



FUNCTIONAL SERVICING REPORT

SARNIA TOWERS RESIDENTIAL DEVELOPMENTS

530 - 540 EXMOUTH STREET

SARNIA, ONTARIO

PROJECT NO: 22-080

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27 Princess St., Unit 102
Leamington, ON N8H 2X8
519.326.6161 TF 1.844.842.9188
bairdAE.ca

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1. INTRODUCTION

Baird AE has been retained to provide civil engineering services for the development of two multi-unit apartment buildings at 530-540 Exmouth Street in Sarnia, Ontario. This report, and the associated design, are prepared in accordance with the City of Sarnia Design Standards for Stormwater Management and site servicing to ensure compliance with local design standards and development regulations.

The two lots for the proposed development are 0.89 hectares (540-Property number; North Towers-Lot 1) and 0.63 hectares (530-property number; South Towers-Lot 2) in size, are zoned General Commercial and are mostly vacant. A part of both lots is currently occupied by asphalt parking areas which partially coincide with the proposed parking provisions for the proposed developments. Details of the removal and replacement of the asphalt paving will be provided at the detailed design stage. The proposed development will include two 23-storey residential buildings – one on each lot, on-grade asphalt parking areas, and landscaped open spaces.

The subject properties are bound to the north by Highway 402, existing commercial developments to the west and east, and Exmouth Street to the south.

This report intends to summarize existing conditions, storm and sanitary servicing provisions, potable water and fire flow servicing provisions to support the proposed development.



Figure 1: Existing Conditions

2. EXISTING CONDITIONS

2.1. EXISTING DRAINAGE

The existing lots have been designed to drain to an existing 450mm storm sewer on the Exmouth Street. The as-constructed drawings obtained from the City of Sarnia are attached along with report for reference. Refer to Appendix A- Existing Conditions Drawings.

2.2 ALLOWABLE RELEASE RATE

The pre-development analysis of the two lots were established from the existing stormwater management report completed by BKL engineering. The release rate for the entire site of 3.96ha was 274.86L/s. Based on the this, the allowable release rates for the north towers and south towers were calculated at 69.308L/s/ha.

- Allowable Release rate for North Tower = 61.68 L/s
- Allowable Release rate for South Tower = 43.17 L/s

Post-development discharge for the two lots will be restricted to the 2-year pre-development release rate obtained in the existing SWM report. Excess runoff will be stored temporarily on-site in a combination of above-ground parking lots, rooftops and underground storage, with the aid of tube orifices/inlet control devices.

2.2. EXISTING INFRASTRUCTURE

The following storm, sanitary and watermain infrastructure exist adjacent to the subject property:

Storm Sewers:

- One existing 200mm diameter storm sewer connecting Lot 1 drainage to CBMH-16 (Reference: As-built Underground Utilities Plan – Appendix A)
- One existing 375mm diameter storm sewer connecting CBMH-12 in the existing commercial development on the west to CBMH-16 in Lot 1 of the proposed development.

- One existing 375mm diameter storm sewer connecting CBMH-11 to CBMH-16 (Both in Lot 1)
- One existing 450mm diameter storm sewer connecting CBMH-16 (Lot 1) to STMH-30.
- 3 storm connections from Lot 2 to a 450mm storm sewer between CBMH-16 (Lot-1) and STMH-30.

Sanitary Sewers:

- One existing 200mm diameter sanitary sewer connecting the existing commercial development to the west of Lot 1 to MH-03 in Lot 1 (Reference: As-built Underground Utilities Plan – Appendix A).
- One existing 200mm diameter sanitary sewer connecting MH-03 (Lot 1) to MH-02.
- One sanitary sewer connecting Lot 2 to a 200mm diameter sanitary sewer between MH-02 and MH-01 on the East Street N. extension

Watermains:

- One existing 200mm diameter watermain along Exmouth Street which runs from south to the north side along the development.

3. PROPOSED CONDITIONS

3.1. BUILDING AND PARKING LOT

The development will consist of four high-rise buildings, with two on each lot, landscaped areas, and an asphalt parking lot.



Figure 2: Proposed Development

3.2. DRAINAGE

The stormwater management criteria for this development align with the standards set by City of Sarnia SWM guidelines 2017. A post-development hydrologic assessment of the site was conducted using the rational method. As the site falls in high-value commercial area, a post development run-off coefficient of 0.85 was utilized for analysis. We propose the relocation of CBMH-16 from Lot 1 to the existing right-of-way (ROW) between the two lots. This will require the relocation and reconnection of storm pipes from the existing commercial development to the west of Lot 1 and the removal of CBMH-11 and associated pipes. The two storm connections for Lot 2 north of STMH-30 will be removed, leaving only one storm connection to the existing drainage system. In compliance with the approved stormwater management report for the site, the post-development release rates for the lots will be restricted to the following:

The following rainfall distributions were used in the analyses to model the response of the stormwater management facilities to design storm events.

Table 1: IDF Parameters for City of Sarnia

Modified Return Period Rainfall Intensity (mm/hr)	Return Period (years)					
	2	5	10	25	50	100
$I = A \cdot T^B$ (best fit)						
Coefficient A is	25.3	34.1	40.2	47	53	58.5
Exponent B (T in hrs)	-0.715	-0.727	-0.733	-0.735	-0.739	-0.740

3.3 STORMWATER MANAGEMENT AND QUANTITY CONTROL

Table 2: Design Flows and storage requirement– Lot 1; North Towers

Design Storm	Post Development Flows (L/s)	Allowable Discharge (L/s)	Required Storage (m ³)
2-year	193	61.6	78.80
5-year	198	61.6	122.60
100-year	779	61.6	215.30

Table 3: Design Flows – Lot 2; South Towers

Design Storm	Post Development Flows (L/s)	Allowable Discharge (L/s)	Required Storage (m³)
2-year	137	43.17	56.10
5-year	140	43.17	87.20
100-year	552	43.17	152.50

Table 4: Orifice Sizing

Lot	Required Orifice Size (mm)
Lot 1	147
Lot 2	123

The proposed stormwater management provisions outlined above adhere to the relevant design standards. Below is a summary of the proposed system and results:

- As the site was previously assessed to discharge into the existing 450mm storm sewer on Exmouth Street and the allowable release for the site has been maintained to predevelopment levels, downstream capacity assessment is not required.
- The storage on Lot 1 and 2 will be temporary on-site in a combination of above-ground parking lot storage through grading (depression storage), rooftop, and underground storage.

- The storage provided for Lot 1 and Lot 2, along with high water level (HWL), finished grade elevations, and the freeboard requirements, will be validated during the detailed design stages.
- Both Lot 1 and Lot 2 will have two maintenance holes located close to the property line for installing orifice control and Oil Grit Separator.
- The orifice location and sizing will be confirmed and validated during the detailed design stages. The results for post-development analysis are attached in Appendix C-Servicing calculations.
- The storm sewers will be sized based on the City of Sarnia's 5-year return period, and the connection of the networks will be completed during the detailed design stages.
- The site plan and conceptual servicing plan is attached in Appendix B.

3.4 SANITARY SEWER SYSTEM

The sanitary servicing provisions for the development have been analyzed in accordance with the Ministry of Environment Conservation and Parks (MECP) sewer design guidelines and the City of Sarnia standards. Sanitary waste from proposed Lot 1 and Lot 2 will be connected to the existing 200mm sanitary sewer on the private road located north of Exmouth Street. The existing 200mm sanitary drain connects to the sanitary sewer network on Exmouth Street, which drains to the existing 975mm sanitary Trunk sewer.

Findings are summarized below, with proposed sanitary flow calculations provided in Appendix C:

- Lot 1 consists of 451 units with an anticipated population of 1,128 people. The peak sewage flow is estimated to be at 17.37 L/s.
- Lot 2 consists of 397 units with an anticipated population of 993 people. The peak sewage flow is estimated to be at 15.41 L/s.

- The site plan and conceptual servicing plan are attached in Appendix B.
- Each lot will have a proposed 200mm sanitary servicing connections at a 0.50% slope connected to the sampling manhole located on the existing streets.

The existing 200mm sanitary sewer findings are summarized below, with sanitary flow calculations provided in Appendix C:

- The existing 200mm sanitary on the private road was assessed to calculate the remaining sanitary capacity to accommodate the proposed sanitary flows from Lot 1 and 2.
- To finalize the existing capacity, the existing commercial buildings located to the east were assessed.
- The Fisheries and Ocean office building, Shoppers Drug Mart, and the roads' infiltration and peak sewage flow is estimated to be at 2.97 L/s.
- The existing 200mm sanitary sewer at a 0.33% slope has an existing capacity, based on Manning's flow equation, of 18.80 L/s.
- The total flows, which include proposed Lot 1, 2, and existing commercial, were estimated to be at 35.75L/s, while the estimated sewer capacity was at 18.80L/s.
- To provide more capacity, the existing 200mm sanitary sewer at a 0.33% slope should be replaced with a 300mm sanitary sewer pipe at the same slope, which provides an overall capacity upgrade of 55.50 L/s.

The downstream trunk sewer on Exmouth Street is a large 975mm at a 0.10% slope. Considering the pipe size, the existing system should have enough capacity in the system to accommodate the proposed sanitary flows from Lot 1 and 2. However, if required during detailed design stages, flow monitoring can be completed on the existing 975mm trunk sewer to determine the real time flows.

3.5. WATERMAINS

To serve the proposed developments' domestic and fire water supply requirements, a 150mm water service connection is proposed. The water service connection will be tied to serve the proposed buildings with a 100mm main for potable water and a 150mm main for fire service. The watermain connection for the proposed development will be tied into the existing 200mm watermain on the private street.

Findings are summarized below, with proposed water calculations provided in Appendix C:

- Lot 1 North Tower will require a Fire Flow demand of 67.84 L/s for 2 hours along with Peak Day Demand of 17.13 L/s.
- Lot 2 South Tower will require a Fire Flow demand of 38 L/s for 2 hours along with Peak Day Demand of 16.61 L/s.
- Hydrant testing at Exmouth Street can be completed during detailed design stages to check the pressure within the water distribution system.
- During Fire Flow and Maximum Day Demand, the pressure should not drop below 40 PSI.
- During other water demand requirements, the pressure should not drop below 20 PSI.

3.4. WATER QUALITY, EROSION AND SEDIMENT CONTROL

The proposed development should provide a “normal level” of protection capable of removing at least 70% of suspended solids. Detailed information on the proposed the water quality unit will be provided at the detailed design stage.

Erosion and sediment control measures for the site during construction will include:

- Installation of silt fence before grading begins to protect downstream areas from sediment migration in overland flow;

- Placement of filter fabric over drainage grates; and
- All disturbed areas will be stabilized by the restoration of vegetative ground cover as soon as possible.

Details of sediment control measures for the site will be provided during detailed design stages of the project.

4. CONCLUSION

This report presents municipal servicing details, proposed servicing, and stormwater management requirements for the proposed mixed-use development in the City of Sarnia. Based on our investigations, we conclude and recommend the following:

Storm Servicing – All minor storm events will be serviced through the proposed storm sewers. Storms up to the 5-year storm will result in no surface ponding above manhole rim elevations. During major storm events, the parking lots, rooftops, and underground storage will provide temporary storage and attenuate storm outflows. A 147mm orifice is required to restrict storm outflow from the site to the allowable release rate of 61.66 L/s for Lot 1, and a 123mm orifice is required to restrict storm outflow from the site to the allowable release rate of 43.17 L/s for Lot 2.

Sanitary Servicing – Two new 200 mm diameter sanitary services will connect each lot to the existing sanitary sewer, which will be replaced with a 300mm sanitary sewer instead of the existing 200mm to accommodate the increase in sanitary flows from the proposed developments.

Water Servicing – The proposed development will be serviced via a 100mm water service connection and a 150mm connection for fire. Flow tests will be provided during detailed design stages.

We trust the foregoing is satisfactory and will allow for the review and approval of the stormwater, sanitary and watermain servicing design and engineering drawings

for this development. If you have questions or require additional information, please contact Baird AE at your earliest convenience.

All of which is respectfully submitted.

BAIRD AE INC.

700 - 1350 PROVINCIAL ROAD,

N8W 5W1,

WINDSOR, ONTARIO.



Gowtham Sivakumar, P.Eng.

Civil Engineer