.56	67.17		70.08	146.19	104.38	300	2.10	2.004	76.12	52.07%
Solidago Mews	R11321 S11321 S11301	MH11321	MH11301			0.53	0.22	0.15	0	58 2.5	50 10.0	$\frac{0.09}{0.03}$	11.90	73.32	99.02	116.50	170.99	183.08		183.08	347 53	77.89	525	0.60	1.095	164 45	47.32%
						0.00		0.10		.00 2.0		0.00	11.70	10.02	00.10	110.00	110.21			100.00	047.00	11.00	020		1.000	101.10	
Barrett Farm Drive		MH11301	MH11300						0	.00 20.9	92 14.	54 0.53	15.07	62.88	85.08	99.65	145.53	1,315.81		1,569.35	2,206.67	79.16	1050	0.60	2.469	637.32	28.88%
Barrett Farm Drive	R11301, S11301A, S11301B	MH11301	MH11300			0.43	3	0.20	1	.09 2.9	98 14.8	54 0.53	15.07	62.88	85.08	99.65	145.53	253.54		1,569.35	2,206.67	79.16	1050	0.60	2.469	637.32	28.88%
Bouvardia Crescent	R11315	MH11316	MH11315	-		0.14			0	0.22 0.2	$\frac{22}{10.0}$	0 0.11	10.11	76.81	104.19	122.14	1/8.56	17.04		17.04	69.36	9.12	250	1.25	1.369	52.32	/5.43%
Bouvardia Crescent	R11313A R11313B S11313	MH11313	MH11314 MH11313			0.44	0.30		0	22 2 0	$\frac{52}{10}$	$\frac{11}{90}$ 0.79	11.90	73.52	99.68	121.40	177.55	149.98		149.98	325.82	96.25	450	2.40	1.097	175.84	53.97%
Bouvardia Crescent	R11313C	MH11313	MH11312			0.10)		0	0.16 2.2	20 11.7	71 0.08	11.78	70.82	95.97	112.45	164.33	155.69		155.69	325.82	9.33	450	1.20	1.985	170.13	52.22%
Bouvardia Crescent	R11311, S11312, S11311B	MH11312	MH11311			0.48	3	0.37	1	.51 3.7	71 11.7	78 0.74	12.53	70.57	95.62	112.05	163.74	261.81		261.81	448.66	89.18	525	1.00	2.008	186.85	41.65%
Bouvardia Crescent	S11311, S11311A	MH11311	MH11300					0.25	0	.51 4.2	22 12.5	53 0.55	13.07	68.30	92.51	108.39	158.36	288.04		288.04	590.57	66.44	600	0.85	2.023	302.52	51.23%
Dalahining One court			N4144407								20 40 (0.07	10.07	70.04	404.40	100.11	470.50	0.00		0.00	70.47	05.04	050	1.00	4 5 4 0	70.47	400.00%
Delphinium Crescent	S11407	MH11408 MH11407	MH11407 MH11406				0.18		0	0.00 0.0	$\frac{10.0}{36}$	$\frac{00}{0.27}$	10.27	75.70	104.19	122.14	178.50	27.31		0.00	/8.4/ 78.47	25.01	250	1.60	1.549	/8.4/ 51.17	65 20%
Delphinium Crescent	R11407	MH11407 MH11406	MH11400 MH11405			0.17	, 0.10		0	0.30 0.3	$\frac{50}{53}$ 10.2	58 0.51	11.09	74 65	102.79	120.49	173.44	47.01		47.01	78.47	47.61	250	1.80	1.549	31.17	40 10%
Delphinium Crescent		MH11405	MH11404			0.17			0	0.00 0.6	53 11.0	0.10	11.19	72.86	98.76	115.75	169.17	45.88		45.88	78.47	9.35	250	1.60	1.549	32.60	41.54%
Delphinium Crescent	S11404	MH11404	MH11403			0.48	0.49			.74 2.3	37 11.1	19 0.72	11.91	72.51	98.29	115.19	168.35	171.94		171.94	282.17	74.37	450	0.90	1.719	110.23	39.07%
Nemesia Way	S11350, R11350A, R11350B	MH11350	MH11351		+	0.28	0.24		0	0.92 0.9	92 10.0	0.61	10.61	76.81	104.19	122.14	178.56	70.97		70.97	141.68	45.20	375	0.60	1.243	70.71	49.91%
Nemesia Way	<u>S11351</u>	MH11351	MH11403		+		0.25		0	0.50 1.4	+2 10.6	o1 0.79	11.39	/4.55	101.10	118.49	1/3.20	106.20		106.20	230.39	66.41	450	0.60	1.403	124.19	53.90%
Delphinium Crescent	S11401A P11402	MH11/02	MH11402		+	0.07	/ 0.24			191 17	70 110	0.02	12.85	70 17	05.07	111 /0	162 79	330.05	+ +	330.05	580 71	71 / 2	750	0.25	1 072	250 66	12 160/
Delphinium Crescent		MH11402	MH11401	1	+	0.27	0.24			0.00 4.7	70 128	35 0.93	12.00	67.36	91.07	106 87	156 13	316.86		316.86	580.71	9.06	750	0.25	1 273	263.84	45 44%
Delphinium Crescent	S11401B. R11401	MH11401	MH11400	1	+	0.31	0.18		0	0.85 5.5	56 12.9	97 1.05	14.02	67.03	90.76	106.33	155.33	372.35		372.35	580.71	80.19	750	0.25	1.273	208.36	35.88%
Delphinium Crescent	S11400, R11400A, R11400B	MH11400	MH11300			0.22	2 0.26		0	.87 6.4	42 14.0	0.95	14.96	64.19	86.88	101.76	148.63	412.39		412.39	669.70	68.90	825	0.20	1.214	257.31	38.42%
Barrett Farm Drive		MH11300	EX Blkhd		\downarrow				0	0.00 31.5	57 15.0	0.02	15.09	61.60	83.33	97.58	142.50	1,944.49		2,192.79	4,658.21	2.51	1650	0.24	2.110	2465.42	. 52.93%
Barrett Farm Drive		MH11300	EX Blkhd		+		+ $+$ $+$		0	0.00 2.9	98 15.0	0.02	15.09	61.60	83.33	97.58	142.50	248.31	<u> </u>	2,192.79	4,658.21	2.51	1650	0.24	2.110	2465.42	. 52.93%
					+		+ $+$ $+$		+ + + + + + + + + + + + + + + + + + +									├───						┼──┼──┼			
Definitions:				Notes:	<u> </u>						Desig	ned:	AC.				No			Revision					Date		
Q = 2.78CiA where				1. Mar	nninas coef	ficient (n) =	0.013				Desig						1		Submission No.	1 for City Revi	ew				2021-11-1	0	
Q = Peak Flow in Litres p	per Second (L/s)						0.024										2.		Submission No.	2 for City Revi	ew .				2022-02-2	4	
A = Area in Hectares (Ha	a)										Check	ed:	JIM				3.		Submission No.	3 for City Revi	ew				2022-04-0	6	
i = Rainfall intensity in mi	illimeters per hour (mm/hr)																			·							
[i = 732.951 / (TC+6.19	99)^0.810]	2 YEAR										_		-													
[i = 998.071 / (TC+6.05	53)^0.814]	5 YEAR									Dwg. I	Reference:	34731-520)													
[i = 1174.184 / (TC+6.0)]	014)^0.816]	10 YEAR																File Reference:			Date:				Sheet No		
[I = 1735.688 / (TC+6.0	U14)^U.820]	TUU YEAR																34/31-5./			2021-11-10				1 of 1		

Black text 2 year event curve design Blue text 5 year event curve design (Barrett Farm Drive) Green Text 100 year design curve

STORM SEWER DESIGN SHEET

Barrett Lands Phase 3 City of Ottawa Barrett Co-Tenancy ttLands\5.9 Drawings\59civil\layouts\Phase 3\520-Storm Drainage Plan.dwg Layout Name: Storm Drainage Plan Plot Style: AlA STANDARD-HALF.CTB Plot Scale: 1:50.8 Plotted At: 2022-02-25 Last Saved By: mmilne Last Saved At: 2022-



LEGEND : S11407 0.18 0.69 F ,	AREA NUMBER RUNOFF COEFFICIENT AREA IN HECTARES
SEE 020, 021, 022 FOR NOTES STREET SECTIONS AND DET LEITRIM ROAD	S, LEGEND, CB TABLE, ALS
12 11 10 9 8 7 6 5 4 3 2 SUBMISSION NO. 2 FOR C 1 SUBMISSION NO. 1 FOR C No. REVISION	ITY REVIEW J.I.M. 2022:02:28 ITY REVIEW J.I.M. 2022:111:10 S By Date
CO-TE BIGROU 400 - 333 Ottawa C tel 613 22 ibigroup	JP 3 Preston Street N K1S 5N4 Canada 25 1311 fax 613 225 9868 .com
PHA PROFESSIONAL CROMENT	ASE 3
Drawing Title	RAINAGE
AREA Scale	
Design FHJF	Date NOVEMBER 2021
Drawn M.M. Project No.	Checked J.I.M. Drawing No.
34731	520
IBI GROUP ΒI ibigroup.com

400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868

DESIGNE CHECKE

STORMWATER MANAGEMENT

Formulas and Descriptions

i_{2yr} = 1:2 year Intensity = 732.951 / (T_c+6.199)^{0.810} i_{5yr} = 1:5 year Intensity = 998.071 / (T_c+6.053)^{0.814} i_{100yr} = 1:100 year Intensity = 1735.688 / (T_c+6.014)^{0.820} T_c = Time of Concentration (min) C = Average Runoff Coefficient A = Area (Ha)Q = Flow = 2.78CiA (L/s)

Maximum Allowable Release Rate

Restricted Flowrate (based on modelled flow from Phase 3)

EXT	234.000 l/s		From Barrett Phase 3
Private Residential Future Commercial	203.31 30.69	1.060 0.160	ha ha
Q _{restricted} =	203.31 L/s]

Uncontrolled Release (Q uncontrolled = 2.78*C*i 100yr *A uncontrolled)

C =	0.8
$T_c =$	10 min
i _{100yr} =	178.56 mm/hr
$A_{uncontrolled} =$	0.06 Ha
Q uncontrolled =	23.83 L/s

Maximum Allowable Release Rate (Q max allowable = Q restricted - Q uncontrolled)

Q max allowable = 179.48 L/s

MODIFIED RATIONAL METHOD (100-Year, 100-Year +20% & 2-Year Ponding)

Drainage Area	S20A]							Drainage Area	S20A			
Area (Ha)	0.090								Area (Ha)	0.090	D		
C =	1.00	Restricted Flow Q _r (L	./s)=	15.00					C =	0.80) Restricted Flow Q _r (I	_/s)=	
		100-Year Pondir	וg				100Yr +20%	,			2-Year Pon	ding	
T _c Variable	i _{100yr}	Peak Flow Q _p =2.78xCi _{100yr} A	Q,	$Q_p - Q_r$	Volume 100yr	100YRQp 20%	Qp - Qr	Volume 100+20	T _c Variable	i _{2yr}	Peak Flow Q _p =2.78xCi _{2yr} A	Q,	Q _p -Q
(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m³)	(L/s)	(L/s)	(m3)	(min)	(mm/hour)	(L/s)	(L/s)	(L/s)
5	242.70	60.72	15.00	45.72	13.72				8	85.46	17.11	15.00	2.11
10	178.56	44.68	15.00	29.68	17.81				9	80.87	16.19	15.00	1.19
15	142.89	35.75	15.00	20.75	18.68	42.90	27.90	25.11	10	76.81	15.37	15.00	0.37
20	119.95	30.01	15.00	15.01	18.01				11	73.17	14.65	15.00	-0.35
25	103.85	25.98	15.00	10.98	16.47]			12	69.89	13.99	15.00	-1.01
		Stor	age (m ³)				100+20				:	Storage (m	³)
	Overflow 0.00	Required 18.68	Surface 20.59	Sub-surface 0	Balance 0.00	Overflow 0.00	Required 25.11	Balance 4.52	-	Overflow 0.00	Required 0.22	Surface 20.59	Sub-surf 0

L/s = 5.02





OVERFLOW SUMMARY TABLE

Overflow to

Barrett Farm Drive

Delphinium Cres.

Area ID

Total

Barrett Phase 3 allowance

100year 39.68 97.70

137.38

350

PROJECT:	Barrett Block 178
DATE:	2022-11-11
FILE:	135925-6.4.4
REV #:	2
SIGNED BY:	AC
IECKED BY:	RM



1	5	00	

(r)	2yr
)	(m^{3})
	(111)
	1.01
	0.64
,	0.22
5	-0.23
1	-0.73

face	Balance	
	0.00	

overflows to: S10

nied (⊓a)	0.440								Drainage Area	S10				
2 =	1.00	Restricted Flow Q _r (L	/s)=	33.00					Атеа (на) C =	0.140	Restricted Flow Q _r (L	_/s)=	33.00	
·		100-Year Pondir	na			1	100Yr +20%				2-Year Pon	dina		
T _c	;	Peak Flow	0	0.0	Volume	100YRQp	Qp - Qr	Volume	T _c	i	Peak Flow	0	0 -0	Volume
Variable	• 100yr	Q _p =2.78xCi _{100yr} A	w,	α _p -α _r	100yr	20%		100+20	Variable	' 2yr	Q _p =2.78xCi _{2yr} A	۹r	α _p -α _r	2yr
(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m°)	(L/s)	(L/s)	(m3)	(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m°)
-1	462.72	180.09	33.00	147.09	-8.83	_			8	85.46	26.61	33.00	-6.39	-3.07
9	188.25	73.27	33.00	40.27	21.75	87.92	54.92	29.66	10	76.81	23.91	33.00	-9.09	-4.22
14	148.72	57.88	33.00	24.88	20.90				11	73.17	22.78	33.00	-10.22	-6.74
19	123.87	48.21	33.00	15.21	17.34]			12	69.89	21.76	33.00	-11.24	-8.09
_		Stor	age (m ³)				100+20				:	Storage (m	3)	
	Overflow 0.00	Required 21.75	Surface 0.32	Sub-surface 0	Balance 21.43	Overflow 4.52	Required 34.18	Balance 33.86		Overflow 0.00	-5.45	Surface 0.32	Sub-surface 0	Balance 0.00
				L/s =	39.68		L/s =	62.70						D "F D'
				overflows to:	Barrett Farm D	rive							overflows to:	Barrett Farm Drive
Drainage Area	FUTCOM]							Drainage Area	FUTCOM				
rea (Ha) =	0.160	Restricted Flow Q _r (L	/s)=	30.69					Area (Ha) C =	0.160	Restricted Flow Q _r (L	_/s)=	30.69	
·		100-Year Pondir	na	00.00		1	100Yr +20%		-	0.00	2-Year Pon	dina	00.00	
T _c		Peak Flow	<u> </u>		Volume	100YRQp	Qp - Qr	Volume	T _c		Peak Flow		0.0	Volume
Variable	I 100yr	Q _p =2.78xCi _{100vr} A	Q,	$Q_p - Q_r$	100yr	20%		100+20	Variable	I _{2yr}	Q _p =2.78xCi _{2vr} A	Q,	$Q_p - Q_r$	2yr
(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m ³)	(L/s)	(L/s)	(m3)	(min)	(mm/hour)	. (L/s)	(L/s)	(L/s)	(m ³)
4	262.41	116.72	30.69	86.03	20.65				8	85.46	30.41	30.69	-0.28	-0.13
9	188.25	83.74	30.69	53.05	28.65	70.00	40.00	40.00	9	80.87	28.78	30.69	-1.91	-1.03
14	148.72	55 10	30.69	35.46 24.41	29.79	79.38	48.69	40.90	10	70.81	27.33	30.69	-3.30	-2.01
24	106.68	47.45	30.69	16.76	24.14	-			12	69.89	24.87	30.69	-5.82	-4.19
		04	(3)				100.00					0 4 (3,	
-	Overflow	Required	age (m°) Surface	Sub-surface	Balance	Overflow	100+20 Required	Balance		Overflow	Required	Storage (m Surface) Sub-surface	Balance
	0.00	29.79	12.00	0	17.79	0.00	40.90	28.90		0.00	-2.01	12.00	0	0.00
				L/s =	21.18 S4		L/s =	34.41					overflows to:	54
		_			01									01
Drainage Area	S4								Drainage Area	S4				
rea (Ha)	0.150	Destricte d Flaux O (l	(-)-						Area (Ha)	0.150	De etciete el Elever O (l	(-)-		
;=	1.00	Restricted Flow Qr (L	/s)-	26.00		1	4003/		C =	0.80		_/S)=	26.00	
-		100-Year Pondir	ıg				100 1 + 20%	Malaina			2-Year Pon	aina		
		Deels Flow			1/-/	4000000	A A				De als Elasse			N/- /
Variable	İ _{100yr}	Peak Flow	Q,	$Q_p - Q_r$	Volume	100YRQp	Qp - Qr	100±20	T _c Variable	i _{2yr}	Peak Flow	Q,	$Q_p - Q_r$	Volume
Variable	i _{100yr} (mm/bour)	Peak Flow $Q_p = 2.78 \times Ci_{100yr} A$	Q,	Q _p -Q _r	Volume 100yr (m ³)	100YRQp 20% (1/s)	Qp - Qr	100+20 (m3)	T _c Variable (min)	i _{2yr} (mm/bour)	Peak Flow Q _p =2.78xCi _{2yr} A	Q, (1/s)	Q _p -Q _r	Volume 2yr (m ³)
Variable (min) 4	i _{100yr} (mm/hour) 262 41	Peak Flow Q _p =2.78xCi _{100yr} A (L/s) 109 42	Q _r (L/s) 26.00	Q _p -Q, (L/s) 83.42	Volume 100yr (m ³) 20.02	100YRQp 20% (L/s)	Qp - Qr (L/s)	100+20 (m3)	T _c Variable (min) 8	i _{2yr} (mm/hour) 85.46	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28 51	Q, (L/s) 26.00	Q _p -Q _r (L/s) 2.51	Volume 2yr (m ³) 1.20
Variable (min) 4 9	i _{100yr} (mm/hour) 262.41 188.25	Peak Flow Q _p =2.78xCi _{100yr} A (L/s) 109.42 78.50	Q _r (L/s) 26.00 26.00	Q _p -Q _r (L/s) 83.42 52.50	Volume 100yr (m ³) 20.02 28.35	100YRQp 20% (L/s)	Qp - Qr (L/s)	100+20 (m3)	T _c Variable (min) 8 9	i _{2yr} (mm/hour) 85.46 80.87	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98	Q, (L/s) 26.00 26.00	Q _p -Q _r (L/s) 2.51 0.98	Volume 2yr (m ³) 1.20 0.53
Variable (min) 4 9 14	<i>i_{100yr}</i> (<i>mm/hour</i>) 262.41 188.25 148.72	Peak Flow Q _p =2.78xCi _{100yr} A (L/s) 109.42 78.50 62.02	Q _r (L/s) 26.00 26.00 26.00	Q _p -Q _r (L/s) 83.42 52.50 36.02	Volume 100yr (m ³) 20.02 28.35 30.25	100YRQp 20% (L/s) 74.42	Qp - Qr (L/s) 48.42	40.67	T _c Variable (min) 8 9 10	<i>i _{2yr}</i> (<i>mm/hour</i>) 85.46 80.87 76.81	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62	Q _r (L/s) 26.00 26.00 26.00	Q _p - Q _r (L/s) 2.51 0.98 -0.38	Volume 2yr (m³) 1.20 0.53 -0.23
Variable (min) 4 9 14 19	i _{100yr} (mm/hour) 262.41 188.25 148.72 123.87	Peak Flow Q _p =2.78xCi 100yrA (L/s) 109.42 78.50 62.02 51.65	Q _r (L/s) 26.00 26.00 26.00 26.00	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65	Volume 100yr (m ³) 20.02 28.35 30.25 29.24	100YRQp 20% (L/s) 74.42	Qp - Qr (L/s) 48.42	100+20 (m3) 40.67	<i>T</i> c Variable (min) 8 9 10 11	<i>i</i> _{2yr} (mm/hour) 85.46 80.87 76.81 73.17	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 26.92	Q _r (L/s) 26.00 26.00 26.00 26.00	Q _p - Q _r (L/s) 2.51 0.98 -0.38 -1.59	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05
Variable (min) 4 9 14 19 24	i _{100yr} (mm/hour) 262.41 188.25 148.72 123.87 106.68	Peak Flow Q _p =2.78xCi _{100yr} A (L/s) 109.42 78.50 62.02 51.65 44.48	Q _r (L/s) 26.00 26.00 26.00 26.00	Q _p - Q _r (L/s) 83.42 52.50 36.02 25.65 18.48	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62	100YRQp 20% (L/s) 74.42	Qp - Qr (L/s) 48.42	40.67	<i>T</i> _c <i>Variable</i> <i>(min)</i> 8 9 10 11 12	<i>i</i> _{2yr} (<i>mm/hour</i>) 85.46 80.87 76.81 73.17 69.89	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00	Q _p - Q _r (L/s) 2.51 0.98 -0.38 -1.59 -2.68	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93
Variable (min) 4 9 14 19 24	i _{100yr} (mm/hour) 262.41 188.25 148.72 123.87 106.68	Peak Flow Q _p =2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 age (m ³)	Q _p - Q , (L/s) 83.42 52.50 36.02 25.65 18.48	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62	100YRQp 20% (L/s) 74.42	Qp - Qr (L/s) 48.42 100+20	40.67	T _c Variable (min) 8 9 10 11 12	<i>i 2yr</i> (<i>mm/hour)</i> 85.46 80.87 76.81 73.17 69.89	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00	Q _p -Q _r (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³)	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93
Variable (min) 4 9 14 19 24	<i>i</i> _{100yr} (<i>mm/hour</i>) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79	Peak Flow Q _p =2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 age (m ³) Surface 1 16	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88	100YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 60 58	100+20 (m3) 40.67 Balance	T _c Variable (min) 8 9 10 11 12	<i>i</i> _{2yr} (<i>mm/hour</i>) 85.46 80.87 76.81 73.17 69.89 Overflow	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1 16	$Q_p - Q_r$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00
Variable (min) 4 9 14 19 24	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79	Peak Flow Q _p =2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 age (m ³) Surface 1.16	$Q_{p}-Q_{r}$ (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s =	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81	100 YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s =	40.67 (m3) 40.67 Balance 68.42 81.45	T _c Variable (min) 8 9 10 11 12	i _{2yr} (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23	Q, (L/s) 26.00 26.	$Q_p - Q_r$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00
Variable (min) 4 9 14 19 24	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79	Peak Flow Q _p = 2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 300 26.00	$\begin{array}{c} {\bf Q}_{p} - {\bf Q}_{r} \\ (L/s) \\ 83.42 \\ 52.50 \\ 36.02 \\ 25.65 \\ 18.48 \end{array}$	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5	100 YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s =	100+20 (m3) 40.67 Balance 68.42 81.45	T _c Variable (min) 8 9 10 11 12	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23	Q, (L/s) 26.00 26.	Q _p -Q _r (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to:	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5
Variable (min) 4 9 14 19 24	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79	Peak Flow Q _p = 2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 age (m ³) Surface 1.16	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to:	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5	100 YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s =	100+20 (m3) 40.67 Balance 68.42 81.45	T _c Variable (min) 8 9 10 11 12 12	i _{2yr} (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00	Peak Flow Q _p =2.78xCi _{2yr} A (L's) 28.51 26.98 25.62 24.41 23.32 Required -0.23	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1.16	Q _p -Q _r (L/s) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to:	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5
Variable (min) 4 9 14 19 24 0rainage Area rea (Ha)	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040	Peak Flow Q _p = 2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 3ege (m ³) Surface 1.16	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to:	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5	100YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s =	100+20 (m3) 40.67 Balance 68.42 81.45	T _c Variable (min) 8 9 10 11 12	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00	Q _p -Q _r (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to:	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5
Variable (min) 4 9 14 19 24 0rainage Area rea (Ha) =	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00	Peak Flow Q p = 2.78xCi 100yr A 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04	Q r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 30 ge (m ³) Surface 1.16	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to:	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 \$5	100YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s =	100+20 (m3) 40.67 Balance 68.42 81.45	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C =	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00	$Q_p - Q_r$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to: 10.00	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5
Variable (min) 4 9 14 19 24 24 Drainage Area rea (Ha) : =	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00	Peak Flow Q p = 2.78x Ci 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Restricted Flow Qr (L 100-Year Pondir	Q r (L/s) 26.00 20.00 20	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to:	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5	100YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20%	100+20 (m3) 40.67 Balance 68.42 81.45	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C =	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I 2-Year Pon	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1.16	Q _p -Q _r (L/s) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to: 10.00	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5
Variable (min) 4 9 14 19 24 Drainage Area vea (Ha) c = T _c	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00	Peak Flow Q p = 2.78x Ci 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Restricted Flow Qr (L 100-Year Pondir Peak Flow	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 30urface 1.16	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5	100 YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C =	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I 2-Year Pon Peak Flow	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1.16	Q _p -Q _r (<i>L</i> /s) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to: 10.00	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5
Variable (min) 4 9 14 19 24 0rainage Area rea (Ha) : = Variable	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 <i>i</i> 100yr	Peak Flow Q _p = 2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Required 48.04 Peak Flow Q _r (L Peak Flow Q _p = 2.78xCi 100yr A	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 1.16	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5	100 YRQp 20% (L/s) 74.42 Overflow 28.90	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = T _c Variable	i _{2yr} (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I 2-Year Pon Peak Flow Q _p =2.78xCi _{2yr} A	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1.16	$Q_{p}-Q_{r}$ (<i>L/s</i>) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to: 10.00	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr
Variable (min) 4 9 14 19 24 24 Drainage Area rea (Ha) = T c Variable (min)	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 <i>i</i> 100yr (mm/hour)	$Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Image: Colspan="2">Colspan="2"Colspan="2">Colspan="2"	Q, (L/s) 26.00 20.00 20	$Q_{p}-Q_{r}$ (<i>L/s</i>) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 <i>L/s</i> = overflows to: 10.00	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³)	100 YRQp 20% (L/s) 74.42 Overflow 28.90 100 YRQp 20% (L/s)	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s)	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3)	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = T _c Variable (min)	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80 i 2yr (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Required -0.23 Restricted Flow Q _r (L 2-Year Pont Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1.16	$Q_{p}-Q_{r}$ (<i>L/s</i>) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to: 10.00 $Q_{p}-Q_{r}$ (<i>L/s</i>)	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³)
Variable (min) 4 9 14 19 24 Drainage Area Vea (Ha) c = T _c Variable (min) -4	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 <i>i</i> 100yr (mm/hour) 977.56	$Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Image: Colspan="2">Colspan="2"Colspan	Q, (L/s) 26.00 20.00 20	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00 Q _p -Q _r (L/s) 98.70 98.70	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69	100 YRQp 20% (L/s) 74.42 Overflow 28.90 100 YRQp 20% (L/s)	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s)	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3)	$ T_c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = Variable (min) 8 \circ $	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80 <i>i</i> 2yr (mm/hour) 85.46	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (L 2-Year Pont Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 7.60	Q, (L/s) 26.00 20.00 20	$Q_{p}-Q_{r}$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to: 10.00 $Q_{p}-Q_{r}$ (L/s) -2.40 -2.40	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³) -1.15
Variable (min) 4 9 14 19 24 Drainage Area vea (Ha) ; = T _c Variable (min) -4 1 6	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 <i>i</i> 100yr (mm/hour) 977.56 351.38 226 04	Qp = 2.78xCi 100yr A (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Peak Flow Qr (L Too-Year Pondir Peak Flow Qr (L 100-Year Pondir Peak Flow Qp = 2.78xCi 100yr A (L/s) 108.70 39.07 25 12	Q _r (L/s) 26.00 20.00 2	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00 Q _p -Q _r (L/s) 98.70 29.07 29.07	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69 1.74 54	100 YRQp 20% (L/s) 74.42 Overflow 28.90 100 YRQp 20% (L/s) 30.15	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s) 20.16	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3) 7.26	T_c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = Variable (min) 8 9	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overfiow 0.00 S20B 0.040 0.80 <i>i</i> 2yr (mm/hour) 85.46 80.87 76.84	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I 2-Year Pony Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 7.60 7.19 6.92	Q, (L/s) 26.00 20.00 20	$Q_p - Q_r$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to: 10.00 $Q_p - Q_r$ (L/s) -2.81 -2.81 -2.81 -2.40 -2.81 -2.317	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³) -1.15 -1.51 -1.51 -1.51
Variable (min) 4 9 14 19 24 Drainage Area urea (Ha) 2 = T _c Variable (min) -4 1 6 11	<i>i</i> 100yr (<i>mm/hour</i>) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 <i>S20B</i> 0.040 1.00 <i>i</i> 100yr <i>(mm/hour)</i> 977.56 351.38 226.01 169.91	$Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Required 48.04 Peak Flow $Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 108.70 39.07 25.13 18.89	Q _r (L/s) 26.00 20.00 2	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00 Q _p -Q _r (L/s) 98.70 29.07 15.13 8.89	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69 1.74 5.45 5.87	100 YRQp 20% (L/s) 74.42 Overflow 28.90 100 YRQp 20% (L/s) 30.16	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s) 20.16	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3) 7.26	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = Variable (min) 8 9 10	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 \$20B 0.040 0.80 i 2yr (mm/hour) 85.46 80.87 76.81 73.17	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I 2-Year Pon Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 7.60 7.19 6.83 6.51	Q, (L/s) 26.00 20.00 20	$Q_p - Q_r$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to: 10.00 $Q_p - Q_r$ (L/s) -2.40 -2.81 -3.17 -3.49	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³) -1.15 -1.51 -1.51 -1.51 -1.90 -2 30
Variable (min) 4 9 14 19 24 24 0rainage Area rea (Ha) = T c Variable (min) -4 1 6 11 16	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 <i>i</i> 100yr (mm/hour) 977.56 351.38 226.01 169.91 137.55	$Peak$ Flow $Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Restricted Flow Q _r (L Peak Flow $Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 108.70 39.07 25.13 18.89 15.30	Q _r (L/s) 26.00 20.00 2	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00 Q _p -Q _r (L/s) 98.70 29.07 15.13 8.89 5.30	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69 1.74 5.87 5.87 5.08	100 YRQp 20% (L/s) 74.42 0verflow 28.90 100 YRQp 20% (L/s) 30.16	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s) 20.16	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3) 7.26	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = Variable (min) 8 9 10	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 0verflow 0.00 \$20B 0.040 0.80 i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89	Peak Flow Q _p =2.78×Ci _{2yr} A (L/s) 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I 2-Year Pon Peak Flow Q _p =2.78×Ci _{2yr} A (L/s) 7.60 7.19 6.83 6.51 6.22	Q, 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1.16 /s)= ding Q, (L/s) 10.00 10.00 10.00 10.00	$Q_{p}-Q_{r}$ (<i>L/s</i>) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to: 10.00 $Q_{p}-Q_{r}$ (<i>L/s</i>) -2.40 -2.81 -3.17 -3.49 -3.78	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³) -1.15 -1.51 -1.51 -1.51 -1.51 -2.30 -2.72
Variable (min) 4 9 14 19 24 24 0rainage Area rea (Ha) 5 = T c Variable (min) -4 1 6 11 16	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 <i>i</i> 100yr (mm/hour) 977.56 351.38 226.01 169.91 137.55	$Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Restricted Flow Q _r (L Peak Flow $Q_p = 2.78 \times Ci_{100r} A$ (L/s) 108.70 39.07 25.13 18.89 15.30	Q _r (L/s) 26.00 20.00 2	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00 Q _p -Q _r (L/s) 98.70 29.07 15.13 8.89 5.30	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69 1.74 5.45 5.87 5.08	100 YRQp 20% (L/s) 74.42 0verflow 28.90 100 YRQp 20% (L/s) 30.16	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s) 20.16	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3) 7.26	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = T _c Variable (min) 8 9 10 10 11 11 12	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 0verflow 0.00 \$20B 0.040 0.80 i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89	Peak Flow Q _p =2.78×Ci _{2yr} A (L/s) 26.98 25.62 24.41 23.32 Required -0.23 Restricted Flow Q _r (I 2-Year Pon Peak Flow Q _p =2.78×Ci _{2yr} A (L/s) 7.60 7.19 6.83 6.51 6.22	Q, 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 1.16 //s)= ding Q, (L/s) 10.00 10.00 10.00 10.00 10.00	$Q_{p}-Q_{r}$ (<i>L</i> /s) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to: 10.00 $Q_{p}-Q_{r}$ (<i>L</i> /s) -2.40 -2.81 -3.17 -3.49 -3.78	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³) -1.15 -1.51 -1.51 -1.51 -1.51 -2.30 -2.72
Variable (min) 4 9 14 19 24 24 Vrainage Area rea (Ha) = T _c Variable (min) -4 1 6 11 16	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 i 100yr (mm/hour) 977.56 351.38 226.01 169.91 137.55	$Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Required 48.04 Peak Flow $Q_p = 2.78 \times Ci_{00yr} A$ (L/s) 108.70 39.07 25.13 18.89 15.30	Q _r (L/s) 26.00 20.00 2	Q _p -Q _r (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00 Q _p -Q _r (L/s) 98.70 29.07 15.13 8.89 5.30	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69 1.74 5.87 5.08	100 YRQp 20% (L/s) 74.42 0verflow 28.90 100 YRQp 20% (L/s) 30.16	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s) 20.16 100+20	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3) 7.26	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = T _c Variable (min) 8 9 10 10 11 12	<i>i</i> ₂ _{yr} (<i>mm/hour</i>) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80 <i>i</i> ₂ _{yr} (<i>mm/hour</i>) 85.46 80.87 76.81 73.17 69.89	Peak Flow $Q_p = 2.78 \times Ci_{2yr} A$ (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Required -0.23 Peak Flow Q _r (I Peak Flow Q _p = 2.78 × Ci ₂ × A (L/s) 7.60 7.19 6.83 6.51 6.22	Q, 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Storage (m 0.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00	$Q_{p}-Q_{r}$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 ³) Sub-surface 0 overflows to: 10.00 $Q_{p}-Q_{r}$ (L/s) -2.40 -2.81 -3.17 -3.49 -3.78 ³)	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 \$5 Volume 2yr (m ³) -1.15 -1.51 -1.51 -1.51 -2.30 -2.72
Variable (min) 4 9 14 19 24 24 Drainage Area rea (Ha) = T c Variable (min) -4 1 1 6 11 16	<i>i</i> 100yr (<i>mm/hour</i>) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 <i>S20B</i> 0.040 1.00 <i>i</i> 100yr (<i>mm/hour</i>) 977.56 351.38 226.01 169.91 137.55 Overflow 0.00	$Peak$ Flow $Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Required 48.04 Restricted Flow Q _r (L Peak Flow $Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 108.70 39.07 25.13 18.89 15.30 Stor Required Stor	Q, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 10.00 1.16 V/s)= Q, (L/s) 10.00 1	$Q_p - Q_r$ (L/s) 83.42 52.50 36.02 25.65 18.48 Sub-surface 0 L/s = overflows to: 10.00 $Q_p - Q_r$ (L/s) 98.70 29.07 15.13 8.89 5.30 Sub-surface	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69 1.74 5.45 5.87 5.08 Balance	100 YRQp 20% (L/s) 74.42 Overflow 28.90 100 YRQp 20% (L/s) 30.16	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s) 20.16 100+20 Required 7.26	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3) 7.26 Balance 5.85	T _c Variable (min) 8 9 10 11 12 Drainage Area Area (Ha) C = Variable (min) 8 9 10 11 12	<i>i</i> 2 ₂ /r (<i>mm/hour</i>) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 S20B 0.040 0.80 0.80 <i>i</i> 2 ₂ /r (<i>mm/hour</i>) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00	$Q_p = 2.78 \times Ci_{2yr} A$ (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Required Required Required Required Required	Qr Qc.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 10.00 10.00 10.00 10.00 10.00 Storage (m Surface 1.41	$Q_{p}-Q_{r}$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to: 10.00 $Q_{p}-Q_{r}$ (L/s) -2.40 -2.81 -3.17 -3.49 -3.78 3) Sub-surface 0 Sub-surface 0 -2.68 -2.40 -3.17 -3.78 -3.78 -3.78 -3.78 -3.78 -3.78 -3.78 -3.78 -3.78 -2.68 -2.68 -2.68 -2.68 -2.68 -2.68 -2.69 -2.69 -2.69 -2.69 -2.69 -2.78 -3.78	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³) -1.15 -1.51 -1.51 -1.51 -2.30 -2.72 Balance 0.00
Variable (min) 4 9 14 19 24 24 24 24 24 24 24 24 24 24 24 24 24	i 100yr (mm/hour) 262.41 188.25 148.72 123.87 106.68 Overflow 17.79 S20B 0.040 1.00 <i>i</i> 100yr (mm/hour) 977.56 351.38 226.01 169.91 137.55 Overflow 0.00	$Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 109.42 78.50 62.02 51.65 44.48 Stor Required 48.04 Required 48.04 Peak Flow Q _r (L Peak Flow $Q_p = 2.78 \times Ci_{100yr} A$ (L/s) 108.70 39.07 25.13 18.89 15.30 Stor Required 5.45	Q _r (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 30 surface 1.16 /s)= g Q _r (L/s) 10.00	$\begin{array}{c} {\bf Q}_{p} - {\bf Q}_{r} \\ (L/s) \\ 83.42 \\ 52.50 \\ 36.02 \\ 25.65 \\ 18.48 \end{array}$ $\begin{array}{c} {\bf Sub-surface} \\ 0 \\ L/s = \\ overflows to: \end{array}$ $\begin{array}{c} 10.00 \\ \hline \\ {\bf Q}_{p} - {\bf Q}_{r} \\ (L/s) \\ 98.70 \\ 29.07 \\ 15.13 \\ 8.89 \\ 5.30 \\ \hline \\ {\bf Sub-surface} \\ 0 \\ L/s = \end{array}$	Volume 100yr (m ³) 20.02 28.35 30.25 29.24 26.62 Balance 46.88 55.81 S5 Volume 100yr (m ³) -23.69 1.74 5.45 5.87 5.08 Balance 4.04 11.22	100 YRQp 20% (L/s) 74.42 0verflow 28.90 100 YRQp 20% (L/s) 30.16 0verflow 0.00	Qp - Qr (L/s) 48.42 100+20 Required 69.58 L/s = 100Yr +20% Qp - Qr (L/s) 20.16 100+20 Required 7.26 L/s =	Volume 100+20 (m3) 40.67 Balance 68.42 81.45 Volume 100+20 (m3) 7.26 Balance 5.85 16.24	T _c Variable (min) 8 9 10 11 12	i 2yr (mm/hour) 85.46 80.87 76.81 73.17 69.89 Overflow 0.00 85.46 80.87 76.81 73.17 69.89 0.040 0.80 0.80 0.80 0.80 0.81 73.17 69.89	Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 28.51 26.98 25.62 24.41 23.32 Required -0.23 Required Peak Flow Q _p =2.78xCi _{2yr} A (L/s) 7.60 7.19 6.83 6.51 6.22 Required -1.90	Qr, (L/s) 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00 Storage (m Surface 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00	$Q_{p}-Q_{r}$ (L/s) 2.51 0.98 -0.38 -1.59 -2.68 3) Sub-surface 0 overflows to: 10.00 $Q_{p}-Q_{r}$ (L/s) -2.40 -2.81 -3.17 -3.49 -3.78 3) Sub-surface 0	Volume 2yr (m ³) 1.20 0.53 -0.23 -1.05 -1.93 Balance 0.00 S5 Volume 2yr (m ³) -1.15 -1.51 -1.51 -1.90 -2.30 -2.72 Balance 0.00

Drainage Area	S5]							Drainage Area	S5				
Area (Ha)	0.140) Restricted Flow O (I	(0)-	05.00					Area (Ha)	0.140	Postricted Flow Q (I	(0)-	05.00	
C =	1.00) Restricted Flow Q _r (L	_/s)=	25.00					C =	0.80	Restricted Flow Qr (I	_/s)=	25.00	
		100-Year Pondi	ng				100Yr +20%				2-Year Pon	ding		
T _c	İ 100ur	Peak Flow	Q,	QQ.	Volume	100YRQp	Qp - Qr	Volume	T _c	Í sur	Peak Flow	Q,	Q,-Q,	Volume
Variable	10091	Q _p =2.78xCi _{100yr} A		ap ar	100yr	20%		100+20	Variable	291	Q _p =2.78xCi _{2yr} A		ap ar	2yr
(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m°)	(L/s)	(L/s)	(m3)	(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m°)
6	226.01	87.96	25.00	62.96	22.67				8	85.46	26.61	25.00	1.61	0.77
11	169.91	66.13	25.00	41.13	27.14	64.04	20.24	27.67	9	80.87	25.18	25.00	0.18	0.10
21	137.55	55.55 45.26	25.00	20.55	27.39	04.24	39.24	37.07	10	70.01	23.91	25.00	-1.09	-0.65
26	101.18	39.38	25.00	14.38	22.43				12	69.89	21.76	25.00	-3.24	-2.33
		Stor	rage (m ³)				100+20				:	Storage (m	³)	
-	Overflow	Required	Surface	Sub-surface	Balance	Overflow	Required	Balance		Overflow	Required	Surface	Sub-surface	Balance
	50.92	78.31	1.32	0	76.99	74.26	111.93	110.61		0.00	-0.65	1.32	0	0.00
				L/s =	80.20		L/s =	115.22						22
				overflows to:	56								overflows to:	56
Drainage Area	S6	7							Drainage Area	S6	1			
Area (Ha)	0.300)							Area (Ha)	0.300				
C =	1.00	Restricted Flow Q _r (L	_/s)=	50.00					C =	0.80	Restricted Flow Q _r (I	_/s)=	50.00	
		100-Year Pondi	na				100Yr +20%		-	1	2-Year Pon	dina		
T		Peak Flow	- g	1	Volume	100VROn	On - Or	Volume	τ	1	Peak Elow	unig	<u>г</u>	Volume
Variable	i _{100yr}	$Q = 2.78 \times Ci_{100} A$	Q,	$Q_p - Q_r$	100vr	20%	ap - ai	100+20	, c Variable	i _{2yr}	$Q = 2.78 \times Ci_{\odot} A$	Q,	$Q_p - Q_r$	2vr
(min)	(mm/hour)	(1/s)	(I /s)	(1/s)	(m^3)	(1/s)	(1/s)	(m3)	(min)	(mm/hour)	(1/s)	(I /s)	(I /s)	(m^3)
8	199.20	166 13	50.00	116 13	55 74	(1))	(1))	(110)	8	85 46	57.02	50.00	7.02	3.37
13	155.11	129.36	50.00	79.36	61.90				9	80.87	53.96	50.00	3.96	2.14
18	128.08	106.82	50.00	56.82	61.37	128.19	78.19	84.44	10	76.81	51.24	50.00	1.24	0.75
23	109.68	91.47	50.00	41.47	57.23				11	73.17	48.82	50.00	-1.18	-0.78
28	96.27	80.29	50.00	30.29	50.89				12	69.89	46.63	50.00	-3.37	-2.42
		0.	(3)				100.00					0 4	3,	
-	Overflow	Boguirod	rage (m ⁻)	Sub-surface	Balanco	Overflow	100+20 Required	Balanco		Overflow	Poquirod	Storage (m) Sub-surface	Balanco
	76.99	138.36	9 71	0	128 65	110.61	195.06	185.35		0.00	0 75	9 71	0	0.00
	10.00	100.00	0.71	L/s =	119.12	110.01	L/s =	171.62		0.00	0.70	0.71	0	0.00
				overflows to:	R6								overflows to:	R6
		-									-			
Drainage Area	R6								Drainage Area	R6				
Area (Ha)	0.170) Restricted Flow Q _r (L	_/s)=	20.00					Area (Ha)	0.170				
C =	0.68	3 50% Restricted Flow	/ Q _r (L/s)=	10.00					C =	0.68	Restricted Flow Q _r (I	_/s)=	10.00	
		100-Year Pondi	ng				100Yr +20%				2-Year Pon	ding		
T _c	;	Peak Flow	0	0.0	Volume	100YRQp	Qp - Qr	Volume	T _c		Peak Flow	0	0.0	Volume
Variable	l 100yr	Q _p =2.78xCi _{100yr} A	Q,	ω _p -ω _r	100yr	20%	-	100+20	Variable	l _{2yr}	Q _p =2.78xCi _{2yr} A	Q,	$\mathbf{w}_{p} \cdot \mathbf{w}_{r}$	2yr
(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m ³)	(L/s)	(L/s)	(m3)	(min)	(mm/hour)	(L/s)	(L/s)	(L/s)	(m³)
16	137.55	44.20	10.00	34.20	32.84				11	73.17	23.51	10.00	13.51	8.92
21	116.30	37.37	10.00	27.37	34.49				12	69.89	22.46	10.00	12.46	8.97
26	101.18	32.52	10.00	22.52	35.12	39.02	29.02	45.27	13	66.93	21.51	10.00	11.51	8.98
31	89.83	28.87	10.00	18.87	35.09				14	64.23	20.64	10.00	10.64	8.94
36	80.96	26.02	10.00	16.02	34.60				15	01.//	19.85	10.00	9.85	٥.४/
		Stor	rage (m ³)				100+20				:	Storage (m	³)	
-	Overflow	Required	Surface	Sub-surface	Balance	Overflow	Required	Balance		Overflow	Required	Surface	Sub-surface	Balance
	128.65	163.78	4.38	6.98	152.42	185.35	230.61	219.25		0.00	8.98	4.38	6.98	0.00
				L/s =	97.70		L/s =	140.55						
				overflows to:	Delphinium Cres	i.							overflows to:	Delphinium Cres.

https://ibigroup.sharepoint.com/sites/Projects1/135925/Internal Documents/6.0_Technical/6.04_Civil/04_Design-Analysis/Submission No.2/CCS_swm



IBI GROUP 400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com
 PROJECT:
 Barrett Block 178

 DATE:
 2022-10-27

 FILE:
 135925-6.4.4

 REV #:
 2

 DESIGNED BY:
 AC

 CHECKED BY:
 RM

UNDERGROUND STORAGE CALCULATIONS - BARRETT BLOCK 178

Pipe Storage	Area R6				
From	То	Length	Diameter	X-sec Area	Volume
ECB1	RYCB7	26.07	250	0.049	1.28
RYCB7	ECB2	28.46	250	0.049	1.40
ECB2	ECB3	29.13	250	0.049	1.43
ECB3	ECB4	20.50	250	0.049	1.01
				Total	5.11

Structure Stora	ge	Area				
	Base	Тор	Height	diameter	X-sec Area	Volume
ECB1	98.480	99.48	1.00	300	0.071	0.07
ECB2	100.080	101.08	1.00	300	0.071	0.07
ECB3	100.090	101.09	1.00	300	0.071	0.07
ECB4	100.150	101.15	1.00	300	0.071	0.07
RYCB7	99.630	101.03	1.40	1200	1.131	1.58
					Total	1.87

TOTAL AREA

6.98



STORM HYDRAULIC GRADE LINE DESIGN SHEET PROJECT TITLE CITY OF OTTAWA DEVELOPPER

JOB #:	135925 - 6.04
DATE:	2022-11-11
DESIGN:	AC
CHECKED:	RM
REV #:	2

FRICTION LOSS	FROM MH	TO MH	PIPE ID	MANNING	FORMULA - F	LOWING FULL				
Block 178	10	9		DIA	Area	Perim.	Slope	Hyd.R.	Vel.	Q
				(m)	(m2)	(m)	(%)	(m)	(m/s)	(l/s)
INVERT ELEVATION (m)	98.030	98.091	_	0.45	0.16	1.41	0.550	0.11	1.33	211.34
DIAMETER (mm)	98.480	98.541	450				0.847]] 1		
LENGTH (m)			450	DESIGN FL	OW TO FULL		0.847			
			170.00	DEGIGINTE		-	0.010	<u>]</u>		
FLOW (I/S)			179.00							٦
HGL (m) ***	96.430	96.474	0.044		Head loss in	manhole simplifie	ed method p.	71 (MWDM)	Ki =0.75	
MANHOLE COEE K= 0.75	LOSS (m)	0.048	-		Velocity = FI	ow / Area =	enus	1 13	m/s	
	()				HL = K∟ * '	V^2/ 2g				
TOTAL HGL (m)		98.406								-
MAX. SURCHARGE (mm)		-135]							
	FROM	ТО								
FRICTION LOSS	MH	MH	ID	MANNING	FURINULA - F					
Block 178	9	8		DIA	Area	Perim.	Slope	Hyd.R.	Vel.	Q
	00.404	00.150	_	(m)	(m2)	(m)	(%)	(m)	(m/s)	(l/s)
INVERT ELEVATION (m)	98.121	98.156		0.45	0.16	1.41	0.550	0.11	1.34	212.23
OBVERTELEVATION (m)	98.571	98.606	450		C SLOPE =		2 %]]]]		
			450	DESIGN FL	OW DEPTH -	FLOW RATIO (C	0.749			
			150.00	DESIGNTE	OW DEFINI-	-	0.200	<u>1</u>		
			159.00	_						7
HGL (m) ****	98.406	98.426	0.020		Head loss in	manhole simplifie	ed method p.	71 (MWDM)	K =0.75	
					fig1.7.1, Kra	tio = 0.75 for 45 b	ends		KL-0.75	
MANHOLE COEF K= 0.75	LOSS (m)	0.038	4		Velocity = FI	ow / Area =		1.00) m/s	
		09 464	4		HL = KL "	v~2/ 2g				1
		90.404								
MAX. SURCHARGE (IIIII)		-142								
				٦						
FRICTION LOSS	FROM MH	TO MH	PIPE ID	MANNING	Formula - F	LOWING FULL				
Block 178	8	7		DIA	Area	Perim.	Slope	Hyd.R.	Vel.	Q (1/a)
INVERT ELEVATION (m)	98 186	08 522	-	(11)	(III2)	(m)	(%)	(m)	(m/s)	(I/S) 101 17
OBVERT ELEVATION (m)	98.636	98.972	-1	HYDRAULI	C SLOPE =	0.49	0.430	0.11	1.20	191.17
DIAMETER (mm)	00.000	00.012	450	DESIGN FL	OW TO FULL	FLOW RATIO (C	0.832			
LENGTH (m)			74.7	DESIGN FL	OW DEPTH =	:	0.311			
FLOW (I/s)			159.00	1				<u>1</u>		
HGL (m) ***	98 464	98 696	0 232		Head loss in	manhole simplifie	ed method n	71 (MWDM)		7
	00.404	00.000			straight through	uah	ba motiloa p.	/	K∟=0.05	
MANHOLE COEF K= 0.05	LOSS (m)	0.003	1		Velocity = FI	ow / Area =		1.00) m/s	
			1		HL = K∟ * '	V^2/ 2a				
TOTAL HGL (m)		98.833	1			, _9				4
MAX. SURCHARGE (mm)		-139	1							
<i>t</i>	//									
FRICTION LOSS	FROM	TO	PIPE	MANNING	FORMULA - F	LOWING FULL				
Block 178	MH 7	MH 6	U ID		Area	Perim	Slope	Hvd R	Vel	
BIOCK ITO	,	Ũ		(m)	(m2)	(m)	(%)	(m)	(m/s)	(l/s)
INVERT ELEVATION (m)	98.552	98.587		0.45	0.16	1.41	0.450	0.11	1.20	191.50
OBVERT ELEVATION (m)	99.002	99.037		HYDRAULI	C SLOPE =	0.26	s %			
DIAMETER (mm)			450	DESIGN FL	OW TO FULL	FLOW RATIO (C	Q 0.658]		
LENGTH (m)			7.8	DESIGN FL	OW DEPTH =		0.266			
FLOW (I/s)			126.00							
HGL (m) ***	98.833	98.848	0.015		Head loss in	manhole simplifie	ed method p.	71 (MWDM)		
			7		straight thro	ugh			K∟=0.05	
MANHOLE COEF K= 0.05	LOSS (m)	0.002	ŤI		Velocitv = FI	ow / Area =		0.79	m/s	
	()		1		HL = K∟ * '	V^2/ 2g				
TOTAL HGL (m)		98.853	Ť			•				4
MAX. SURCHARGE (mm)	li i	-185	TI I							



STORM HYDRAULIC GRADE LINE DESIGN SHEET PROJECT TITLE CITY OF OTTAWA DEVELOPPER

JOB #: 135925 - 6.04 DATE: 2022-11-11 DESIGN: AC CHECKED: RM REV #: 2

				٦				REV #:	2		
FRICTION LOSS	FROM MH	ТО МН	PIPE	E MANNING FORMULA - FLOWING FULL							
Block 178	6	5		DIA	Area	Perim.	Slope	Hyd.R.	Vel.	Q	
	00.047	00.750		(m)	(m2)	(m)	(%)	(m)	(m/s)	(l/s)	
INVERTELEVATION (m)	98.617	98.753	_		0.16	1.41	0.450	0.11	1.20	190.76	
	99.067	99.203	450				0 661				
			450	DESIGN FL	OW TO FULL	FLOW RATIO (G	0.001				
			30.4	DESIGN FL	OW DEFTH-		0.200	1			
FLOW (I/s)	<u> </u>		126.00							1	
HGL (m) ****	98.853	98.912	0.059		Head loss in straight throu	manhole simplifie Igh	ed method p. 7	71 (MWDM)	K∟=0.05		
MANHOLE COEF K= 0.05	LOSS (m)	0.002			Velocity = Fl HL = KL * \	ow / Area = /^2/ 2ɑ		0.79	m/s		
TOTAL HGL (m)		99.019				0				1	
MAX. SURCHARGE (mm)		-185									
				7							
FRICTION LOSS	FROM MH	TO MH	PIPE ID	MANNING F	FORMULA - FI	LOWING FULL					
Block 178	5	4		DIA	Area	Perim.	Slope	Hyd.R.	Vel.	Q	
	00.040	00.000		(m)	(m2)	(m)	(%)	(m)	(m/s)	(I/S)	
	98.848	98.963				1.18	0.300	0.09	0.87	90.19	
	99.223	99.330	275				0 520				
LENGTH (m)			3/5	DESIGN FL	OW TO FULL	FLOW RATIO (G	0.530				
			56.2	DESIGN FL	OW DEFTH -		0.191				
FLOW (I/s)			51.00		l					1	
HGL (m) ***	99.019	99.051	0.032		Head loss in	manhole simplifie	ed method p. 7	71 (MWDM)	K1 =0.05		
					straight throu	ign		0.40	KL-0.05		
MANHOLE COEF K= 0.05	LOSS (m)	0.001			$Velocity = Fleter HI = K_1 * Velocity$	ow / Area = /^2/ 2a		0.46	m/s		
TOTAL HGL (m)		99,154				- 2, 29				1	
MAX_SUBCHARGE (mm)		-184									
FRICTION LOSS	FROM MH	TO MH	PIPE ID	MANNING F	Formula - Fi						
Block 178	5	20	-	DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (I/s)	
INVERT ELEVATION (m)	99.013	99.314		0.25	0.05	0.79	0.450	0.06	0.81	39.90	
OBVERT ELEVATION (m)	99.263	99.564		HYDRAULI	C SLOPE =	0.66	%				
DIAMETER (mm)			250	DESIGN FL	OW TO FULL	FLOW RATIO (Q	0.627				
LENGTH (m)			66.8	DESIGN FL	OW DEPTH =		0.143				
FLOW (I/s)			25.00					-			
HGL (m) ***	99.019	99.137	0.118		Head loss in	manhole simplifie	ed method p. 7	71 (MWDM)			
					straight throu	ıgh			K∟=0.05		
MANHOLE COEF K= 0.05	LOSS (m)	0.001			Velocity = Fl	ow / Area =		0.51	m/s		
					HL = K∟ * \	/^2/ 2g					
TOTAL HGL (m)		99.457									
MAX. SURCHARGE (mm)		-108									
FRICTION LOSS	FROM	ТО	PIPE	MANNING F	FORMULA - FI	LOWING FULL					
Block 178	MH 4	MH 21	ID	DIA	Area	Perim.	Slope	Hvd.R.	Vel.	Q	
	00.400	00.400		(m)	(m2)	(m)	(%)	(m)	(m/s)	(l/s)	
	99.198	99.432	_		0.03	0.63	0.600	0.05	0.81	25.39	
DIAMETER (mm)	99.398	99.632	200				70	1			
			200	DESIGN FL	OW DEPTH	FLUW RATIO (Q	u U.UUO				
LENGTH (m)			39.0	DESIGN FL	OW DEPTH =		0.002	l			
			0.00	4						1	
FLOW (I/s)				Head loss in manhole simplified method p. 71 (MWDM) straight through KL=0.05							
HGL (m) ***	99.457	99.457	0.000		Head loss in straight throu	mannole simplifie igh	a method p. 7		K∟=0.05		
HGL (m) *** HGL (m) *** MANHOLE COEF K= 0.05	99.457 LOSS (m)	99.457 0.000	0.000		Head loss in straight throu Velocity = Flo	mannole simplifie igh ow / Area =	a method p. 7	0.00	KL=0.05 m/s		
HGL (m) **** MANHOLE COEF K= 0.05 TOTAL HGL (m)	99.457	99.457 0.000	0.000		Head loss in straight throu Velocity = Fle HL = KL * V	mannole simplifie ugh ow / Area = /^2/ 2g	a method p. r	0.00	KL=0.05 m/s		
HCUW (I/s) HGL (m) *** MANHOLE COEF K= 0.05 TOTAL HGL (m) MAX_SUBCHARGE (mm)	99.457 LOSS (m)	99.457 0.000 99.457	0.000		Head loss in straight throu Velocity = Flu HL = KL * V	mannole simplifie igh ow / Area = /^2/ 2g		0.00	K∟=0.05 m/s		

IBI GROUP

	STORM HYDRAULIC GRADE LINE DESIGN SHEET							JOB #: 135925 - 6.04				
	1	PROJECT TITLE						DATE:	2022-11-11			
		CITY OF OTTAW	A					DESIGN:	AC			
GROOT	1	DEVELOPPER						CHECKED:	RM			
								REV #:	2			
FRICTION LOSS	FROM	ТО	PIPE	MANNING F	ORMULA - FI	LOWING FULL						
	MH	MH	U			• ••	0					
BIOCK 178	4	3	_	DIA	Area	Perim.	Slope	Hyd.R.	Vel.	Q		
	00.059	00.169	-1	(11)	(112)	(11)	(%)	(11)	(11/5)	(1/S)		
	99.056	99.100	-11			0.94	0.350	0.06	0.01	50.95		
	99.300	99.400	200				70	1				
			300		JW TO FULL	FLOW RATIO (Q	0.457					
			31.7	DESIGN FLO	JW DEFIN-	•	0.141	l				
FLOW (I/s)			26.00		-							
HGL (m) ***	99.154	99.177	0.023		Head loss in	manhole simplifie	d method p. 7	71 (MWDM)				
					straight throu	ıgh			K∟=0.05			
MANHOLE COEF K= 0.05	LOSS (m)	0.000			Velocity = Flo	ow / Area =	0.37 m/s					
	()		1		HL = K∟ * \	/^2/ 2g						
TOTAL HGL (m)		99.309				-						
		450	71									

FRICTION LOSS	FROM MH	TO MH	PIPE ID	MANNING FORMULA - FLOWING FULL									
Block 178	3	2		DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (I/s)			
INVERT ELEVATION (m)	99.298	99.342		0.2	0.03	0.63	0.600	0.05	0.81	25.54			
OBVERT ELEVATION (m)	99.498	99.542		HYDRAULIC	SLOPE =	0.48	%						
DIAMETER (mm)			200	DESIGN FLO									
LENGTH (m)			7.3	DESIGN FLOW DEPTH = 0.002									
FLOW (I/s)			0.00							_			
HGL (m) ***	99.309	99.309	0.000		Head loss in	manhole simplifie	d method p. 7	'1 (MWDM)					
					straight throu	ıgh	K∟=0.05						
MANHOLE COEF K= 0.05	LOSS (m)	0.000			Velocity = Fle	ow / Area =	0.00 m/s						
					HL = K∟ * \	√^2/ 2g							
TOTAL HGL (m)		99.344	l										
MAX. SURCHARGE (mm)		-198		J									

FRICTION LOSS	FROM	TO	PIPE	MANNING FORMULA - FLOWING FULL								
	MH	MH	ID									
Block 178	2	1		DIA	Area	Perim.	Slope	Hyd.R.	Vel.	Q		
				(m)	(m2)	(m)	(%)	(m)	(m/s)	(l/s)		
INVERT ELEVATION (m)	99.372	99.514		0.2	0.03	0.63	0.05	0.81	25.35			
OBVERT ELEVATION (m)	99.572	99.714		HYDRAULIC SLOPE = 0.72 %								
DIAMETER (mm)			200	DESIGN FLOW TO FULL FLOW RATIO (Q 0.000								
LENGTH (m)			23.7	DESIGN FLOW DEPTH = 0.002								
FLOW (I/s)			0.00									
HGL (m) ***	99.344	99.344	0.000		Head loss in	manhole simplifie	d method p. 7	1 (MWDM)				
]		straight throu	ugh						
MANHOLE COEF K= 0.05	LOSS (m)	0.000]	Velocity = Flow / Area = 0.00 m/s								
			1		HL = K∟ * \	√^2/ 2g						
TOTAL HGL (m)		99.516]									
MAX. SURCHARGE (mm)		-198]	<u> </u>								

		STORM HYDRAULIC GRADE LINE ⁽¹⁾									
			100 YEAR 3 H	IOUR CHICAG	0		100 YEAR 3 HOL	IR CHICAGO +	- 20%		
XPSWMM NODE	USF (M)	RARE EVE	NT SANITARY	ANNUAL EV	ENT SANITARY	RARE EVE	NT SANITARY	ANNUAL EVENT SANITARY			
		F	LOW	F	LOW	F	LOW	F	LOW		
		HGL (M)*	(M)	HGL (M)*	USF-HGL (M)	HGL (M)*	(M)	HGL (M)*	USF-HGL (M)		
MH11300	95.63	93.91	1.72	93.91	1.72	93.96	1.67	93.96	1.67		
MH11301	96.58	94.96	1.62	94.96	1.62	94.96	1.62	94.96	1.62		
MH11302	97.98	95.70	2.28	95.70	2.28	95.71	2.27	95.71	2.27		
MH11303	98.67	96.23	2.44	96.23	2.44	96.23	2.44	96.23	2.44		
MH11304	99.23	96.36	2.87	96.36	2.87	96.36	2.87	96.36	2.87		
MH11305	99.28	96.43	2.85	96.43	2.85	96.43	2.85	96.43	2.85		
MH11311	96.38	94.90	1.48	94.90	1.48	94.90	1.48	94.90	1.48		
MH11312	97.28	95.85	1.43	95.85	1.43	95.85	1.43	95.85	1.43		
MH11313	97.48	96.13	1.35	96.13	1.35	96.13	1.35	96.13	1.35		
MH11314	98.63	97.27	1.36	97.27	1.36	97.27	1.36	97.27	1.36		
MH11315	100.93	99.51	1.42	99.51	1.42	99.51	1.42	99.51	1.42		
MH11316	100.93	99.60	1.33	99.60	1.33	99.60	1.33	99.60	1.33		
MH11321	97.63	96.11	1.52	96.11	1.52	96.11	1.52	96.11	1.52		
MH11322	97.88	96.61	1.27	96.61	1.27	96.61	1.27	96.61	1.27		
MH11323	100.08	98.80	1.28	98.80	1.28	98.80	1.28	98.80	1.28		
MH11331	98.93	97.60	1.33	97.60	1.33	97.60	1.33	97.60	1.33		
MH11332	98.93	97.73	1.21	97.73	1.21	97.73	1.21	97.73	1.21		
MH11333	100.38	98.71	1.67	98.71	1.67	98.71	1.67	98.71	1.67		
MH11334	100.88	99.24	1.64	99.24	1.64	99.24	1.64	99.24	1.64		
MH11350	96.48	95.77	0.71	95.77	0.71	95.77	0.71	95.77	0.71		
MH11351	96.63	95.42	1.21	95.42	1.21	95.42	1.21	95.42	1.21		
MH11400	95.43	94.56	0.87	94.56	0.87	94.59	0.84	94.59	0.84		
MH11401	96.03	94.85	1.18	94.85	1.18	94.89	1.14	94.89	1.14		
MH11402	95.78	94.89	0.89	94.89	0.89	94.94	0.84	94.94	0.84		
MH11403	96.01	95.06	0.95	95.06	0.95	95.11	0.90	95.11	0.90		
MH11404	96.73	95.62	1.11	95.62	1.11	95.63	1.10	95.63	1.10		
MH11405	97.13	96.03	1.10	96.03	1.10	96.03	1.10	96.03	1.10		
MH11406	97.68	96.77	0.91	96.77	0.91	96.77	0.91	96.77	0.91		
MH11407	98.08	97.23	0.85	97.23	0.85	97.23	0.85	97.23	0.85		
MH11408	98.73	97.49	1.24	97.49	1.24	97.49	1.24	97.49	1.24		

Table 5.10 Storm Hydraulic Grade Line - Local Sewers within Barrett Lands Phase 3 for the 100 Year 3 Hour Chicago and 100 Year 3 Hour Chicago increased by 20% Storm Events

(1) HGL results were obtained from the XPSWMM models entitled 34738-202002-RARE-3CHI100.out, 34738-202002-ANN-3CHI100.out, 34738-202002-ANN-3CHI120.out and enclosed as part of the digital submission.

Barrett Block 178 Barrett Co-Tenancy			2023-01-10	
Ditch S6		Length = 17.26 m		
New Ditch Section Required 1: From Seelve use n =	:100 yr. flow = 119.12 l/s 0.013 (Channels)	0.119 Cu m/sec	areas	0.01
choose: slope S =	12.17 %	Up Stream Ditch btm=	102.10 wp=	0.92
Ditch slopes	22.00 :1	Difference =	2.10	
Water depth Check Ditch Capacity (Q)	0.021 metres (depth needs	ed to carry 0.13 Cu. M/sec)	Top Bank = 100.15 Free Board = 0.13	
Q =	0.012 Cu M/sec	and Velocity = 1.29 M/s		
Ditch S6	400	Length = 17.26 m		
From Seelye use n =	0.013 (Channels)	0.172 Cd misec	area=	0.07
choose: slope S = Ditch Bottom	12.17 % 0.00 metres	Up Stream Ditch btm= Dn Stream Ditch Btm =	102.10 wp= 100.00	2.48
Ditch slopes Water depth	22.00 :1 0.056 metres (depth peeds	Difference =	2.10 Top Bank = 100.15	
Check Ditch Capacity (Q)	0.172 Cu Minne	and Melecity - 2 49 M/s	Free Board = 0.09	
Q-	UTTE OF MIDLO	and velocity - 2.40 mil		
Ditch S10 New Ditch Section Required 1:	:100 yr. flow = 39.68 l/s	Length = 38.00 m 0.040 Cu m/sec		
From Seelye use n = choose: slope S =	0.013 (Channels) 0.89 %	Up Stream Ditch btm=	area= 101.44 wp=	0.04
Ditch Bottom	0.00 metres	Dn Stream Ditch Btm =	101.10	
Water depth	0.113 metres (depth needs	ed to carry 0.13 Cu. M/sec)	Top Bank = 101.25	
Check Ditch Capacity (Q) Q =	0.040 Cu M/sec	and Velocity = 1.03 M/s	Free Board = 0.04	
Ditch S10		Length = 38.00 m		
New Ditch Section Required 1:	100 yr. +20% flow = 62.7 l/s	0.063 Cu m/sec		0.05
choose: slope S =	0.89 %	Up Stream Ditch btm=	101.44 wp=	0.85
Ditch Bottom Ditch slopes	0.00 metres 3.00 :1	Dn Stream Ditch Btm = Difference =	101.10 0.34	
Water depth Check Ditch Capacity (Q)	0.135 metres (depth needs	ed to carry 0.13 Cu. M/sec)	Top Bank = 101.25 Free Board = 0.02	
Q =	0.064 Cu M/sec	and Velocity = 1.16 M/s		
Ditch S20	100	Length = 26.64 m		
From Seelye use n =	0.013 (Channels)	0.000 Cu m/sec	area=	0.00
choose: slope S = Ditch Bottom	3.72 % 0.00 metres	Up Stream Ditch btm= Dn Stream Ditch Btm =	102.39 wp= 101.40	0.00
Ditch slopes	3.00 :1 0.000 metres (death	Difference =	0.99 Top Bank = 101 55	
Check Ditch Capacity (Q)	o oco ou til		Free Board = 0.15	
Q =	0.000 Cu M/sec	and Velocity = 0.02 M/s		
Ditch S20 New Ditch Section Required 1:	:100 vr. +20% flow = 5.02 l/s	Length = 26.64 m 0.005 Cu m/sec		
From Seelye use n =	0.013 (Channels)	Lie Steene Ditek kime	area=	0.00
Ditch Bottom	0.00 metres	Dn Stream Ditch Btm =	102.39 wp= 101.40	0.25
Ditch slopes Water depth	3.00 :1 0.039 metres (depth needs	ed to carry 0.13 Cu. M/sec)	0.99 Top Bank = 101.55	
Check Ditch Capacity (Q) Q =	0.005 Cu M/sec	and Velocity = 1.04 M/s	Free Board = 0.11	
Ditch S20B		Length = 37.00 m		
New Ditch Section Required 1:	100 yr. flow = 11.22 l/s	0.011 Cu m/sec		
From Seelye use n = choose: slope S =	0.013 (Channels) 0.86 %	Up Stream Ditch btm=	area= 102.47 wp=	0.01
Ditch Bottom Ditch slopes	0.00 metres 3.00 :1	Dn Stream Ditch Btm = Difference =	102.15 0.32	
Water depth Check Ditch Canacity (O)	0.070 metres (depth needs	ed to carry 0.13 Cu. M/sec)	Top Bank = 102.3 Eree Board = 0.08	
oncer bien oupacity (a)			1100 00010 - 0.00	
Q =	0.011 Cu M/sec	and Velocity = 0.74 M/s		
Q = Ditch S20B	0.011 Cu M/sec	and Velocity = 0.74 M/s Length = 37.00 m		
Q = Ditch S20B New Ditch Section Required 1: From Seelye use n =	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels)	and Velocity = 0.74 M/s Length = 37.00 m 0.016 Cu m/sec	area=	0.02
Q = Ditch S20B New Ditch Section Required 1: From Seelye use n = choose: slope S = Ditch Bottom	0.011 Cu M/sec :100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.86 % 0.00 metres	and Velocity = 0.74 M/s Length = 37.00 m 0.016 Cu m/sec Up Stream Ditch btm = Dn Stream Ditch btm =	area= 102.47 wp= 102.15	0.02 0.51
Q = Ditch S20B New Ditch Section Required 1: From Seelye use n = choose: slope S = Ditch Bottom Ditch slopes Water death	0.011 Cu M/sec 100 yr. +20% flow = 18.24 l/s 0.013 (Channels) 0.88 % 0.00 metres 3.00 :1	and Velocity = 0.74 M/s Length = 37.00 m 0.016 Cu m/sec Up Stream Ditch bitm= Dn Stream Ditch bitm = Difference = Difference = Difference =	area= 102.47 wp= 102.15 0.32 Tan Banka 100.3	0.02 0.51
Q = Ditch S208 New Oltch Section Required 1: From Seelye use n = choose: slope S = Ditch Bottom Ditch slopes Water depth Check Ditch Capacity (Q)	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.68 % 0.00 metres 3.00 :1 0.081 metres (depth needs	and Velocity = 0.74 M/s Length = 37.00 m 0.016 Cu m/sec 0.016 Cu m/sec Up Stream Ditch bitm= Difference = Difference = ed to carry 0.13 Cu. M/sec	area= 102.47 wp= 102.15 0.32 Tog Bank = 102.3 Free Baard = 0.07	0.02 0.51
Q = Ditch S20B New Ditch Section Required 1: From Seelye use n = choose: stope S = Ditch Bottom Ditch stopes Water depth Check Ditch Capacity (Q) Q =	0.011 Cu Misec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.88 % 0.00 metres 3.00 :1 0.081 metres (depth needs 0.016 Cu Misec	and Velocity = 0.74 Ms Length = 37.00 m 0.016 Curnieec 0.016 Curnieec Up Steam Dich film= Difference = od to carry 0.13 Cu. Misec) and Velocity = 0.81 Mis	area= 102.47 wp= 102.15 0.32 Top Bank = 102.3 Free Board = 0.07	0.02
Q = Ditch S20B New Ditch Section Required 1: From Seebje use n = Ditch Bottom Ditch alopes Water depth Check Ditch Capacity (Q) Q = Ditch Section Required 1:	0.011 Cu Misec 100 yr.+20% flow = 18.24 l/s 0.013 (Channels) 0.86 % 0.00 metres 3.00 :1 0.061 metres (depth need) 0.016 Cu Misec 100 yr. flow = 80.20 l/s	and Velocity = 0.74 Ms Length = 37.00 m 0.016 Curvisec 0.016 Curvisec Up Steam Dich htm= Difference = Difference = 0.016 Curvisec and Velocity = 0.81 Ms Length = 2.130 m 0.080 Curvisec 0.808 Curvisec	area= 102.47 wp= 102.15 0.32 Top Bank = 102.3 Free Board = 0.07	0.02
G = Ditch S208 New Ditch Section Required 1: From Seelye use n = choose: slope S = Ditch Bottom Ditch Bottom Other A Ditch Capacity (0) Q = Ditch S5 New Ditch Section Required 1: From Section Required 1: From Section S =	0.011 Cu M/sec 100 yr. +20% flow = 16.24 (is 0.013 (Channels) 0.08 (% 0.00 metes 0.001 Cu M/sec 100 yr. flow = 80.20 (s 0.013 (Channels) 120 (s	and Velocity = 0.74 Ms Lengh = 37.00 m 0.016 Cu mrisec 0.016 Cu mrisec Up Steam Dich Mm= Difference = Difference = 0.81 Mrs Difference = 0.81 Mrs Difference = 0.81 Mrs United velocity = 0.81 Mrs Lengh = 21.30 m 0.000 Cu mrisec 10.580 cu mrisec	area= 102.47 wp= 102.15 0.32 Top Bank = 102.3 Free Board = 0.07 area= 102.23 wrea =	0.02 0.51
G = Ditch S208 New Ditch Section Required 1: From Seelye use n = choose: slope S = Ditch Bottom Ditch Bottom Ditch S5 New Ditch Section Required 1: Chase Signe S = Ditch S5 New Ditch Section Required 1: choose: slope S = Ditch Bottom	0.011 Cu M/sec 100 yr +20% flow = 16.24 l/s 0.013 (Channels) 0.86 % 0.00 metes 3.00 -1 0.081 metres (depth need 0.016 Cu M/sec 100 yr. flow = 60.20 l/s 0.013 (Channels) 1.20 % 0.013 (Channels) 1.20 %	and Velocity = 0.74 Ms Length = 37.00 m 0.016 Com/ms Uig Stream Dich bitm Dr. Stream Dich bitm and Velocity = 0.81 Ms Length = 21.30 m 0.080 Cum/ms Uig Stream Dich bitm 0.080 Cum/ms	102.47 area* 102.15 wp* 0.2 Top Bank = 102.3 Free Board = 0.07 area* 102.23 wp* 102.15 vp*	0.02 0.51 0.06 0.88
G = Dich S208 New Dich Section Required 1: From Seelye use n = choose: slope State Well with Section Required 1: Dich Nopes Well with Section Required 1: Dich Section Requ	0.011 Cu M/sec 100 yr. +20% flow = 18.24 l/s 0.013 (Channels) 0.86 % 0.06 metres 3.03 1 0.061 metres 0.016 Cu M/sec 100 yr. flow = 6020 l/s 0.013 (Channels) 1.20 % 0.030 cl 3.03 metres (depth needs	and Velocity = 0.74 Ms Length = 37.00 m 0.010 CumMec Uig Steam Dich bim- Difference = and Velocity = 0.81 Ms 0.000 CumMec Uig Steam Dich bim- 0.000 CumMec Uig Steam Dich bim- Difference = Difference =	area= 102.47 wp= 102.15 wp= 102.3 Top Bank = 102.3 Free Board = 0.07 area= 102.25 wp= 102.15 0.08 Top Bank = 102.35	0.02 0.51 0.06 0.88
G = Dick 5208 New Dich Section Required 1: From Seelye use n = choose: slope 3 to 5 to 5 to 5 to 5 to 5 to 5 to 5 to	0.011 Cu M/sec 100 yr. +20% flow = 18.24 (/s 0.013 (Channels) 0.88 % 0.00 metes 3.00 1 0.081 metes (depth need 0.016 Cu M/sec 100 yr. flow = 60.20 (/s 0.013 (Channels) 1.20 % 0.00 nites 3.00 1 0.138 metes (depth need 0.139 metes (depth need 0.080 Cu M/sec	and Velocity 0.74 Ms Lergit + 37.04 Ms 0.010 Curve: 0.010 Curve: Up Stream Dich bitm- Difference + 0.010 Curve: and Velocity 0.81 Ms 0.080 Curve: 0.081 Ms 0.080 Curve: 0.081 Ms 0.080 Curve: 0.081 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms 0.080 Curve: 0.080 Ms	area= 102.47 wp= 102.15 0.27 Bank = 102.3 Top Bank = 102.3 Top Bank = 0.07 102.23 wp= 102.15 0.08 Top Bank = 102.25 Free Board = 0.06	0.02 0.51 0.06 0.88
G = Didch S208 Didch S305 (Sin Required 1: From Seebye use n = choose: single S = Ditch Bottom Ditch Bottom Ditch Bottom Ditch soges Water depth Check Ditch Capacity (C) G = Ditch S5 New Ditch Section Required 1: From Seebye signs 7 = Choose: single S = Choose: single S = Ditch Adopes Ditch Adopes Ditch Adopes Ditch S55 Ditch Capacity (C) G = Ditch S5	0.011 Cu M/sec 100 yr. +20% flow = 18.24 Vs 0.013 (Channels) 0.86 % 0.00 metes 3.00 :1 0.081 metes (depth needs 0.016 Cu M/sec 100 yr.flow = 80.20 Vs 0.013 (samnels) 0.013 (samnels) 0.00 metes 0.00 n H 0.019 metes (depth needs 0.000 Cu M/sec	and Velocity 0.74 Ms Length 37.00 m 0.016 Countes 0.016 Notes Up Stream Dich bitm- Difference at discarry 0.13 Out Mees) 0.81 Ms Image: Stream Dich bitm- Difference at discarry 0.13 Out Mees) 0.81 Ms Length 2.13 Or 0.080 Countee 0.81 Ms Up Stream Dich bitm- Difference at discarry 0.13 Out Mees) 0.81 Ms discarry 0.13 Out Mees 0.81 Ms Difference at discarry 0.13 Out Mees) 1.38 Ms and Velocity 1.28 Ms	area= 102.47 wp= 0.32 Top Bank = 102.3 Free Board = 0.07 area= 102.23 wp= 102.15 0.08 0.08 Top Bank = 102.25 Free Board = 0.06	0.02 0.51 0.06 0.88
G = Distristication Terra Diaho Section Required 1: fricton Section tare n = choose: slope S = Diché dopes Wel edeph Check Dich Capacity (C) G = Diché Sé New Dich Bockion Required 1: dhoose: slope S = dhoose: slope S = dhoose: slope S = Diché dopes Waler deph Diché dopes Waler deph Diché dopes Waler deph Diché dopes Waler deph Diché dopes Waler deph Diché dopes Waler deph Diché Séction Required 1: Diché Séction Required 1	0.011 Cu M/sec 100 yr -200; flow = 16.24 (s 0.012 (Chambel) 0.013 (Chambel) 0.010 (Chambel) 0.000 metes 0.016 Cu M/sec 100 yr flow = 01.20 (s 0.010 (Chambel) 0.010 metes 0.010 and 0.080 Cu M/sec 100 yr -200; flow = 11.222 (s	and Velocity 0.74 Ms Length 37.00 m 0.016 CumHer 0.016 Ms Up Steam Dicht bitm Difference * Difference * 0.81 Ms Independent Dicht bitm Difference * et al carry 0.13 Out Mises 0.81 Ms Length * 0.81 Ms Up Steam Dicht bitm Difference * Up Steam Dicht bitm Difference * Difference * et al carry 0.13 Out Mises and Velocity * 0.81 Ms Difference * et al carry 0.13 Out Mises and Velocity * 1.38 Ms Length * 2.13 m m 0.115 Cummise 1.31 m	area- 102.47 wp= 102.15 wp= 0.32 Top Bank = 102.3 Free Board = 0.07 102.23 wp= 102.23 wp= 102.15 wp= 102.15 rpe Bank = 102.35 Free Board = 0.06	0.02 0.51 0.06 0.88
G = Dishs 5200 New Dish Section Required 1: From Service and Section Required 1: from Service and Section Section Section Olich alopes Were Dish Section Required 1: Prom Service and section Section Section Were Dish Section Required 1: Prom Service and Section Section Section Water depth Check Ditch Capacity (G) Q = Dish SS New Dish Section Required 1: From Service and Section Required 1: From Service and Section Required 1: From Service and Section Required 1: From Service and Section Required 1: From Service and Section Required 1: From Service and Section Required 1: From Service and Section Required 1: From Service Section Required 1: From Service and Section Required 1: From Service Section Required 1: From Service Section Required 1: From Service Section Required 1: From Service Section Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Required 1: From Fort Fort Required 1: From Fort Fort Fort Fort Fort Fort Fo	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.00 metes 100 or. 0.00 metes 0.016 Cu M/sec 0.016 Cu M/sec 0.017 (Channels) 1.20 % 0.080 metes 0.080 cu M/sec 100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 %	and Velocity = 0.74 Ms Length = 37.00 m 0.016 Comme Debased Dich bitm Debased Dich bitm Debased Dich bitm Debased Dich bitm 0.080 Comme Length = 21.30 m 0.080 Comme Up Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm De Steam Dich bitm 0.010 Comme	102.47 area 102.15 vp 32 To plank = 102.3 Free Board = 0.07 102.25 Free Board = 102.3 Free Board = 0.07 102.23 vp To plank = 102.35 Free Board = 0.06	0.02 0.51 0.06 0.88 0.88
G = Dich: 5200 New Dich Section Required 1: from Seeby tops 5 = choice: solid 5 choice: solid 5 Choice: Solid 5 Wer Dich Section Required 1: Prom Seeby use n = choice: sides 5 Check Ditch Capacity (0) Check Ditch Capacity (2) Check Ditch Ca	0.011 Cu M/sec 100 yr. +20% flow = 18.24 l/s 0.013 (Channets) 0.86 % 0.06 % 0.06 % 0.016 Cu M/sec 0.016 Cu M/sec 0.018 (Channets) 12.0 % 0.001 uffects (depth needd 0.080 Cu M/sec 100 yr. 100* 80.20 l/s 0.013 (Channets) 12.0 % 0.080 Cu M/sec 1100 yr. +20% flow = 115.22 l/s 0.013 (Channets) 12.0 % 0.000 netes 3.00 :1	and Velocity = 0.74 Ms Length = 37.00 m 0.016 Comme: Up Steam Dich bitm Dn Steam Dich bitm Dn Steam Dich bitm and Velocity = 0.81 Ms ultip Steam Dich bitm 0.000 Comme: Up Steam Dich bitm Dn Steam Dich bitm Dn Steam Dich bitm Dn Steam Dich bitm Dn Steam Dich bitm 0.115 Co mises	area= 102.47 area= 102.15 wp= 0.2 Top Dank = 102.3 Free Board = 0.07 area= 102.23 wp= 102.15 0.06 Top Bank = 102.35 Free Board = 0.06 area= 102.25 0.06	0.02 0.51 0.06 0.88
G = Olich S208 Olich S208 Olich S208 Olich S208 Olich S208 Olich S208 Olich Motor Olich Motor Olich Motor Olich Motor Olich S5 New Dich Sector Required 1 Olich S5 Pere Dich Sector Required 1 Olich S5 Pere Dich S6	0.011 Cu M/sec 100 yr. +20%, flow = 18.24 l/s 0.013 (Channets) 0.86 % 0.06 metres 0.001 metres (depth need 0.016 (Chamsel) 120 % 0.017 (Channets) 120 % 0.030 netres 0.031 (Channets) 120 % 0.060 Cu M/sec 100 yr. +20%, flow = 11.522 l/s 0.080 Cu M/sec 100 yr. +20%, flow = 11.522 l/s 0.080 Cu M/sec	and Velocity = 0.74 Ms Length = 37.00 m 0.010 CumMec Difference = difference = 10.000 CumMec 10.000 CumMe	area= 102.47 wp= 102.15 wp= 0.32 Top Bank = 102.3 Free Board = 0.07 area= 102.23 wp= 102.15 0.06 Top Bank = 102.35 Free Board = 0.06 Top Bank = 102.35 Free Board = 0.025 Free Board = 0.025	0.02 0.51 0.06 0.88
G = Ditch 5208 Ditch 5208 Ditch 5308 Ditch 5308 Ditch 5308 Ditch 5408 Ditch 5	0.011 Cu M/sec 100 yr. +20% flow = 18.24 l/s 0.013 (Channels) 0.86 % 0.06 metres 3.00 1 0.061 metres 3.00 1 0.016 Cu M/sec 100 yr. flow = 80.20 /s 0.013 (Channels) 1.20 % 0.030 0.1 0.139 metres (depth need 0.010 (Channels) 1.20 % 0.013 (Channels) 0.013 (Channels)	and Velocity 0.74 Ms Length 37.04 Ms Length 37.04 Ms 0.016 Counte Ds Up Stream Dich bitm- Dn Beem Dich Bitm = Difference = D and Velocity 0.81 Ms 0.000 Countries 0.000 Countries Up Stream Dich Bitm = Dn Steem Dich Bitm = Difference = 0.000 Countries and Velocity 1.38 Ms Length 2.130 m 0.116 Countries Dis Steem Dich Bitm = Difference = D up Steem Dich Bitm = Difference = 2.130 m 0.116 Countries Up Steem Dich Bitm = Difference = D Up Steem Dich Bitm = Difference = 0.018 Countries Up Steem Dich Bitm = Difference = 0.018 Dim Difference =	area= 102.47 wp= 102.15 0.32 PBaht = 102.3 Top Baht = 0.07 102.23 wp= 102.23 wp= 102.25 0.08 Top Baht = 102.35 Free Board = 0.06 102.25 Parea= 102.25 Pres Board = 102.35 Free Board = 0.04	0.02 0.51 0.08 0.88
G = Dich: 5000 Nem Dich: Section Required 1: Triono Stephy care n = choose: slope S = Dich: dopes Water depth Check Dich: Capacity (C) Check Dich: Section Required 1: Norm Dich: Section Required 1: Check Dich: Section Required 1: Section Section Required 1: S	0.011 Cu M/sec 100 yr. +20% flow = 18.24 (s 0.013 (Channels) 0.86 % 0.00 metes 3.00 1 0.88 metes (depth needs 0.016 Cu M/sec 100 yr. how = 60.20 (s 0.013 (Channels) 1.20 % 0.080 netes 3.00 1 0.139 metes (depth needs 0.080 Cu M/sec 1100 yr. +20% flow = 115.22 (s 0.001 (Channels) 1.20 % 0.013 (Channels) 1.20 % 0.013 (Channels) 1.20 % 0.013 (Channels) 1.20 % 0.016 Cu M/sec 1.16 Cu M/sec	and Velocity 0.74 Ms Length 37.0 m 0.016 Countee 0.016 Countee Up Stream Dich bitm- Difference = 0.016 Countee and Velocity 0.81 Ms Length 2.13 m 0.080 Countee 0.81 Ms Length 2.13 m 0.080 Countee 0.81 Ms Length 2.13 m 0.080 Countee 0.81 Ms Length 2.13 m 0.115 Countee 0.116 Countee Up Steam Dich bitm- Difference = 0.13 Msec) and Velocity 1.38 Ms Up Steam Dich bitm- Difference = 0.116 Countee Difference = 0.016 Countee and Velocity 1.51 Msec Length = 2.01 m	area 102.47 wp 0.32 3.2 Top Bank = 102.3 Free Board = 0.07 102.15 0.08 Top Bank = 102.35 Free Board = 0.06 area 102.23 Free Board = 102.35 Free Board = 0.04	0.02 0.51 0.08 0.08
G = Distribution Nerro Disch Section Required 1: Fron Deshy icu can be a fron Deshy icu can be a Disch stopes S = Disch spectra be a sector of the sector Were Disch Section Required 1: Prom Seely can a n = Disch sign Disch sologies Water desh Check Disch Capacity (C) Q = Disch Sister a sector Disch sologies Water desh Disch sologies Disch sologies Disch sologies Disch sologies Disch sologies Water desh Check Disch Capacity (C) Q = Disch Sister a sector Disch Sector Required 1: Prom Seely can a n = Disch Sister a sector Disch Sector Required 1: Prom Seely can a n = Disch Sister a sector Disch Sector Required 1: Disch Sector Req	0.011 Cu M/sec 100 yr -20% flow = 16.24 l/s 0.013 (Channels) 0.00 metes 0.00 metes 0.016 Cu M/sec 0.016 Cu M/sec 0.013 (Channels) 1.00 yr. 60v = 60.20 l/s 0.013 (Channels) 1.00 metes 0.080 Cu M/sec 1.00 yr20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.013 (Channels) 1.20 % 0.016 Cu M/sec 0.116 Cu M/sec 1.00 yr. 60v = 55.81 l/s 0.013 (Channels)	and Velocity 0.74 Mis Length 37.00 mis 0.010 Distributions 0.010 Missions Differences 0.01 Missions Differences 0.01 Missions Differences 0.01 Missions Differences 0.01 Missions Differences 0.01 Missions Up Obseam Disch bitms 0.000 Currrises Differences 1.38 Missions Differences 1.38 Missions Length 2.130 missions OBB Countries 1.38 Missions Lingth 2.130 missions 0.11 Missions 2.130 missions 0.12 Missions 1.38 Missions Lingth 2.130 missions Differences 2.130 mi	102.47 wp+ 102.15 v0.27 To Bank = 102.3 Free Board = 0.07 102.15 v0.7 0.00 To Bank = 102.3 Free Board = 0.05 102.15 v0.7 102.23 wp+ 102.25 free Board = 0.04 102.25 free Board = 0.04	0.02 0.51 0.06 0.88
G = Other Scotler New Dich Section Required 1: From Service and sectors Required 1: from Service and sectors Sectors Water depth Check Dich Capacity (G) O = Dich SS New Dich Sectors Required 1: From Service use n = choose: slope S = Dich Bottom Check Ditch Decound((C)	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.00 metes 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.013 (Channels) 1.20 % 0.080 Cu M/sec 100 yr. +20% flow = 115.22 l/s 0.080 Cu M/sec 1100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.000 metes 3.00 :1 8.160 metes (depth need 0.116 cu M/sec 1100 yr. sport flow = 55.81 l/s 0.017 (Channels) 1.00 % 1.00 %	and Velocity = 0.74 Ms Length = 37.00 m 0.016 Comme: Up Sheam Dich bim Dr. Sheam Dich bim Dr. Sheam Dich bim Dr. Sheam Dich bim Dr. Sheam Dich bim 0.080 Comme: Up Sheam Dich bim 0.080 Comme: Up Sheam Dich bim Dr. Sheam Dich bim Difference = Up Sheam Dich bim Difference = do carry 0.13 Co. Meec) Length = 2.10 m 0.15 Co. misec Up Sheam Dich bim Difference = do carry 0.13 Co. Meec) Length = 0.210 m 0.056 Co. misec	area* 102.47 wp* 102.15 0.02 32 Top Bank = 102.3 769 Bank = 0.07 102.23 wp* 102.23 wp* 102.23 wp* 102.23 wp* 0.06 709 Bank = 102.35 102.23 wp* 102.23 wp* 0.08 709 Bank = 102.35 769 Bank = 102.35 769 Bank = 102.35 769 Bank = 102.47 0.08 700.47 702.47 wp* 102.23 102.35 702.23 102.35	0.62 0.51 0.68 0.88 1.01
G = Chich Scall New Dich Section Required 1 From Seely usen n = Chock: Dich Rottom Dich Algoes Wet desph Check Dich Capacity (0) Check Dich Section Required 1 From Seely use n = chocse: sigles S = chock Dich Section Required 1 From Seely use n = chocse: sigles S = Dich Bottom Dich Bo	0.011 Cu M/sec 100 yr. +20% flow = 18.24 l/s 0.013 (Channels) 0.86 % 0.86 % 0.01 for metres (depth needs 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.013 (Channels) 1.20 % 0.080 Cu M/sec 100 yr. export = 15.22 l/s 0.080 Cu M/sec 100 yr. +20% flow = 115.22 l/s 0.080 Cu M/sec 100 yr. +20% flow = 15.28 l/s 0.013 (Channels) 120 % 0.00 metres 3.00 :1 0.160 metres (depth needs 0.116 cu M/sec	and Velocity 0.74 Ms Length 37.00 m 0.010 Commec 0.010 Commec Up Sheam Dich bitm D.Breace D.Breace and Velocity 0.81 Ms und Velocity 0.81 Ms b.Breace Up Sheam Dich bitm D.Breace b.Breace and Velocity 0.81 Ms b.Breace Dis Steam Dich bitm D.Breace b.Breace Dis Breace D.Breace b.Breace Dis Breace D.Breace b.Breace Difference = et et b.Steam Dich Breace Difference = de b.Steam Dich Breace b.Breace Difference = de carry 0.13 C.M Msee b.Breace Difference = de carry 0.13 C.M Msee b.Breace Difference = de caru	area 102.47 area 102.15	0.02 0.51 0.06 0.88 1.01 0.05 0.05 0.05
G = Dich S208 New Dich Section Required 1: from Seely use n = Choice: solve Both Bothm Dich More Were Chich Sector Required 1: Prom Seely use n = choose: slope S = Dich SS New Dich Sector Required 1: Prom Seely use n = choose: slope S = Dich SS New Dich Sector Required 1: From Seely use n = Check Dich Capacity (C) Dich Bottom Dich Bottom Bo	0.011 Cu M/sec 100 yr. +20% flow = 18.24 l/s 0.013 (Channets) 0.86 % 0.06 metres 2.00 metres 2.00 metres 2.00 yr. flow = 80.20 l/s 0.013 (Channets) 1.20 % 0.000 cu M/sec 100 yr. flow = 80.20 l/s 0.013 (Channets) 1.20 % 0.000 cu M/sec 100 yr. +20% flow = 115.22 l/s 0.000 metres 3.00 ·1 0.130 metres (depth needt 0.080 Cu M/sec 1100 yr. flow = 55.81 l/s 0.010 (Channets) 1.20 % 0.00 metres 3.00 ·1 0.180 metres 3.00 ·1 0.190 metres 3.00 ·1 0.000 metres 3.00 ·1	and Velocity 0.74 Ms Length 37.0 m 0.010 Countee 0.010 Countee Up Steam Dich bitm Difference Difference 0.010 Countee 0.000 Countee 0.010 Countee 0.000 Countee 0.000 Countee 0.000 Countee 0.000 Countee 0.000 Countee 0.000 Countee 0.000 Countee 0.010 Countee of Velocity 0.135 Countee and Velocity 0.136 Ms Difference e of carry 0.13 Countee on 115 Countee Difference e of the carry 0.13 Countee on 115 Countee Difference e of the carry 0.13 Countee on 115 Countee Difference 1.51 Ms Length 0.01 0 mm 0.056 Countee 0.01 0 mm Up Steam Dich bitm Difference d to carry 0.13 Countee Difference using to 13 Countee Difference d to carry 0.13 Countee Difference d to carry 0.13 Countee Di	area 102.47 area 102.13 area 0.32 Top Bank = 0.07 102.23 wp= 102.25 oot 0.08 mp= 102.23 wp= 102.23 wp= 102.23 rea 102.23 rep 102.23 rep 102.23 rep 102.23 rep 102.23 rep 102.24 area 102.47 area 102.47 area 102.47 area 102.47 area 102.47 area 102.47 rep Bank = 102.48 0.24 rop Bank = 0.04	0.02 0.51 0.06 0.88 1.01
G = Dichs Scott Nem Dich Section Required 1: Triono Scely is use n = thoses: slope S = Dich dopes Water deph Check Dich Capacity (0) Check Dich School (Check Dich Bottom Dich Bottom	0.011 Cu M/sec 100 yr. +20% flow = 18.24 l/s 0.013 (Channels) 0.86 % 0.060 metres 3.00 1 0.061 metres 3.00 1 0.011 (Channels) 120 % 0.013 (Channels) 120 % 0.013 (Channels) 120 % 0.080 Cu M/sec 1100 yr. flow = 15.22 l/s 0.013 (Channels) 120 % 0.016 (Channels) 120 % 0.016 (Channels) 120 % 0.016 (Channels) 120 % 0.016 (Channels) 120 % 0.016 (Channels) 120 % 0.016 (Channels) 120 % 0.016 (Channels) 120 % 0.000 metres 3.00 1 0.120 metres 0.010 (Channels) 1.00 % 0.000 metres 3.00 1 0.120 metres 0.010 (Channels) 1.00 % 0.000 metres 3.00 1 0.120 metres 0.010 (Channels) 0.010 (Channels) 0.010 (Channels) 0.010 (Channels) 0.010 metres 3.00 1 0.120 metres 0.000 metres 3.00 1 0.000 metres 3.000 1 0.000 metres 3.00	and Velocity 0.74 Ms Length 37.00 ms 0.016 Comme 0.016 Ms Up Stream Dich bim- Distance 0.81 Ms and Velocity 0.81 Ms 0.000 Comme 0.016 Ms 0.000 Comme 0.000 Comme Up Stream Dich bim- Distance 0.81 Ms 0.000 Comme 0.000 Comme Up Stream Dich bim- Distance Dich Bim = Distance Dich Bim = Difference = et al carry (13 Cu Msec) 1.51 Ms Up Stream Dich Bim = Difference = et al carry (13 Cu Msec) 1.16 Ms	area 102.47 wp= 102.15 0.27 102.15 0.07 Top Bank = 102.3 Free Board = 102.3 102.23 wp= 102.25 mp= 102.25 mp= 102.25 mp= 102.25	0.02 0.51 0.06 0.88 1.01
G = Dich: 5030 New Dich Section Required 1: From Dich Section Required 1: From Dich Section Required 1: From Secty and Section Required 1: Dich: 40pes Water depth Check Dich: Capacity (C) Check Dich: Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: From Secty and Section Required 1: Check Ditch Section Required 1: Bitch Section Required 1: Check Ditch Capacity (C) Q = Ditch S4 New Ditch Section Required 1: Ditch S4 New Ditch Section Required 1: Ditch S4	0.011 Cu M/sec 100 yr -20% flow = 16.24 l/s 0.013 (Cannets) 0.00 metes 0.016 Cu M/sec 0.016 Cu M/sec 0.016 Cu M/sec 100 yr -80/20 l/s 0.013 (Channets) 1.00 metes 0.080 Cu M/sec 100 metes 0.080 Cu M/sec 100 metes 0.080 Cu M/sec 100 metes 0.080 Cu M/sec 100 yr -20% flow = 115.22 l/s 0.013 (Channets) 1.20 % 0.080 Cu M/sec 100 yr -80% flow = 115.22 l/s 0.013 (Channets) 1.20 % 0.016 Cu M/sec 0.116 Cu M/sec 0.116 Cu M/sec 0.116 Cu M/sec 0.118 Cu M/sec	and Velocity 0.74 Mis Length 3700 mis 0.016 Carbon bitme 0.016 Mis Dig Stamp Diab bitme 0.016 Mis Dig Stamp Diab bitme 0.016 Mis Dig Stamp Diab bitme 0.016 Mis dig Carbon Diab bitme 0.016 Mis dig Carbon Diab bitme 0.016 Carbon Dig Stamp Diab bitme 0.016 Mis Difference Stamp 0.018 Mis Difference Diab bitme 0.018 Mis Difference Diab bi	102.47 wp= 102.15 vo.27 mp: 102.15 vo.27 mp:	0.02 0.51 0.06 0.88 1.01
G = Distri 5000 Nem Dish Section Required 1: Pro Boly Section Required 1: Pro Boly Section Required 1: Pro Section Required 1: Dish Section Required 1: Prom Section Req Prom Section Required 1	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.00 metes 0.00 metes 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.017 (Channels) 1.20 % 0.020 metes 0.080 Cu M/sec 100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.080 Cu M/sec 110 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.00 metes 3.00 1 0.196 metes (depth need 0.110 metes 3.00 1 0.126 metes 3.00 1 0.126 metes 3.00 1 0.126 metes 3.00 1 0.127 metes (depth need 0.013 (Channels) 1.00 % 0.00 metes 3.00 1 0.126 metes 3.00 1 0.126 metes 3.00 1 0.127 metes (depth need 0.013 (Channels) 1.00 % 0.056 Cu M/sec	and Velocity = 0.74 Mis Length = 37.00 m 0.010 Comme Design Dich bitm Design Dich bitm Design Dich bitm Design Dich bitm Design Dich bitm Design Dich bitm 0.080 Comme Ug Steam Dich bitm Design Dich bitm Dich	102.47 wp= 102.15 v0.7 102.15 v0.7 102.15 v0.7 102.3 mp.lank = 102.3 Free Board = 0.07 102.23 wp= 102.25 mp.lank = 102.35 Free Board = 0.00 102.25 mp.lank = 102.35 Free Board = 0.00 102.25 mp.lank = 102.35 rot p.lank = 102.35 rot p.lank = 102.45 102.47 wp=	0.02 0.51 0.66 0.88 0.08 1.01
G = Dichs 5200 New Dich Section Required 1: From Service sarry S = Choose: sarry S = Choose: sarry S = Check Dich Capacity (C) O = Dich SS New Dich Section Required 1: From Service us n = choose: slope S = Dich BSC Check Dich Capacity (C) Check Dich Section Required 1: From Service us n = choose: slope S = Dich Ages Water depth Check Dich Capacity (C) Check Dich Capacity (C) Check Dich Section Required 1: From Service us n = Check Dich Capacity (C) Check Dich Capacit	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.05 (Channels) 0.016 Cu M/sec 0.016 Cu M/sec 0.016 Cu M/sec 0.017 (Channels) 1.20 % 0.03 (Channels) 1.20 % 0.09 metres (depth needd 0.980 Cu M/sec 1100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.00 metres 3.00 :1 0.160 metres (depth needd 0.110 metres (depth needd 0.110 metres (depth needd 0.110 metres 3.00 :1 0.013 (Channels) 1.20 % 0.00 metres 3.00 :1 0.128 metres (depth needd 0.138 metres (depth needd 0.139 metres 3.00 :1 0.013 (Channels) 1.00 % 0.00 metres 3.00 :1 0.128 metres (depth needd 0.126 metres (depth needd 0.136 Cu M/sec 100 yr20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.00 metres 3.00 :1 0.100 metres 3.00 :1 0.100 metres 3.00 :1 0.000 metres 3.000 :1 0.000 metres 3.000 :1 0.000 metres 3.000 :1 0.000 metres 3.000 :1 0.0000 metres 3.000 :1	and Velocity 0.74 Mis Length 37.00 mis 0.016 Comme 0.016 Norme Up Sheam Dich bitm D.5 mis D.5 Sheam Dich bitm D.5 mis of to carry 0.13 Q. Miseci and Velocity 0.81 Mis Up Sheam Dich bitm D.5 mis D.5 mis D.5 Sheam Dich bitm D.5 mis D.5 mis D.5 Sheam Dich bitm D.5 Sheam Dich bitm D.5 mis D.5 Sheam Dich bitm D.5 Mis D.5 Mis D.6 Sheam Dich bitm D.5 Mis D.5 Mis D.5 Sheam Dich bitm D.5 Mis D.5 Mis D.5 Sheam Dich bitm D.5 Mis Mis D.5 Sheam Dich bitm D.5 Mis Mis D.5 Sheam Dich bitm D.5 Mis Mis D.5 Sheam Dich bitm D.5 Mis Mis D.5 Sheam Dich bitm D.5 M	area 102.47 area 102.15 wp= 0.2 Top Bank = 0.07 102.3 wp= 0.07 102.23 wp= 0.06 102.23 wp= 0.06 102.23 wp= 0.06 702.05 me= 0.06 0.08 mp= 0.04 102.23 rea= 102.35 0.08 mp= 0.04 102.23 area= 102.35 769 Bank = 102.35 0.04 102.23 area= 102.45 759 Bank = 102.45 0.04 0.24 mp= 0.04	0.02 0.51 0.66 0.88 0.08 1.01
G = Dich S200 New Dich Section Required 1: from Seeby case are Gloose: safety case are Web Dich Rotrom Dich Algoes Web Chich Capacity (c) Prom Seeby case a = choose: slope S = Dich SS New Dich Section Required 1: from Seeby case a = choose: slope S = Dich BSD Check Ditch Capacity (c) Check Ditch Section Required 1: from Seeby case a = Ditch BSD Check Ditch Section Required 1: from Seeby case are Ditch Bottom Dich Algoes Water deph Check Ditch Capacity (c) C = Ditch S4 New Dich Section Required 1: Check Ditch Section Required 1: Check Ditch Capacity (c) C = Ditch S4 New Dich Section Required 1: Check Ditch Section Required 1: Check Ditch Section Required 1: Check Ditch Section Required 1: Ditch Bottom Ditch Bottom Ditch Bottom Ditch Bottom Ditch Bottom Ditch Bottom	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.86 % 0.86 % 0.86 % 0.86 % 0.98 % 0.98 % 0.98 % 0.98 % 0.98 % 0.98 % 0.91	and Velocity 0.74 Ms Length 37.00 m 0.010 Comme 0.010 mm 0.010 Comme 0.010 mm Datasen Dich bitme Datasen Datasen Dich bitme Datasen Datasen Dich bitme Datasen John Starm Datasen John Starm Datasen Datasen Datasen	area 102.47 area 102.15 area 102.15 0.07 102.23 wp= 102.23 wp= 102.25 wp= 102.25 wp= 102.25 wp= 0.08 marea 102.25 mp= 102.25 mp= 102.25 mp= 102.25 mp= 102.25 mp= 102.47 area= 0.24 po Bank = 0.24 area= 0.24 area= 0.24 area= 0.24 area=	0.02 0.51 0.06 0.88 1.01 0.05 0.80 0.05 0.80
G = Dich S208 New Dich Section Required 1: from Seely use n = 0 Choice: solar Chich Botom Dich Alges Wer Dich Sector Required 1: Prom Seely use n = 0 choice: solar B = choice: solar B = Dich S5 New Dich Sector Required 1: from Seely use n = choice: solar B = Dich B 55 New Dich Sector Required 1: from Seely use n = choice: solar B = Dich B 55 New Dich Botom Dich Botom Dich Botom Dich Botom Dich Botom Dich Botom Dich Botom Dich Botom Dich Botom Sector Required 1: from Seely use n = Dich S4 New Dich Sector Required 1: from Seely use n = Dich S4 New Dich Sector Required 1: From Seely use n = Dich Botom Check Dich Required 1: From Seely use n = Dich Botom Dich Botom	0.011 Cu M/sec 100 yr20% flow = 16.24 l/s 0.013 (Channels) 0.06 % 0.06 metes 0.001 metes (depth need 0.016 Cu M/sec 100 yr. flow = 80.20 /s 0.013 (Channels) 1.20 % 0.030 metes 0.031 (Channels) 1.20 % 0.060 Cu M/sec 100 yr. flow = 55.81 l/s 0.130 metes 0.001 (Channels) 1.20 % 0.00 metes 0.001 (Channels) 1.20 % 0.00 metes 0.00 metes 0.001 (Channels) 1.20 % 0.00 metes 0.001 (Channels) 1.20 % 0.00 metes 0.001 (Channels) 1.00 % flow = 55.81 l/s 0.013 (Channels) 1.00 % flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 metes 0.001 (Channels) 1.00 % 0.001 metes 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 0.001 (Channels) 1.00 % 0.001 (Channels) 0.001 (Channels)	and Velocity 0.74 Ms Length 37.0 m 0.010 Comme 0.010 comme Uig Sheam Dich bitm D.58eem Dich bitm Difference = 0.011 More and Velocity 0.011 More Uig Sheam Dich bitm D.58eem Dich bitm Difference = 0.001 Commerce Uig Sheam Dich bitm D.58eem Dich bitm Difference = 0.115 Commerce did Velocity 1.58 Mix Length = 2.010 m Ofference = 0.115 Commerce did velocity 1.51 Mix Difference = 0.011 Sourmisee Ofference = 0.015 Commerce Uig Sheam Dich bitm D.51 Mix Length = 2.010 m 0.056 Commerce Uig Sheam Dich bitm Difference = 1.18 Mix uig Sheam Dich bitm D.51 Mix Uig Sheam Dich bitm D.51 Mix Uig Sheam Dich bitm D.51 Mix Uig Sheam Dich bitm D.51 Mix Uig Sheam Dich bitm D.51 Mix Uig Sheam Dich bitm	102.47 102.15 0.32 7ep Bank = 102.23 Free Board = area= 102.3 Free Board = 102.23 Free Board = area= 102.25 0.08 Free Board = 102.3 0.00 102.23 0.08 Free Board = 402.35 0.00 102.23 Free Board = 102.35 0.00 102.23 Free Board = 402.35 0.00 102.23 Free Board = 402.35 0.00 102.47 Free Board = area= 102.47 Free Board = 102.45 0.00 102.47 Free Board = area= 102.47 Free Board = 102.4 0.00	0.02 0.51 0.06 0.88 1.01 0.05 0.80 0.05 0.80
G = Distribuso Nem Diah Section Required 1 chrono Section can an en- choose: slope S = Disch abopes Weiter Bolth Capacity (C) Check Diah Capacity (C) Check Diah Section Required 1 choose: slope S = dhoose: slope S = dhoose: slope S = Disch Section Required 1 choose: slope S = Disch Boston Required 1 From Seely can S = Disch Section Required 1 Check Disch Section Required 1 From Seely can S = Disch Section Required 1 Prom Seely can S = Disch Ref Disch Section Required 1 Disch Section Required 1 Disch Section Required 1 Disch Section Required 1 Prom Seely can S = Disch Section Required 1 Prom Seely can S = Disch Ref Disch Section Required 1 Prom Seely can S = Disch Ref Disch Section Required 1 Prom Seely can S = Disch Ref Disch Section Required 1 Prom Seely can S = Disch Ref Disch Section Required 1 Prom	0.011 Cu M/sec 100 yr -20% flow = 16.24 (s 0.012 (s monets) 0.013 (s monets) 0.016 Cu M/sec 100 yr flow = 80.20 (s 0.016 Cu M/sec 100 yr flow = 80.20 (s 0.018 (Cu M/sec 100 yr -20% flow = 115.22 (s 0.018 (Cu M/sec 100 yr -20% flow = 115.22 (s 0.018 (Cu M/sec 100 yr -20% flow = 115.22 (s 0.018 (Cu M/sec 100 yr -20% flow = 115.22 (s 0.018 (Cu M/sec 100 yr -20% flow = 115.22 (s 0.018 (Cu M/sec 100 yr -20% flow = 115.22 (s 0.018 (Cu M/sec 100 yr -20% flow = 61.45 (s 0.018 (Cu M/sec	and Velocity 0.74 Mis Length 3700 Mis 0.010 Control 3700 Mis 0.010 Control 3700 Mis of the carry 0.13 Cu. Mases) 0.01 Mis of the carry 0.13 Cu. Mases) 0.01 Mis of the carry 0.13 Cu. Mases) 0.01 Mis of the carry 0.13 Cu. Mases) 0.01 Mis of the carry 0.13 Cu. Mases) 0.000 Curreice of the carry 0.13 Cu. Mases) 0.010 Mis	102.47 mg/mg/mg/mg/mg/mg/mg/mg/mg/mg/mg/mg/mg/m	0.02
G = Distri 5000 Ren Dibb Section Required 1: Fron Deshy icu and the deph Check Dibb Section Required 1: Distri bages Were Dish Section Required 1: Check Dish Section Required 1: Prom Seely use n = Check Dish Section Required 1: Prom Seely use n = Dish Botton Dish Botton Bot	0.011 Cu M/sec 100 yr -20% flow = 16.24 l/s 0.013 (Channels) 0.00 metes 0.00 of the sec 0.016 Cu M/sec 100 yr flow = 80.20 l/s 0.013 (Channels) 120 % 0.021 (Channels) 120 % 0.021 (Channels) 120 % 0.080 Cu M/sec 110 yr flow = 115.22 l/s 0.013 (Channels) 120 % 0.080 Cu M/sec 110 yr flow = 55.81 l/s 0.013 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.000 metes 3.00 1 0.128 metes (depth need 0.056 Cu M/sec 110 yr -20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.000 metes 3.00 1 0.128 metes (depth need 0.056 Cu M/sec 110 yr -20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.000 metes 3.00 1 0.146 metes (depth need 0.056 Cu M/sec 110 yr -20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.000 metes 3.00 1 0.146 metes (depth need 0.056 Cu M/sec	and Velocity 0.74 MS Length 37.00 m 0.016 Common 0.016 MS Difference 0.016 MS Difference 0.016 MS Difference 0.016 MS Difference 0.018 MS Difference 0.018 MS Difference 0.018 MS Difference 0.018 MS Difference 1.038 MS Difference 1.038 MS Length 2.130 m Difference 1.038 MS Length 2.130 m 0.13 Co. Mixec: 1.038 MS Length 2.130 m 0.13 Co. Mixec: 1.038 MS Length 2.130 m Up Sheam Dich bitm Difference Difference 1.01 MS Up Sheam Dich bitm Difference Us carry 1.13 Co. Mixec: 1.01 MS Length 2.01 0 m 0.056 Commise 2.01 0 m 0.056 Commise 2.01 0 m Up Sheam Dich bitm Difference Starry 1.13 Co. Mixe	102.47 102.5 102.5 102.5 102.5 102.3 Free Board = 102.3 Free Board = 102.3 102.3 Pop Bank = 102.3 102.3 Pop Bank = 102.3 102.3 Pop Bank = 102.35 Free Board = 102.35 Pree Board = 102.3	0.02 0.51 0.06 0.88 0.08 0.08 0.08 0.08 0.08 0.08
G = Diahs 3200 New Diah Section Required 1: From Serbip usan s Ghose: along S = Ghose: along S = Ghose: along S = Ghose: along S = Diah Section Required 1: From Serbip usan s Hew Diah Section Required 1: From Serbip usan s Check Diah Section Required 1: From Serbip usan s Diah Sister S Diah Sister S Diah Section Required 1: From Serbip usan s Diah Sister S Diah Sister S Diah Section Required 1: From Serbip usan s Diah Sister S Diah Section Required 1: From Serbip usa s Diah Sister S Diah Sister S Diah Section Required 1: Diah Sister S Diah Section Required 1: Diah Sister S Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Sister S Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: From Serbip usa s Diah Section Required 1: Diah Section Required 1:	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.00 metres 0.014 Cu M/sec 100 yr. flow = 80.20 l/s 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.013 (Channels) 1.20 % 0.080 Cu M/sec 100 yr. +20% flow = 115.22 l/s 0.031 (Channels) 1.20 % 0.080 Cu M/sec 1100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.000 metres 3.00 :1 0.198 metres (depth need 0.110 metres 3.00 :1 0.110 metres 3.00 :1 0.128 metres (depth need 0.013 (Channels) 1.00 % 0.001 (Channels) 1.00 % 0.013 (Channels) 1.00 % 0.000 metres 3.00 :1 0.128 metres (depth need 0.013 (Channels) 1.00 % 0.000 metres 3.00 :1 0.128 metres (depth need 0.013 (Channels) 1.00 % 0.000 metres 3.00 :1 0.128 metres (depth need 0.016 Cu M/sec 1.00 yr. flow = 97.7 l/s 0.07 (homets) 1.00 %	and Velocity 0.74 Ms Length 37.00 m 0.016 Comme 0.016 Norme Up Sheam Dich bitm D.5 me D.516 South Stars D.51 MS od to carry 0.13 Out Meese 0.01 MS und Velocity 0.81 Ms D.558em Dich bitm D.5 me D.558em Dich bitm D.5 Meese Dich bitm D.558em Dich bitm D.5 Meese Dich bitm D.558em Dich bitm D.51 MS D.516 Com Mice 21.00 m 0.015 Cou mice D.51 MS Up Sheam Dich bitm D.51 MS D.568 Cou Dich bitm D.51 MS D.568 Cou Dich bitm D.51 MS D.568 Cou Dich bitm D.51 MS O.568 Cou mixes 0.058 Cou mixes and Velocity 1.51 MS D.568 Cou mixes D.51 MS	area 102.47 wp= 102.15 102.3 2 mp Bank = 102.3 102.23 wp= 0.07 102.23 wp= 0.06 102.23 wp= 0.06 102.23 wp= 0.06 102.23 wp= 0.06 102.23 wp= 0.04 102.23 mp= 0.04 102.23 mp= 0.04 102.23 mp= 0.04 102.47 mp= 0.02.4 102.47 mp= 0.02.4 102.47 mp= 102.4 102.47 mp= 102.4 100.43 mp= 102.4	0.02 0.51 0.06 0.88 0.05 0.06 0.99 0.06 0.92 0.02 0.12 2.70
G = Dich: 5200 New Dich Section Required 1: From Servey toges S= Choice: slope S Wew Dich Section Required 1: Prom Servey toges S= Dich: Biolish Bection Required 1: Prom Servey toges n = choose: slope S = Dich: Biolish Bection Required 1: From Servey toges S = Dich: Biolish Bection Required 1: Prom Servey toges n = choose: slope S = Dich: Biolish Bection Required 1: Prom Servey toges n = Chock Dich: Capacity (C) Check Dich: Gancer (C) Dich: Biolish Bection Required 1: Prom Servey toges n = Dich: Biolish Bection Required 1: Dich: Biolish Bection Required 1: Dich: Biolish Bection Required 1: Dich: Biolish Bection Required 1: Prom Servey toges n = Dich: Biolish Bection Required 1: Prom Bervey toges n = Dich: Biolish Bection Required 1: Dich: Biolish Biolish Bection Required 1: Dich: Biolish Biolish Bection Required 1: Dich: Biolish Bioli	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.86 % 0.026 % 0.026 % 0.026 % 0.026 % 0.026 % 0.026 % 0.026 % 0.016 (Cu M/sec 100 yr. flow = 80.20 l/s 0.013 (Channels) 1.20 % 0.00 Cu M/sec 1.00 % 0.000 Cu M/sec 100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.000 Cu M/sec 1100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.000 metres 3.00 :1 0.198 metres (depth needd 0.198 metres (depth needd 0.116 Cu M/sec 1100 yr. +20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.001 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.0146 metres (depth needd 0.015 (Channels) 0.013 (Channels) 0.014 (Channels) 0.020 metres 3.00 :1 0.145 metres (depth needd 0.015 (Channels) 0.015 (Channels) 0.00 metres 3.00 :1 0.145 metres (depth needd 0.016 (Channels) 0.00 metres 3.00 :1 0.145 metres (depth needd 0.016 (Channels) 0.00 metres 3.00 :1 0.145 metres (depth needd 0.016 (Channels) 0.00 metres 3.00 :1 0.145 metres (depth needd 0.016 (Channels) 0.00 metres 3.00 :1 0.145 metres (depth needd 0.016 (Channels) 0.00 metres 3.00 :1 0.145 metres (depth needd 0.016 (Channels) 0.00 metres 3.00 :1 0.00 metre	and Velocity = 0.74 Ms Length = 37.00 m 0.016 Comme: Uig Sheam Dich bitm Distance 2 m 0.016 Comme: Uig Sheam Dich bitm Distance 2 m 0.080 Comme: Uig Sheam Dich bitm 0.080 Comme: Uig Sheam Dich bitm 0.080 Comme: and Velocity = 1.38 Ms Length = 21.30 m 0.080 Comme: Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.51 Ma Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.51 Ms Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.51 Ms Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.51 Ms Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.18 Ms Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.18 Ms Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.28 Ms Uig Sheam Dich bitm Difference = di carry 0.13 Cu Maec] and Velocity = 1.29 Ms Length = 11000 m 0.080 Curmer Uig Sheam Dich bitm Difference = di to carry 0.13 Cu Maec] and Velocity = 1.29 Ms Length = 11000 m 0.080 Curmer Uig Sheam Dich bitm Difference = di to carry 0.13 Cu Maec] and Velocity = 1.29 Ms Length = 1.100 m 0.080 Curmer Uig Sheam Dich bitm Difference = di to carry 0.13 Cu Maec]	102.47 102.15 0.22 20.27 7 p Bank = area 102.3 20.27 7 p Bank = 102.3 0.00 102.23 Free Board = wp= 102.23 0.00 7 p Bank = 102.3 0.00 102.23 0.00 7 pe Bank = 102.35 0.00 102.23 0.00 7 pe Bank = 102.35 0.00 102.23 0.00 area= 102.25 0.00 102.23 0.00 area= 102.47 7 p Bank = 102.35 102.45 7 pe Band = 102.4 Free Board = 102.4 0.00 area= 102.4 7 p Bank = 102.4 Free Board = area= 0.24 0.00 area= 102.4 7 p Bank = 102.4 Free Board = 102.4 0.00 area= 0.00 103.4 0.53 area= 0.53 area= 100.14	0.02 0.51 0.06 0.08 0.08 0.08 0.08 0.02 0.12 2.70
G = Dich S200 New Dich Section Required 1: from Seeby case n ≥ dioace: solar Section Required 1: from Seeby case n ≥ Web Dich Botton Dich Botton Section Required 1: Prom Seeby case n = choose: solar B = choose: solar B = choose: solar B = choose: solar B = choose: solar B = choose: solar B = choose: solar B = choose: solar B = Dich B 55 Per Dich Section Required 1: from Seeby case n = choose: solar B = Dich B Section Required 1: from Seeby case n = Dich B Section Required 1: from Seeby case n = Dich B Section Required 1: from Seeby case n = Dich B Section Required 1: from Seeby case n = Dich B Section Required 1: from Seeby case n = Dich B Section Required 1: From Seeby case n = choose: solar B = Dich B Section Required 1: from Section Required 1: from Section Required 1: Dich B Section Required 1: from Seeby case n = choose: solar B = Dich B Section Required 1: from Seeby case n = choose: solar B = Dich B Section Required 1: from Seeby case n = choose: solar B = Dich B Section Required 1: from Seeby case n = choose: solar B = Dich B B New Dich Section Required 1: from Seeby case n = choose: solar B = Dich B B Dich Bottom Dich	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.86 % 0.86 % 0.86 % 0.86 % 0.97 % 0.98 % 0.98 % 0.98 % 0.98 % 0.91	and Velocity = 0.74 Ms Length = 37.0 m 0.010 Cumme: Uig Sheam Dich bitm Dis Sheam Dich bitm Dis Sheam Dich bitm Dis Sheam Dich bitm 0.000 Cumme: Uig Sheam Dich bitm 0.000 Cumme: Uig Sheam Dich bitm Dis Sheam	102.47 area 102.47 area 102.15 0.07 70 Bank = 0.07 102.23 area 102.23 area 102.25 o.00 0.08 mp 102.23 area 102.24 area 102.25 person 0.08 mp 102.23 area 102.23 area 102.24 mp 102.25 o.00 700.05 mp 102.23 area 102.4 mp 102.25 person 700.05 area 102.4 person 102.4 preson 102.4 preson 0.24 preson 0.23 area 0.24 preson 0.25 area 10.31 area 10.31 area 10.31 area 10.31	0.02 0.51 0.06 0.88 0.08 0.08 0.08 0.08 0.08 0.08
G = Dich: 5000 Nem Dich: Section Required 1: choose: slope S = Dich: 6000 G = Dich: 6000 Dich: 6000 G = Dich: 6000 Dich: 6000 Di	0.011 Cu M/sec 100 yr -20% flow = 16.24 (s 0.012 (s menes) 0.013 (s menes) 0.016 (s menes) 0.016 Cu M/sec 100 yr flow = 80.20 (s 0.016 Cu M/sec 100 yr flow = 80.20 (s 0.013 (claments) 0.016 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.019 (claments) 0.019 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.019 (claments) 0.019 (claments) 0.019 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.013 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.018 (claments) 0.019 (claments)	and Velocity 0.74 Mis Length 370.0 mis 0.010 Convection 370.0 mis 0.010 Convection 0.0 mis objection Dials bitmen for Sheare Dials	102.47 102.5 102.5 102.5 102.5 102.3 102.4 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.3 102.4 102.3 102.3 102.4 102.3 102.4 1	0.02 0.51 0.06 0.88 0.05 0.05 0.00 0.02 0.02 0.02 0.12 2.70
G = Distri 5000 Ren Dibb Section Required 1: Fron Deshy icu and the deph Check Dibb Section Required 1: Fron Secty icu and the deph Check Dish Section Required 1: Anose icu and the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: From Secty icu and a section of the deph Check Dish Section Required 1: Marker deph Check Dish Section Required 1: Marker deph Check Dish Section Required 1: Marker deph Check Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish Section Required 1: Dish Ref New Dish	0.011 Cu M/sec 100 yr -20% flow = 16.24 l/s 0.013 (Channels) 0.00 metes 0.00 of the sec 0.016 Cu M/sec 100 yr flow = 80.20 l/s 0.013 (Channels) 1.20 % 0.013 (Channels) 1.20 % 0.080 Cu M/sec 1100 yr -80% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.080 Cu M/sec 1100 yr -80% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.080 Cu M/sec 1100 yr -80% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.080 Cu M/sec 1100 yr -80% flow = 115.25 l/s 0.016 Cu M/sec 100 yr cow = 55.81 ls 0.016 Cu M/sec 100 yr -80% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.000 metes 3.00 1 0.168 metes (depth need 0.056 Cu M/sec 1100 yr -90% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.000 metes 3.00 1 0.148 metes (depth need 0.051 Cu M/sec 1100 yr tow = 97.7 l/s 0.013 (Channels) 0.013 (Channels) 0.000 metes 10.000	and Velocity 0.74 Ms Length 37.00 m 0.016 Comme 0.016 Ms 0.016 Comme 0.016 Ms Dig Brann Dich bim- pristeren Dich bim- pristeren Dich Bim - Dicheren Dich Bim + 0.016 Ms Length 2.130 m 0.080 Commes 0.81 Ms Dis Brain Dich Bim + Dis Brain Dich Bim + 1.38 Ms Length 2.130 m 0.080 Commes 0.81 Ms Up Sheam Dich Bim + Dis Brain Dich Bim + Dis Brain Dich Bim + Dis Brain Dich Bim - Dis Bra	102.47 102.15 102.3 Free Board = 102.3 Free Board = 102.3 102.35 Free Board = 102.3 102.35 Pree Board = 102.35 Pree Board = 10	0.02 0.51 0.06 0.68 0.08 0.05 0.06 0.9 0.06 0.9 0.02 0.12 2.70
G = Carb 2020 New Dich Section Required 1: Phot Body Section Required 1: Phot Body Section Required 1: Phot Body Section Required 1: Phot Body Section Required 1: Dich 40pes Water depth Check Dich Section Required 1: Photose: slope S = Dich BdS Dich BdSection Required 1: Photose: slope S = Dich BdS Photose: slope S =	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.00 netes 0.00 netes 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.013 (Channels) 1.20 % 0.020 metres 0.039 metres (depth need 0.080 Cu M/sec 100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.000 metres 3.00 metres 3.00 metres 3.00 metres 3.00 metres 3.00 metres 3.00 metres 3.00 1 0.199 metres (depth need 0.013 (Channels) 1.00 % 0.000 metres 3.00 1 0.190 metres (depth need 0.013 (Channels) 1.00 % 0.000 metres 3.00 1 0.126 metres (depth need 0.056 Cu M/sec 1100 yr. +20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.000 metres 3.00 1 0.148 metres (depth need 0.056 Cu M/sec 1100 yr. +20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.000 metres 3.00 1 0.148 metres (depth need 0.061 Cu M/sec	and Velocity = 0.74 Ms Length = 37.00 m 0.010 Comme Up Sheam Dich bim- Dr. Sheam Dich bim	102.47 102.15 20.15 20.15 20.15 20.15 20.15 20.15 20.15 20.15 20.00 700 Bank = area- 102.35 wp- 102.15 0.00 700 Bank = 102.3 0.00 0.00 100.15 0.00 700 Bank = 102.23 0.25 Free Board = area- 102.25 0.00 0.00 700 Bank = 102.35 0.00 0.00 100.45 700 Bank = 102.23 0.00 700 Bank = area- 102.45 700 Bank = 102.35 100.15 100.00 10	0.02 0.51 0.05 0.05 0.05 0.05 0.05 0.05 0.05
G = Dich 5200 New Dich Section Required 1: From Service salary S = Choice: salary S = Choice: salary S = Choice: Salary S = Otherh Section Required 1: Dich Soloms = salary S = Dich SS New Dich Section Required 1: From Service use n = choose: salary S = Dich BSC Dich BSC Dich BSC Pero Dich Section Required 1: From Service use n = choose: salary S = Dich BSC Dich B	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.056 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.016 Cu M/sec 100 yr. flow = 80.20 l/s 0.013 (Channels) 1.20 % 0.013 (Channels) 1.20 % 0.000 netres 3.00 :1 0.199 metres (depth need 0.080 Cu M/sec 1100 yr. +20% flow = 115.22 l/s 0.013 (Channels) 1.20 % 0.00 metres 3.00 :1 0.199 metres (depth need 0.198 netres (depth need 0.013 (Channels) 1.00 % 0.00 metres 3.00 :1 0.120 metres (depth need 0.056 Cu M/sec 100 yr -20% flow = 81.45 l/s 0.00 metres 3.00 :1 0.133 (Channels) 1.00 % 0.00 metres 3.00 :1 0.145 metres (depth need 0.056 Cu M/sec 100 yr -20% flow = 97.7 l/s 0.07 % 0.090 metres 0.013 (Channels) 0.07 % 0.000 metres 0.014 (Shannels) 0.07 % 0.000 metres 0.000 metres 0.015 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 0.014 (Channels) 0.015 (Channels)	and Velocity 0.74 Ms Length 37.00 m 0.016 Comme 0.016 mm 0.016 Comme 0.016 Min Dateman Dich bitm Dateman Dateman Dich bitm Dateman Dateman Dich bitm Dateman Dateman Dateman 0.016 Comme Up Steam Dich bitm Dateman Dateman Dateman Datema	102.47 102.15 20.2 20.2 20.2 20.2 20.2 20.2 20.2 20.	0.02 0.51 0.06 0.08 0.08 0.05 0.00 0.02 0.02 0.02 0.02 0.02 0.02
G = Ditch Scotia Pera Ditch Section Required 1 Tricron Scelyb use in thoses: slope S = Ditch Bottom	0.011 Cu M/sec 100 yr. +20% flow = 16.24 l/s 0.013 (Channels) 0.86 % 0.86 % 0.86 % 0.98 % 0.99 % 0.99 % 0.90 % metres (depth needs 0.013 (Channels) 1.20 % 0.00 netres 3.00 1 0.080 Cu M/sec 100 yr. 100 w = 80.20 ks 0.013 (Channels) 1.20 % 0.00 metres 3.00 1 0.100 metres 3.00 1 0.000 metres 0.001 (Channels) 0.000 metres 0.001 (Channels) 0.00 metres 0.001 (Channels) 0.00 metres 0.001 (Channels) 0.000 metres 0.001 (Channels) 0.000 metres 0.001 (Channels) 0.000 metres 0.001 (Channels) 0.000 metres 0.000 metres 0.0	and Velocity 0.74 Ms Length 37.00 m 0.010 Commec 0.010 mm 0.010 Commec 0.011 Ms Difference = 0.011 Ms und Velocity 0.011 Ms 0.000 Commec 0.001 Commec Up Sheam Dich bitms Difference = of carry 0.13 Co. Mixeci 0.015 Commec Up Sheam Dich bitms Difference = of carry 0.13 Co. Mixeci 0.115 Commec 0.015 Commec 0.015 Commec 0.015 Commec 0.015 Commec of carry 0.13 Co. Mixeci 0.016 Commec of beam Dich bitms Difference = of carry 0.13 Co. Mixeci 0.016 Commec up Sheam Dich bitms Difference = of to carry 0.13 Co. Mixeci 0.01 m 0.080 Commec 0.080 Commec up Sheam Dich bitms Difference = of to carry 0.13 Co. Mixeci 0.080 Commec up Sheam Dich bitms Difference = of to carry 0.13 Co. Mixeci 0.080 Commec up Sheam Dich bitms Difference = of carry 0.13 Co. Mixeci	102.47 102.15 2.2 2 area plane 102.3 2 rep Bank = 102.3 5 area plane 102.3 7 area plane 102.35 0.08 7 area plane 102.35 0.08 7 area plane 102.35 7 area plane 102.35 7 area plane 102.47 0.08 7 area plane 102.47 0.08 7 area plane 102.47 7 area plane 102.47 7 area plane 102.47 7 area plane 102.47 7 area plane 102.47 7 area plane 102.47 7 area plane 102.4 7 area plane 102.4 7 area plane 102.4 7 area plane 102.4 7 area plane 103.5 7 area plane 103.5 7 area plane 103.5 7 area plane 103.5 7 area plane	0.02 0.51 0.06 0.69 0.09 0.05 0.09 0.02 0.02 0.12 2.70 0.12 2.70 0.13 10 0.15 0.55 0.55 0.55 0.55 0.55 0.55 0
G = Dichs 3000 Nem Dich Section Required 1: from Sechy and Section Required 1: from Sechy and Section Required 1: from Sechy and Section Required 1: Dich stopes Water depth Check Dich Section Required 1: from Sechy and Section Required	0.011 Cu M/sec 100 yr -20% flow = 16.24 l/s 0.012 (s mmels) 0.016 (s mmels) 0.00 meles 0.0016 Cu M/sec 100 yr flow = 80.20 l/s 0.016 (Cu M/sec 100 yr flow = 80.20 l/s 0.013 (Channels) 0.013 (Channels) 0.013 (Channels) 1.00 meles 0.001 (Cu M/sec 100 yr -20% flow = 115.22 l/s 0.013 (Channels) 0.016 (Cu M/sec 100 yr -20% flow = 115.22 l/s 0.013 (Channels) 1.00 meles 0.001 (Cu M/sec 100 yr -20% flow = 115.22 l/s 0.013 (Channels) 1.00 meles 0.001 (Cu M/sec 100 yr -20% flow = 51.81 l/s 0.013 (Channels) 1.00 % 0.056 Cu M/sec 1100 yr -20% flow = 81.45 l/s 0.013 (Channels) 1.00 % 0.056 Cu M/sec 1100 yr -20% flow = 81.45 l/s 0.013 (Channels) 0.013 (Channels) 0.009 meles 100 yr -20% flow = 140.55 l/s 0.013 (Channels) 0.009 Cu M/sec	and Velocity 0.74 Mis Length -0.70 Link Dig Stamp Diab bitming 0.81 Mis Length 2.130 mis Dig Stamp Diab bitming 0.81 Mis Dig Stamp Diab bitming 0.81 Mis Dig Stamp Diab bitming 0.81 Mis Dig Stamp Diab bitming 1.38 Mis Length 2.130 mis Difference 1.38 Mis Length 2.130 mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference 1.51 Mis Difference <t< td=""><td>102.47 102.5 1</td><td>0.02 0.51 0.06 0.88 0.05 0.05 0.00 0.05 0.00 0.02 0.02 0.12 2.70 0.16 3.10</td></t<>	102.47 102.5 1	0.02 0.51 0.06 0.88 0.05 0.05 0.00 0.05 0.00 0.02 0.02 0.12 2.70 0.16 3.10



IBI GROUP 400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com PROJECT: BARRETT BLOCK 178 DATE: 2022-10-27 FILE: 135925.6.04 REV #: 2 DESIGNED BY: Anton Chetrar CHECKED BY: Ryan Magladry

TEMPORARY ICD ORIFICE SIZING

Orifice coefficients								
Cv =	0.60							
Cv =	0.65							

		-					Theo	oretical		Recommended
	Invert	Diameter	Centre ICD	Max. Pond Elevation	Hydraulic Slope	Target Flow	Orifice	Actual Flow	Orifice	Actual Flow
	(m)	(mm)	(m)	(m)	(m)	(l/s)	(m)	(I/s)	(m)	(I/s)
SANITARY MH	95.810	200	95.910	101.40	2.000	1.99	0.0230	1.99	0.075	21.14
STORM MH	96.180	675	96.518	101.40	2.000	136.00	0.1905	136.40	0.190	135.68

* minimum orifice size to be 0.075m



IBI GROUP 400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com PROJECT: BARRETT BLOCK 178 DATE: 2022-10-27 FILE: 135925.6.04 REV #: 1 DESIGNED BY: Anton Chetrar CHECKED BY: Ryan Magladry

ICD ORIFICE SIZING

Orifice coeffic	cients
Cv =	0.60
Cv =	0.65

								oretical	Recommended		
	Invert	Diameter	Centre ICD	Max. Pond Elevation	Hydraulic Slope	Target Flow	Orifice	Actual Flow	Orifice	Actual Flow	
	(m)	(mm)	(m)	(m)	(m)	(l/s)	(m)	(l/s)	(m)	(I/s)	
CB4	100.730	200	100.830	102.23	1.400	26.00	0.0910	26.04	0.090	25.47	
CB5	100.630	200	100.730	102.13	1.400	25.00	0.0892	25.02	0.089	24.91	
CB6	100.480	200	100.580	102.10	1.520	50.00	0.1236	50.06	0.123	49.57	
CB9	99.870	200	99.970	101.33	1.360	16.50	0.0730	16.50	0.075	17.43	
CB9A	99.870	200	99.970	101.33	1.360	16.50	0.0730	16.50	0.075	17.43	
CB20	100.750	200	100.850	102.39	1.540	15.00	0.0675	15.00	0.075	18.55	
CB20A	100.970	200	101.070	102.47	1.400	10.00	0.0564	10.00	0.075	17.69	
RYCB7	99.850	250	99.975	101.40	1.425	20.00	0.0794	20.00	0.079	19.80	

* minimum orifice size to be 0.075m



CLIENT
BARRETT CO-TENANCY
COPYRIGHT This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by IBI Group is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and IBI Group shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to IBI Group for general conformance before proceeding with fabrication.
ISSUES No. DESCRIPTION DATE
1 SUBMISSION NO.1 FOR CITY REVIEW 2022-03-10 2 SUBMISSION NO.2 FOR CITY REVIEW 2022-11-25 3 SUBMISSION NO.3 FOR CITY REVIEW 2023-01-09 4
SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS
CONSULTANTS
0 5 15 25m 1:500 5 15 25m
SEAL
IBI GROUP Suite 400 – 333 Preston Street Ottawa ON K1S 5N4 Canada tel 613 225 1311 / 613 241 3300 fax 613 225 9868
IBI GROUP Suite 400 – 333 Preston Street Ottawa ON K1S 5N4 Canada tel 613 225 1311 / 613 241 3300 fax 613 225 9868 ibigroup.com PROJECT BARRETT BLOCK 178
IBI GROUP Suite 400 – 333 Preston Street Ottawa ON K1S 5N4 Canada tel 613 225 1311 / 613 241 3300 fax 613 225 9868 ibigroup.com PROJECT
IBI GROUP Suite 400 – 333 Preston Street Otawa ON K1S 5N4 Canada tel 613 225 1311 / 613 241 3300 fax 613 225 9868 ibigroup.com PROJECT BARRETT BLOCK 178 PROJECT NO: 135925 DRAWN BY: CHECKED BY: MM
IBI GROUP Suite 400 – 333 Preston Street Ottawa ON K1S 5N4 Canada tel 613 225 1311 / 613 241 3300 fax 613 225 9868 ibigroup.com PROJECT PROJECT NO: 135925 DRAWN BY: M.M. CHECKED BY: A.C. PROJECT MGR: R.M. APPROVED BY: J.I.M.
IBI GROUP Suite 400 - 333 Preston Street Ottawa ON K1S 5N4 Canada tel 613 225 1311 / 613 241 3300 fax 613 225 9868 ibigroup.com PROJECT PROJECT NO: 135925 DRAWN BY: M.M. CHECKED BY: A.C. PROJECT NO: 135925 DRAWN BY: M.M. CHECKED BY: A.C. PROJECT MGR: A.C. PROJECT MGR: B.C. PROVED BY: J.I.M.

IBI GROUP REPORT PROJECT: 34731-5.2.2 DESIGN BRIEF BARRETT LANDS - PHASE 3 3100 LEITRIM ROAD LEITRIM DEVELOPMENT AREA Prepared for BARRETT CO-TENANCY

DRAINAGE AREA ID	CONTINUOUS /SAG ⁽¹⁾⁽²⁾	ROAD TYPE	MINOR SYSTEM DESIGN TARGET (BASED ON ROAD TYPE)		MINOR SYSTEM	
			MINOR SYSTEM DESIGN STORM	GENERATED FLOW ON INDIVIDUAL SEGMENT SIMULATED (L/S)	RE- STRICTION (L/S)	NOTES
R11315	Rear Yard	Rear Yard	5	12	17	
R11321	Rear Yard	Rear Yard	5	73	80	
R11323	Rear Yard	Rear Yard	5	36	40	
R11331	Rear Yard	Rear Yard	5	36	40	
R11332	Rear Yard	Rear Yard	5	17	17	
R11334	Rear Yard	Rear Yard	5	10	17	
R11333	Rear Yard	Rear Yard	5	11	16	
R11350A	Rear Yard	Rear Yard	5	7	17	
R11350B	Rear Yard	Rear Yard	5	31	40	
R11400A	Rear Yard	Rear Yard	5	6	6	
R11400B	Rear Yard	Rear Yard	5	25	80	
R11401	Rear Yard	Rear Yard	5	44		
R11402	Rear Yard	Rear Yard	5	38	45	
R11403A	Rear Yard	Rear Yard	5	34	40	
R11403B	Rear Yard	Rear Yard	5	33	40	
R11403C	Rear Yard	Rear Yard	5	6		
R11406	Rear Yard	Rear Yard	5	19	22	
Total restricted flow (ICD flow) – Rear Yard Segments (L/s) 756						
External Are						
R11304	Rear Yard	Rear Yard	2	234	234	
R11305	Rear Yard	Rear Yard	2	581	581	
R11340	Rear Yard	Rear Yard	2	287	287	

(1) Capture on continuous grade is limited to capacity of grate.

(2) The minor flow restriction has been increased in sags to allow full capture of overflow from upstream segments on continuous

grade during the design storm event without ponding. (3) Where CB lead restricts flow, lead diameter is specified in the CB Data Table.

The storage available on-site and its maximum depth and the results of the DDSWMM evaluation for the subject site are presented in **Table 5.4**. The ponding plan for the subject site is presented on Drawing 34731-620. The DDSWMM output files are presented in Appendix E.

Table 5.4 Summary of On-Site Storage during the Target Minor System Design Storm

DRAINAGE AREA ID	MINOR SYSTEM DESIGN STORM	AVAILABLE STATIC STORAGE (CU-M)	TOTAL STORAGE USED (CU-M)	OVERFLOW (L/S)
S11304A	5	5.67	0	0
S11304B	5	6.17	0	0
S11401A	2	38.98	0	0
S11401B	2	7.14	0	0
S11400	2	20.04	0	0
S11311A	2	6.22	0	0

APPENDIX E

135925-900 - Erosion and Sediment Control Plan 135925-200 - Grading Plan







CITY CITY