Functional Servicing Report

315 Garrison Road
Fort Erie, Ontario

Phase 2 - Residential Development

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315 Garrison Road

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Contents

1.0 Introduction 1
2.0 Background 1
3.0 Water Supply and Distribution 2
4.0 Sanitary Sewerage 5
5.0 Drainage and Stormwater Management 6
6.0 Parking and Driveway 8
7.0 Utility Servicing 8
8.0 Service Locations 8

Appendices

Appendix A – Conceptual Site Servicing Drawing CSS

1.0 Introduction

This functional servicing report (FSR) serves to demonstrate how servicing of the subject development can be appropriately achieved and to provide a basis for detailed engineering. It also evaluates how the proposed development will impact the Town and Region's existing infrastructure capacity. This FSR will discuss the following key aspects of municipal design:

- Water Supply and Distribution
- Sanitary Sewerage
- Drainage and Stormwater Management
- Parking and Roadway
- Utility Servicing
- Servicing Locations

2.0 Background

The subject lands are located on the north side of Garrison Road, between Concession Road and Mather Boulevard. The parcel is approximately 20,000 m2 (2 hectares/4.95 acres) in size with +/- 95 metres of frontage on Garrison Road. The parcel is vacant and lies between low density residential to the north, core mixed use and commercial uses to the east, west and south of Garrison Road.

The property is zoned RM1 (Residential Multiple 1), OS (Open Space), and CMU 1(Core Mixed Use). The development is phased with two phases. The Phase 1 is a proposed commercial plaza solely contained in the CMU1-447 zone. The Phase 1 development is currently under construction. The phase 2 is a residential development on the north of the Phase 1 contained in the RM1-446 and OS-450 zone. The Phase 2 development consist of 37 town home units. The full Phase 2 build-out proposes a total combined property area of 1.25 hectares. This report will undertake site servicing for Phase 2 development.

A conceptual site servicing plan, CS-1, is shown in *Appendix A.* An aerial map showing the subject property is found in Figure 1.

Figure 1. Aerial Map of Development Site

3.0 Water Supply and Distribution

Based on Town-provided information, the existing municipal water distribution system around the site consists of a 300 mm diameter asbestos cement watermain and a 400 mm diameter asbestos cement watermain on the south side of the Garrison Road right-of-way. The 400mm watermain is owned and operated by the Region of Niagara. In pre-consultation meeting notes, this line is not permitted for connection. The 300mm water main is owned by the Town and will provide water supply to the site. A new 150mm service connection at the new entrance to Garrison Road was installed to service the new development. During construction of Phase 1 development, a 150mm water stub was installed at the boundary to the residential site. This connection will be used for phase 2 service.

The population projection and water demand for the development site are summarized in Table 1.

Table 1 Water Demand Summary

Phases	Units	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Phase 1	13	52	0.23	0.35	0.46
Phase 2	37	111	0.41	0.73	1.1
Total		163	0.64	1.08	1.56

Design Criteria:

Phase 1 – Commercial Development:
Average Day Demand: 28m^3/ha/day
Maximum Day Peaking Factor: 1.55
Peak Hour Peaking Factor: 2

The average day demand is based on the Town's Subdivision Control Guideline 2018. The peaking factors are based on Niagara Region 2016 Water and Wastewater Master Servicing Plan Update.

Phase 2 – Residential Development:
Residential Average Day Demand: 320 Lpcd
Maximum Day Demand: 570 Lpcd
Peak Hour Demand: 860 Lpcd

The average day demand, maximum day demand and peak hour demand are based on the Town's Subdivision Control Guideline 2018.

The Town of Fort Erie's water system is supplied by Rosehill water treatment plant. There is one single pressure zone of 241 in the water system. The proposed finished floor elevation for the two buildings are 188.55 and 188.62. The hydrant flow test results of the two adjacent hydrants shows a static pressure of 75 psi at 321 Garrison Road and 70 psi at 310 Garrison Road. A hydraulic model is built with these boundary conditions to size the pipe and evaluate impact to the Town's existing infrastructure capacity using Bentley WaterCAD V8i.

Steady state analysis was performed under four scenarios:

- Average day demand
- Maximum day demand
- Peak hour demand
- Maximum day demand + fire flow

Based on the modeling results, the available pressure at the connection under different scenarios is summarized in Table 2.

Table 2 Available Pressure under different Scenarios

Existing 300mm Main @ connection	ADD (kPa)	MDD (kPa)	PHD (kPa)	MDD+FF* (kPa)
Available Pressure	516.7	516.7	516.4	359

*Residual pressure with 150 L/s fire flow requirement

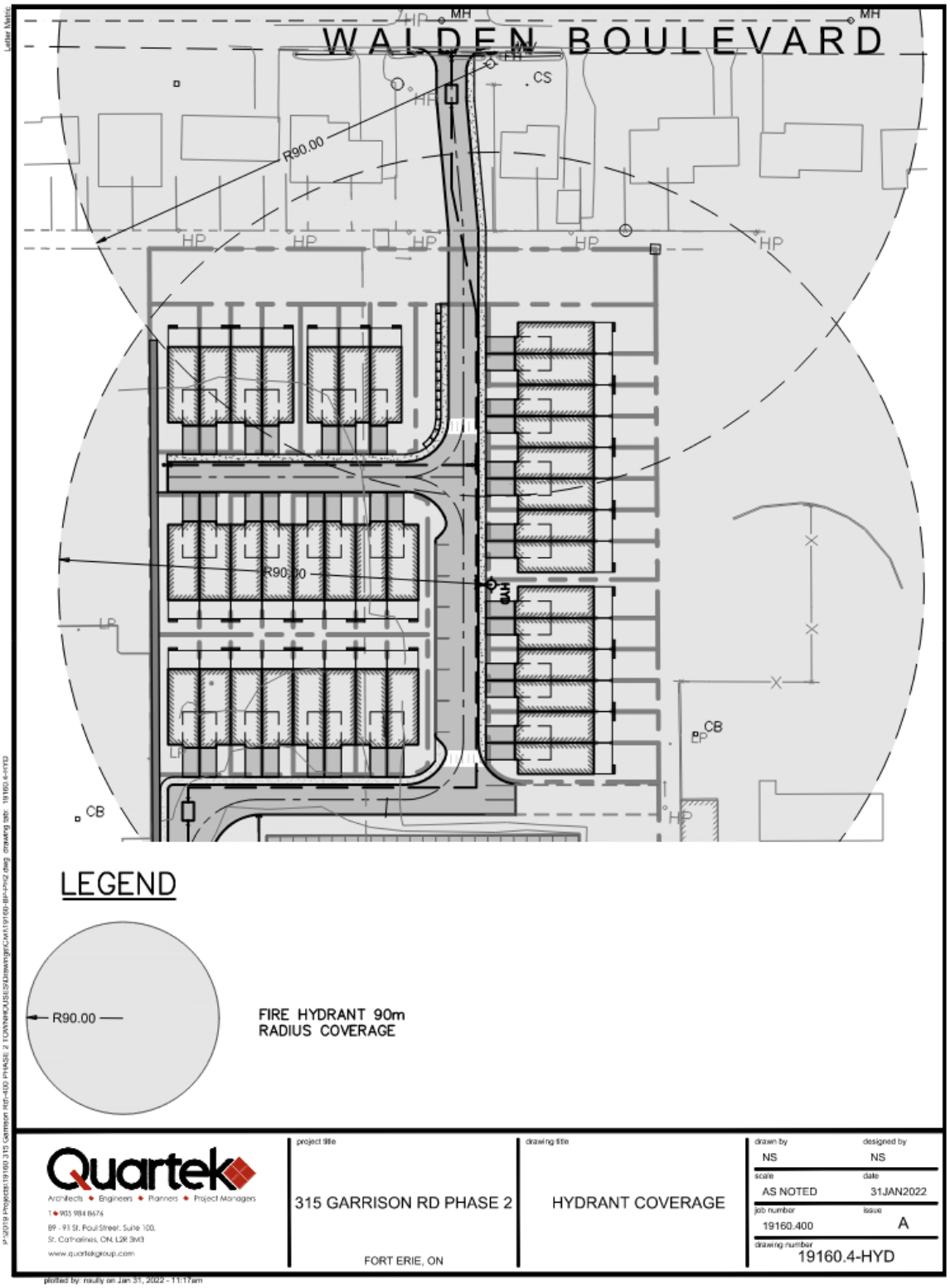
Initial Estimate of Required Fire Flow:

Formula: F = 220 * C * SQRT (A)
F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible)
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire resistive construction (fully protected frame, floor, roof)
A = the total floor area in square metres (incl all storeys but not basements at least 50% below grade)
* for fire resistive buildings, consider the two (2) largest adjoining floors plus 50% of each of any floors immediately above them up to eight (8), when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two (2) immediately adjoining floors.

In order to determine the total Design Water Demand for Phase 2, Fire Flow Demand has been estimated as per the Fire Underwriters Survey. It has been assumed that the buildings will be constructed with ordinary construction materials. The Required Fire Flow Demand has been estimated to be 90 L/s.

There is an existing fire hydrant at the new north entrance to Walden Boulevard. However, this hydrant cannot provide coverage for the whole Phase 2 development site. Therefore, a new fire hydrant is proposed for the residential development. Figure 2.0 shows the coverage provided for Phase 2 site. In order to provide enough fire flow without impacting domestic consumption, the new fire hydrant is proposed to connect to the 150mm water main on south of the Walden Boulevard right-of-way.

Figure 2.0 Fire Hydrant Coverage



4.0 Sanitary Sewerage

There is a 200mm sanitary stub capped at the boundary between Phase 1 and Phase 2 development during Phase 1 construction. Sanitary flows for Phase 2 will be collected from each unit and conveyed through a series of sanitary manholes and pipes connected to the stub installed in Phase 1. The sanitary flow will eventually be convoyed to the 300mm sanitary main on Garrison Road.

Key design data sanitary sewage servicing is as follows:

Table 3 Sanitary Design Parameters

No. of Residence Units	37
No. of Commercial Retail Units	13
Total Design Population	163 persons
Peaking Factor	Babbitt Equation
Mean sewage flow	320 L/cap/day
Sewage shed area (total)	1.95 ha
Manning's 'n'	0.013
Infiltration Rate	0.28 L/ha•s

Average Sewage for both phases: 320X163/(24X3600) = 0.60 L/s

Peaking Factor: $5/ (163/1000)^{0.2}$ = 7.2 > 4.5, so use 4.5

I/I flow: 0.28X1.95=0.55

Peak sewage flow: 0.6X4.5+0.55 = 3.25 L/s

From the above, we estimate the peak sewage flow at 3.25 L/s for the whole new development. It is noted that capacity of the receiving sewer, 300mm diameter Asbestos Cement with a slope of 0.21% based on record drawing and Quartek's survey, is 43.2 L/s. This additional flow represents 7.5% of the sewer's capacity (assuming unsurcharged operation).

We expect that there will be no impediments to sanitary sewer servicing for the development using currently existing municipal sewage works.

5.0 Drainage and Stormwater Management

The existing site topography features a general slope down from north to south. The elevation of the site varies from 192.1 to 188.2. During Phase 1 construction, due to the utilities conflicts, the

stormwater outlet has been changed to the Region's 600mm sewer on Garrison Road instead of originally proposed 750mm sewer on Garrison Road owned by the Town.

In the pre-consultation meeting notes, Niagara Region requires post-development flows be controlled to pre-development flow levels for all storms (2-year up to and including 100-year storm) prior to discharge onto Garrison Road.

Minor system stormwater flows will be collected by new storm sewers in the roadway and drained to the underground storage chambers installed in Phase 1 construction. Flows in excess of the minor system will be temporarily stored in the underground storage chambers prior to being discharged.

Design criteria

The stormwater management criteria used for the analysis of the site is as follows:

1. Post-development runoff generated from the site during the 1:2, 1:5 and 1:100 year return storm events is to be attenuated and retained to the pre-development flow rates.
2. Water quality control is required prior to the discharge of runoff from the site.
3. The underground sewer is sized to handle 1:5 year return storm event.

The Town of Fort Erie's design storm is used to size the quality and quantity control components of the stormwater management. The parameters are summarized in Table 4 below and are incorporated in our computerized modelling using MIDUSS.

Table 4: Design Storm Parameters

Storm Return Period	IDF Curve Parameters			Maximum intensity (mm/hr)	Total Depth (mm)
	a	b	c		
2 Year	628.05	6.652	0.796	88.95	29.33
5 year	747.93	6.8	0.768	112.37	40.42
100 year	1083.55	6.618	0.735	178.64	69.63

**rainfall intensity, $I = a/(t+b)^c$, where t = time of concentration (min.)*

Ratio of time to peak = 0.4

Grading design is to direct minor storm runoff to the on-site collection points, provide on-site storage for 100-year storm runoff. Site grading will also take into consideration the following:

- The proposed grading will match the existing grade elevations along the property limit when possible.

- Minimize disruption to existing municipal rights-of-way containing existing utilities and services.
- Promote drainage into the minor storm sewer system.
- Building floor level will be set to avoid building/property damage during all design storms.

Niagara Regional staff have indicated that stormwater runoff should be captured and treated to normal standard protection prior to discharge from the development site. The oil/grit separator installed in Phase 1 was sized to treat the stormwater for both phases prior to leaving the site.
No regulated floodplains affect the subject site.

6.0 Parking and Roadways

Per attached site plan drawing, the intent is to construct a 6.0m wide driveway, consistent with zoning bylaw requirements. Parking areas to be bounded by standard barrier curb only per OPSD 600.110.

7.0 Utility Servicing

Hydro, Gas, and Bell services are all located in the Garrison Road right-of-way. Services connection conflicts with these utilities have been solved during Phase 1 construction. There are no new connections to Garrison Road needed for Phase 2 development. There is gas service on Walden Boulevard which will not impede the proposed fire hydrant lead.

8.0 Service Locations

Appendix A contains drawing 19160-CSS, a schematic representation of the approximate locations of existing services and possible locations for proposed services for the development.

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Functional Servicing Report

Proposed Residential Development
Phase 2
315 Garrison Road

Fort Erie, Ontario

APPENDIX A

Conceptual Site Servicing Drawing

Metric: Metres

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- 275.00 EXISTING GROUND CONTOUR
- X X EXISTING FENCE
- B EXISTING BELL
- G EXISTING GAS
- PROPOSED CONCRETE CURB
- PROPOSED SWALE
- PROPOSED STORM SEWER
- STM PROPOSED STORM SERVICE
- W PROPOSED WATER SERVICE
- PROPOSED WATERMAIN
- PROPOSED SANITARY SEWER
- S PROPOSED SANITARY LATERAL
- PROPOSED ASPHALT
- EXISTING ASPHALT
- PROPOSED CONCRETE SIDEWALK
- FIB EXISTING FOUND IRON BAR
- SIB EXISTING STANDARD IRON BAR
- EXISTING TREES SITE
- BENCHMARK
- HYD PROPOSED HYDRANT
- MH EXISTING MAINTENANCE HOLE
- PROPOSED MAINTENANCE HOLE
- CB EXISTING CATCHBASIN
- PROPOSED CATCHBASIN
- DIRECTION OF FLOW
- WV PROPOSED WATER VALVE

WALDEN BOULEVARD

FILL DITCH & EXTEND EX. 250mmø CSP CULVERT

150mmø HYDRANT WTM

50mmø WTM

SANMH1A

30.1m – 200mmø SAN @ 1.0%

1.1m – 250mmø STM @ 0.5%

CB1

SANMH2A

67.2m – 200mmø SAN @ 0.4%

7.7m – 375mmø STM @ 0.3%

SANMH3A

CB9

6.3m – 250mmø STM @ 0.5%

STMMH4

2.2m – 375mmø STM @ 0.3%

CULTEC RECHARGER 280HD
1 ROW – 17 CHAMBERS LONG
38.6 c.m STORAGE

CULTEC RECHARGER 330XLHD
3 ROWS – 14 CHAMBERS LONG
103.0 c.m STORAGE

STMMH1

1.6m – 375mmø STM @ 0.3%

CB4

CULTEC RECHARGER 330XLHD
2 ROWS – 26 CHAMBERS LONG
2 ROWS – 22 CHAMBERS LONG
239.6 c.m STORAGE

2.8m – 250mmø STM @ 0.6%

CBMH2

1.0m – 250mmø STM @ 1.0%

CB8

13.0m SWALE

CB6

27.5m SWALE

27.5m – 250mmø STM @ 0.5%

CBMH3

14.5m SWALE

14.5m – 200mmø STM @ 0.6%

CB7

26.0m SWALE

40.3m – 300mmø STM @ 0.3%

HYD

21.0m SWALE

35.9m – 250mmø STM @ 0.5%

CB3

31.4m SWALE

100mmø WTM

200mmø SAN @ 1.0%

58.3m – 375mmø STM @ 0.3%

57.4m

SANMH1A

CB2

50mmø BLOW OFF ASSEMBLY

26.0m SWALE

26.0m – 200mmø STM @ 0.6%

CB5

54.3m – 250mmø SAN @ 0.4%

100mmø WTM

1.6m – 375mmø STM @ 0.3%

STMMH6
WITH VORTEX VALVE &
150mmø ORIFICE PLATE

1.6m – 300mmø STM @ 0.3%

STMMH7
(OGS)

STMMH6

10.6m – 250mmø STM @ 0.5%

12.8m – 200mmø STM @ 1.0%

STMMH5

SANMH4A

11.6m – 200mmø SAN @ 0.4%

3800mm x 2400mm
WATER METER CHAMBER

15.0m – 200mmø STM @ 1.0%

REMOVE PHASE 1 BLOW-OFF &
INSTALL CAP ON TEE

PROPOSED RETAINING WALL

EX. 150mmø PVC DR18 WTM

EX. 250mmø PVC DR35 SAN

PIN 64220-0120 (LT)
3.81 WIDE LANE

60.96 (P5 & MEAS)

N 87°53'50" E (MEAS) 188.54'10" (P2, P3)
44.32 (P3 & MEAS)

04 Feb 2022
PRELIMINARY

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seal

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