



Functional Servicing and Stormwater Management Report

# LeBreton Flats Library Parcel Mixed-use Development

REISSUED FOR SPA & NCC 99%

February 2023 — TYLin Ref. 10399

Dream Asset Management

30 Adelaide Street East, Suite 301,

Toronto, Ontario

M5C 3H1



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# 1. Introduction

TYLin has been retained by Dream Asset Management to prepare a detailed Functional Servicing and Stormwater Management Report along with a corresponding grading and servicing design for the redevelopment of LeBreton Flats Library Parcel. The subject property is located at the northeast corner of Booth Street and Albert Street at municipal address 665 Albert Street in the City of Ottawa (refer to **Figure 1.1**).

This report will:

- Provide background information regarding the subject property;
- Summarize the existing site conditions;
- Provide information regarding the proposed development conditions;
- Outline the proposed grading for the development; and
- Outline the existing and proposed municipal servicing.

The recommended servicing has been developed in accordance with the applicable design criteria and requirements of the City of Ottawa.



Figure 1-1 Location Plan

## 1.1. PROJECT BACKGROUND

The total property is approximately 1.26ha in area at municipal address 665 Albert Street in the City of Ottawa, however this area also includes the air rights reserved by NCC over the Pimisi station and a small parcel located north of the station. Therefore, the proposed development is approximately 0.96ha in area.

The subject site is bound by Booth Street to the west and Albert Street to the south. The site is currently vacant and Ottawa Public Library will be constructed northeast of the subject site.

The existing general topography of the site has a gentle slope from north to south. Existing site drainage primarily is discharged towards the Albert Street right-of-way, which is captured by existing municipal storm infrastructure. At the northern side of the site there is a steep bank sloping down to the transit line.

The overall servicing design and strategy is based on the allocated servicing allowances for the site, as detailed in the Master Servicing Report (MSR) for the LeBreton Flats Development area. This report was prepared by CIMA+ and details the anticipated development and resulting servicing requirements for the surrounding area. As per the MSR, the redevelopment site (conceptual Block 1) was allocated conceptual breakdown of 403 apartment units, 3,063m<sup>2</sup> of retail area, and 19,307m<sup>2</sup> of office/loft area. The MSR was completed based on the LeBreton Flats Master Concept Plan, prepared by O2 Planning and Design in 2020. Relevant excerpts from the MSR can be found in **Appendix D**.

## 1.2. PROPOSED DEVELOPMENT

The proposed site includes the construction of a 36-storey (plus penthouse) 2-tower mixed-use development. The development will include 608 residential units, 1,332m<sup>2</sup> of retail space, and a childcare facility. The development will utilize a 2-storey underground parking structure which will cover the majority of the subject site. Refer to **Figure 1.2** for the proposed development plan.

## 1.3. SITE ACCESS

Vehicular access into the site and underground parking will be through a vehicular entrance at the southeastern corner of the site at the intersection of Albert Street and Empress Avenue. Loading and garbage access will be from the same entrance. Pedestrian access into the site is available along Albert Street and Booth Street.

## 1.4. UTILITIES

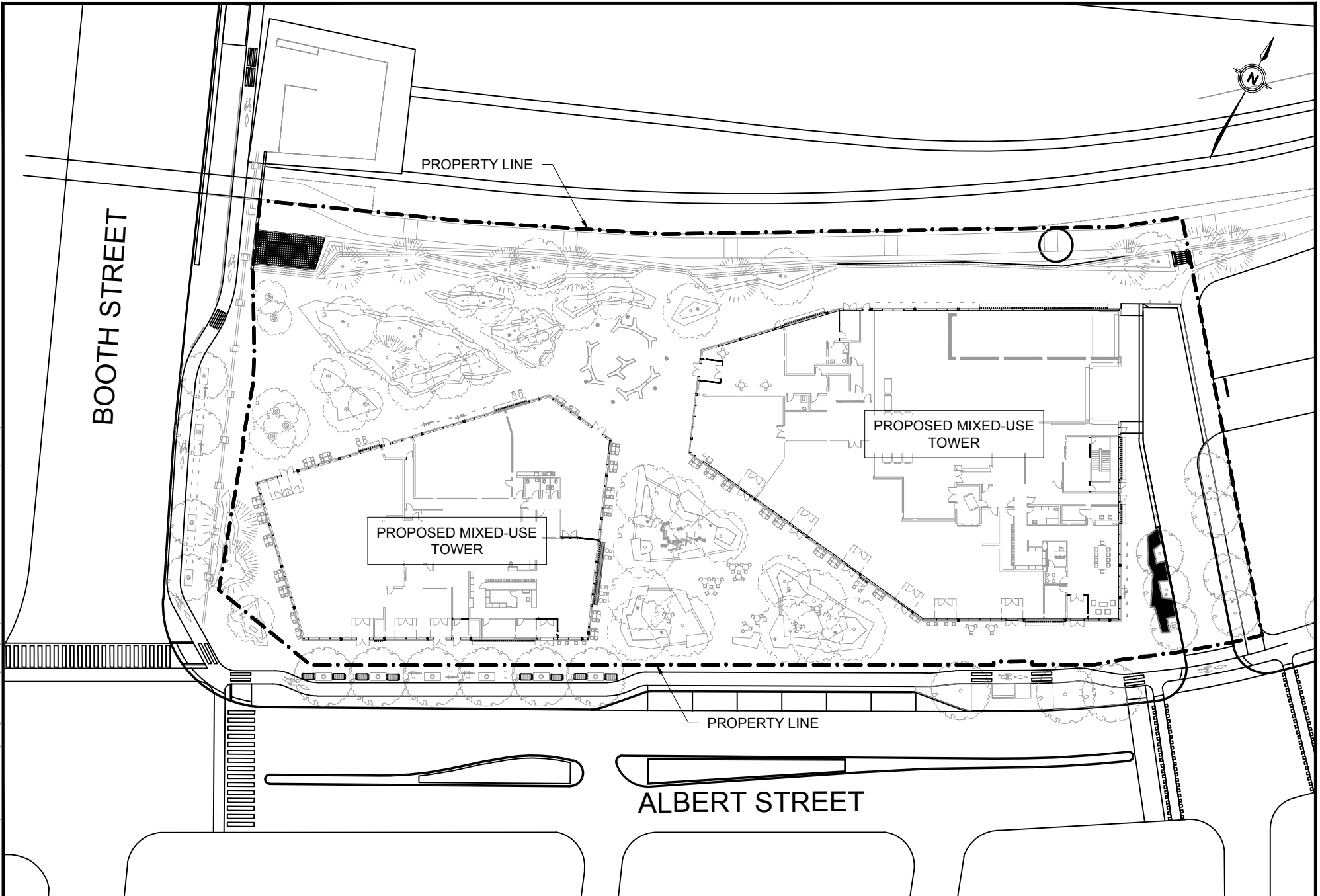
The property is in a well-established location in the City of Ottawa, all utilities including telephone, cable, electricity, and gas are readily available to service the subject property.

## 1.5. GROUNDWATER

A Discharge Plan for the subject site was completed in November 2022 by Golder Associates. The investigation indicates that permanent/long-term dewatering will be required for the subject site. The Hydrogeological Investigation calculated a long-term discharge rate of 129,000L/day (1.49L/s). Based on the currently available groundwater quality data from wells on site, some of the water quality parameters exceeded the City's allowable limits for discharge to the storm sewer. As such, the hydrogeological investigation recommends long term groundwater discharge to the sanitary sewer.

Calculations have been completed to confirm that the capacities of the downstream sanitary sewers will not be negatively impacted by this additional flow. This is discussed in further detail in **section 3.2** and calculations are provided in **Appendix B**.

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### PROPOSED DEVELOPMENT PLAN

665 ALBERT STREET  
DREAM ASSET MANAGEMENT

SCALE:	<b>N.T.S</b>
DATE:	SEPTEMBER 2022
DESIGNED BY:	V.P.
CHECKED BY:	B.G.

PROJECT No.	10399
FIGURE No.	1-2

## 2. Stormwater Management

### 2.1. EXISTING STORMWATER MANAGEMENT

The existing site servicing details obtained from The City of Ottawa utility plan, engineering plan and profiles and a topographical survey completed of the area indicate that there is a 1050mm diameter storm sewer located within the Albert Street right-of-way that flows southwest. Existing site drainage primarily is discharged towards the Albert Street right-of-way, where the runoff is captured by catch basins, leading into the existing 1050mm municipal storm sewer system. Refer to the **Servicing Drawing (S1)** for the existing storm sewer infrastructure.

### 2.2. PROPOSED STORMWATER MANAGEMENT

#### 2.2.1. Stormwater Management Design Strategy

The stormwater strategy for the proposed development is based on the MOE 2003 Stormwater Management Planning & Design (SWMPD) and The City of Ottawa Sewer Design Guidelines (2012) for stormwater quality and quantity controls, including water quality treatment, water balance and water quantity treatment through the reduction of peak storm flows.

As per Section 1.1, the allocated storm discharge allowances for the site are based on the Master Servicing Report (MSR) for the LeBreton Flats Development area. As per the MSR, the allowable release rate for the redevelopment site (Block 1) will be limited to the 5-year pre-development flow (0.50 runoff co-efficient), with quantity control on site up to and including the 100-year event. Relevant excerpts from the MSR can be found in **Appendix D**.

The development will be pursuing LEED ND and LEED NC certification and therefore must meet the mandatory requirements for rainwater management. Based on the sustainability requirements, a portion of the rainwater runoff from the developed site must be retained onsite (i.e. infiltrated, evapotranspired or collected and reused) using low-impact development (LID) and green infrastructure (GI) practices. The site will be designed to retain the 80<sup>th</sup> percentile of regional or local rainfall events. Based on the City of Ottawa rainfall records, a rainfall depth of 15.7mm will be used to achieve 80<sup>th</sup> percentile of rainfall retained.

#### 2.2.2. Proposed Stormwater Outlet Connection

Storm servicing for the proposed development will consist of a 300mm diameter connection at a 1.0% slope connecting into the 1050mm storm main within Albert. The service will enter the site adjacent to the stormwater management vault located at the center of the site along the southern property line. The connection will be made as per City of Ottawa standards.

The proposed sewer infrastructure is shown on the **Servicing Plan (S1)**.

#### 2.2.3. Stormwater Quantity Control

As per Section 2.2.1, the allowable release rate for the site will be limited to the 5-year pre-development flow (0.50 runoff co-efficient), with quantity control on site up to and including the 100-year event. A portion of the site along the northern property line and a triangular section at the northwest corner (2,566m<sup>2</sup> area total) will be developed as enhanced landscape area that will provide extensive area for the rainwater runoff to infiltrate onsite. Therefore, this area will act independently of the remainder of the site in reference to the stormwater management and



rainwater retention requirements.

Based on a remaining development area of 7,061m<sup>2</sup>, and a runoff coefficient of 0.5 (as per the MSR), the 5-year allowable release rate from the development site into the storm sewer system is 102.2L/s. Due to design constraints, the site has been designed to allow some area along the property line to flow unrestricted offsite to Albert Street and Booth Street. The total area of uncontrolled flow is 665.7m<sup>2</sup>. The unrestricted portion of the site will release 29.7L/s during the 100-year storm. The stormwater discharge for the remainder of the site will be controlled release from the stormwater management vault. Therefore, the total allowable 100-year post-development release rate is 72.5L/s (102.2L/s total minus the 29.7L/s uncontrolled). The detailed calculations of the discharge rates can be found in **Appendix A**.

Onsite storage will be provided via a stormwater storage vault, located within the underground parking structure. Under proposed conditions, runoff from the rooftops and ground surface will drain via the mechanical system and into the stormwater management vault prior to discharging into the Albert Street storm sewer system. The stormwater management vault is to be located on the south side of the underground parking structure. The restricted outlet rate from the tank will be mechanically pumped to the control maintenance hole at a maximum controlled flow rate in order for the storm service to cross above the 1220mm HPTM watermain. The control maintenance hole will then outlet into the Albert Street storm sewer. The pump will be designed with a maximum pumping rate of 70.0L/s, which is less than the maximum allowable release rate of 72.5L/s.

Controlling flows to the allowable release rate during the 100-year storm event will fill the vault to the designated 100-year high-water level (59.64m) and provide an active storage volume within the vault required to meet the reduced peak flow rate from the site. If there is a pump failure inside the stormwater management tank, the emergency flows will spill out the access lid at the surface and discharge out to the Albert Street right of way. Overland emergency flow routes for the site will mainly flow out to Albert Street with a small portion of the northwest corner flowing out to Booth Street.

Pump design and maintenance requirements will be provided by the mechanical engineer.

Refer to **Figure 2.1** for the post-development drainage area plan and **Appendix A** for the detailed stormwater management calculations.

#### 2.2.4. Stormwater Quality Control

As per discussions with the RVCA, water quality controls for the subject site are not required based on the current site plan. Correspondence with the RVCA concerning quality control requirements can be found in **Appendix A**. Similarly, there is no specific reference to any required quality control measures associated with the LEED certification. However, surface runoff will be routed to landscaped areas wherever possible in order to increase TSS removal onsite.

#### 2.2.5. Stormwater Water Balance

As noted in section 2.2.3, a portion of the site along the northern property line and a triangular section at the northwest corner (2,566m<sup>2</sup> area total) will be developed as enhanced landscape area that will be provide extensive area for the rainwater runoff to infiltrate onsite. Therefore, this area will act independently of the remainder of the site in reference to rainwater retention requirements.

Based on a remaining area of 7,061m<sup>2</sup>, the 80<sup>th</sup> percentile (15.7mm depth) volume required to be

retained on site is 110.9m<sup>3</sup>. Due to the large underground parking area, infiltration of stormwater into the subsurface is not a viable water balance solution for the remainder of the site. The volume of water to be retained will be captured in the storage vault and reused on site. The proposed vault will be designed with a 5.10m baffle wall which will separate the vault into two separate storage sections. One section will provide re-use storage while the other section will provide the active storage requirement. Flows collected on site will flow into the re-use section via the building’s mechanical system. Flows stored in this re-use section will be reused onsite via mechanical reuse systems or landscape irrigation. Refer to mechanical and landscape drawings for additional information. Once the re-use section of the vault is full, flows will spill over the baffle wall and into the active storage portion of the tank to be directed off site as discussed in section 2.2.3. The baffle wall height and position within the tank have been determined to achieve the required retention volume of 110.9m<sup>3</sup>. Refer to drawings **S1** and **D1** for details.

Water balance calculations can be found in **Appendix A**.

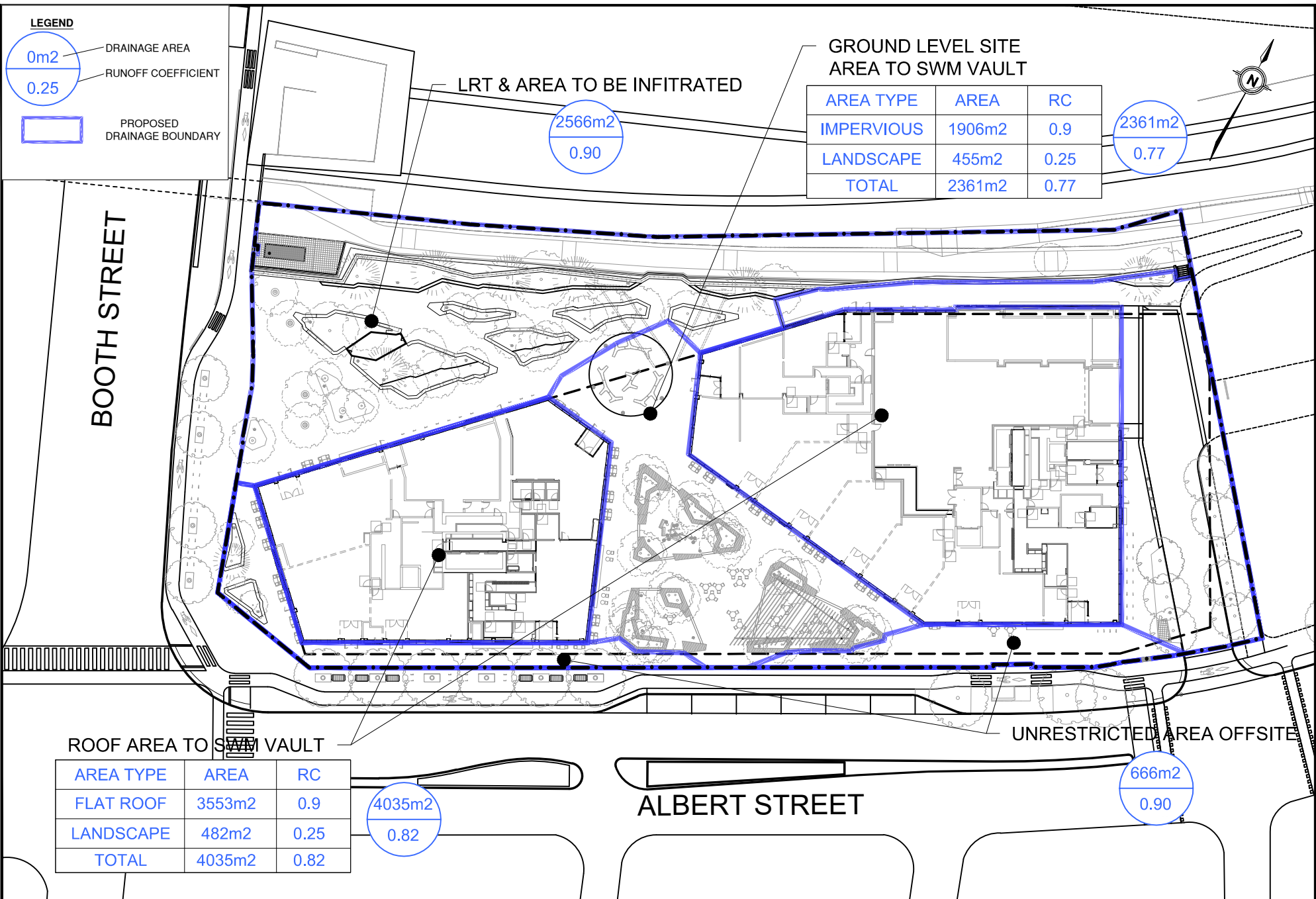
### **2.3. CONSTRUCTION EROSION & SEDIMENT CONTROL**

Details for erosion and sedimentation control during construction will be subject to the City of Ottawa approval prior to issuance of Building Permit. During the construction works, there is potential for sediment-laden runoff to be directed toward the adjoining properties, municipal streets, and existing storm infrastructure. Therefore, prior to any grading activity, sediment control and hoarding fencing must be installed along the site perimeter. Additional measures will include construction of an entrance “mud-mat” on the access to be used during construction to minimize mud tracking offsite. Material stockpiles are to be located in appropriate locations. Inlet sediment control devices are to be used on existing catchbasins in municipal rights-of-way that may be affected by the construction of this site. The sequencing of the implementation of the above and additional erosion and sediment control measures is summarized in the following table.

*Table 2-1: Erosion Control Sequencing*

<b>Activity</b>	<b>Erosion Control Practice</b>
<b>Area Grading</b>	<ul style="list-style-type: none"> <li>• Construct and maintain entrance “mud-mat”.</li> <li>• Construct and maintain sediment control fencing around the downstream perimeter of the site.</li> <li>• Locate stockpiles away from sensitive areas.</li> </ul>
<b>Servicing and Asphalt Works</b>	<ul style="list-style-type: none"> <li>• Limit open trench lengths to minimize erosion potential of excavated material.</li> <li>• Prevent erosion of material stockpiles.</li> <li>• During work stoppages or inclement weather, plug ends of open sewers to prevent downstream sedimentation.</li> <li>• Protect catchbasin inlets with Terrafix 240R non-woven geotextile.</li> </ul>
<b>Maintenance</b>	<ul style="list-style-type: none"> <li>• Remove accumulated sediments when depth exceeds 0.30 m.</li> <li>• Maintain and repair sediment control fencing as required.</li> <li>• Maintain and repair catchbasin sediment controls as required.</li> </ul>

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**LEGEND**

0m2 — DRAINAGE AREA  
0.25 — RUNOFF COEFFICIENT

PROPOSED DRAINAGE BOUNDARY

**GROUND LEVEL SITE AREA TO SWM VAULT**

AREA TYPE	AREA	RC
IMPERVIOUS	1906m2	0.9
LANDSCAPE	455m2	0.25
<b>TOTAL</b>	<b>2361m2</b>	<b>0.77</b>

2361m2  
0.77

2566m2  
0.90

666m2  
0.90

**ROOF AREA TO SWM VAULT**

AREA TYPE	AREA	RC
FLAT ROOF	3553m2	0.9
LANDSCAPE	482m2	0.25
<b>TOTAL</b>	<b>4035m2</b>	<b>0.82</b>

4035m2  
0.82



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**PROPOSED DRAINAGE AREA PLAN**  
665 ALBERT STREET  
DREAM ASSET MANAGEMENT

SCALE:	<b>NTS</b>
DATE:	FEBRUARY 2023
DESIGNED BY:	B.G.
CHECKED BY:	B.W.

PROJECT No.	<b>10399</b>
FIGURE No.	<b>F2-1</b>

### 3. Sanitary Servicing

#### 3.1. EXISTING SANITARY SERVICING

The existing site servicing details obtained from The City of Ottawa utility plan, engineering plan and profiles and a topographical survey completed of the area indicate that there is sanitary sewer infrastructure in the vicinity of the site. The following sanitary infrastructure is adjacent to the subject site;

- A 450mm diameter sanitary sewer located within the Albert Street right-of-way that flows southwest
- A 1.67m × 1.67m sanitary collector sewer located within the Booth Street right-of-way that flows northeast

Refer to the **Servicing Drawing (S1)** for the existing sanitary sewer infrastructure and proposed sanitary service design.

#### 3.2. PROPOSED SANITARY SERVICING

Both the allocated (as per the MSR) and the proposed demand determination for the site has been calculated using the parameters defined in the City of Ottawa Sewer Design Guidelines, 2012 (CoO SDG). A summary of the sanitary design parameters is provided in **Table 3.1**.

Table 3.1 - Sanitary design parameters

Parameter		Value
Residential	Baseflow	280 L/cap/day
Population per Dwelling	Apartment	1.8 person/unit
	Townhome	2.7 person/unit
Harmon Peaking Factor Parameters	Harmon Correction Factor (K)	0.8
	Max Harmon P.F	4
	Min Harmon P.F.	2
Commercial	Baseflow	2.8 L/m <sup>2</sup> /day
	Peaking Factor	1.5
	Peaking Factor if Commercial area is <20% of total area	1.0
Infiltration		0.33 L/s/ha

A breakdown of MSR allocated vs proposed sanitary demands for the site is presented in **Table 3.2**, below. Refer to **Appendix B** for the detailed sanitary design calculations and **Appendix D** for the excerpts from the MSR.

Table 3.2 - Proposed Vs. As-Zoned Sanitary Design Flow Calculation

		<b>Allocated (as per MSR)</b>	<b>Proposed Development</b>
Area		1.26 ha	1.26 ha
Residential	Apartment Units	403	608
	Population	726	1,095
	Average Design Flow	2.35 L/s	3.55 L/s
	Harmon Correction Factor	0.8	0.8
	Peaking Factor	3.31	3.22
	<b>Peak Residential Flow</b>	<b>7.78 L/s</b>	<b>11.42 L/s</b>
Non-Residential	Total Non-Res Floor Area	22,370 m <sup>2</sup>	2,442 m <sup>2</sup>
	Average Design Flow	0.72 L/s	0.08 L/s
	Peaking Factor	1.5	1.0
	<b>Peak Non-Res Flow</b>	<b>1.09 L/s</b>	<b>0.08 L/s</b>
Infiltration		<b>0.32 L/s</b>	<b>0.32 L/s</b>
Long Term Groundwater Discharge		<b>0 L/s</b>	<b>1.45 L/s</b>
<b>TOTAL WET WEATHER PEAK FLOW</b>		<b>9.19 L/s</b>	<b>13.31 L/s</b>

As shown in the table above, the proposed site will result in a 4.12L/s increase in the anticipated design flow as compared to the allocated design flow specified in the MSR downstream sewer calculations. Therefore, further investigation was completed to assess whether the downstream municipal infrastructure has capacity for the increase in density.

As detailed in Section 5.4.4.3 of the MSR, the Library Parcel (Block 1) is part of the Cave Creek Collector system. As per the MSR, the City of Ottawa has indicated that there is likely no capacity limitation for the Cave Creek Collector but has provided the current estimated capacity in order to compare the proposed sanitary flows with the current estimated capacity. The Library Parcel discharges into the Albert Street Sewer, which has a current estimated capacity of 110L/s. Using the 9.19L/s MSR allocated design flow, the total sanitary flow into the sewer is 75.1L/s, representing 68.3% of the total estimated capacity. With the 4.12L/s increase in proposed design flow, the new total sanitary flow into the sewer is 79.2L/s. This revised design flow represents only 72.0% of the total estimated capacity, and therefore the receiving sanitary sewer system has adequate capacity to handle the increase in site density.

Under proposed conditions the sanitary flows generated from the site will be redirected via the mechanical system to the sanitary control manhole located in the first level of the underground parking garage, at the south side of the site. The sanitary flow calculations included in **Appendix B** indicate that a 150mm diameter sanitary service connection will be required to service the proposed development. However, a new 300mm diameter sanitary service connection with a 2.0% slope will

be provided in order to accommodate the internal mechanical system design. The proposed service will be connected to the existing 450mm sanitary sewer located within the Albert Street. Access to the sanitary control manhole will be at-grade, adjacent to the Albert Street property line.

Refer to the **Servicing Drawing (S1)** for the location of the existing sanitary sewers and **Appendix B** for the detailed sanitary design calculations.

## 4. Water Servicing

### 4.1. EXISTING WATER SERVICING

The existing site servicing details obtained from The City of Ottawa utility plans, engineering plan and profiles and a topographical survey completed of the area, indicate that there are existing watermain infrastructure in the vicinity of the site, including a 406mm diameter watermain running along the south side of Albert Street

Refer to the **Servicing Drawing (S1)** for the location of the existing watermain infrastructure.

### 4.2. PROPOSED WATER SERVICING

The proposed water service connections for the subject site will be made to the existing 406mm watermain located within the Albert Street right-of-way. As the building is greater than 84 m in height, two water service connections will be provided as per Ontario Building Code (OBC) requirements. The primary connection will consist of a 150mm fire main/domestic connection into the site. The fire and domestic connection will be separated inside the building. Both domestic connections for the site will be used with an internal connection. The secondary water service connection will consist of a 150mm fire/domestic connection installed at the southeast corner of the site. As with the first connection, the fire and domestic connection will be separated them inside the building.

Fire protection for the proposed development will be achieved through the existing hydrants that surround the site and through internal sprinkler systems. A siamese connection is provided near the main entrance of the western tower, within the maximum allowable distance (less than 45m) from the nearest hydrant. The 'principal entrances' to each building are located no more than 90m from an existing municipal hydrant.

Booster pumps may be required for fire and domestic pressure at the upper levels of the condominium developments. The internal onsite water supply and distribution system will be designed and specified to comply with the current standards and specifications of the City of Ottawa and the Ontario Building Code and NFPA 13. The mechanical consultant will provide details building permit application stage.

Both the allocated (as per the MSR) and the proposed demand determination for the site has been calculated using the parameters defined in the City of Ottawa Sewer Design Guidelines, 2012 (CoO SDG). A summary of the water design parameters is provided in **Table 4.1**.

Table 4.1 - water demand parameters

Parameter		Value
Residential	Baseflow	350 L/cap/day
	Apartment Population	1.8 person/unit
	Maximum Day Peak Factor	2.5
	Peak Hour Peak Factor	2.2
Non-Residential	Commercial Baseflow	2.8 L/m <sup>2</sup> /day
	Office/Childcare Baseflow	8.06 L/m <sup>2</sup> /day
	Maximum Day Peak Factor	1.5
	Maximum Day Peak Factor	1.5
	Peak Hour Peak Factor	1.8

A breakdown of MSR allocated vs proposed water demands for the site is presented in **Table 4.2**, below. Refer to **Appendix C** for the detailed water design calculations and **Appendix D** for the excerpts from the MSR.

Table 4.2 - PROPOSED VS. AS-ZONED water demand CALCULATION

		Allocated (as per MSR)	Proposed Development
Residential	Population	726	1,095
	Average Day Demand	2.94 L/s	4.44 L/s
	Maximum Day Demand	7.35 L/s	11.09 L/s
	Peak Hour Demand	16.18 L/s	24.40 L/s
Commercial	Total Floor Area	3,063 m <sup>2</sup>	1,332 m <sup>2</sup>
	Average Day Demand	0.10 L/s	0.04 L/s
	Maximum Day Demand	0.15 L/s	0.06 L/s
	Peak Hour Demand	0.27 L/s	0.12 L/s
Office & Childcare	Total Floor Area	19,307 m <sup>2</sup>	1,110 m <sup>2</sup>
	Average Day Demand	1.80 L/s	0.10 L/s
	Maximum Day Demand	2.70 L/s	0.16 L/s
	Peak Hour Demand	4.87 L/s	0.28 L/s
<b>TOTAL AVERAGE DAY DEMAND</b>		<b>4.84 L/s</b>	<b>4.58 L/s</b>
<b>TOTAL MAXIMUM DAY DEMAND</b>		<b>10.20 L/s</b>	<b>11.31 L/s</b>
<b>TOTAL PEAK HOUR DEMAND</b>		<b>21.31 L/s</b>	<b>24.79 L/s</b>



As shown in the table above, the proposed site will result in a decrease in the average day demand (95% of allocated), an increase in the maximum day demand (111% of allocated), and an increase in the peak hour demand (116% of allocated). As per the MSR, the fire flow demand of 217L/s was considered per the maximum fire demand level of service in core areas as stipulated in the 2013 City of Ottawa Water Master Plan (Stantec, 2013). Under proposed conditions, the site is anticipated to have a maximum fire flow demand of 198L/s, (based on the Fire Underwriters Survey). Therefore, the proposed fire flow demand is less than the anticipated demand as per the MSR and there is no concern with the revised water demand based on the revised site design.

The boundary conditions and HGL were analyzed based on a maximum day demand + fire flow of 209.54L/s and the two boundary condition connection locations are shown in **Appendix C**. The proposed HGL of the two connections (109.8m and 109.6m) were within the minimum and maximum HGL provided by the City (107.8m and 115.6m, respectively).

The water demand calculations are shown in **Appendix C** and the proposed and existing watermain infrastructure are shown on the **Servicing Drawing (S1)**.

## 5. Conclusion

The proposed development will see the construction of two podium/tower mixed-use development with two levels of below grade parking in the City of Ottawa. The proposed development can be serviced utilizing the existing and proposed infrastructure outlined in the **Servicing Drawing (S1)**. Our conclusions and recommendations for servicing of the proposed development is summarized as follows:

### Stormwater Servicing

- The allowable release rate for the site will be limited to the 5-year pre-development flow (0.50 runoff co-efficient), with quantity control on site up to and including the 100-year event.
- The water balance requirement will be achieved by capturing the reuse volume in the re-use section of the stormwater management vault and reused for mechanical or irrigation purposes on-site.
- There are no additional stormwater quality measures required as per LEED requirements or discussions with the RVCA.
- The site will be serviced by a new 300mm storm sewer with a slope of 1.0%, connected to the 1050mm storm sewer within Albert Street.
- Onsite storage will be provided via a storage vault within the underground parking facility. The restricted outlet rate from the tank will be mechanically pumped to the control maintenance hole at a maximum pumping rate of 70.0L/s.
- Sediment and erosion control measures to be taken during construction have been presented in this report.

### Sanitary Servicing

- The anticipated peak sanitary peak flow for the proposed development is 13.3L/s.
- Sanitary servicing is proposed to be connected into the existing 450mm sanitary sewer located within the Albert Street right-of-way.
- The proposed site will result in a 4.12L/s increase in the anticipated design flow as compared to the allocated design flow specified in the MSR downstream sewer calculations. Even with the additional flow, the downstream sewer is 28.0% below the total capacity and therefore has adequate capacity to handle the increase in site density.

### Water Servicing

- The calculated maximum day and peak hour demands were calculated as 11.31L/s and 24.79L/s, respectively.
- Two 150mm combined fire and domestic service connections will be made to the existing 406mm watermain located within the Albert Street. The fire and domestic connections will be separated them inside the building. Both domestic connections for the site will be used with an internal connection.
- Fire protection for the proposed development will be achieved through the existing hydrants that surround the site and through internal sprinkler systems. A siamese connection for the buildings will be placed near the main lobby entrance of the western building.

- Under proposed conditions, the site is anticipated to have a maximum fire flow demand of 198L/s, less than the anticipated the fire flow demand of 217L/s, as per the MSR. Therefore, there is no concern with the revised water demand based on the revised site design.

**Recommendations**

The following Stormwater Management Report is sufficient for your purposes. If you have any questions or comments, please do not hesitate to contact the undersigned.

Sincerely,

**TYLin**

Prepared By:



Brendan Grimes, P.Eng.  
Site Plan Engineer

# Appendix A

STORMWATER CALCULATIONS



Project Name: LeBreton Library Parcel	
Project #: 10399	Prepared by: B.G.
Date: February 2023	Checked by: B.W.

**ALLOWABLE RELEASE FLOW**

**1. Pre, External & Post Development Uncontrolled Area:**

Note: Post Dev. Controlled Area is shown in Office Calculations

Table 1. a) Total Uncontrolled Area

Type of Land	T (min)	Runoff Coef. (C)	Uncontrolled Area (m <sup>2</sup> )			
			Pre Dev. Site (A)	Pre Dev. Incoming External (A)	Total Pre Dev. (A)	Post Dev. Uncontrolled (A)
<b>Total Unrestricted Area</b>			<b>7061.19</b>	-	<b>7061.19</b>	<b>665.7</b>
<b>Combined T (min)</b>					<b>10</b>	<b>10</b>
<b>Combined Runoff Coefficient</b>			<b>0.50</b>	-	<b>0.50</b>	<b>0.90</b>
Landscape	10	0.25	0	0	0	0
Impervious	10	0.90	0	0	0	665.7
General	10	0.50	7061.19	0	7061.19	0

**2. Formulas, Coefficients & Average Rainfall Intensity:**

$i = a(T+b)^{-c}$ , where  $i$  (mm/h);  $T$  (min)

$Q = A(i)C/3600$ , where  $A$  (m<sup>2</sup>);  $i$  (mm/h)

Note: a,b,c = coefficients as per municipal standards

Description Units	Return Period (years)					
	2	5	10	25	50	100
a	732.951	998.071	1174.184	1402.884	1569.58	1735.688
b	6.199	6.053	6.014	6.018	6.014	6.014
c	0.81	0.814	0.816	0.819	0.82	0.82
<b>Total Unrestricted Area i (mm/h)</b>	<b>76.81</b>	<b>104.19</b>	<b>122.14</b>	<b>144.69</b>	<b>161.47</b>	<b>178.56</b>

**3. Pre Development Flow:**

Description Units	Return Period (years)					
	2	5	10	25	50	100
<b>Total Unrestricted Area Q (L/s)</b>	<b>75.32</b>	<b>102.18</b>	<b>119.79</b>	<b>141.90</b>	<b>158.36</b>	<b>175.12</b>

Summary: The Pre Development Flow is Q2=75.3L/s, Q5=102.2L/s, Q10=119.8L/s, Q25=141.9L/s, Q50=158.4L/s, Q100=175.1L/s.

**4. Post Development Uncontrolled Flow:**

Description Units	Return Period (years)					
	2	5	10	25	50	100
Total Unrestricted Area Q (L/s)	12.78	17.34	20.33	24.08	26.87	29.72
<b>Cumulative Flow Q (L/s)</b>	<b>12.78</b>	<b>17.34</b>	<b>20.33</b>	<b>24.08</b>	<b>26.87</b>	<b>29.72</b>

Summary: The Post Development Uncontrolled Flow is Q2=12.8L/s, Q5=17.3L/s, Q10=20.3L/s, Q25=24.1L/s, Q50=26.9L/s, Q100=29.7L/s.

**5. Allowable Flow:**

Description Units	Return Period (years)					
	2	5	10	25	50	100
Pre Development Flow Q (L/s)	75.32	102.18	119.79	141.90	158.36	175.12
<b>Allowable Release Flow Q (L/s)</b>	<b>102.18</b>	<b>102.18</b>	<b>102.18</b>	<b>102.18</b>	<b>102.18</b>	<b>102.18</b>
Post Development Uncontrolled Flow Q (L/s)	12.78	17.34	20.33	24.08	26.87	29.72
<b>Remaining Release Flow for Vault Q (L/s)</b>	<b>89.40</b>	<b>84.84</b>	<b>81.86</b>	<b>78.10</b>	<b>75.31</b>	<b>72.47</b>

Summary: The Allowable Release Flow is Q5=102.2L/s.

Summary: The Uncontrolled Release Flow is Q100=29.7L/s.

**Summary: The Remaining Release Flow for Vault is Q100=72.5L/s.**



Project Name: LeBreton Library Parcel	
Project #: 10399	Prepared by: B.G.
Date: February 2023	Checked by: B.W.

**ORIFICE CALCULATIONS - POST DEV. CONTROLLED FLOWS**

**6. Summary Table of Allowable Flow:**

Description Units	Return Period (years)					
	2	5	10	25	50	100
Allowable Release Flow Q (L/s)	102.18	102.18	102.18	102.18	102.18	102.18
Uncontrolled Release Flow Q (L/s)	12.78	17.34	20.33	24.08	26.87	29.72
<b>Remaining Release Flow for Vault Q (L/s)</b>	<b>89.40</b>	<b>84.84</b>	<b>81.86</b>	<b>78.10</b>	<b>75.31</b>	<b>72.47</b>

Summary: The remaining release flow for the orifice is Q100=72.5L/s.

**7. Total Post Development Area:**

Types of Land	T (min)	Runoff Coef. (C)	Area (m <sup>2</sup> )		
			Post Dev. Uncontrolled (A)	Post Dev. Controlled (A)	Total Post Dev. (A)
<b>Total Area</b>			<b>665.7</b>	<b>6395.49</b>	<b>7061.19</b>
<b>Combined T (min)</b>			<b>10</b>	<b>10</b>	<b>10</b>
<b>Combined Runoff Coefficient</b>			<b>0.9</b>	<b>0.8</b>	<b>0.81</b>
<b>Total Area (Unrestricted)</b>			<b>665.7</b>	<b>6395.49</b>	<b>7061.19</b>
<b>Combined T (min) (Unrestricted)</b>			<b>10</b>	<b>10</b>	<b>10</b>
<b>Combined Runoff Coefficient (Unrestricted)</b>			<b>0.9</b>	<b>0.8</b>	<b>0.81</b>
Landscape	10	0.25	0	454.66	454.66
Impervious	10	0.9	665.7	1905.86	2571.56
Landscape Roof	10	0.25	0	481.79	481.79
Unrestricted Flat Roof	10	0.9	0	3553.18	3553.18
<b>Total</b>					

**8. Pump Design:**

Pump Details:

Post Development Return Period to be Controlled	=	100 year
Pre Development Return Period to Control	=	5 year
High Water Head from invert (h)	=	5.1 m
Allowable Vault Flow (Q)	=	72.47 L/s
Max Pump Flow (Q)	=	70.00 L/s

Summary: The Actual Pump Flow is Q100=70L/s.

**9. Storage Facility Design:**

Storage Facility	=	Vault
Storage Volume Required (V <sub>r</sub> )	=	120.6 m <sup>3</sup> (Storage Calc's)

Storm Service Connection:

Diameter (mm)	Slope (%)	Velocity (m/s)	Full Flow Capacity (L/s)	Actual Flow (%)
300	1	1.37	96.7	72%

**Active Storage Volume using 0% of Dead Storage Volume**

Vault Elevations:

Surface Elevation	=	62.64 m
Top of Vault Elevation	=	61.00 m
High Water Level (HWL)	=	59.64 m
Pump Invert Elevation	=	54.04 m
Bottom of Vault Elevation	=	54.04 m
P2 Slab Elevation	=	54.04 m

Vault Details:

Freeboard Height	=	0.30 m
Baffle Wall Height	=	5.10 m
Total Vault Area	=	44.5 m <sup>2</sup>
Total Vault Volume	=	236.9 m <sup>3</sup>
Rainwater Re-Use Area	=	22.6 m <sup>2</sup>
<b>Re-Use Volume Provided</b>	=	<b>115.1 m<sup>3</sup></b>
<b>Active Storage Volume Provided</b>	=	<b>121.8 m<sup>3</sup></b>

15.7mm Storm Retention:

Initial Abstraction	Depth (mm)	Area (m <sup>2</sup> )	IA (m <sup>3</sup> )
<b>TOTAL</b>		<b>7061.19</b>	<b>15.1</b>
Landscape	5	455	2.3
Impervious	0.6	2572	1.5
Gravel	5	0	0.0
Building (Flat Roof)	2.5	3553	8.9
Landscape Rooftop	5	482	2.4

80th Percentile Water Reuse

Total Unrestricted Area	A =	7061.19 m <sup>2</sup>
Storm Event to be Captured	E =	15.7 mm
Required Dead Storage Volume	V =	110.9 m <sup>3</sup>
Required Baffle Wall Height	V / A <sub>2</sub> =	4.91 m

**Summary: The Vault Active Storage Volume Required is 120.6m<sup>3</sup>.**

**Summary: The Vault Active Storage Volume Provided is 121.8m<sup>3</sup>.**

**Summary: The Dead Storage Volume Required is 110.9 m<sup>3</sup>.**

**Summary: The Dead Storage Volume Provided is 115.1 m<sup>3</sup>.**



Project Name: LeBreton Library Parcel	
Project #: 10399	Prepared by: B.G.
Date: February 2023	Checked by: B.W.

**STORAGE CALCULATIONS**

**10. Storage Calculations**

Note: Restricted Flat Roof & Restricted Green Roof are controlled to 42L/s/ha.

Controlling the 100 Year Post Development Flow to the 5 Year Pre Development Flow.

	Total Site	Vault	Restricted Flat Roof	Restricted Green Roof
Area (m <sup>2</sup> )	7061.19	6395.49	-	-
Runoff Coef.	0.81	0.80	-	-
Q <sub>controlled</sub> (m <sup>3</sup> /s)	0.07247	0.07	-	-

$i = a[(T+b)/60]^c$ , where  $i$  (mm/h) ;  $T$  (min)  
 $Q = A(i)C/3600$ , where  $A$  (m<sup>2</sup>) ;  $i$  (mm/h)  
 $a = 1735.688$   
 $b = 6.014$   
 $c = 0.82$

$i$  = average rainfall intensity (mm/h)  
 $a, b, c$  = coefficients as per municipal standards  
 $T$  = time of concentration (min)  
 $Q$  = flow (m<sup>3</sup>/s)  
 $A$  = area (m<sup>2</sup>)  
 $C$  = runoff coefficient

Note: 'Vault' Inflow calculation = 100 year flow + 'restricted flat roof' flow (0m<sup>3</sup>/s) + 'Green Roof' flow (0m<sup>3</sup>/s).  
 Note: Max. 'Vault' Inflow = 0.254m<sup>3</sup>/s

Time (min)	i (mm/h)	Total Site Storage			Vault Storage			Restricted Flat Roof Storage			Restricted Green Roof Storage		
		Inflow, Q (m <sup>3</sup> /s)	Flow Stored, Q (m <sup>3</sup> /s)	Req. Storage, V (m <sup>3</sup> )	Inflow, Q <sub>1</sub> (m <sup>3</sup> /s)	Flow Stored, Q <sub>1</sub> (m <sup>3</sup> /s)	Req. Storage, V <sub>1</sub> (m <sup>3</sup> )	Inflow, Q <sub>2</sub> (m <sup>3</sup> /s)	Flow Stored, Q <sub>2</sub> (m <sup>3</sup> /s)	Req. Storage, V <sub>2</sub> (m <sup>3</sup> )	Inflow, Q <sub>3</sub> (m <sup>3</sup> /s)	Flow Stored, Q <sub>3</sub> (m <sup>3</sup> /s)	Req. Storage, V <sub>3</sub> (m <sup>3</sup> )
	Maximum	-	-	141.8	0.254	0.254	120.6	-	-	0.0	-	-	0.0
10	178.56	0.284	0.211	126.731	0.254	0.184	110.263	0.000	0.000	0.000	0.000	0.000	0.000
11	169.91	0.270	0.197	130.332	0.241	0.171	113.173	0.000	0.000	0.000	0.000	0.000	0.000
12	162.13	0.258	0.185	133.288	0.230	0.160	115.507	0.000	0.000	0.000	0.000	0.000	0.000
13	155.11	0.246	0.174	135.688	0.220	0.150	117.344	0.000	0.000	0.000	0.000	0.000	0.000
14	148.72	0.236	0.164	137.606	0.211	0.141	118.749	0.000	0.000	0.000	0.000	0.000	0.000
15	142.89	0.227	0.155	139.100	0.203	0.133	119.776	0.000	0.000	0.000	0.000	0.000	0.000
20	119.95	0.191	0.118	141.724	0.170	0.100	120.571	0.000	0.000	0.000	0.000	0.000	0.000
25	103.85	0.165	0.093	138.778	0.148	0.078	116.384	0.000	0.000	0.000	0.000	0.000	0.000
30	91.87	0.146	0.073	132.277	0.131	0.061	109.017	0.000	0.000	0.000	0.000	0.000	0.000
35	82.58	0.131	0.059	123.329	0.117	0.047	99.461	0.000	0.000	0.000	0.000	0.000	0.000
40	75.15	0.119	0.047	112.604	0.107	0.037	88.315	0.000	0.000	0.000	0.000	0.000	0.000
45	69.05	0.110	0.037	100.535	0.098	0.028	75.967	0.000	0.000	0.000	0.000	0.000	0.000
60	55.89	0.089	0.016	58.801	0.079	0.009	33.979	0.000	0.000	0.000	0.000	0.000	0.000
70	49.79	0.079	0.007	27.863	0.071	0.001	3.200	0.000	0.000	0.000	0.000	0.000	0.000
80	44.99	0.071	0.000	0.000	0.064	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
90	41.11	0.065	0.000	0.000	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
120	32.89	0.052	0.000	0.000	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
150	27.61	0.044	0.000	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
180	23.90	0.038	0.000	0.000	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Summary: **Vault Storage**  
 1 'Vault Storage' Required = 120.6m<sup>3</sup>.  
 2 'Vault Storage' Provided = 121.79202m<sup>3</sup>.

SWM Measure	Value
Allowable Release Flow (Q)	102.18L/s
Uncontrolled Release Flow (Q)	17.34L/s
Allowable Vault Flow (Q)	72.47L/s
Max Pump Flow (Q)	70L/s
'Vault Storage' Required	120.6m <sup>3</sup>
'Vault Storage' Provided	121.79m <sup>3</sup>
'Restricted Flat Roof Storage' Utilized	0m <sup>3</sup>
'Restricted Green Roof Storage' Utilized	0m <sup>3</sup>
'Dead Storage' Required	110.9m <sup>3</sup>
'Dead Storage' Provided	115.1m <sup>3</sup>

## Caitlin Beaudoin

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**Subject:** FW: LeBreton Library Parcel - SWM Enquiry

### Caitlin Beaudoin

PROJECT MANAGER, URBAN DEVELOPMENT

T +1 647.914.3008



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**From:** Ben Worth <[ben.worth@tylin.com](mailto:ben.worth@tylin.com)>

**Sent:** April 7, 2022 5:08 PM

**To:** Eric Lalande <[eric.lalande@rvca.ca](mailto:eric.lalande@rvca.ca)>; Evelyn Liu <[evelyn.liu@rvca.ca](mailto:evelyn.liu@rvca.ca)>

**Cc:** Caitlin Beaudoin <[caitlin.beaudoin@tylin.com](mailto:caitlin.beaudoin@tylin.com)>

**Subject:** RE: LeBreton Library Parcel - SWM Enquiry

Thanks for confirming Eric – quick response much appreciated.

Yes, we will certainly let you know if there are any significant changes in site design intent, however the plans are relatively well advanced and I wouldn't envision anything changing from this point.

### Ben Worth

SENIOR PROJECT MANAGER, WATER RESOURCES

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**From:** Eric Lalande <[eric.lalande@rvca.ca](mailto:eric.lalande@rvca.ca)>

**Sent:** April 7, 2022 5:03 PM

**To:** Ben Worth <[ben.worth@tylin.com](mailto:ben.worth@tylin.com)>; Evelyn Liu <[evelyn.liu@rvca.ca](mailto:evelyn.liu@rvca.ca)>

**Cc:** Caitlin Beaudoin <[caitlin.beaudoin@tylin.com](mailto:caitlin.beaudoin@tylin.com)>

**Subject:** RE: LeBreton Library Parcel - SWM Enquiry

Hi Ben,

Based on the plan provided, the RVCA will not require any water quality controls for the subject site. Please keep me in the loop should the plan change significantly from what's shown below.

Cheers,

**Eric Lalande, MCIP, RPP**

Planner, RVCA

613-692-3571 x1137

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**From:** Ben Worth <[ben.worth@tylin.com](mailto:ben.worth@tylin.com)>

**Sent:** Thursday, April 7, 2022 4:56 PM



**To:** Eric Lalande <[eric.lalande@rvca.ca](mailto:eric.lalande@rvca.ca)>; Evelyn Liu <[evelyn.liu@rvca.ca](mailto:evelyn.liu@rvca.ca)>

**Cc:** Caitlin Beaudoin <[caitlin.beaudoin@tylin.com](mailto:caitlin.beaudoin@tylin.com)>

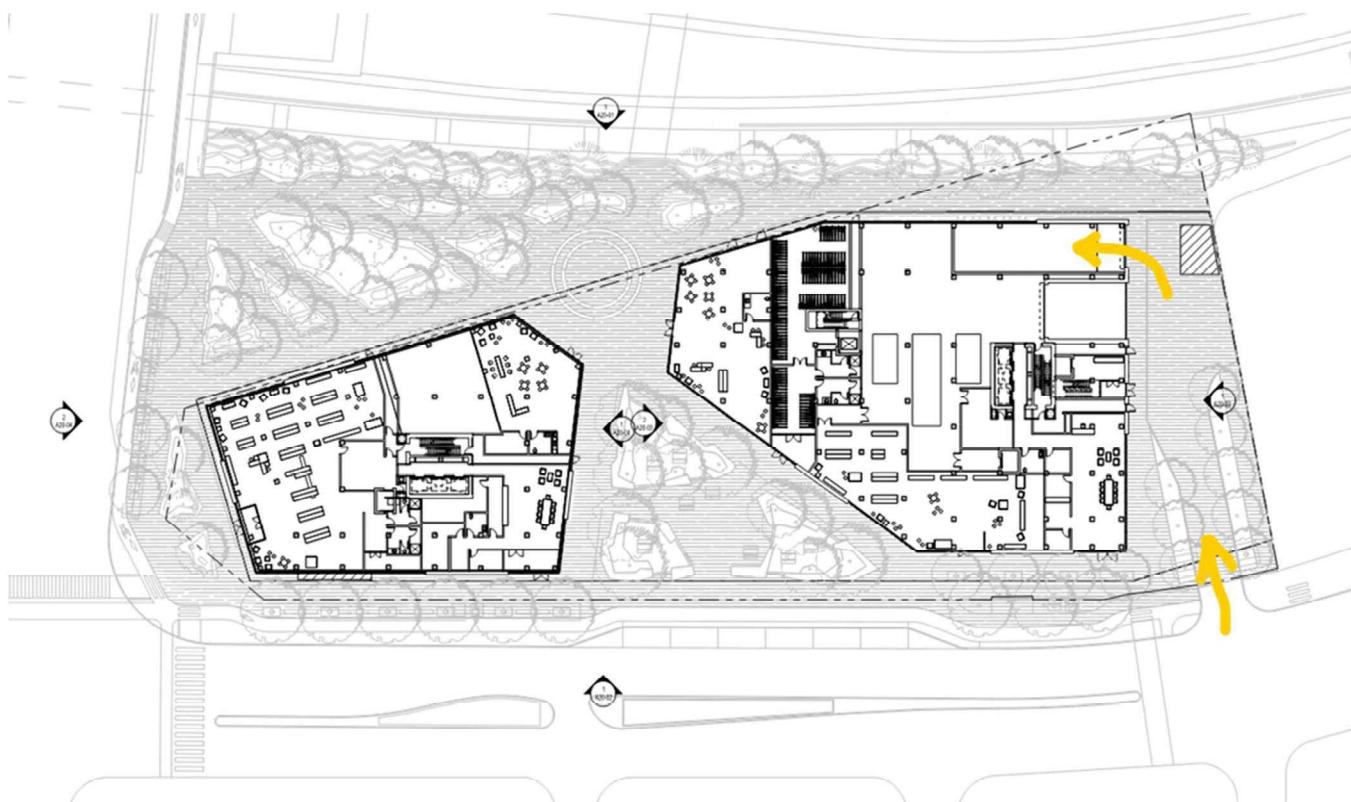
**Subject:** RE: LeBreton Library Parcel - SWM Enquiry

Hi Eric,

The site plan is still in progress (due to be submitted to the City within the next few weeks), but I've provided a snip below of work-in-progress architectural site plan.

The only vehicular access to the site is at the east end (short extension of Empress Ave, north off Albert) with a basement entry/egress ramp in the north-east corner of the basement structure. The remainder of at-grade areas are a mixture of hard/soft landscaping, no surface parking is proposed on site.

Thanks,  
Ben



**Ben Worth**

SENIOR PROJECT MANAGER, WATER RESOURCES

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**TYLin**

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**From:** Eric Lalande <[eric.lalande@rvca.ca](mailto:eric.lalande@rvca.ca)>

**Sent:** April 7, 2022 3:29 PM

**To:** Ben Worth <[ben.worth@tylin.com](mailto:ben.worth@tylin.com)>; Evelyn Liu <[evelyn.liu@rvca.ca](mailto:evelyn.liu@rvca.ca)>

**Cc:** Caitlin Beaudoin <[caitlin.beaudoin@tylin.com](mailto:caitlin.beaudoin@tylin.com)>

**Subject:** RE: LeBreton Library Parcel - SWM Enquiry

# Appendix B

SANITARY CALCULATIONS

Project Name: **LeBreton Library Parcel**  
 Project No.: **10399**  
 Task: **Sanitary Servicing Analysis**



Prepared by: BG  
 Checked by: BW  
 Date: Feb 2023

				ALLOTTED	PROPOSED
				CIMA	DREAM
<b>Residential</b>	Apartment	Persons/unit:	1.8	403	608
	Townhome	Persons/unit:	2.7		0
	<b>Population</b>			<b>726</b>	<b>1095</b>
	Per Capita Flow (Lpcd)			280	280
	Average Flow (L/s)			2.35	3.55
	Harmon Correction Factor			0.8	0.8
	Peaking Factor			3.31	3.22
	<b>Residential Peak Flow (L/s)</b>			<b>7.78</b>	<b>11.42</b>
<b>Non-Res</b>	Commercial/Retail			3,063	1,332
	Office/Loft			19,307	35
	Childcare				1,075
	<b>Total Gross Floor Area (m<sup>2</sup>)</b>			<b>22,370</b>	<b>2,442</b>
	Flow (L/m <sup>2</sup> /day)			2.8	2.8
	Peaking			1.5	1.0
	<b>Average Flow (L/s)</b>			<b>1.09</b>	<b>0.08</b>
<b>TOTAL DRY WEATHER DESIGN FLOW (L/s)</b>				<b>8.87</b>	<b>11.50</b>
<b>Wet-Weather</b>	Site Area (m <sup>2</sup> )			9,629	9,629
	Infiltration Allowance (L/ha/s)			0.33	0.33
	Long term groundwater discharge (L/s)			0	1.49
	<b>Wet Weather Flow (L/s)</b>			<b>0.32</b>	<b>1.81</b>
<b>TOTAL WET WEATHER DESIGN FLOW (L/s)</b>				<b>9.19</b>	<b>13.31</b>
<b>PROP INCREASE FROM ALLOTTED SAN FLOW:</b>				<b>4.12 L/s</b>	

Service Connection	Design Flow (L/s)	Diameter (m)	Slope (%)	Velocity (m/s)	Capacity (L/s)	Total Usage (%)
Residential	13.31	150	2.00	1.22	21.54	61.8

Note:

The above calculations show that a 150mm service connection is sufficient to convey the proposed sanitary flows from the proposed development. However, a 300mm service connection has been proposed on drawing S1 to accommodate the internal mechanical system design.

# Appendix C

WATER DEMAND CALCULATIONS

Project Name: **LeBreton Library Parcel**  
 Project No.: **10399**  
 Task: **Water Demand Analysis**



Prepared by: CB  
 Checked by: BD  
 Date: Feb 2023

				ALLOTTED	PROPOSED
				CIMA	DREAM
<b>Residential</b>	Apartment	Persons/unit:	1.8	403	608
	Townhome	Persons/unit:	2.7		0
	<b>Population</b>			<b>726</b>	<b>1095</b>
	Baseflow (Lpcd)			350	350
	<b>Average Day Demand Flow (L/s)</b>			<b>2.94</b>	<b>4.44</b>
	Maximum Day Peaking Factor			2.5	2.5
	Peak Hour Peaking Factor			2.2	2.2
	<b>Maximum Day Demand (L/s)</b>			<b>7.35</b>	<b>11.09</b>
	<b>Peak Hour Demand (L/s)</b>			<b>16.18</b>	<b>24.40</b>
<b>Commercial</b>	Commercial/Retail			3,063	1,332
	Baseflow (L/m2/day)			2.8	2.8
	<b>Average Day Demand Flow (L/s)</b>			<b>0.10</b>	<b>0.04</b>
	Maximum Day Peaking Factor			1.5	1.5
	Peak Hour Peaking Factor			1.8	1.8
	<b>Maximum Day Demand (L/s)</b>			<b>0.15</b>	<b>0.06</b>
	<b>Peak Hour Demand (L/s)</b>			<b>0.27</b>	<b>0.12</b>
<b>Office &amp; Childcare</b>	Office/Loft			19,307	35
	Childcare				1,075
	Baseflow (L/m2/day)			8.06	8.06
	<b>Average Day Demand Flow (L/s)</b>			<b>1.80</b>	<b>0.10</b>
	Maximum Day Peaking Factor			1.5	1.5
	Peak Hour Peaking Factor			1.8	1.8
	<b>Maximum Day Demand (L/s)</b>			<b>2.70</b>	<b>0.16</b>
	<b>Peak Hour Demand (L/s)</b>			<b>4.87</b>	<b>0.28</b>
<b>TOTAL AVERAGE DAY DEMAND FLOW (L/s)</b>				<b>4.84</b>	<b>4.58</b>
<b>TOTAL MAX DAY DEMAND FLOW (L/s)</b>				<b>10.20</b>	<b>11.31</b>
<b>TOTAL PEAK HOUR DEMAND FLOW (L/s)</b>				<b>21.31</b>	<b>24.79</b>

Project Name: **LeBreton Library Parcel**  
 Project No.: **10399**  
 Task: **Fire Water Calculations**



Prepared by: CB  
 Checked by: BW  
 Date: Aug 2022

**Standards** = Based on Fire Underwriters Survey

Where:

- C = Coefficient related to construction type
- A = Total floor area in m<sup>2</sup> (excluding basements, including above ground garage)
- M<sub>A</sub> = Area Multiplier (Reduction)
- M<sub>O</sub> = Occupancy Multiplier (<100% = Reduction, >100% = Increase)
- M<sub>SPR</sub> = Sprinkler Multiplier (Reduction)
- M<sub>SEP</sub> = Separation Multiplier (Increase)
- F = Required Flow (L/min)

**Initial Required Fire Flow**

C = Non-combustible construction  
 = 0.8

Floor	A <sub>0</sub> (m <sup>2</sup> )	M <sub>A</sub>
Ground	3,801	100%
3	2,848	100%
4	2,272	50%
5	2,009	50%
6	1,094	50%
7	1,401	50%
8	1,401	50%
9	1,401	50%
10	1,401	50%
11	1,401	50%

A =  $\Sigma [A_{0i}(M_{Ai})]$   
 = 12839 m<sup>2</sup>  
 F<sub>1</sub> = 220(C)A<sup>1/2</sup>  
 = 19,942 L/min  
 = 20,000 L/min (round to nearest 1000)

**Occupancy Multiplier**

M<sub>O</sub> = Limited combustible  
 = 85%  
 F<sub>2</sub> = F<sub>1</sub>(M<sub>O</sub>)  
 = 17000 L/min

**Sprinkler Multiplier**

M<sub>SPR</sub> = NFPA Sprinkler system  
 = 70%  
 F<sub>3</sub> = F<sub>2</sub>(M<sub>SPR</sub>)  
 = 11900 L/min

**Separation Multiplier**

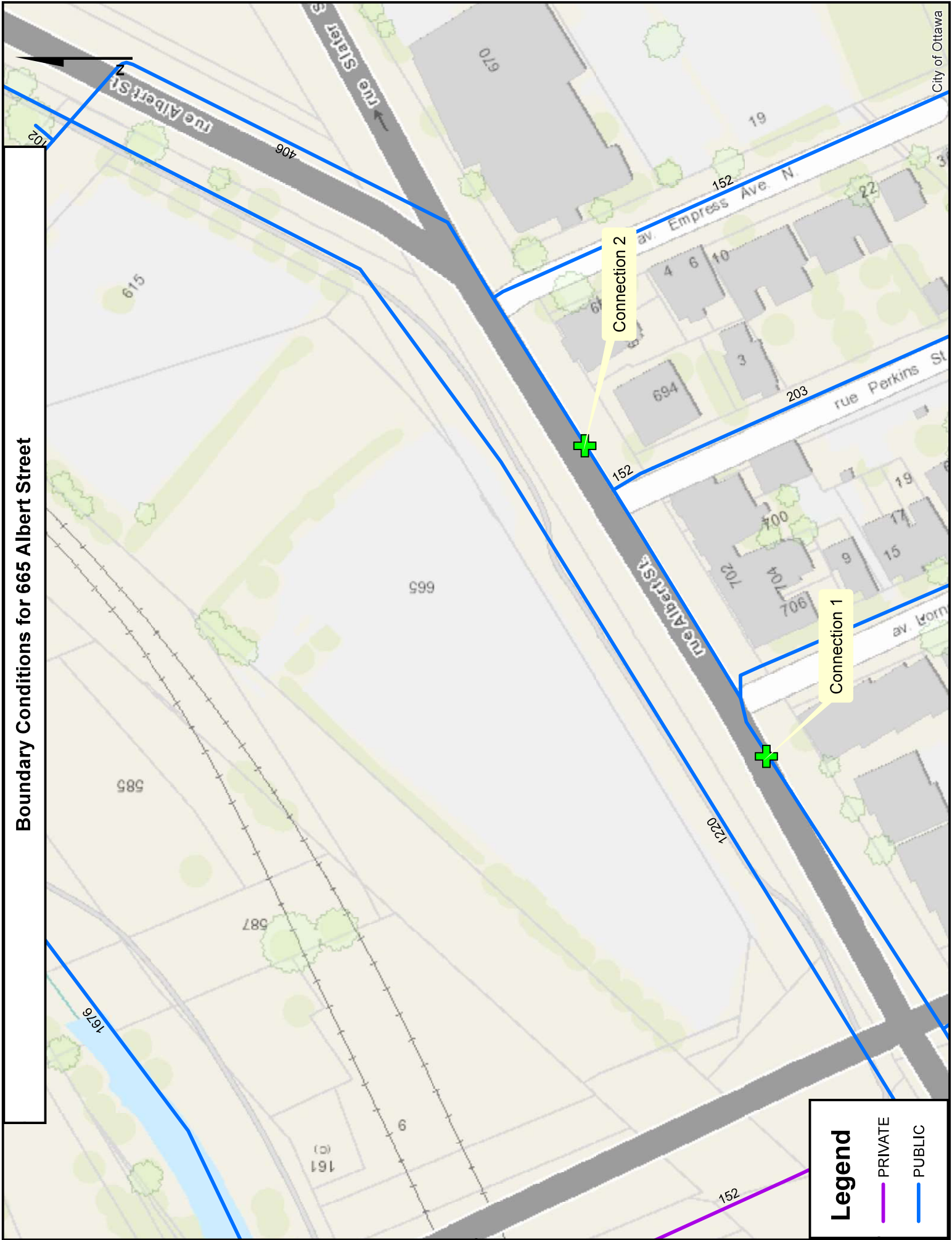
Direction	Separation Distance	M <sub>SEP</sub>
Total		100%
North Side	45m +	0%
East Side	45m +	0%
South Side	45m +	0%
West Side	45m +	0%

Note: Maximum Multiplier is 175%

**Required Fire Flow**

F<sub>4</sub> = F<sub>3</sub>(M<sub>SEP</sub>) (2000 ≤ F ≤ 45000)  
 = 11900 L/min  
**198.33 L/s**

**Boundary Conditions for 665 Albert Street**



**Legend**

- PRIVATE
- PUBLIC

# Appendix D

EXCERPTS FROM THE MESP



## 4. Water Servicing

### 4.1 Existing Infrastructure

A summary of the existing water servicing infrastructure in the vicinity of the LeBreton Flats Development area has been provided in the *LeBreton Flats Servicing Vision*, prepared by Parsons in 2019. A detailed catalogue of the existing infrastructure has also been presented in that report.

Based on a review of available as-built drawings, the principal watermains surrounding the site are a 400mm Dr 18 PVC watermain on Albert St., the 300mm DR 18 PVC watermain on Wellington Street, the 400mm DR 18 PVC stub on Booth Street at Fleet Street. Detailed information on the existing water supply infrastructure can be found on the water servicing plan in Appendix A.

Recommendations have been made in previous reports regarding options for the relocation of the low-pressure transmission main (Parsons, 2019), however, this is no longer required since buildings are no longer conflicting with its existing location as per the LeBreton Flats Development Master Concept Plan (Appendix I).

## 4.2 Proposed Development

### 4.2.1 Potable Water Demands

Potable water demands are calculated using the parameters defined in the City of Ottawa Water Design Guidelines 2010, updated with the relevant Technical Bulletins 2020 (CoO WDG), and the Ministry of Environment, Climate and Parks (MECP) Design Guidelines for Water Supply (2008). A summary of those design parameters is provided in the following table:

Table 4.1 : Potable Water Demand Calculation Parameters

Parameter		Value	Units	Source
<b>Residential</b>	Base Demand	350	l/p/d	CoO WDG
Population per dwelling	Apartment	1.8	p/dwelling	CoO WDG
	Townhome	2.7	p/dwelling	CoO WDG
Peaking Factors	Maximum Day	2.5	unitless	CoO WDG
	Peak Hour	2.2	unitless	CoO WDG
<b>Commercial</b>	Base Demand	2.8	L/m <sup>2</sup> /d	CoO WDG
Peaking Factors	Maximum Day	1.5	unitless	CoO WDG
	Peak Hour	1.8	unitless	CoO WDG
<b>Unit Flows</b>				
Hotel	Baseflow	225	L/bedspace/d	CoO WDG
	beds per room	2	bedspace / room	CIMA+ Assumption
	% rooms	65%	room area/ GFA	
	325 sq.ft / room	30.1	room area (m <sup>2</sup> ) / room	
	rooms per GFA	0.022	Rooms/GFA (m <sup>2</sup> )	
Parks	Density / acre	75	Person per acre	CoOSDG / Assumption
	Density /hectare	185.33	Person per hectare	CoOSDG / Assumption
	Picnic area; flush toilet	20	L/p/d	CoOSDG
	Contingency	25%	Unitless	CIMA+ Assumption
	Peaking Factor	As per commercial	unitless	CIMA+ / CoO WDG
<b>Flow Monitoring</b>	Arena / Major Event Centre Base Demand	110	L/seat/d	Parsons (2019)

Hotel water demands were determined with a baseflow value per the City of Ottawa Water Design Guidelines, 2010 and based on a value of 0.022 Rooms per m<sup>2</sup> of gross floor area. This value represents a 65% utilization rate for rooms, with 325 sq. ft per room, and was validated with information from previous CIMA+ projects.

Park water demands were determined based on daily sanitary demand unit rates for parks with washrooms only, using a population density of 75 persons per acre, as presented in the City of Ottawa Sewer Design Guidelines with a contingency of 25%. The commercial peaking factors were assumed for this demand.

Major Event Centre demands were based on the values provided in the Parsons Servicing Vision 2019, which is based on flow monitoring of an arena. The value obtained of 110 L/seat/d corresponds to the OBC value (20 L/d) (Ontario Building Code, 2017) multiplied by a factor of 5.5. Commercial peaking factors were assumed for this demand.

A breakdown of the resulting estimated potable water demands for each phase is presented in Table 4.2. The water demand calculation sheet supporting these values is included in Appendix E.

Table 4.2 : LeBreton Water Demands

Concept Dev. Block	Residential Population (persons)	Gross Floor Area (m <sup>2</sup> )			Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
		Commercial/ Institutional	Office/ Loft	Hotel			
Block 1	726	3 063	19 307	-	4.84	10.20	21.31
Block 2	512	1 559	-	11 246	2.76	6.21	13.25
Block 3	1 834	5 169	27 000	-	10.12	22.61	48.12
Block 4	-	3 717	24 098	-	2.37	3.55	6.40
Block 5	3 114	3 921	-	7 956	13.19	32.40	70.93
Block 6	1 716	2 687	-	-	28.68	71.62	135.86
Block 7	571	-	-	-	2.31	5.78	12.72
LeBreton Place	-	2722			0.09	0.13	0.24
Parks	-	-	-	-	0.42	0.85	1.87
<b>Total</b>	<b>8 473</b>	<b>22 838</b>	<b>70 405</b>	<b>19 202</b>	<b>64.78</b>	<b>153.35</b>	<b>310.70</b>

#### 4.2.2 Fire Protection

Given the design is at a conceptual stage with limited available building information, it would not be appropriate to develop fire flows in accordance with the FUS and City requirements at this time. For a preliminary analysis and determination of boundary conditions, a fire flow demand of 217 L/s (13 000 L/min) was considered per the maximum fire demand level of service in core areas as stipulated in the 2013 City of Ottawa Water Master Plan (Stantec, 2013).

#### 4.2.3 Proposed Connections

The proposed LeBreton Flats water servicing configuration utilizes the connection points proposed in the *LeBreton Flats Servicing Vision* (Parsons, 2019) and the *Servicing and Stormwater Management Report 557-584 Wellington Street & 550 Albert Street* (Stantec, 2017). Table 4.3 summarises the proposed primary and secondary connection points while the water servicing plan provided in Appendix A demonstrates the proposed water servicing layout.

For each individual building, multiple connections will be required if the average day demand is over 50 m<sup>3</sup>/d, as per the requirements of the City of Ottawa Water Design Guidelines.

The 2019 Parsons report also highlighted a need for pressure reducing valves at each building. The updated boundary conditions may also highlight this requirement, which will need to be confirmed at detailed design.

*Table 4.3 : LeBreton Proposed Watermain Connection Points*

<b>Concept Dev. Phase</b>	<b>Primary Connection</b>	<b>Size*</b>	<b>Secondary Connection</b>	<b>Size*</b>
<b>Block 1</b>	Albert St.	406mm PVC	Albert St.	406mm PVC
<b>Block 2</b>	Albert St.	406mm PVC	Albert St.	406mm PVC
<b>Block 3</b>	Preston Street North of Albert	406mm DR 18 PVC	Albert St. near Rochester St.	406mm PVC
<b>Block 4</b>	Preston Street North of Albert	406mm DR 18 PVC	Albert St. near Rochester St.	406mm PVC
<b>Block 5</b>	Wellington St. and Preston St.	305mm Class 52 DI (+300mm PVC and Stubs)	Booth St. and Fleet St.	406 mm booth st. / 305mm Fleet street PVC
<b>Block 6</b>	Albert St. and City Centre Ave.	406mm DR 18 PVC	Preston Street North of Albert	406mm DR 18 PVC
<b>Block 7</b>	Wellington St. and Preston St.	305mm Class 52 DI (+300mm PVC and Stubs)	Booth St. and Fleet St.	406 mm booth st. / 305mm Fleet street PVC
<b>LeBreton Place</b>	Connected to Block 4 Network	-	-	-
<b>Parks</b>	Connected to LeBreton Place Network	-	-	-

*\*Based on a review of as-built drawings available to CIMA+ at the time of publication of this report*

#### 4.2.4 Watermain Boundary Conditions

The following boundary condition was obtained from the City of Ottawa on March 16<sup>th</sup>, 2020, using a fire flow of 217 L/s at each connection. The connection points used are shown in Appendix A. Based on the boundary conditions, and the proposed site grading, the resulting pressure at the connection points ranges approximately from 59 to 89 psi. To satisfy the City of Ottawa hydraulic objectives and Ontario Building Code requirements, pressure-reducing valves will be required at the building connections where the watermain pressure exceeds 80 psi, as per the City of Ottawa Water Design Guidelines.

*Table 4.4 : LeBreton Proposed Watermain Connection Points*

Concept Dev. Phase	Connection points	Min. HGL	Max HGL	Max Day + Fire Flow
		(m)	(m)	(m)
Block 1	Connection 1A,1B	107.0	116.5	109.0
Block 2	Connection 2A, 2B*	107.0	116.5	109.0
Block 3	Connection 3A, 3B	107.0	116.0	109.0
Block 4, Block 5, LeBreton Place, Parks	Connection 5A	107.0	116.5	97.0
	Connection 5B	107.0	116.5	107.0
Block 6	Connection 6A, 6B	107.0	116.0	109.0
Block 7	Connection 7A	107.0	116.5	107.0
	Connection 7B, 7C	107.0	116.5	108.0

*\*Assuming a connection to a future 406mm diameter watermain on Albert St.*

#### 4.3 Conclusions and Recommendations – Water Servicing

Water Servicing for the LeBreton Flats development is feasible and meets the City of Ottawa hydraulic objectives provided that connection 2B connects to a future 406mm dia. watermain. However, it should be noted that actual fire protection requirements may dictate otherwise.

Actual fire flow demands will need to be assessed and fire scenarios analysed as part of the detailed design. It should also be noted that there may be difficulty in achieving FUS fire flow requirements depending on construction type, gross floor area and percent of unprotected openings. The final design will need to meet the available fire flow with capacity of the existing network or provide additional measures to meet the requirements of the Fire Marshall and appropriate governing bodies.

## 5. Sanitary Servicing

### 5.1 Existing Infrastructure

The sanitary sewer network in the vicinity of the LeBreton Flats Development Area is complex and consists of multiple components, including infrastructure such as collectors, regulators, and interceptor sewers, as well as local sewers. Sanitary flow distribution to sewers in this area is actively and passively distributed between the major trunk sewers by various diversion and regulating chambers in the area near Booth St., Albert St., and Preston St., south of the LeBreton development.

A detailed catalogue of the existing infrastructure has been presented in the LeBreton Flats Servicing vision prepared by Parsons in 2019 (Appendix K).

The principal infrastructure which will service the LeBreton Flats Development Area as follows:

- + The Albert Street Sanitary Sewer at Brickhill St. (Albert St.)
- + The Fleet Street Sanitary Sewer and LeBreton Flats Sanitary Pumping station (LFPS)
- + The West Nepean collector and Cave Creek Collectors (WNC/CCC)
- + The Interceptor Outfall Sewer (IOS)

Additional information on sanitary allocations for the LeBreton Development Area is presented in the 2004 *LeBreton Flats Master Servicing Report* prepared by Dessau-Soprin (Appendix J). The flows outlined in this report have previously been approved by the City of Ottawa. The City has requested that CIMA+ ensure the sanitary allocations discussed in the 2004 report are adhered to as part of this Master Servicing Report.

### 5.1.1 Capacity analysis for existing outfall infrastructure

A review of the available information on the principal sanitary infrastructure was undertaken to assess the available capacity in each outlet. Table 5.1 summarises estimated capacities, per the principal outlet and its components.

*Table 5.1 : Summary of outlet-specific sanitary flow allocations and estimated capacity, including external contributions*

Outlets	Element	Estimated Capacity (L/s)	Source
LFPS	Fleet St. Sewer	117.6	Dessau-Soprin, 2004; Novatech 2017
	Pumping station (Current Capacity)	100	ECA - MOE 2010
	Flowrate until overflow to Storm	140	City of Ottawa 2018
Albert St. Sewer	Sewer + ICD	233	City of Ottawa 2020
	Design Sanitary Flow	110	Robinson 2015
CCC	-	Capacity not limited	Parsons, 2019; City of Ottawa, 2018

#### 5.1.1.1 Fleet street gravity sewer, LFPS and IOS

The Fleet street sanitary sewer conveys sewage to the LFPS, and its capacity was estimated at 117.6 L/s in the 2004 LeBreton Master Servicing Report (Dessau-Soprin, 2004). In discussions with the City, the City has indicated that it could be acceptable for this sewer to surcharge in order to accommodate the required flow, provided acceptable justification and analysis.

The LFPS itself has a current firm rated at a capacity of 100L/s, as indicated in its associated Environmental Compliance Approval No. 8494-84GSRF (MOE, 2010), and in the LFPS Design Brief (Stantec 2006, 2008).

As referred to in the LeBreton Flats Servicing Vision (Parsons, 2019), the City of Ottawa's analysis demonstrated additional capacity of 130 L/s in the downstream pipe connecting the effluent of the LFPS to the IOS (Tousignant, 2018).

#### 5.1.1.2 Albert St. Sanitary Sewer

The Albert St. Sanitary sewer is the planned outlet for the Chaudière and Albert Island developments as well as the outlet of a 600mm combined sewer. The outlet of the combined sewer contains an inlet control device (ICD) to control the flow going into the sanitary sewer. It also has a 450mm overflow pipe that discharges to the 900mm storm sewer when the flow exceeds the ICD's capacity. Design sanitary capacity for this outlet were determined at 110.68 L/s (Robinson, 2015). However, it should be noted that this structure is part of the combined sewer system and that sanitary flows directed to this outlet impact the return period of combined sewer overflow at this location (Tousignant, 2020).

### 5.1.1.3 Cave Creek Collector Capacity

The City of Ottawa has indicated that there are likely no capacity limitations for this outlet but has requested to be provided with the proposed design flows to this collector in order to update their models. Additionally, the City has provided the HGL within the CCC, at the anticipated connection point ( )

*Table 5.2 : HGL of the Cave Creek Collector at Preston St.*

Return Period	HGL @ MHS00189 (m)	Source
2-year	52.28	City of Ottawa, 2020
5-year	52.33	
100-year	52.48	



## 5.2 External Flow Contributions

This section summarises the external developments and constructed infrastructure that are or are expected to discharge to the proposed outlets of the LeBreton Flats Development Area. These flow contributions must be considered when determining allocated flows for the LeBreton Flats Development Area. A summary of the proposed external sanitary flows is indicated in Table 5.3. The external contributions only consider the most recently proposed sanitary flows for each site.

Table 5.3 : External Sanitary Demands

Concept Dev. Phase	Area (ha)	Residential Population	GFA (m <sup>2</sup> )			Proposed Outlet	Peak Flow (L/s)	Source
			Commercial/ Institutional	Office/ Loft	Hotel			
<b>External Flow Contributions</b>								
Canadian War Museum	-	-	-	-	-	LFPS	3.18	Parsons, November 2019
Claridge Phase I-V	-	-	-	-	-	LFPS	33.95*	Novatech, March 2020
OPL-LAC Joint Facility	-	-	-	-	-	Albert St.	4.3*	Stantec, September 2017
Chaudière and Albert Isl.	-	-	-	-	-	Forcemain to Albert St.	53.6*	David Shaeffer Engineering, June 2018
Victoria Island	-	-	-	-	-	Portage Bridge/ LFPS	20.0	Dessau-Soprin, 2004
Future Cultural/ Institutional Use	-	-	30 000	-	-	LFPS	1.52*	CIMA+, Parsons 2019

\*External demands provided in this table only consider the proposed sanitary flows. Approved flow allocations by the NCC and the City of Ottawa remain to be confirmed.

### 5.2.1 Canadian War Museum

Based on the LeBreton Flats Servicing Vision (Parsons, 2019) and the LeBreton Flats Master Servicing Report, the Canadian War Museum contributes 3.18 L/s in peak sanitary flows to the LFPS. This is the allocation considered as part of this MSR.

### 5.2.2 Claridge Homes Phase I-V

Currently, only phases I, II and III of the Claridge Homes Development are occupied and contribute flows to the LFPS. Based on the most recent servicing brief for this development, a proposed buildout sanitary peak flow of 33.95 L/s (Novatech, 2020; Mottalib, 2020) (Appendix P). This exceeds the allocated capacity of 22.10 L/s from the Dessau-Soprin Master Servicing report that was previously approved by the City of Ottawa (Mottalib, 2020; Dessau-Soprin, 2004).

### 5.2.3 Ottawa Public Library – Library and Archives Canada Joint Facility

This Master Servicing Report considers developments that were also addressed in a 2017 Servicing Study titled *Servicing and Stormwater Management Report 557-584 Wellington Street & 550 Albert Street* prepared by Stantec (Appendix K, appended to the Parsons report).

The sanitary contributions of the sites addressed by this MSR were reassessed based updated design and land use parameters. For the sanitary contribution of the sites not considered in this Master Servicing Report, the demand totaled 4.3 L/s (Stantec, 2017).

### 5.2.4 Albert and Chaudière Islands Development (Zibi)

The Albert and Chaudière Islands Development, situated north of the LeBreton Development Area, are currently serviced by a pumping station and twin forcemain discharging to the Albert Street Sewer (DSEL 2018; Parsons 2019; City of Ottawa Wastewater Service Interactive Map 2020). The sanitary forcemain discharges into the Brickhill Dr. and Albert St. gravity sewers.

This allocation was previously determined to be 39.7 L/s discharging to the LFPS in the 2019 *LeBreton Flats Servicing Vision* (Parsons, 2019), but was updated with more recent available information.

Based on a revised version of the Windmill Developments Phase 1 Master Servicing Study (DSEL, 2018), the sanitary flows to the Albert St. sewer via the Brickhill St. sanitary sewer have been revised to 53.6 L/s and discharging to the Albert St. Sewer via a twinned forcemain. This updated information was used in CIMA+'s analysis.

The flow contributions from this development have been revised from 39.7 L/s to 53.6 L/s from the 2019 Parsons report (Appendix M) with the most recent available information.

### 5.2.5 Victoria Island

Based on previous engineering reports (Dessau-Soprin 2004, Parsons 2019), Victoria Island sanitary servicing is expected to discharge to the LFPS. However, based on information provided by the NCC, Victoria Island is already serviced by its own system of pumping stations and forcemains, ultimately discharging to the IOS near the intersection of Bronson Ave. and Sparks St.

Victoria Island is currently serviced by sanitary sewers and a pumping station to the of Portage bridge, pumping sanitary flows across the Hydro-Ottawa generating station tailrace. Sanitary sewage then is lifted a second time, through a pumping station northeast of the Portage Bridge and Wellington St. Intersection to the IOS. The body of engineering reports also provide for a future allocation of 20 L/s of sanitary flows from Victoria Island to the LFPS (Dessau-Soprin 2004, Parsons 2019). It is anticipated that the NCC uses this allocation to redirect flows from the existing system of pumping stations to the LFPS in the future.

## **5.3 Proposed Configuration**

### **5.3.1 Design Constraints**

The planned outlet from Block 4 is the Cave Creek Collector which was selected to avoid an additional crossing of the covered aqueduct. Due to the currently proposed grading for this block, a sanitary pumping station is likely to be required to service this parcel through to the CCC.

### 5.3.2 Sanitary Demands

The sanitary demand determination for this site has been performed using the parameters defined in the City of Ottawa Sewer Design Guidelines, 2012 (CoO SDG), as updated with the relevant Technical Bulletins. A summary of those design parameters is provided in Table 5.4.

Table 5.4 : Sanitary Demand Calculation Parameters

Parameter		Value	Units	Source
<b>Residential</b>	Baseflow	280	l/capita/d	CoO SDG
Population per dwelling	Apartment	1.8	p/dwelling	CoO SDG
	Townhome	2.7	p/dwelling	CoO SDG
Harmon Peaking Factor Parameters	Harmon Correction Factor (K):	0.8	unitless	CoO SDG
	Max Harmon P.F.	4	unitless	CoO SDG
	Min Harmon P.F.	2	unitless	CoO SDG
<b>Commercial</b>	Baseflow	2.8	L/m <sup>2</sup> /d	CoO SDG
	Peaking Factor	1.5	unitless	CoO SDG
	Peaking Factor if Commercial area is <20% of total area	1.0	unitless	CoO SDG
<b>Infiltration</b>		0.33	L/s/ha	CoO SDG
<b>Unit Flows</b>				-
Hotel	Baseflow	225	L/bedspace/d	CoO SDG
	beds per room	2	bedspace / room	CIMA+ Assumption
	% rooms	0.65	room area/ gfa	
	325 sq. ft / room	30.1	room area (m <sup>2</sup> ) / room	
	rooms per GFA	0.022	Rooms/GFA (m <sup>2</sup> )	
Parks	Density / acre	75	Person per acre	CoO SDG / Assumption
	Density /hectare	185.33	Person per hectare	CoO SDG / Assumption
	Picnic area; flush toilet	20	L/p/d	CoO SDG
	Contingency	25%	unitless	-
<b>Flow Monitoring</b>	Arena / Major Event Centre Baseflow	110	L/seat/d	Parsons (2019)

Assumptions for the sanitary unit flow parameters are identical to the ones discussed for water demands in Section 4.2.1. The assumptions are restated below for the reader's convenience.

Hotel sanitary demands were determined with a baseflow value per the City of Ottawa Sewer Design Guidelines, 2012 and based on a value of 0.022 Rooms per m<sup>2</sup> of gross floor area. This value represents a 65% utilization rate for rooms, with 325 sq. ft per room, and was validated with information from previous CIMA+ projects.

Park sanitary demands were determined based on daily sanitary demand unit rates for parks with washrooms only, using a population density of 75 persons per acre, as presented in the City of Ottawa Sewer Design Guidelines with a contingency of 25%. The commercial peaking factors were assumed for this demand.

Major Event Centre demands were based on the values provided in the Parsons Servicing Vision 2019, which is based on flow monitoring of an arena. The value obtained of 110 L/seat/d corresponds to the OBC value (20 L/d) (Ontario Building Code, 2017) multiplied by a factor of 5.5. Commercial peaking factors were assumed for this demand.

A breakdown of estimated sanitary demands for each development block is presented in Table 5.5, with the proposed outlets identified for each. The sanitary design sheet supporting these values is included in Appendix F, and a preliminary servicing plan is included in Appendix B

*Table 5.5 : Sanitary Demand for the LeBreton Flats Development*

Concept Dev. Phase	Area (ha)	Residential Population	GFA (m <sup>2</sup> )			Proposed Outlet	Peak Flow (L/s)	Source
			Commercial/ Institutional	Office/ Loft	Hotel			
<b>LeBreton Sanitary Demands</b>								
Block 1	1.26	726	3 063	19 307	-	Albert St.	9.29	CIMA+
Block 2	0.97	512	1 559	-	11 246	Albert St.	7.89	CIMA+
Block 3	2.77	1 834	5 169	27 000	-	CCC	20.85	CIMA+
Block 4	3.00	-	3 717	24 098	-	CCC	2.34	CIMA+
Block 5	5.19	2 940	3 921	-	7 956	LFPS	32.43	CIMA+
Block 6	3.75	1 716	2 687	-	-	CCC	40.26	CIMA+
Block 7	1.19	503	-	-	-	LFPS	6.60	CIMA+
LeBreton Place	0.48	-	2722	-	-	CCC	0.29	CIMA+
Park Area	7.91	-	-	-	-	CCC	3.25	CIMA+

## 5.4 Recommendations – Sanitary Servicing

### 5.4.1 Cave Creek Collector Relocation

The current alignment of the Cave Creek Collector conflicts with the proposed site plan. In order to develop Blocks 3 and 5, a realignment of the Cave Creek Collector will be required. The NCC and the City of Ottawa have agreed on a re-alignment geometry of the Cave Creek Collector, with a separation distance from the High-Pressure Transmission Main of 5.0m centre to centre, and a future easement extending 4.5m from the Cave Creek Collector centreline (Chakraborty, 2020) (Appendix N).

The NCC and the City of Ottawa have initiated discussions towards reaching a cost-sharing agreement to relocate the Cave Creek Collector into the Albert Street corridor in upcoming years, as early as 2024.

A pre-feasibility analysis was performed to assess whether the relocation of the CCC to this proposed alignment was possible by micro-tunneling, and to determine the associated constraints and risks related to this undertaking. A feasibility study is required for more detailed information on this aspect.

To confirm the feasibility of this option, the following items will be required as part of a feasibility study supporting this work:

- + Geotechnical Interpretation and validation
  - The geotechnical information supporting the pre-feasibility analysis would need to be validated with the appropriate information, as the reality of the site conditions is critical to the construction risk.
  - There are records of seven (7) boreholes performed in proximity of the site, but the associated borehole logs were not available for pre-feasibility analysis. This information should be consulted in order to quantify and validate the risks and preliminary information.
  - The preparation of a geotechnical interpretation will be required with the support of an additional geotechnical investigation, likely consisting of 2-3 boreholes.
- + Survey and location validation of underground infrastructure
- + Preliminary design and quantity estimation
  - The feasibility study should also include preliminary design, quantity estimation and feasibility of the preliminary design.
- + Tender design package
  - The relocation would also require the preparation of a detailed design package (drawings and specifications) to support the tender process.

As for geotechnical risks related to construction, the pre-feasibility analysis noted the presence of a limestone bedrock with shale interbedding, some partial mixed-face conditions at the proposed tunnelling elevation, and presence of fill with wood debris in proximity of the proposed alignment.

To this undertaking, mixed-face conditions present risks associated with increased complexity and difficulty of the tunneling operation, and the presence of the wood and debris presents a major risk related to the potential stalling the tunneling operation caused by debris, which would then require an open excavation to free the stalled tunneling equipment.

Additional risks highlighted were related to the provisions required for traffic management and construction laydown.

Consultation with appropriate stakeholders for approvals and coordination will be required as part of the Cave Creek Collector relocation.

#### 5.4.2 Block 4 Sanitary Pumping Station

A sanitary pumping station is required for the sanitary servicing of block 4, the Park Area and LeBreton Place. The following design elements were established on a preliminary design basis:

- + Pump station wet well invert: 48.820m
- + Invert at forcemain outfall to SAN MH 11: 54.850m
- + Design flow rate (subject to modifications):  $\pm 5.88$  L/s

The proposed outfall for this pumping station must cross underneath the Confederation Line LRT tracks south towards SAN MH 11.

The functional design of this pump station should be completed under a separate mandate once the Park Area sanitary demands have been confirmed.

#### 5.4.3 Sanitary Flow Allocations from Previous Servicing Reports and Studies

The LeBreton Flats Sanitary Pumping Station is shared with existing and planned external developments as well as with the proposed developments in the LeBreton Flats Development area. To alleviate concerns of conflicting sanitary flow allocations, a comparison between the current design flows and the ones presented in the 2004 *LeBreton Flats Master Servicing Report* was undertaken to quantify any discrepancy or conflict.

This exercise concluded that the allocated capacities from the 2004 report were of 66.40 L/s, on basis of allocated sanitary flows; while proposed sanitary flows total 60.55 L/s, corresponding to 91% of allocated. This analysis and calculations are presented in Appendix H.

A similar exercise was undertaken for the sanitary flows provisioned in the Stantec 2017 report which confirmed agreement with present allocations of Blocks 1 and 2.

A comparison of the Master Concept Plan sanitary demands with the sanitary allocations of both the Dessau-Soprin and Stantec reports is presented in Table 5.6.

*Table 5.6 : Comparison of demands with previous allocations*

Outlet	Sanitary Demands for LeBreton Master Concept Plan (L/s)	2004 Dessau-Soprin Flow Allocation (L/s)	Source
LFPS	60.55	66.40	Appendix H
Albert St. Sewer	17.18	28.9	Stantec, 2017
WNC/CCC	66.99	-	-

## 5.4.4 Proposed Sanitary Flow Allocations

This section discusses the proposed sanitary allocations vs capacity for each outlet identified in Section 5.1 (LFPS, Albert St., WNC/CCC) for the buildout of the LeBreton Flats Development Area.

### 5.4.4.1 LeBreton Flats Sanitary Pumping Station

Based on the design sanitary demands for this outlet, 14.17 L/s of pump station capacity remains unallocated (Table 5.7). Thus, this remaining unallocated capacity has been redistributed between the proposed developments, based on their relative contributions to the total sanitary allocations prior to redistribution (Table 5.8).

*Table 5.7 : LeBreton Flats Pumping Station proposed sanitary flow allocations per master concept plan.*

Outlet	Concept Dev. Phase	Pre-Authorised Sanitary Flow Allocations (L/s)	Proposed Sanitary Flow Allocations (L/s)
LFPS	<b>Block 5</b>	-	<b>32.43</b>
	<b>Block 7</b>	-	<b>6.60</b>
	Victoria Island	20.0 <sup>[1]</sup>	
	<b>Future Cultural/ Institutional</b>	-	<b>1.52</b>
	Canadian War Museum	3.18 <sup>[1]</sup>	
	Claridge ph. I-III	8.73 <sup>[1,2]</sup>	
	<b>Claridge ph.IV-V</b>	-	<b>13.37<sup>[2]</sup></b>
	Subtotal	31.91	53.92
	Total Allocation	85.83	
	LFPS Available Capacity	100.00	
	Remaining Capacity (see Table 5.8 for redistribution)	14.17	

*Note: Values in bold denote proposed developments*

<sup>[1]</sup> Values Previously Approved by the City of Ottawa, based on the Dessau-Soprin Servicing Report

<sup>[2]</sup> Novatech 2020 – RE: Phase 1 LeBreton Flats – Revised Building Statistics & City of Ottawa Comments (May 12<sup>th</sup> 2020); Flow split confirmed by NCC.



Table 5.8 : LeBreton Flats Pumping Station proposed redistribution of unallocated flows

Outlet	Concept Dev. Phase	Sanitary Flow Allocation (L/s)	Distributed Remaining Capacity (L/s)	Total Sanitary Allocation (L/s)
LFPS	<b>Block 5</b>	<b>32.43</b>	<b>8.52</b> <b>(60.14%)</b>	<b>40.95</b>
	<b>Block 7</b>	<b>6.60</b>	<b>1.73</b> <b>(12.24%)</b>	<b>8.33</b>
	Victoria Island	20.0 <sup>[1]</sup>		20.0
	<b>Future Cultural/ Institutional</b>	<b>1.52</b>	<b>0.40</b> <b>(2.82%)</b>	<b>1.92</b>
	Canadian War Museum	3.18 <sup>[1]</sup>		3.18
	Claridge ph. I-III	8.73 <sup>[1,2]</sup>		8.73
	<b>Claridge ph.IV-V</b>	<b>13.37<sup>[2]</sup></b>	<b>3.51</b> <b>(24.80%)</b>	<b>16.88</b>
	Subtotal	85.83	14.17 (100%)	100.00

Note: Values in bold denote proposed developments

<sup>[1]</sup> Values Previously Approved by the City of Ottawa, based on the Dessau-Soprin Servicing Report

<sup>[2]</sup> Novatech 2020 – RE: Phase 1 LeBreton Flats – Revised Building Statistics & City of Ottawa Comments (May 12<sup>th</sup> 2020); Flow split confirmed by NCC.

#### 5.4.4.2 Albert St. Sanitary Sewer

For the Albert Street Sewer, the capacity of the sewers and ICD is sufficient to accommodate both the Windmill Developments Phase 1 (noted as Chaudiere and Albert Isl.) and the LeBreton Developments Block 1 and 2 flows (Stantec, 2017; Robinson Consultants, 2015).

#### 5.4.4.3 Cave Creek Collector

As mentioned previously in Section 5.1.1.3, the City of Ottawa has indicated that there is likely no capacity limitation for this collector but has requested to be provided with the proposed design flows to this collector in order to update their models.

Table 5.9 : Albert Street Sewer and the Cave Creek Collector proposed sanitary flow allocations vs. estimated capacity.

Outlet	Concept Dev. Phase	Sanitary Allocation (L/s)		Total Sanitary Allocation (L/s)	Current Estimated Capacity (L/s)	
Albert St. Sewer	Block 1	9.29	17.18	75.08	110	Capacity OK
	Block 2	7.89				
	Ottawa Central Library	4.3 <sup>[2]</sup>				
	Chaudière and Albert Isl.	53.6 <sup>[3]</sup>				
CCC	Block 3	20.85	66.99	Capacity not limited	Capacity OK	
	Block 4	2.34				
	Block 6	40.26				
	LeBreton Place	0.29				
	Park Area	3.25				

Note: Values in bold denote proposed developments

<sup>[1]</sup> Values Previously Approved by the City of Ottawa, based on the Dessau-Soprin Servicing Report

<sup>[2]</sup> Stantec 2017 – Servicing and Stormwater Management Report 557-584 Wellington Street & 550 Albert Street (September 11, 2017)

<sup>[3]</sup> DSEL. 2018. – Master Servicing Study (Phase 1) – Revision 7. Ottawa

## 5.5 Conclusions – Sanitary Servicing

The proposed servicing and flow allocations for the LeBreton Flats development area are feasible provided that the relocation of the Cave Creek Collector is performed prior to the development of Blocks 3 and 6. A summary of the proposed sanitary flow allocations for each development is shown below.

Table 5.10 : Summary of proposed sanitary flow allocations

Outlet	Development	Total Sanitary Allocation (L/s)
LFPS	<b>Block 5</b>	<b>40.95</b>
	<b>Block 7</b>	<b>8.33</b>
	Victoria Island	20.0
	<b>Future Cultural/ Institutional</b>	<b>1.92</b>
	Canadian War Museum	3.18
	Claridge ph. I-III	8.73
	<b>Claridge ph.IV-V</b>	<b>16.88</b>
Albert St. Sewer	<b>Block 1</b>	<b>9.29</b>
	<b>Block 2</b>	<b>7.89</b>
	Ottawa Central Library	4.3
	Chaudière and Albert Isl.	53.6
CCC	<b>Block 3</b>	<b>20.85</b>
	<b>Block 4</b>	<b>2.34</b>
	<b>Block 6</b>	<b>40.26</b>
	<b>LeBreton Place</b>	<b>0.29</b>
	<b>Park Area</b>	<b>3.25</b>

Note: Values in bold denote proposed developments

# Appendix E

DRAWINGS