September 21, 2023

The Corporation of the Town of Fort Erie
1 Municipal Centre Dr.
Fort Erie, Ontario, L2A2S6

1127 Garrison Road, Fort Erie
Functional Servicing Report (Revised)

1.0 Background & Information

1.1 Introduction

LandSmith Engineering & Consulting Ltd. have been retained by TrintyStar Aquila Inc. for the completion of a Functional Servicing Report in support of Re-zoning and Official Plan amendment applications for the lands located at 1127 Garrison Road in the Town of Fort Erie. A pre-consultation for the property was completed by NPG Planning Solutions in spring of 2022 on behalf of the owner, and the City's comments were provided through the planner as per the meeting of May 12th, 2022.

The purpose of this Functional Servicing Report is to review the existing municipal services currently in place and available for the servicing of the 90 new units on Garrison Road and ensure their suitability for the proposed Re-zoning and Official Plan Amendment applications. In addition, this report will address the local Stormwater Management (SWM) context for the lot and the required stormwater quantity and quality control measures.

1.2 Site Location & Proposed Development

As noted above, the site being analyzed is located at 1127 Garrison Road, in the Town of Fort Erie. The property is located approximately between Crescent Road and Kraft Rd on the south side of Garrison Road. The lot is currently designated Commercial and Urban residential and zoned Highway Commercial (C3), Neighbourhood Development (ND), and Environmental Conservation (EC).

The current proposal is for the redesignation and rezoning of the land to permit residential uses. This is illustrated on the Concept Plan prepared by Organica Studio + Inc. which is attached to this report within Appendix 'A' for reference purposes. As can be seen, the existing building is to be removed, being replaced by four proposed blocks consisting of one mixed use (commercial and residential) block and three residential blocks, totalling 90 units. The site location plan below further illustrates the location of the proposed development in the context of the local Fort Erie area.

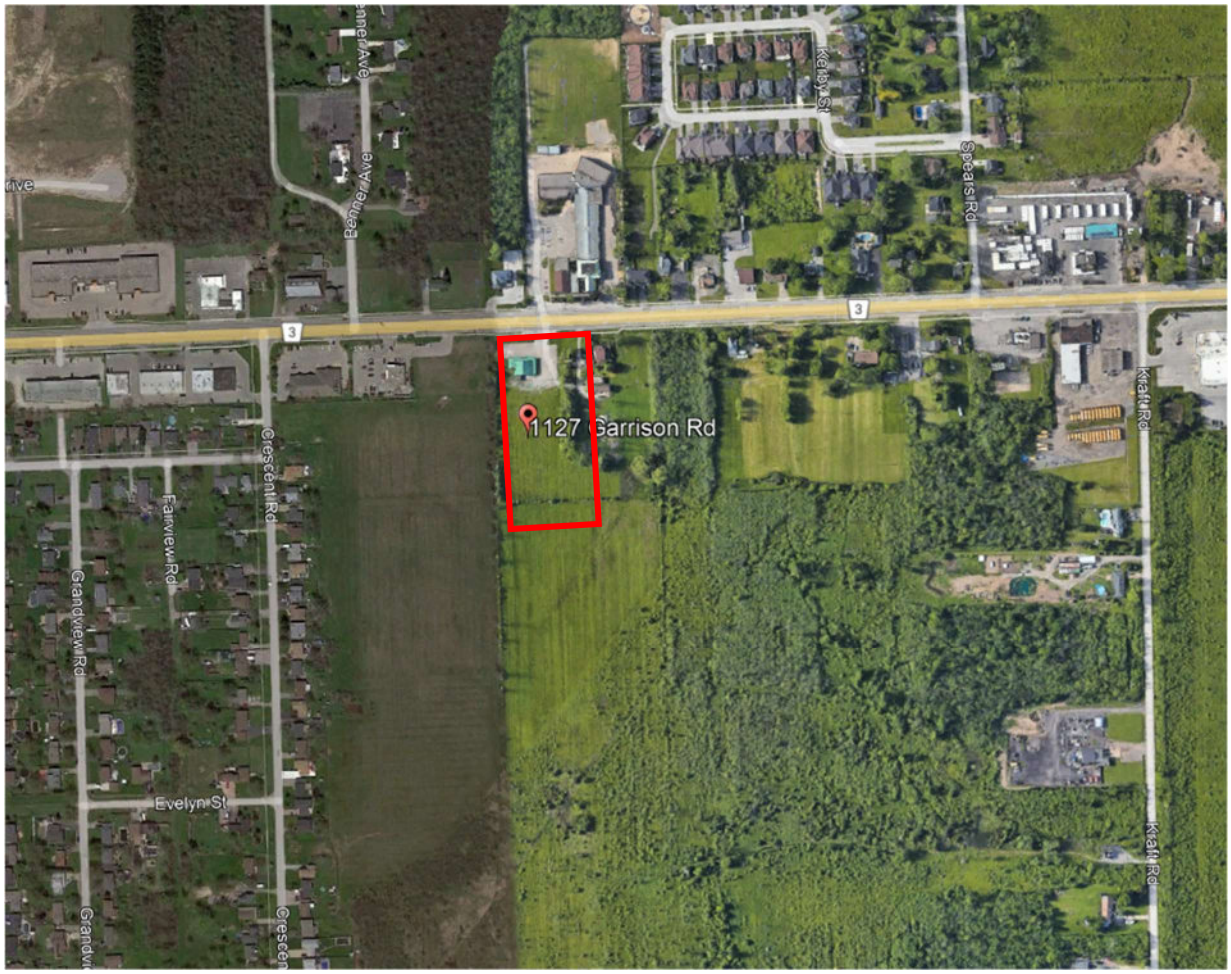


Figure 1: Site Location Plan

2.0 Servicing Analysis

2.1 Water Servicing:

There is a 300mm diameter watermain on Garrison Road as indicated on the Plan & Profile drawing for Garrison Road from Fort Erie Infrastructure Services, which is contained within Appendix 'E' for reference purposes.

Fire-flows have been calculated for each of the new residences according to the methodology recommended by the Ontario Building Code. Using this method, the required fire-flow was calculated to be 45 L/s. Given the 300mm diameter of the existing watermain on Garrison Road it is expected that this fire-flow can be provided. Details of the fire-flow calculation are contained within Appendix 'B' for reference together with a Fire Protection Sketch which illustrates the setbacks of the proposed buildings from the nearest adjacent units.

In addition to the fire-flow calculations, domestic water-use calculations for each of the buildings was completed based on the number of units proposed and the expected number of fixtures for each unit. Based on the Fixture Unit Method as outlined in OBC Table 7.6.3.2.A it is expected that the required peak instantaneous domestic use flow rate for the site will be 9.77 L/s.

A water service size of 150mm can be utilized to provide both the required domestic flows and fire-flows. A Preliminary Servicing Plan has been attached to this report for reference purposes within Appendix 'B' and this plan illustrates the proposed location of the water service and the connection point to each building. It is expected that each building will be sprinklered for additional fire protection, however these details will be finalized at the site-plan stage.

2.2 Sanitary Servicing:

There is a 450mm sanitary sewer on Garrison Road. The site will be connected to the 450mm sanitary sewer with a 200mm sanitary pipe entering the property on the north side of the property. Each of the four blocks will be serviced via a 150mm diameter service connections as illustrated on the Preliminary Servicing Plan contained within Appendix 'B' for reference purposes.

The expected sanitary generation rates for the site have been calculated using the Region of Niagara Standard rate of 275 Liters per capita per day. Based on the proposal for 90 units it is expected that the population for the development will be approximately 180 person (3 persons / unit).

Based on this population the expected peak sanitary generation rate from the site will be:

(275 L/cap/day x 270 persons) / (24 x 60 x 60) = 0.859 Liters / Second

Peaking Factor = 4.098 (Harmon Formula) T**OTAL PEAK FLOW = 3.52 Liters / Second**

The areas contributing to the local sanitary sewer are described within the Region of Niagara Water/Wastewater Master Servicing Plan (WWMSP, 2016) Figure 4.H.1 which has been included within Appendix 'B' for reference purposes. Based on the areas contributing to the existing 450mm sanitary sewer on Garrison Road it is expected that there will be ample capacity within the conveyance system for the proposed density of the development.

The proposed development site is within the catchment of the Alliston Avenue Sanitary Pumping Station (SPS). The Alliston Avenue SPS is noted to have an operational firm capacity of 43 L/s while experiencing an average dry-weather flow of 5.8 L/s (in 2016). It should be noted that the SPS was experiencing high stormwater infiltration and that the peak wet-weather flows were above the

operational firm capacity in 2016. This SPS was expected to be upgraded due to growth triggers and is noted within the Niagara Region WWMSP to be upgraded with a pump replacement to increase the firm capacity of the station between 2022-2031.

Relevant pages from the WWMSP are included in Appendix 'B' for reference purposes – further discussion should be carried out with the Region to determine whether this upgrade would be required at the present time. It appears that the domestic flows can be accommodated within the SPS under its current condition, however stormwater infiltration is using significant capacity within the station. The Town of Fort Erie has an on going wet-weather flow reduction program which may have decreased wet weather flows within the catchment.

2.3 Stormwater Servicing:

The existing grades of the subject lands are illustrated on the Topographic Survey prepared by The Larocque Group and contained within Appendix 'A' for reference. This topographic survey was analyzed in order to determine the pre-development drainage pattern for the lands. A Pre-Development Drainage Area Plan was then prepared and is contained within Appendix 'D' for reference purposes. As can be seen, under the pre-developed condition the site drains almost entirely from north to south and onto the adjacent lands. There is a small intermittent swale which runs southerly on the lands of 885 Kraft Road which receives the runoff from the subject lands and conveys it further southerly toward Lake Erie. An image from the Niagara Peninsula Watershed Explorer indicating the location of this swale is included in Appendix 'D' for reference.

The adjacent infrastructure was reviewed to determine whether it would be possible to provide a storm connection from the subject lands to Garrison Road. The Plan and Profile drawing for Garrison Road indicates that there is a 450mm concrete storm sewer along the north side of Garrison Road – however review of the invert elevation of the storm sewer indicates that it is not at sufficient depth to service the subject lands. The storm sewer invert at the subject lands is ~185.75m while the grade of the site at the southern limit is 185.25m – to extend storm sewer to the southern limit of the site the grade would have to be raised by approximately 2m. This would bring in a requirement for large retaining walls and significant fill import which would not be feasible.

Given the lack of available storm sewer at sufficient depth for the servicing of the site it was decided to maintain the existing drainage pattern, and provide on-site storage for stormwater in the form of low-impact development (LID) features which can provide both stormwater quality and quantity control.

A MIDUSS v2 simulation of the pre-development peak runoff rates was completed and the results are contained within Appendix 'D' for reference purposes. The Chicago 3-hour storm was used in this

analysis as it's peaked rainfall hyetograph presents a conservative analysis with high peak-flow rates. The table below summarizes the peak runoff rates to the southerly lands under the pre-development condition.

Return Period	2-Year	5-Year	100-Year
Area 1, Peak Flow (m^3/s)	0.026	0.036	0.078

Table 1: Pre-Development Drainage Peak Flow Rates

MIDUSS v2 was then utilized to determine the amount of stormwater storage required in order to limit the post-development flows to the pre-development level for the 100-year return period 'worst-case' storm. Based on this analysis it was determined that 224 cubic meters of stormwater storage would be required.

The stormwater storage required will be provided through the use of permeable pavers in several areas of the development site. These areas are indicated on the post-development storm drainage area plan which is contained within Appendix 'D' for reference purposes. The permeable pavers are constructed on a base of 2" clear-stone which functions as a reservoir, capturing stormwater runoff and directing it to groundwater infiltration. Based on a 450mm clear stone reservoir, the permeable pavers will provide 0.18 cubic meters of stormwater storage per 1 square meter area. Based on the overall area of permeable pavers 285 cubic meters of storage is being provided on site within the paver reservoir.

In addition to the permeable pavers, a bio-swale is proposed to be provided at the site's southern limit. This bio-swale will further promote groundwater recharge and infiltration and based on it's proposed cross section it will provide a further 35 cubic meters of storage for stormwater runoff.

Given the proposed capture of stormwater through the permeable pavers and bioswale arrangement the peak runoff rates for the site under the post-development condition and the various return period storms is as follows:

Return Period	2-Year	5-Year	100-Year
Peak Runoff (m^3/s, No SWM)	0.112	0.154	0.266
Storage Used (m^3)	132.98	162.02	265.8
Peak Discharge (m^3/s)	0.011	0.036	0.078

T**able 2: Post Development Drainage, Storage & Peak Flow Rates**

As can be seen, the proposed arrangement accounts for the required storage and will limit peak flows from the site to the pre-development level.

Given the expected clayey soil conditions the permeable pavers will be furnished with 100mm subdrain pipe outlets to convey stormwater to the adjacent swales and ultimately to the proposed bio-swale in the case that the underlying reservoir exceeds its maximum capacity.

Permeable pavers also provide a measure of stormwater quality control because stormwater contaminants are filtered by a filter cloth prior to entry to the reservoir, while smaller contaminants are passed through the sand filter located prior to re-entering the soil. The proposed bio-swale will also provide a measure of stormwater quality control as it also directs runoff to a sand filter prior to the ground water recharge. Under the proposed layout none of the stormwater runoff exiting the site is expected to carry sediment and thus the MECP stormwater criteria of 70% long term total suspended solids removal can be easily met and exceeded.

2.4 Grading Considerations:

As noted above, a topographic survey of the lot completed by The Larocque Group in 2022 is contained within Appendix 'A' for reference purposes. As can be seen there is a significant grade difference between the elevation of Garrison Road and the existing parking lot for the current building. From that parking area the site is relatively flat and drains southerly as noted in Section 2.3.

A preliminary Grading Plan has bene provided within Appendix 'D' for reference and it illustrates how the site can be graded, with swales along both east and west property line draining from north to south, flat permeable paver areas and a flat bioswale with outlet to the lands to the south at the lowest area along the south property line. A final detailed Grading Plan can be provided for the site at the Site Plan stage.

3.0 Conclusion

In conclusion, based on the foregoing analysis we recommend that the proposal for the creation of the four new blocks on 1127 Garrison Road can be completed in accordance with the requirements of the Region of Niagara and Town of Fort Erie as follows:

1. Water servicing can be provided through a proposed 150mm watermain entering the site. Fire demands for the new dwellings will be 45 Lps based on the OBC Calculation for required fire-flows while peak domestic demand is expected to be 13.37 L/s. These water demands can be met through the local adjacent 300mm watermain on Garrison Road.

2. There is a proposed 200mm sanitary sewer on the property which can be used for the servicing of the new buildings. Based on a population of 270 persons for the 90 units a peak domestic sanitary flow rate of 3.52 L/s is expected to be generated from the site. The local 450mm trunk sanitary sewer on Garrison Road can accommodate this flow, while the local Alliston Avenue SPS can accommodate the domestic flows - but may not accommodate these flows based on local infiltration rates. Further discussion with the Region of Niagara should be carried out to determine if the single pump upgrade noted within the 2016 WWMSP will be required.

3. Drainage from the site cannot be directed to the Garrison Road storm sewers based on the grading constraints. It is proposed that a combination of permeable paver parking areas and bio-swale can be utilized to provide stormwater attenuation and limit peak runoff rates to the pre-development level while providing the appropriate level of stormwater quantity control.

4. A preliminary Grading Plan has been provided illustrating how the proposed development can be graded given the constraints of the local topography.

Thank you for your consideration of the above Functional Servicing Report should you have any questions or require clarification with respect to any part of the above please do not hesitate to contact the undersigned.

Respectfully submitted,

Andrew Smith, P. Eng.
Principal & Director
LandSmith Engineering & Consulting Ltd.

4.0 Attachments:

Appendix 'A'

Concept Plan by Organica Studio + Inc.
Topographic Survey by The Larocque Group

Preliminary Grading Plan
Preliminary Servicing Plan

Appendix 'B'

Fire Protection Plan
Fire Flow Requirement Calculations – Unit 1, 2, 3
Domestic Water Demand Calculations

Appendix 'C'

Sanitary Drainage Area Plan
Pages from Niagara Region Water / Wastewater Master Servicing Plan (2016)

Appendix 'D'

Pre-Development Drainage Area Plan
NPCA Figure re: Drainage Context
Post-Development Drainage Area Plan
Permeable Paver Fact Sheet
Bio-Swale Fact Sheet

Appendix 'E'

Garrison Road Plan & Profile, Sheet 6
Garrison Road Plan & Profile, Sheet 7
East Bertie Sewerage System Plan & Profile

Attachments:

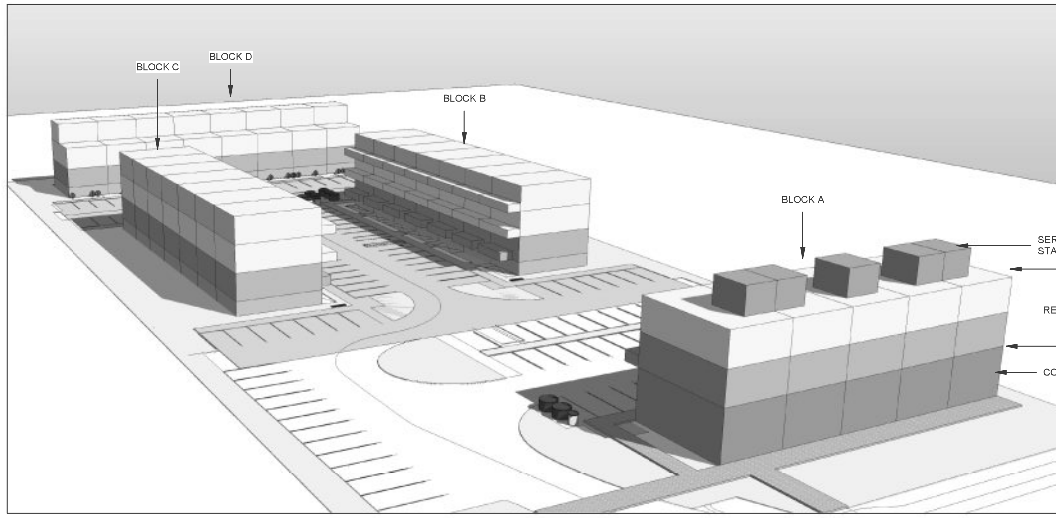
Appendix 'A'

Concept Plan by Organica Studio + Inc.

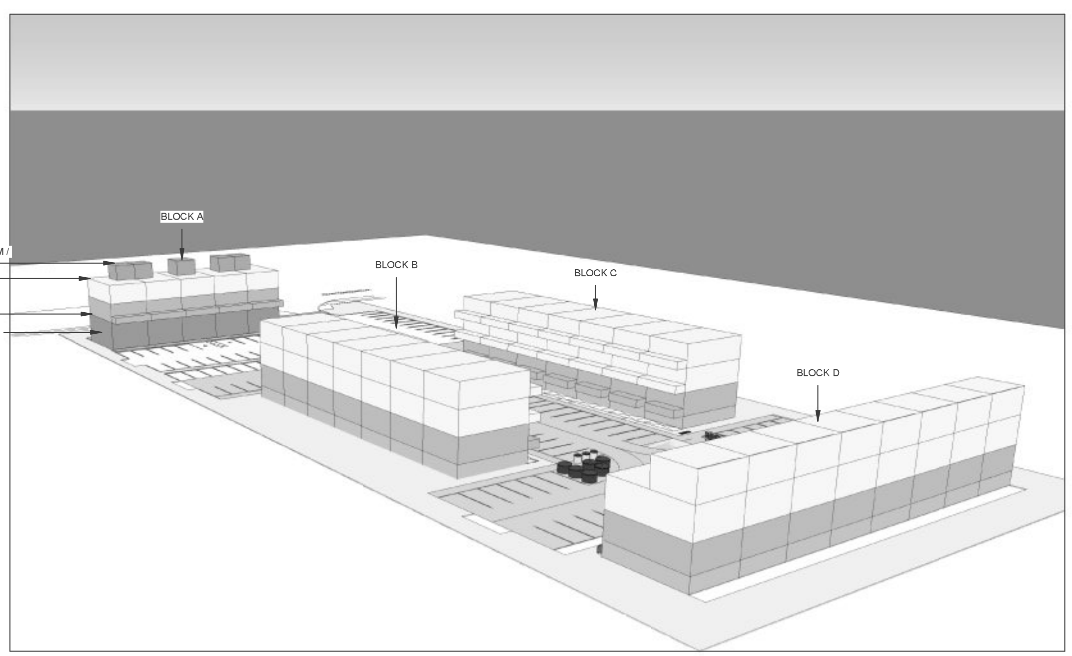
Topographic Survey by The Larocque Group

Preliminary Grading Plan

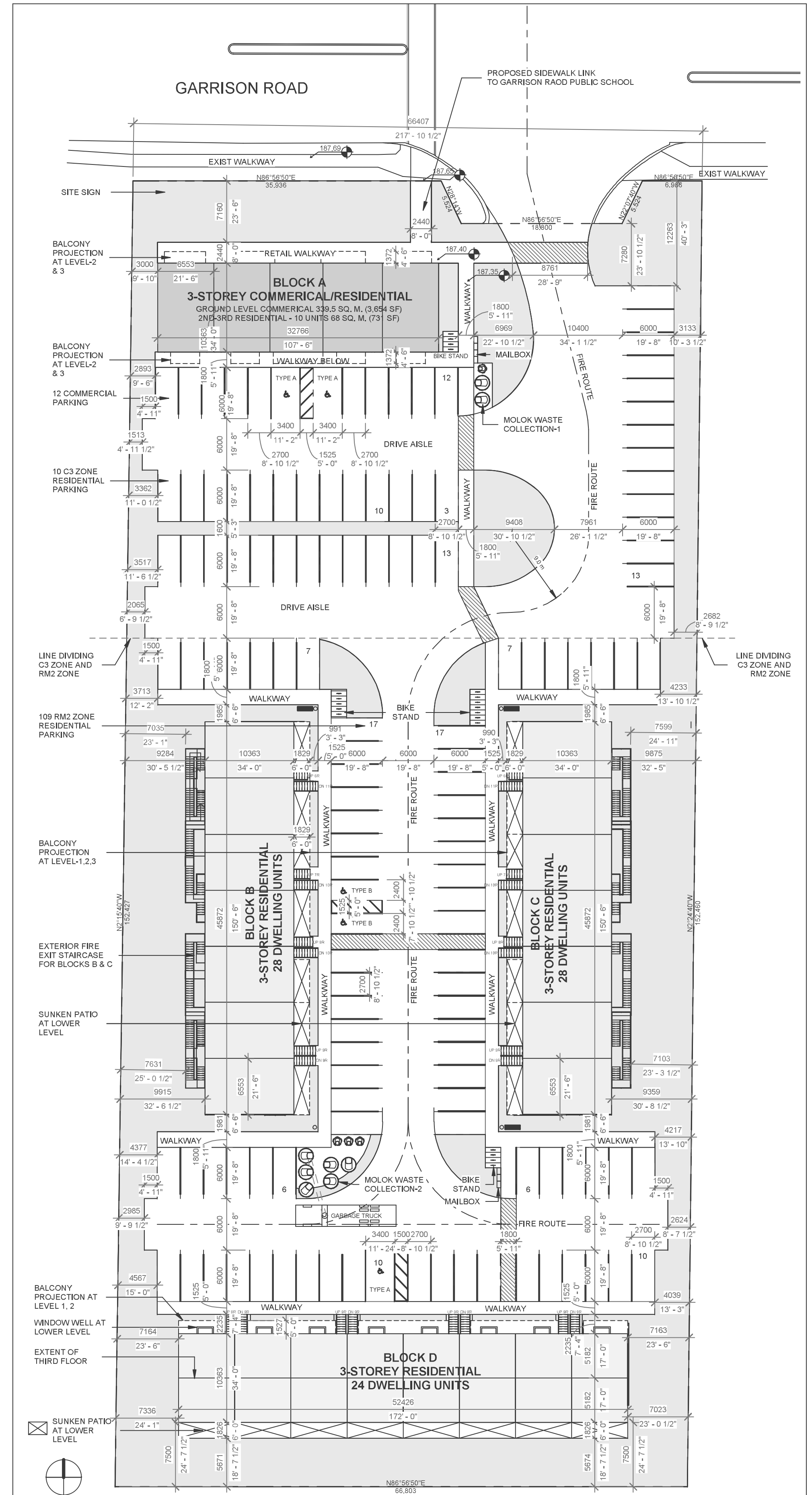
Preliminary Servicing Plan



③ AERIAL PERSPECTIVE 2- Massing



④ AERIAL PERSPECTIVE 1- Massing



① SITE PLAN
1 : 325

LEGEND:

- PROPOSED BUILDING(S)
- PROPOSED BUILDING(S)
- EXISTING / PROPOSED ASPHALT FINISH
- EXISTING/PROPOSED CONCRETE FINISH
- EXISTING/PROPOSED CONCRETE FINISH
- PROPOSED SOFT LANDSCAPING
- EXISTING/PROPOSED WOOD FINISH
- SUNKEN PATIO AT LOWER LEVEL
- PEDESTRIAN CROSSOVER
- PEDESTRIAN/VEHICULAR ENTRANCE POINT
- 2% SLOPE — EXISTING/PROPOSED GRADE SLOPE
- X 000.00 — EXISTING/PROPOSED GRADE ELEVATION
- D.S. — DOWNSPOUT C/W CONCRETE SPLASH PAD
- PROPERTY LINE
- BALCONY PROJECTION ON UPPER FLOORS
- EXISTING/PROPOSED CHAIN LINK FENCE
- EXISTING/PROPOSED WOOD FENCE
- PROPOSED RETAINING WALL

CONCEPTUAL SITE STATISTICS

LOT AREA	10,047.03 SQ. M. (1.00 HECTARES) C3 ZONE AREA = 3,442.35 SQ. M. RM2 ZONE AREA = 6,604.68 SQ. M.
LOT FRONTAGE	66.40 M.
LOT COVERAGE	18.25%
LANDSCAPING	30.88% (3,102.92 SQ. M.)
LANDSCAPING IN C3 ZONE	920 SQ.M
BUILDING HEIGHT	12.0M (ALL BLOCKS)
NUMBER OF STOREYS	3 STOREYS (ALL BLOCKS)
PROPOSED UNITS	90 DWELLINGS
PROPOSED DENSITY	90 UNITS/HECTARE
PROPOSED PARKING	TOTAL 131 PARKING SPACES. -119 RESIDENTIAL SPACES -12 COMMERCIAL SPACES (INCL. 3 TYPE A ACCESSIBLE SPACES & 2 TYPE B ACCESSIBLE SPACES)

AREA SCHEDULE (GROSS BUILDING)

BLOCK	METRIC AREA	IMPERIAL AREA
A (RESIDENTIAL)	679 m^2	7308.7 ft^2
A (COMMERCIAL)	339.5 m^2	3,654 ft^2
B	1,901.5 m^2	20,468 ft^2
C	1,901.5 m^2	20,468 ft^2
D	1,901.5 m^2	20,468 ft^2
TOTAL	**6,723 m^2**	**72365.7 ft^2**

CONCEPTUAL UNIT AREAS:

3 BEDROOM UNITS	MIN. AREA = 79 SQ. M
2 BEDROOM UNITS	MIN. AREA = 60 SQ.M
1 BEDROOM UNITS	MIN. AREA = 50 SQ.M

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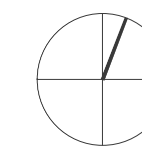

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STAMP

NO.	DESCRIPTION	DATE
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1	ISSUED FOR ZBA & OPA	2023.09.19

SITE PLAN

STACKED DWELLINGS

1127 GARRISON ROAD, FORT ERIE

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CHECKED	JC
PROJECT NUMBER	21084
SHEET	A100

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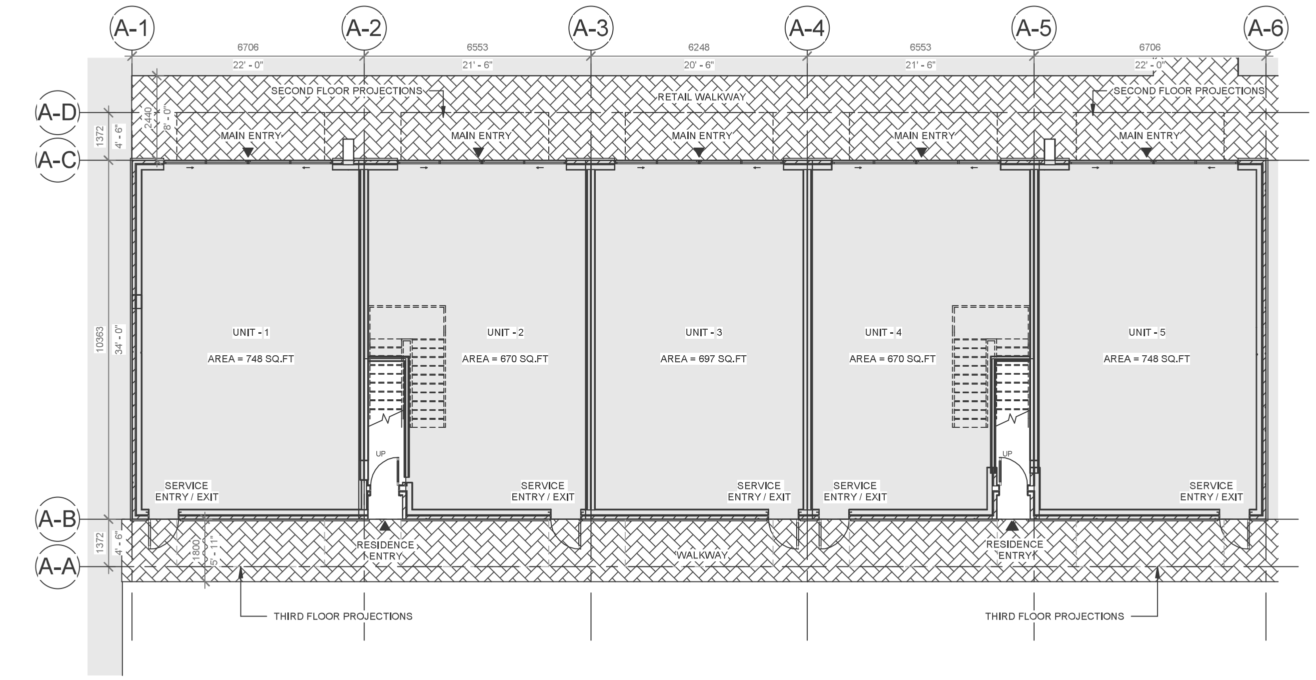

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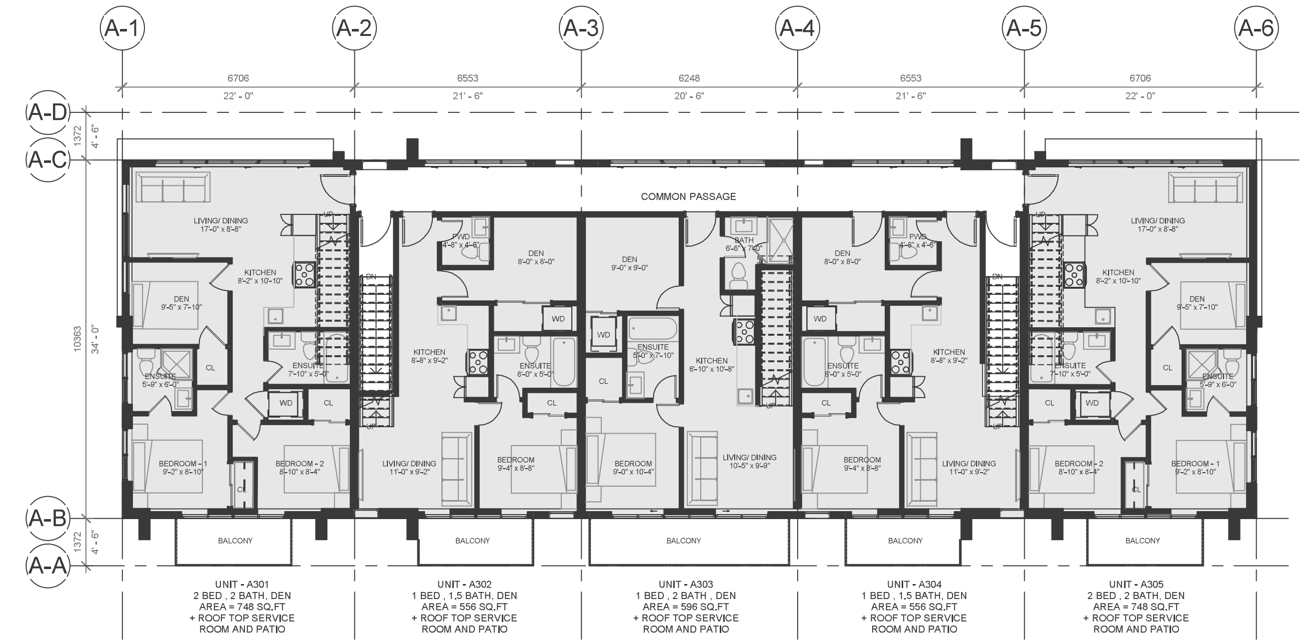

3 Block A - Third Level
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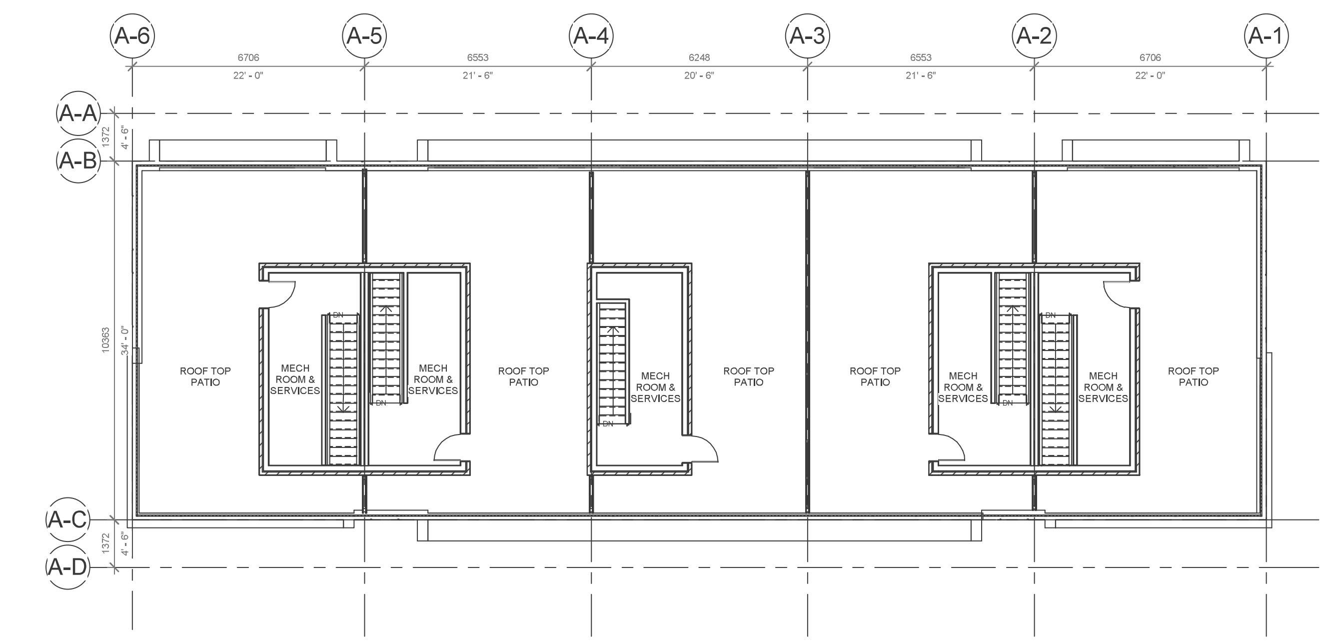
2 Block A - Second Level
1 : 100



4 Block A - Roof Level
1 : 100

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BLOCK A - FLOOR PLANS

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1127 GARRISON ROAD, FORT ERIE

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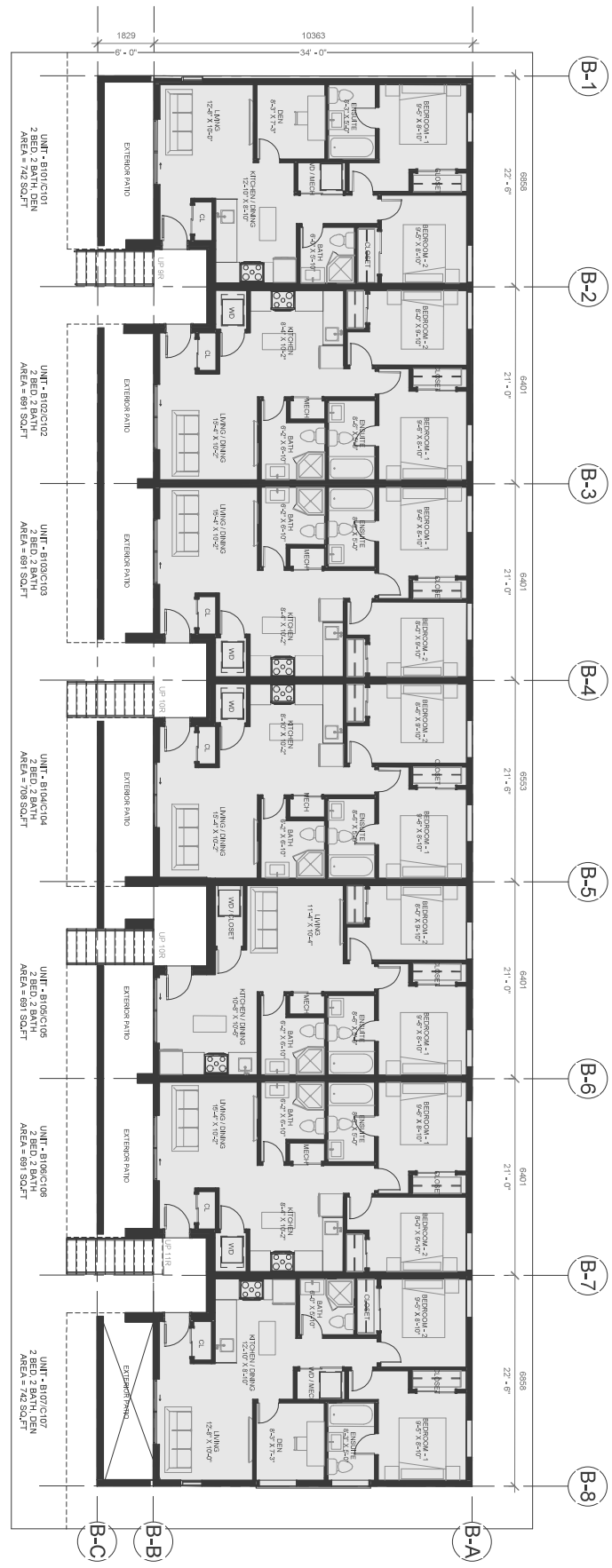

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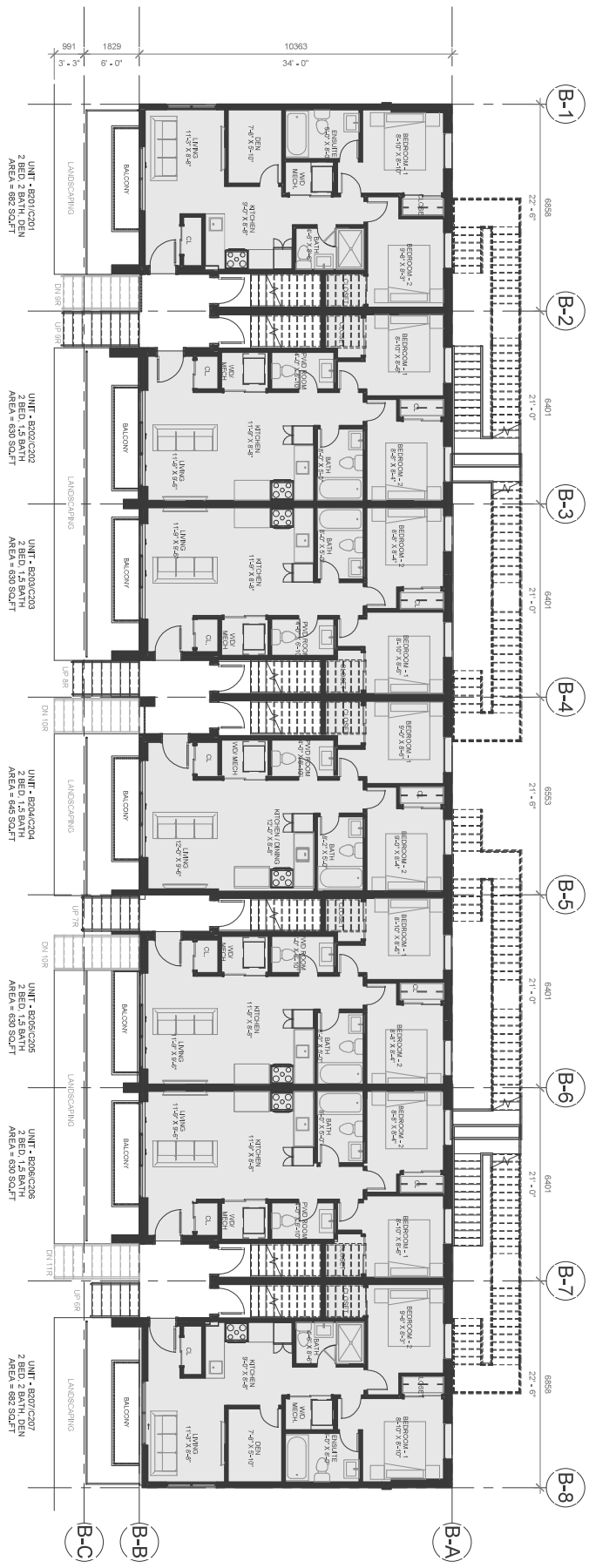

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BLOCKS B & C - FLOOR PLANS

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1127 GARRISON ROAD, FORT ERIE

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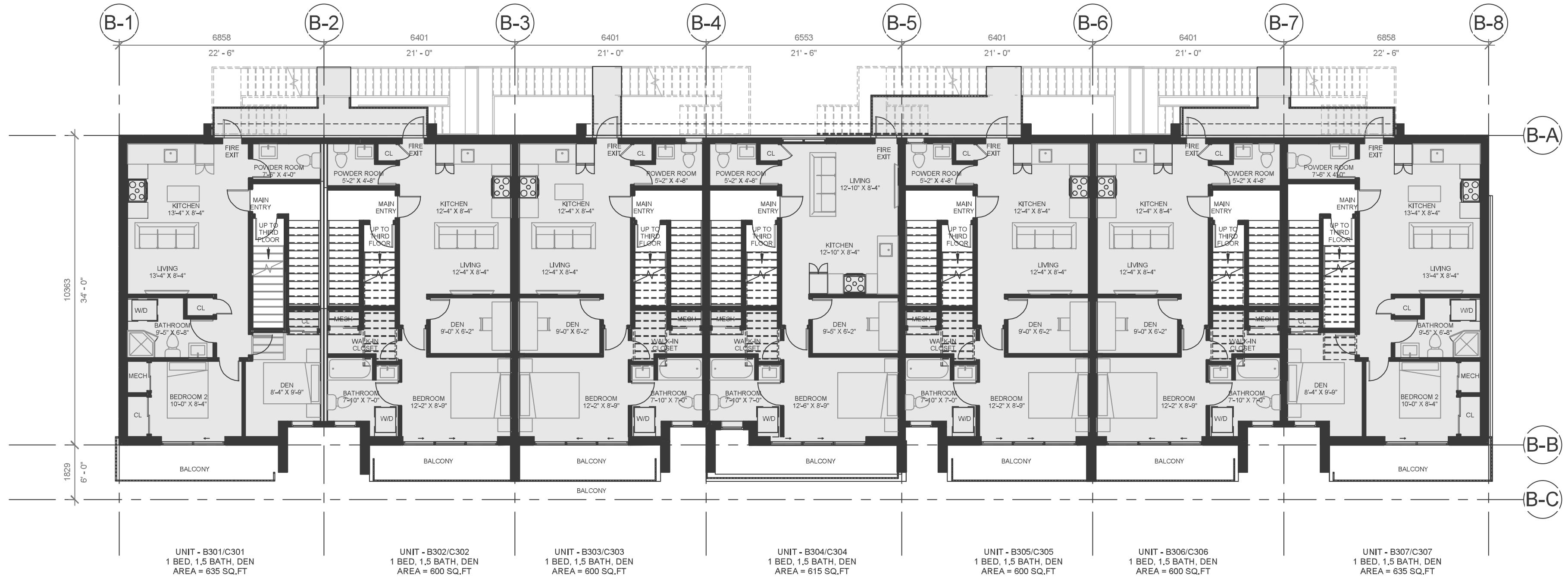

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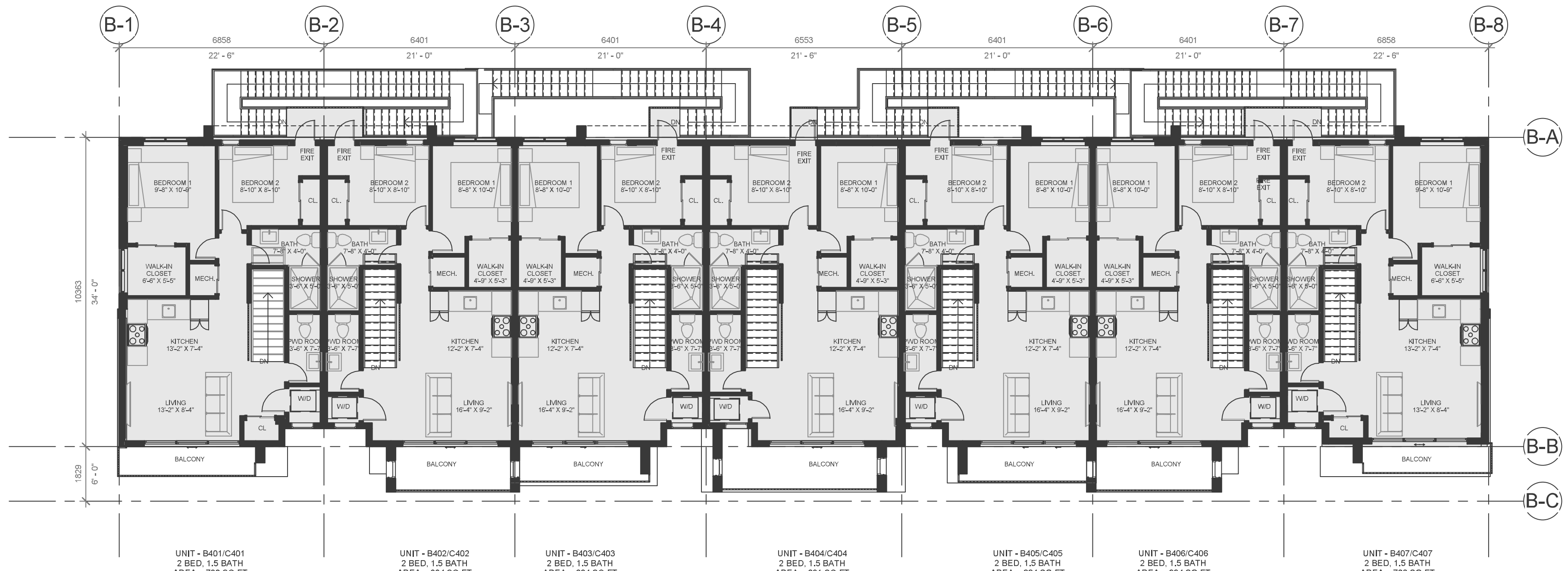

2 Block B & C - Third Level
1 : 100

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BLOCKS B & C - FLOOR PLANS

STACKED DWELLINGS

1127 GARRISON ROAD, FORT ERIE

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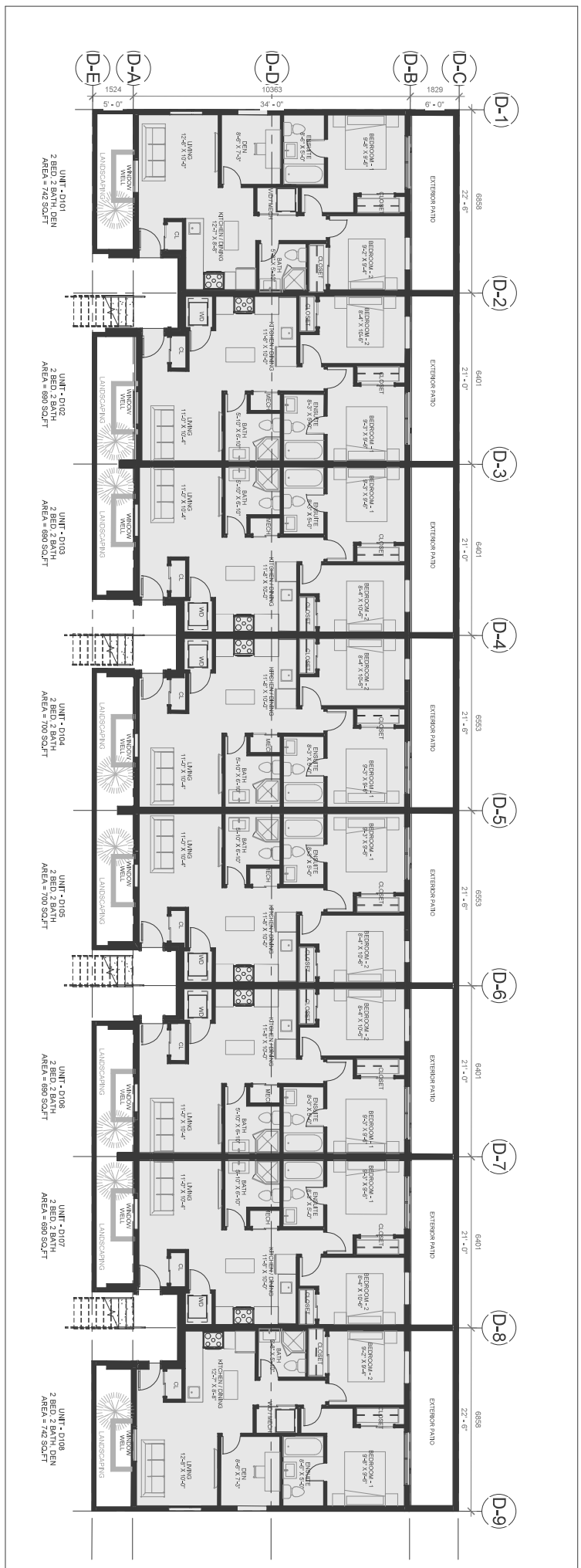

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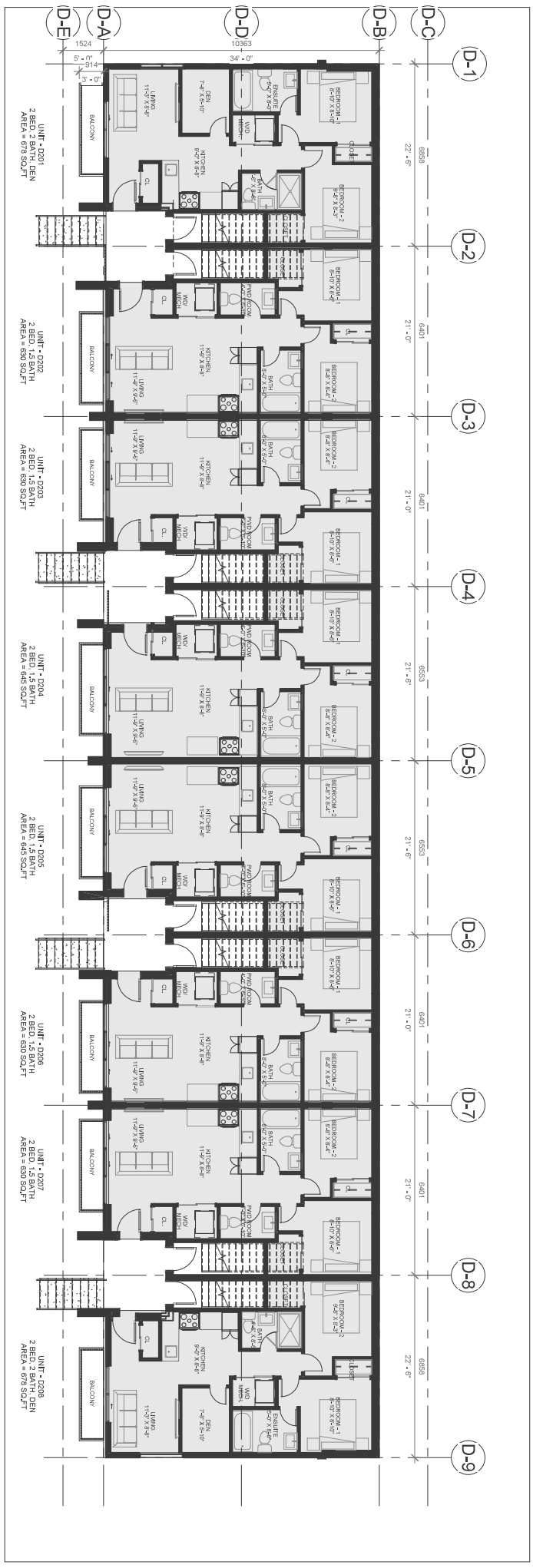

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PROJECT NUMBER
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BLOCKS D - FLOOR PLANS

STACKED DWELLINGS

1127 GARRISON ROAD, FORT ERIE

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The Designer of these plans and specifications gives no warranty or representation to any party about the constructability of the represented by them, all contractors or subcontractors must satisfy themselves when bidding and at all times that they can properly construct the work represented by these plans.

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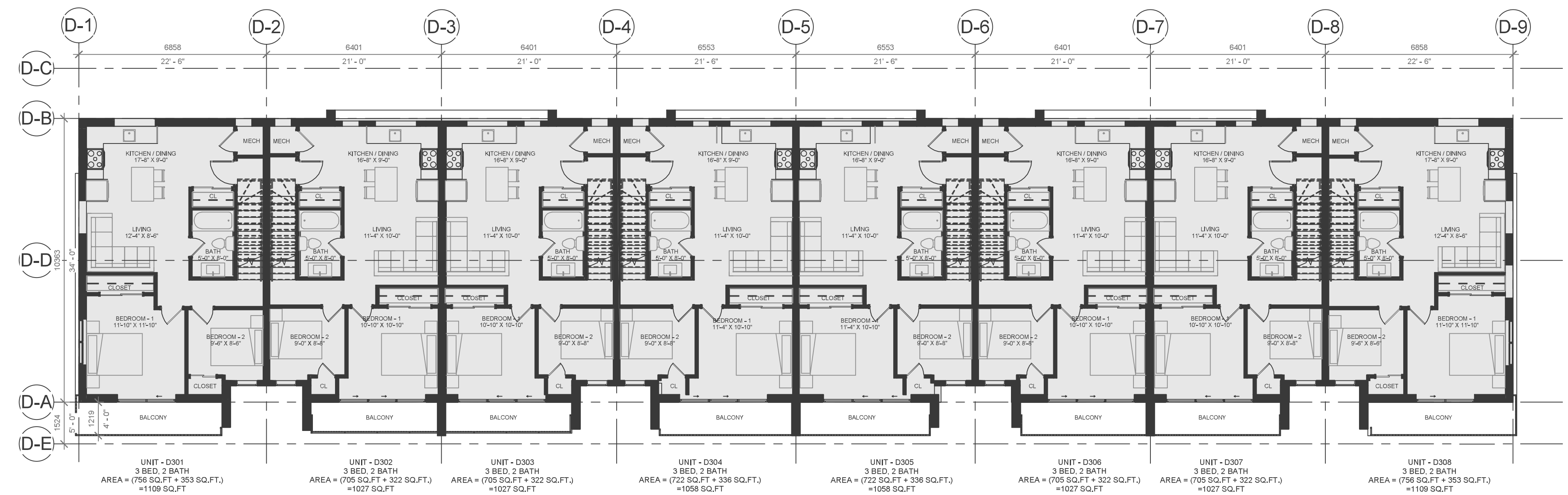
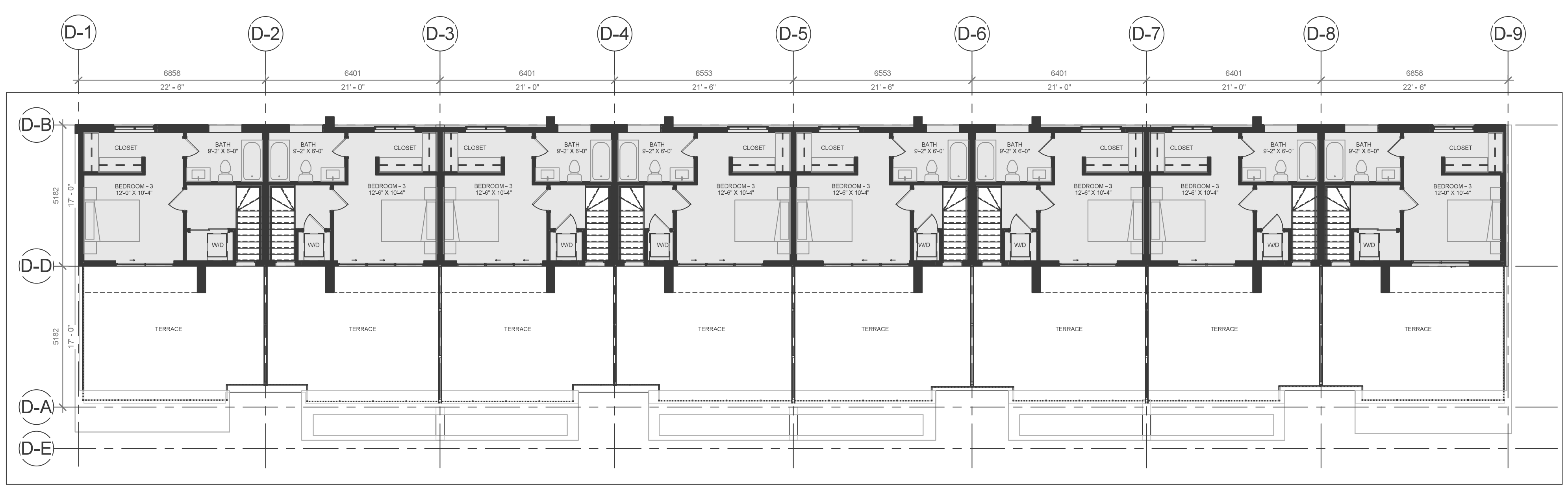


① Block D - Second Level
1 : 100



② Block D - Third Level
1 : 100

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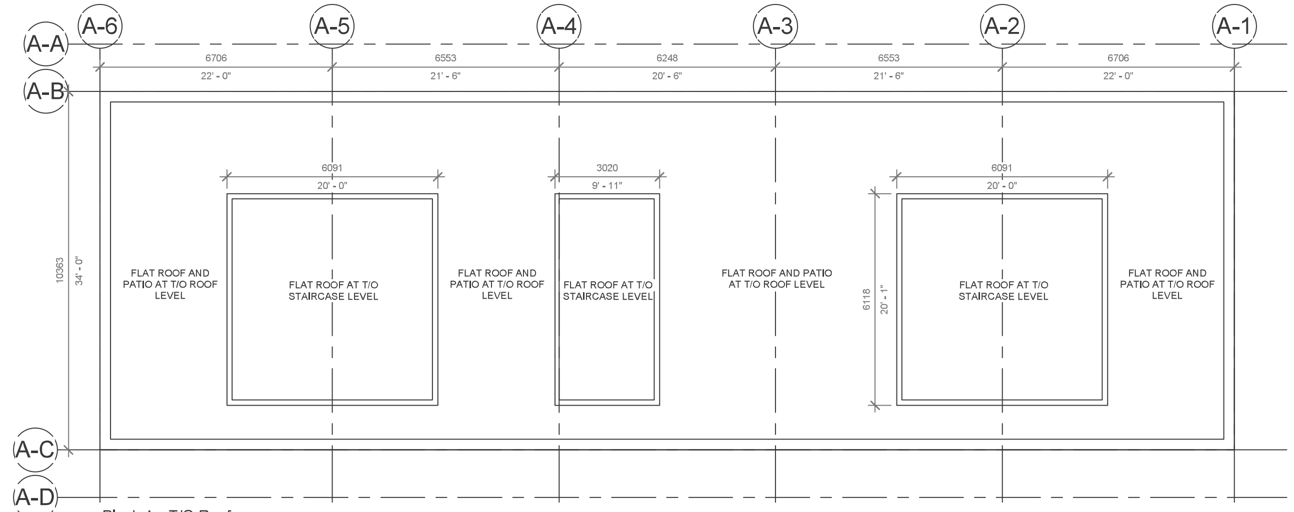
BLOCKS D - FLOOR PLANS

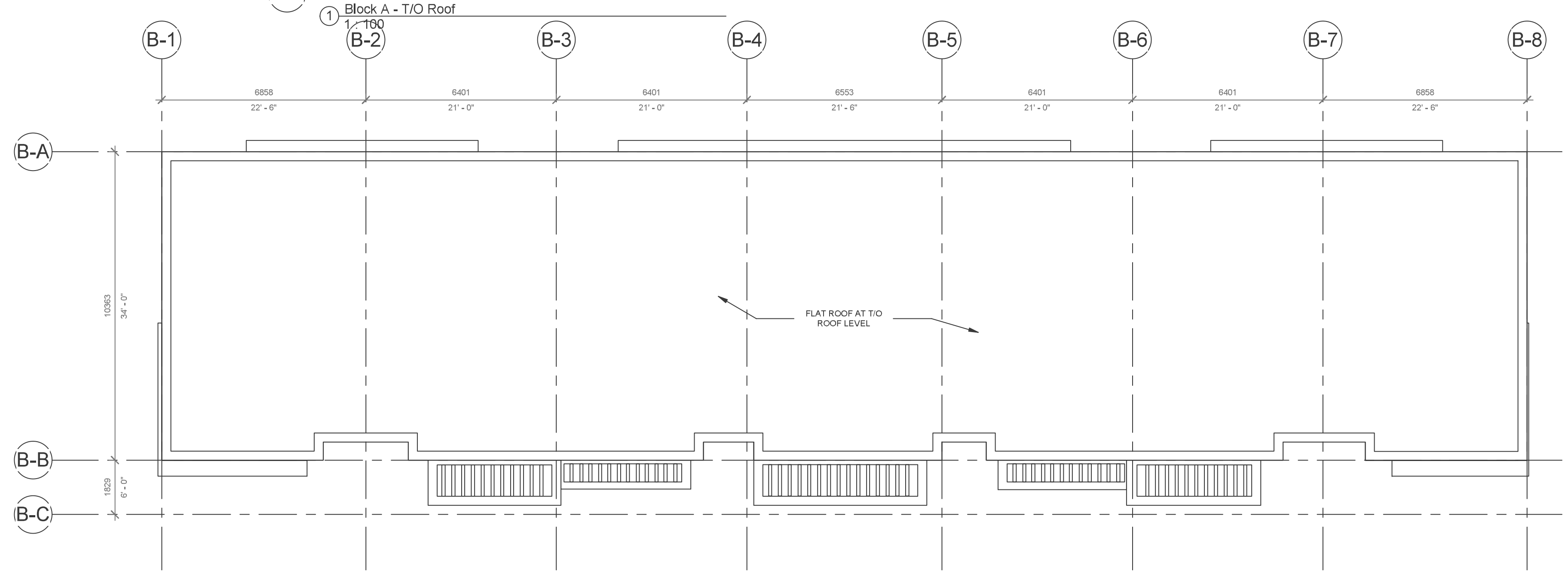
STACKED DWELLINGS

1127 GARRISON ROAD, FORT ERIE

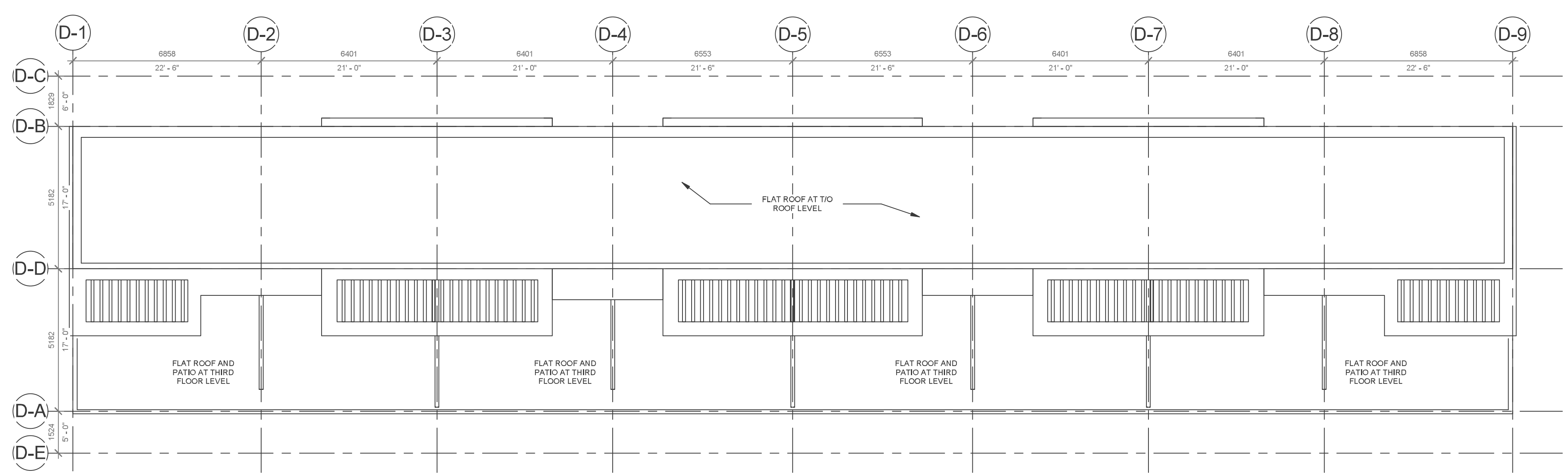
SCALE	1 : 100
DATE	2023-09-19 11:07:49 AM
DRAWN	Author
CHECKED	Checker
PROJECT NUMBER	21084
SHEET	A204



1 Block A - T/O Roof
1 : 100



3 Block B & C - Roof Level
1 : 100



4 Block D - Roof Level
1 : 100

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These Contract Documents are the property of the architect. The architect bears no responsibility for the interpretation of these documents by the Contractor. Upon written application the architect will provide written/graphic clarification or supplementary information regarding the intent of the Contract Documents. The architect will review Shop Drawings submitted by the Contractor for design conformance only.

Drawings are not to be scaled for construction. Contractor to verify all existing conditions and dimensions required to perform the work and report any discrepancies with the Contract Documents to the architect before commencing work.

Positions of exposed or finished mechanical or electrical devices, fittings, and fixtures are indicated on architectural drawings. The locations shown on the architectural drawings govern over the Mechanical and Electrical drawings. Those items not clearly located will be located as directed by the architect.

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NORTH

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NO.	DESCRIPTION	DATE
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ROOF PLANS

STACKED DWELLINGS

1127 GARRISON ROAD, FORT ERIE

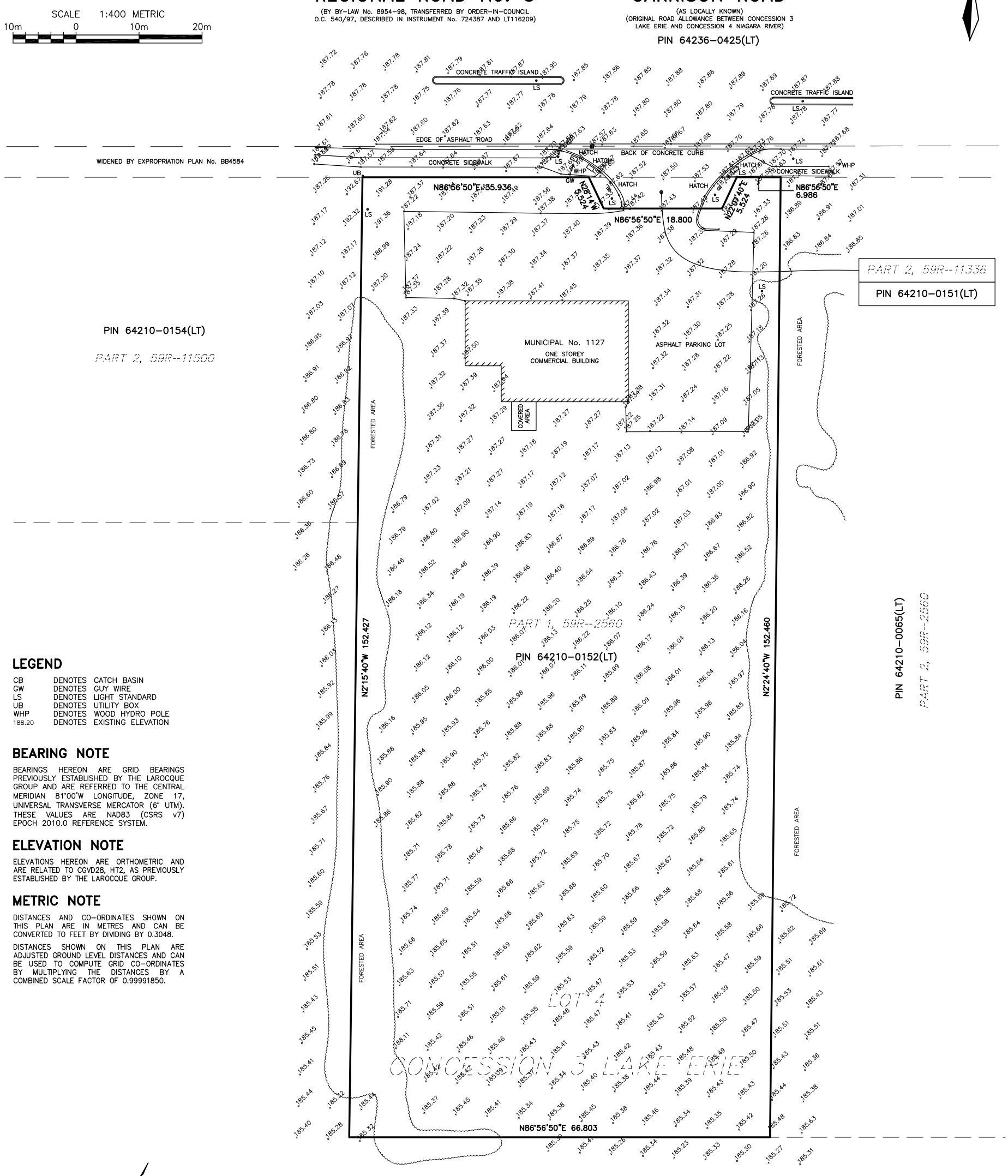
SCALE	1 : 100
DATE	2023-09-19 11:07:50 AM
DRAWN	Author
CHECKED	Checker
PROJECT NUMBER	21084
SHEET	A205

FILE NAME: X:\Organica Projects\2022\22081 - 1127 Garrison Road\Revit Model\2023.09.18 - 1127 Garrison Road - ZBA & OPA - Revised Stairs and Block Locations.rvt
PLOT DATE: 2023-09-19 11:07:50 AM

SITE CONDITION PLAN

PART OF LOT 4
CONCESSION 3 LAKE ERIE
(GEOGRAPHIC TOWNSHIP OF BERTIE)
TOWN OF FORT ERIE
REGIONAL MUNICIPALITY OF NIAGARA

SCALE 1:400 METRIC
10m 0 10m 20m



LEGEND

CB	DENOTES CATCH BASIN
GW	DENOTES GUY WIRE
LS	DENOTES LIGHT STANDARD
UB	DENOTES UTILITY BOX
WHP	DENOTES WOOD HYDRO POLE
188.20	DENOTES EXISTING ELEVATION

BEARING NOTE

BEARINGS HEREON ARE GRID BEARINGS PREVIOUSLY ESTABLISHED BY THE LAROCQUE GROUP AND ARE REFERRED TO THE CENTRAL MERIDIAN 81°00'W LONGITUDE, ZONE 17, UNIVERSAL TRANSVERSE MERCATOR (6° UTM). THESE VALUES ARE NAD83 (CSRS v7) EPOCH 2010.0 REFERENCE SYSTEM.

ELEVATION NOTE

ELEVATIONS HEREON ARE ORTHOMETRIC AND ARE RELATED TO CGVD28, HT2, AS PREVIOUSLY ESTABLISHED BY THE LAROCQUE GROUP.

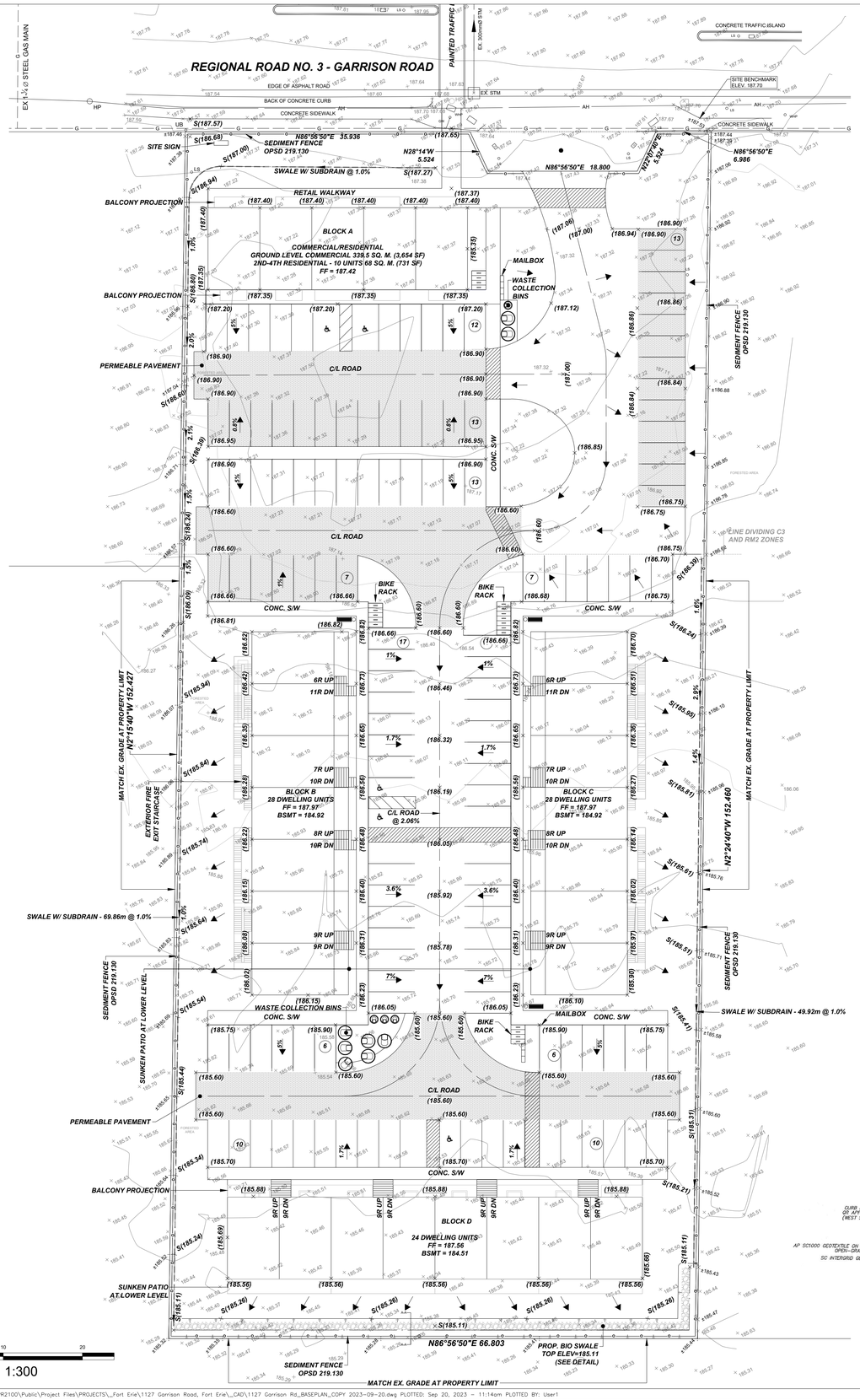
METRIC NOTE

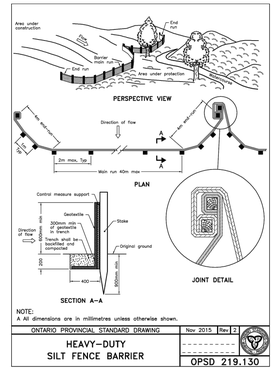
DISTANCES AND CO-ORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

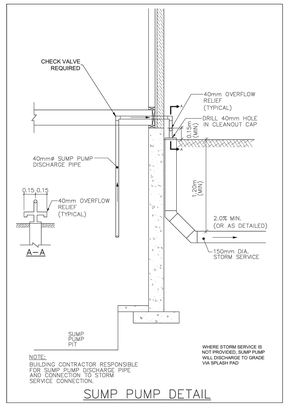
DISTANCES SHOWN ON THIS PLAN ARE ADJUSTED GROUND LEVEL DISTANCES AND CAN BE USED TO COMPUTE GRID CO-ORDINATES BY MULTIPLYING THE DISTANCES BY A COMBINED SCALE FACTOR OF 0.99991850.

THE LAROCQUE GROUP
O.L.S./PROJECT CONSULTANTS/LAND MANAGEMENT
12 LYMAN STREET, ST. CATHARINES, ONTARIO
905-688-1413
6385 COLBORNE STREET, NIAGARA FALLS, ONTARIO
905-358-8400
www.larocquegroup.ca

DATE : SEPTEMBER 20, 2022 FILE No. : NS2022-048_ _ _
DWG.FILE : NS2022-048-01_ _







LEGEND

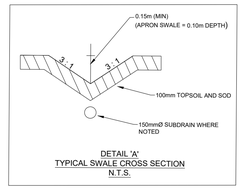
×100.50	EXISTING ELEVATION
±100.50	EXISTING ELEVATION (CALCULATED)
×(100.00)	PROPOSED ELEVATION
(100.00)	PROPOSED APRON ELEVATION
×S(100.00)	PROPOSED SWALE ELEVATION
	PROPOSED DOWNSPOUT
	PROPOSED ENTRANCE LOCATION
	PROPOSED SWALE
	PROPOSED SWALE WITH SUBDRAIN
	PROPOSED SILT FENCE
	PROPOSED PERMEABLE PAVEMENT

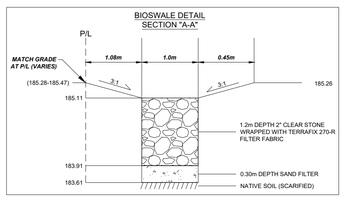
GENERAL GRADING NOTES:

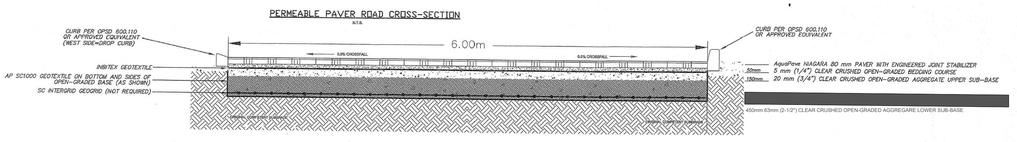
1. MATCH EXISTING GRADE AT PROPERTY / DEVELOPMENT LIMITS WITH SODDED SLOPES OF MAXIMUM 3:1 AND/OR RETAINING WALLS AS SPECIFIED.
2. SLOPES OF SWALES FOR BOTH "BACK–TO–FRONT" AND "SPLIT" DRAINAGE SHALL BE NO LESS THAN 2.0% AND NO GREATER THAN 33% (3:1).
3. MINIMUM GRADE FOR APRON "WRAP–AROUND" SWALE AT THE REAR OF THE UNIT SHALL BE 1.0%.
4. WHEN MATCHING TO EXISTING GRADE AT THE LIMITS OF THE DEVELOPMENT / PROPERTY WHERE 2.0% SLOPE CANNOT BE REASONABLY ACHIEVED A 1.5% GRADE IS PERMITTED PROVIDED A 150MM SUB–DRAIN IS INSTALLED WITH THE SWALE AS PER RD–121 AND CONNECTED TO A SUITABLE OUTLET.
5. DRIVEWAY SLOPES SHALL NOT BE LESS THAN 2.0% AND SHALL NOT BE MORE THAN 7.0%. REVERSED SLOPED DRIVEWAYS ARE NOT ALLOWED FOR ANY NEW CONSTRUCTION.
6. GARAGE FLOOR ELEVATION SHALL BE SET A MINIMUM OF 0.30M HIGHER THAN THE BACK OF WALK, UNLESS OTHERWISE SPECIFIED.
7. THE TOP OF FOUNDATION WALL FOR THE DWELLING UNIT SHALL BE A MINIMUM 150MM (6") ABOVE FINISHED GRADE.
8. UNLESS OTHERWISE NOTED, THE GROUND BETWEEN PROPOSED ELEVATIONS SHALL BE GRADED AS A STRAIGHT LINE.
9. IF GRADING IS REQUIRED ON LANDS ADJACENT TO THE PROPERTY / DEVELOPMENT WHICH ARE NOT OWNED BY THE DEVELOPER, THEN THE DEVELOPER MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNER, OTHERWISE RETAINING WALLS MUST BE USED.
10. ALL RETAINING WALLS SHALL BE PLACED A MINIMUM OF 0.45M FROM PROPERTY LINES.
11. ANY WALL OF GREATER HEIGHT THAN 1.0M MUST BE DESIGNED BY A PROFESSIONAL ENGINEER.
12. TOP OF RETAINING WALL ELEVATIONS SHALL BE SET A MINIMUM OF 150MM ABOVE THE PROPOSED SIDE–YARD SWALES.
13. RETAINING WALLS 0.60M AND HIGHER REQUIRE CONSTRUCTION OF A FENCE OR GUARD RAIL AT THE TOP OF THE REAR OF THE WALL. SUCH FENCES OR GUARD RAILS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE ONTARIO BUILDING CODE.
14. ALL FILL COMPACTED ON THE LOT(S) SHALL BE COMPACTED TO A MINIMUM 95% SPD (UNLESS OTHERWISE RECOMMENDED BY A GEOTECHNICAL ENGINEER). MATERIALS SHALL BE PLACED IN LIFTS NOT EXCEEDING 300MM DEPTH.
15. FOR DELINEATION OF TREE PROTECTION ZONES, BUFFERS, REMOVALS, AND PROTECTION SCHEMATICS REFER TO THE TREE PROTECTION PLAN (IF APPLICABLE).

BACKYARD GRADING NOTES:

1. "REQUIRED BACKYARD" SHALL BE A MINIMUM OF 6.0 METRES UNLESS OTHERWISE DEFINED IN THE APPLICABLE ZONING BY–LAW.
2. THE MAXIMUM SLOPE IN THE BACKYARD ADJACENT TO THE BUILDING FOR A DISTANCE EQUAL TO THE REQUIRED BACKYARD SHALL BE 5% EXCEPT FOR SIDE OR REAR YARD SWALES AND RETAINING WALLS.
3. WHERE THE 5% RESTRICTION ON THE BACKYARD'S GRADES RESULTS IN ELEVATION DIFFERENCES BETWEEN ADJACENT PROPERTIES, RETAINING WALL SHALL BE CONSTRUCTED ALONG THE SIDES AND BACK OF THE LOT.
4. GENERALLY, SLOPES SHALL BE PLACED ON THE LOWER LOT, WHEREAS RETAINING WALLS SHALL BE PLACED ON THE HIGHER LANDS.
5. THE 5% RESTRICTION DOES NOT PRECLUDE RETAINING WALLS IN THE REQUIRED BACKYARDS PROVIDING THE TERRACES ARE MAINTAINED TO THE 5% GRADE AS SET OUT ABOVE. THE INTENTION OF THIS PROVISION IS TO PROVIDE FOR FLEXIBILITY OF HOUSE CONSTRUCTION.
6. BACK TO FRONT DRAINAGE SHALL ONLY BE PERMITTED WHERE THE COMBINED SIDE YARD SETBACK IS 2.0M OR MORE, PROVIDING A MINIMUM OF 2.0M BETWEEN FOUNDATION WALLS FOR DRAINAGE SWALES. A 1.2M SETBACK IS REQUIRED ON THE GARAGE SIDE OF THE LOT







NOTES:

1. LOCATIONS UNDERGROUND SERVICES ARE APPROXIMATE AND MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
2. ANY DISCREPANCIES BETWEEN SERVICE LOCATIONS AND THESE ENGINEERING DRAWINGS MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT ENGINEER.
3. THIS PLAN SHALL BE INTERPRETED IN CONJUNCTION WITH THE SITE PLAN DRAWING PREPARED BY CUSIMANO ARCHITECT (LATEST VERSION). ANY DISCREPANCIES MUST BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY.

KEY PLAN N.T.S.

BENCHMARK NOTE:

ELEVATIONS HEREON ARE ORTHOMETRIC AND ARE RELATED TO CGVD28, HT2, AS PER THE LAROQUE GROUP.

SITE BENCHMARK :

CONCRETE SIDEWALK CORNER, NORTH-EAST OF 1127 GARRISON ROAD.

ELEVATION = 187.70m

GENERAL NOTES:

1. TENDERER SHALL SATISFY THEMSELVES AS TO THE NATURE OF THE GROUND AND BID ACCORDINGLY.
2. ALL ROCK LINE INDICATIONS SHOWN ON THE PLAN MUST BE VERIFIED BY THE CONTRACTOR.
3. CONTRACTOR SHALL VERIFY LOCATIONS AND INVERTS OF ALL EXISTING SANITARY AND STORM SEWERS AND WATERMAINS, PRIVATE DRAINS AND WATER SERVICES, GAS MAINS, CABLE TV, HYDRO AND TELEPHONE DUCTS ETC AT START OF CONSTRUCTION.

NO:	DATE:	DESCRIPTION:
3	2023-09-15	ISSUED WITH FSR
2	2023-09-15	ISSUED WITH FSR
1	2023-09-05	ISSUED FOR CLIENT REVIEW
0	2023-03-14	ISSUED FOR FSR

REVISIONS

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LandSmith ENGINEERING & CONSULTING LTD.
LANDSMITH ENGINEERING & CONSULTING LTD.
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ANDREW@LANDSMITHEC.COM
289-309-3632

CLIENT:

TRINITYSTAR AQUILA INC.

MUNICIPALITY:

TOWN OF FORT ERIE

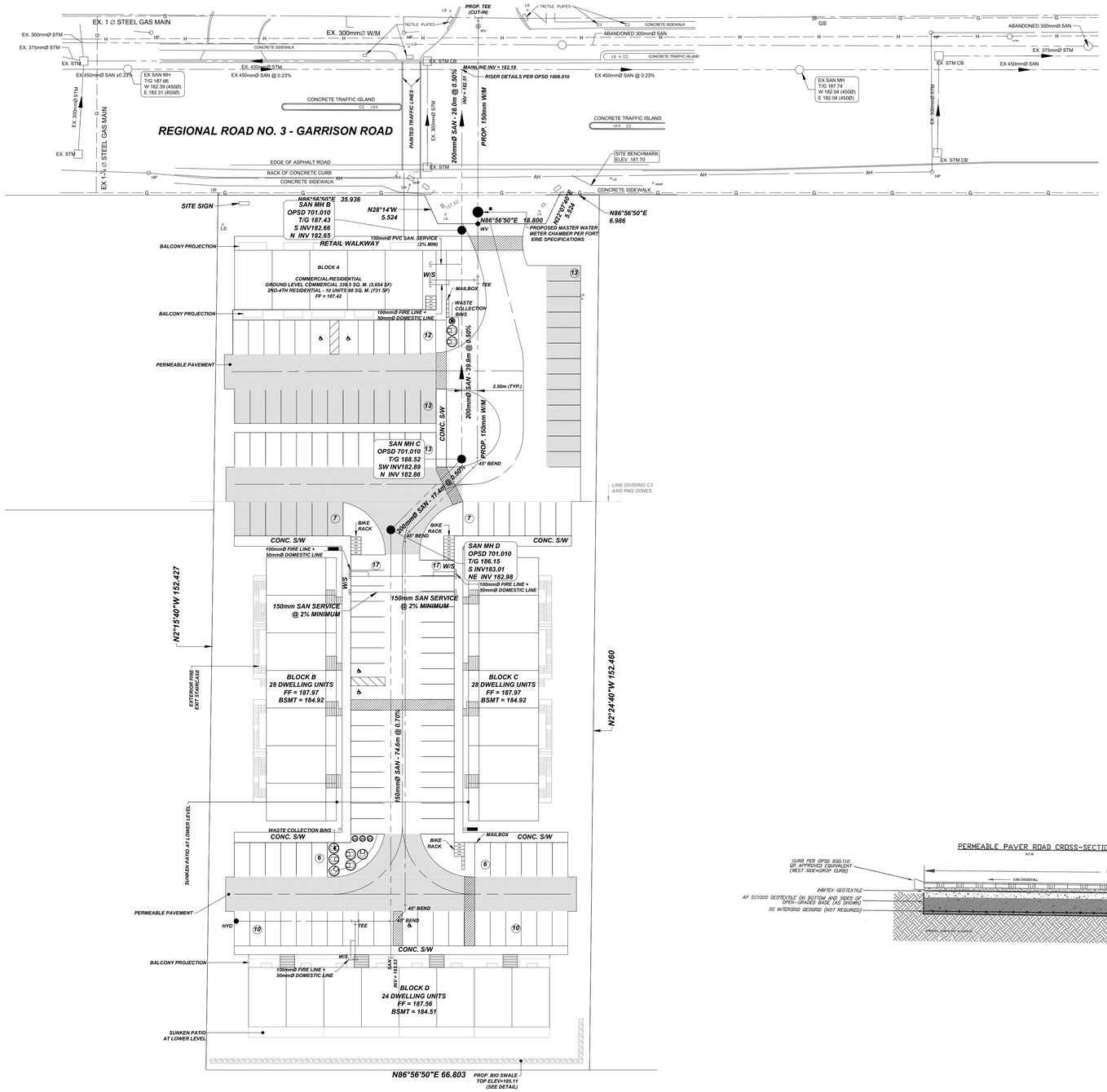
PROJECT NAME:

1127 GARRISON RD.

TITLE:

GRADING PLAN

SCALE: 1:300	DATE: 2022-12-13
CHECKED BY: AS	DESIGNED BY: AS
DWG No: 22038TSA	SHEET No: 1



LEGEND

LS	EXISTING LIGHT STANDARD		EXISTING AERIAL HYDRO
WV	PROPOSED WATER VALVE		EXISTING WATERMAIN
TEE	PROPOSED WATERMAIN TEE		PROPOSED WATER SERVICE
PLUG	PROPOSED PLUG		EXISTING SANITARY
CS	PROPOSED CURB STOP		PROPOSED SANITARY
WV	EXISTING WATER VALVE		EXISTING STORM
GM	EXISTING GAS METER		PROPOSED STORM
HP	EXISTING HYDRO POLE		
CB	EXISTING CATCH BASIN		
SAN	EXISTING SANITARY MAINTENANCE HOLE		
SAN	PROPOSED SANITARY MAINTENANCE HOLE		
PLUG	EXISTING PLUG		
PLUG	PROPOSED PLUG		
STM MH	EXISTING STORM MAINTENANCE HOLE		
STM MH	PROPOSED STORM MAINTENANCE HOLE		
CB	EXISTING CATCH BASIN		
CB	PROPOSED CATCH BASIN		
DCB	EXISTING DOUBLE CATCH BASIN		
DCB	PROPOSED DOUBLE CATCH BASIN		
HYD	PROPOSED FIRE HYDRANT		
FH	EXISTING FIRE HYDRANT		

KEY PLAN N.T.S.

BENCHMARK NOTE:

ELEVATIONS HEREON ARE ORTHOMETRIC AND ARE RELATED TO CGVD28, HT2, AS PER THE LAROQUE GROUP.

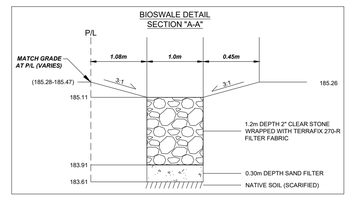
SITE BENCHMARK :

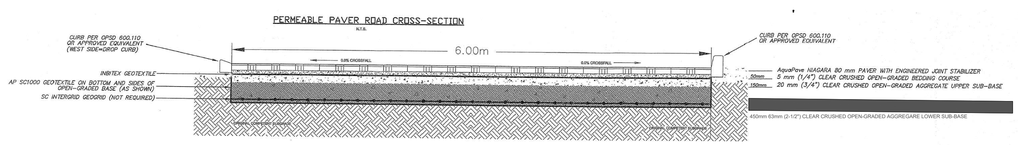
CONCRETE SIDEWALK CORNER, NORTH-EAST OF 1127 GARRISON ROAD.

ELEVATION = 187.70

GENERAL NOTES:

1. TENDERER SHALL SATISFY THEMSELVES AS TO THE NATURE OF THE GROUND AND BID ACCORDINGLY.
2. ALL ROCK LINE INDICATIONS SHOWN ON THE PLAN MUST BE VERIFIED BY THE CONTRACTOR.
3. CONTRACTOR SHALL VERIFY LOCATIONS AND INVERTS OF ALL EXISTING SANITARY AND STORM SEWERS AND WATERMAINS, PRIVATE DRAINS AND WATER SERVICES, GAS MAINS, CABLE TV, HYDRO AND TELEPHONE DUCTS ETC AT START OF CONSTRUCTION.





APPROVAL OF THIS DRAWING IS FOR MATERIAL ACCEPTABILITY AND COMPLIANCE WITH MUNICIPAL AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION BY THE CITY OF THE WORKS DOES NOT CERTIFY THE LINE AND GRADE OF THE WORKS AND IT IS THE OWNER'S RESPONSIBILITY TO HAVE THEIR ENGINEER CERTIFY THIS ACCORDINGLY.

NOTES re: SEPARATION DISTANCES:

1. MINIMUM HORIZONTAL SEPARATION BETWEEN WATER SERVICES / MAINS AND SEWER DRAINS AND MUNICIPAL SEWER MAINS SHALL BE 2.5M MEASURED FROM THE CLOSEST PIPE EDGE TO THE CLOSEST PIPE EDGE.
2. VERTICAL SEPARATION WHERE WATER SERVICE / MAIN PASSES OVER A SEWER DRAIN OR MUNICIPAL SEWER MAIN MUST BE A MINIMUM 0.25M UNLESS GREATER SEPARATION IS REQUIRED TO PROVIDE PROPER BEDDING AND STRUCTURAL SUPPORT. WATER SERVICES/MAINS PASSING UNDER SEWER DRAINS OR MUNICIPAL SEWER DRAINS MUST HAVE A SEPARATION OF 0.50M BETWEEN THE INVERT OF THE SEWER MAIN/DRAIN AND THE CROWN OF THE WATER SERVICE/MAIN.

1. LOCATIONS UNDERGROUND SERVICES ARE APPROXIMATE AND MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
2. ANY DISCREPANCIES BETWEEN SERVICE LOCATIONS AND THESE ENGINEERING DRAWINGS MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT ENGINEER.
3. THIS PLAN SHALL BE INTERPRETED IN CONJUNCTION WITH THE SITE PLAN DRAWING PREPARED BY CUSIMANO ARCHITECT (LATEST VERSION). ANY DISCREPANCIES MUST BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY.

NO:	DATE:	DESCRIPTION:
3	2023-09-20	ISSUED WITH FSR
2	2023-09-15	ISSUED WITH FSR
1	2023-09-05	ISSUED FOR CLIENT REVIEW
0	2023-03-15	ISSUED FOR FSR

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289-309-3632

CLIENT:

TRINITYSTAR AQUILA INC.

MUNICIPALITY:

TOWN OF FORT ERIE

PROJECT NAME:

1127 GARRISON RD.

TITLE:

SERVICING PLAN

SCALE: 1:400	DATE: 2022-09-29
CHECKED BY: AS	DESIGNED BY: BC
DWG No: 22038TSA	SHEET No: 2

Appendix 'B'

Fire Protection Plan

Fire Flow Requirement Calculations – Unit 1, 2, 3

Domestic Water Demand Calculations

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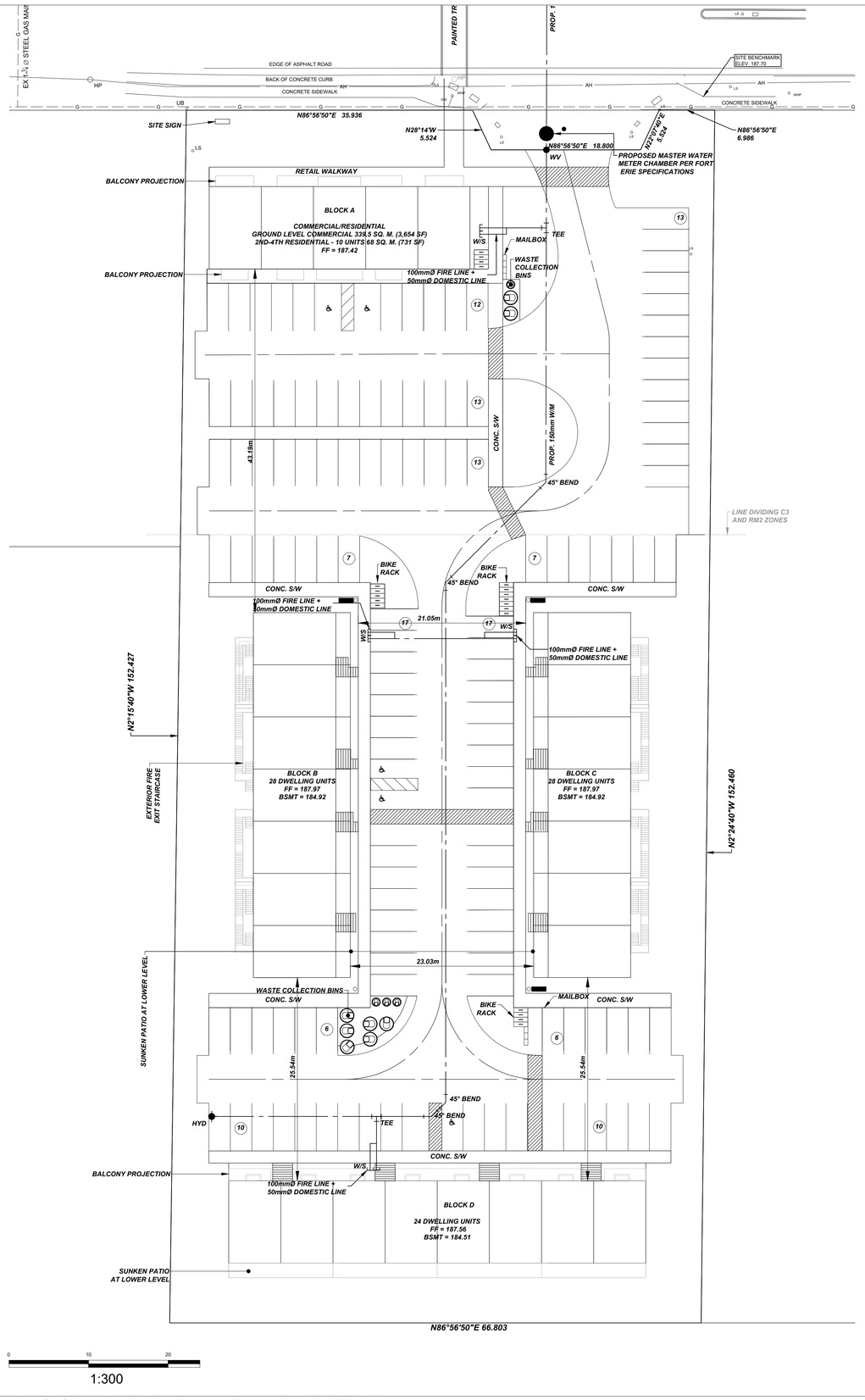

KEY PLAN N.T.S.

BENCHMARK NOTE:

ELEVATIONS HEREON ARE ORTHOMETRIC AND ARE RELATED TO CGVD28, HT2, AS PREVIOUSLY ESTABLISHED BY THE LAROQUE GROUP.

SITE BENCHMARK :

CONCRETE SIDEWALK CORNER, NORTH-EAST OF 1127 GARRISON ROAD.

ELEVATION = 187.70m

GENERAL NOTES:

1. TENDERER SHALL SATISFY THEMSELVES AS TO THE NATURE OF THE GROUND AND BID ACCORDINGLY.
2. ALL ROCK LINE INDICATIONS SHOWN ON THE PLAN MUST BE VERIFIED BY THE CONTRACTOR.
3. CONTRACTOR SHALL VERIFY LOCATIONS AND INVERTS OF ALL EXISTING SANITARY AND STORM SEWERS AND WATERMAINS, PRIVATE DRAINS AND WATER SERVICES, GAS MAINS, CABLE TV, HYDRO AND TELEPHONE DUCTS ETC AT START OF CONSTRUCTION.

NO:	DATE:	DESCRIPTION:
1	2023-09-20	ISSUED WITH FSR
0	2023-03-14	FIRST SUBMISSION

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ANDREW@LANDSMITHEC.COM
289-309-3632

CLIENT:

TRINITYSTAR AQUILA INC.

MUNICIPALITY:

TOWN OF FORT ERIE

PROJECT NAME:

1127 GARRISON RD.

TITLE:

FIRE PROTECTION PLAN

SCALE: 1:300	DATE: 2022-12-13
CHECKED BY: AS	DESIGNED BY: AS
DWG No: 22038TSA	SHEET No: 5

NOTES:

1. LOCATIONS UNDERGROUND SERVICES ARE APPROXIMATE AND MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
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LandSmith
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Date: 3/14/2023

FIRE FLOW DEMAND REQUIREMENTS

Project: 1127 Garrison Road, UNIT 1
Method: OFM-TG-03-1999
FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE
http://www.mcscs.jus.gov.on.ca/english/FireMarshal/Legislation/TechnicalGuidelinesandReports/TG-1999-03.html

Formula:

$$Q = K \times V \times S_{Tot}$$

Where:
Q = minimum supply of water in litres
K = water supply coefficient (Table 1)
V = total building volume in cubic meters
S_{Tot} = total of spacial coefficient tables

Volume (V)

1st + 2nd + 3rd + 4th Floor

Ground Floor Area:	543.33	(sq.m)
Height:	12	(m)
Volume 1 (Building):	6519.96	(cu.m)

Total Volume (V) = 6520.0 (cu.m)

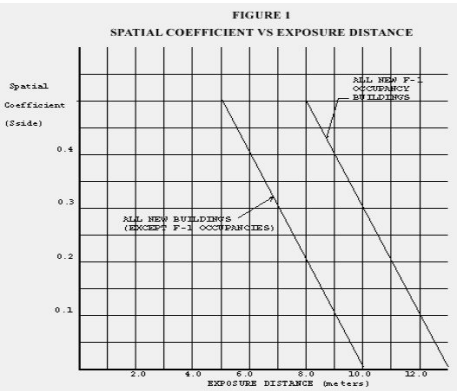
Water Supply Coefficient (K)

K: 18
OBC Part: C (Residential)
Construction Type: *Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2. of the OBC.*

Spacial Coefficients (S)

	Distance		
S_1	0	25.4	(North)
S_2	0	50	(East)
S_3	0	50	(South)
S_4	0	50	(West)

S_{Tot} = $1.0 + S_1 + S_2 + S_3 + S_4 =$ **1**



Q = ***117,360***

Required Flow Rate (OBC) = ***2,700*** **L / Min**
(See Table 2 **=** ***45*** **L / Sec**

Table 2: Minimum Water Supply Flow Rates	
Building Code, Part 3 Buildings	**Required Minimum Water Supply Flow Rate (L/min.)**
One-storey building with building area not exceeding 600m² (excluding F-1 occupancies)	1800
All other buildings	2700 (If **Q** ≤ 108,000L)(1) 3600 (If **Q** > 108,000L **and** ≤ 135,000L)(1) 4500 (If **Q** > 135,000L **and** ≤ 162,000L)(1) 5400 (If **Q** > 162,000L **and** ≤ 190,000L)(1) 6300 (If **Q** > 190,000L **and** ≤ 270,000L)(1) 9000 (If **Q** > 270,000L)(1)

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ENGINEERING & CONSULTING LTD.

Date: 3/14/2023

FIRE FLOW DEMAND REQUIREMENTS

Project: 1127 Garrison Road, UNIT 2
Method: OFM-TG-03-1999
FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE
http://www.mcscs.jus.gov.on.ca/english/FireMarshal/Legislation/TechnicalGuidelinesandReports/TG-1999-03.html

Formula:

$$Q = K \times V \times S_{Tot}$$

Where:
Q = minimum supply of water in litres
K = water supply coefficient (Table 1)
V = total building volume in cubic meters
S_{Tot} = total of spacial coefficient tables

Volume (V)

1st + 2nd + 3rd + 4th floor

Ground Floor Area:	475.4	(sq.m)
Height:	12	(m)
Volume 1 (Building):	5704.8	(cu.m)

Total Volume (V) = 5704.8 (cu.m)

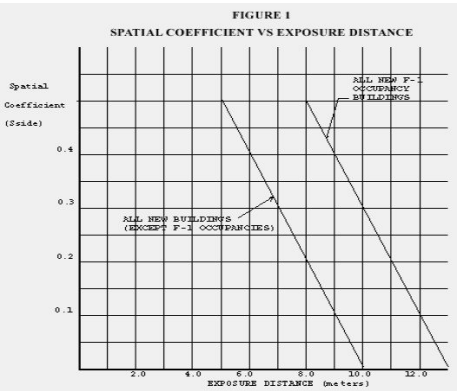
Water Supply Coefficient (K)

K: 18
OBC Part: C (Residential)
Construction Type: *Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2. of the OBC.*

Spacial Coefficients (S)

	Distance		
S_1	0	45.2	(North)
S_2	0	21.05	(East)
S_3	0	25.4	(South)
S_4	0	50	(West)

S_{Tot} = 1.0 + S_1 + S_2 + S_3 + S_4 = 1



Q = *102,686*

Required Flow Rate (OBC) = *2,700* L / Min
(See Table 2 = ***45*** **L / Sec**

Table 2: Minimum Water Supply Flow Rates	
Building Code, Part 3 Buildings	**Required Minimum Water Supply Flow Rate (L/min.)**
One-storey building with building area not exceeding 600m² (excluding F-1 occupancies)	1800
All other buildings	2700 (If **Q** ≤ 108,000L)(1) 3600 (If **Q** > 108,000L **and** ≤ 135,000L)(1) 4500 (If **Q** > 135,000L **and** ≤ 162,000L)(1) 5400 (If **Q** > 162,000L **and** ≤ 190,000L)(1) 6300 (If **Q** > 190,000L **and** ≤ 270,000L)(1) 9000 (If **Q** > 270,000L)(1)

LandSmith
ENGINEERING & CONSULTING LTD.

Date: 3/14/2023

FIRE FLOW DEMAND REQUIREMENTS

Project: 1127 Garrison Road, UNIT 2
Method: OFM-TG-03-1999
FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE
http://www.mcscs.jus.gov.on.ca/english/FireMarshal/Legislation/TechnicalGuidelinesandReports/TG-1999-03.html

Formula:

$$Q = K \times V \times S_{Tot}$$

Where:
Q = minimum supply of water in litres
K = water supply coefficient (Table 1)
V = total building volume in cubic meters
S_{Tot} = total of spacial coefficient tables

Volume (V)

1st + 2nd + 3rd + 4th floor

Ground Floor Area:	543.33	(sq.m)
Height:	12	(m)
Volume 1 (Building):	6519.96	(cu.m)

Total Volume (V) = 6520.0 (cu.m)

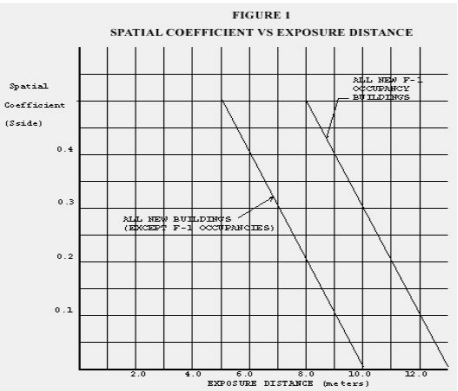
Water Supply Coefficient (K)

K: 18
OBC Part: C (Residential)
Construction Type: *Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2. of the OBC.*

Spacial Coefficients (S)

	Distance		
S_1	0	45.2	(North)
S_2	0	21.05	(East)
S_3	0	25.4	(South)
S_4	0	50	(West)

S_{Tot} = 1.0 + S_1 + S_2 + S_3 + S_4 = 1



Q = *117,360*

Required Flow Rate (OBC) = *3,600* L / Min
(See Table 2 = ***60*** **L / Sec**

Table 2: Minimum Water Supply Flow Rates	
Building Code, Part 3 Buildings	**Required Minimum Water Supply Flow Rate (L/min.)**
One-storey building with building area not exceeding 600m² (excluding F-1 occupancies)	1800
All other buildings	2700 (If **Q** ≤ 108,000L)(1) 3600 (If **Q** > 108,000L **and** ≤ 135,000L)(1) 4500 (If **Q** > 135,000L **and** ≤ 162,000L)(1) 5400 (If **Q** > 162,000L **and** ≤ 190,000L)(1) 6300 (If **Q** > 190,000L **and** ≤ 270,000L)(1) 9000 (If **Q** > 270,000L)(1)

LandSmith
ENGINEERING & CONSULTING LTD.

Date: ***2023-09-21***

DOMESTIC WATER USEAGE REQUIREMENTS

Project: 1127 Garrison Road, Fort Erie
Method: Fixture Unit Method, Per OBC Table 7.6.3.2.A

Fixtures: The number of fixtures was calculated based on the Floor Plans by Organica Studio Inc. + dated Sept. 19, 2023

Amount	***Fixture Type***	***Fixture Units Per***	***Total***	
5	Public Bathroom Group	2.2	11	(Commercial Units)
33	Watercloset	2	66	
85	Private Bathroom Group	3.6	306	
29	Dishwasher	1.4	40.6	
60	Kitchen Sink	1.4	84	
60	Clothes Washer	1.4	84	
8	Hose Bib	2.5	20	
	Total:		***611.6***	***612***

1 - Reference Table 7.6.3.2.A, Ontario Building Code

Hydraulic Load: Fixture units are then transferred to Hydaulic Load based on Ontario Building Code Table 7.4.10.5.

Column 1	Column 2	Column 3	Column 4
Fixture Units in service	*Max Drainage Rate (Gal/m)*		
	Col. 1	Col. 1 × 10	Col. 1 × 100
100	53	174	900
90	51	164	835
80	49	153	750
70	47	140	680
60	44	128	600
50	41	115	520
40	38	102	435
30	33	88	350
20	27	72	262
10	21	53	174

Maximum hydraulic load is estimated to be 129 Imperial Gallons / Minute

612 Fixture Units = 9.77 L/s

The estimated maximum hydraulic load for the proposed development (90 Units) is 9.77 L/s

Appendix 'C'

Sanitary Drainage Area Plan

Pages from Niagara Region Water / Wastewater Master Servicing Plan (2016)

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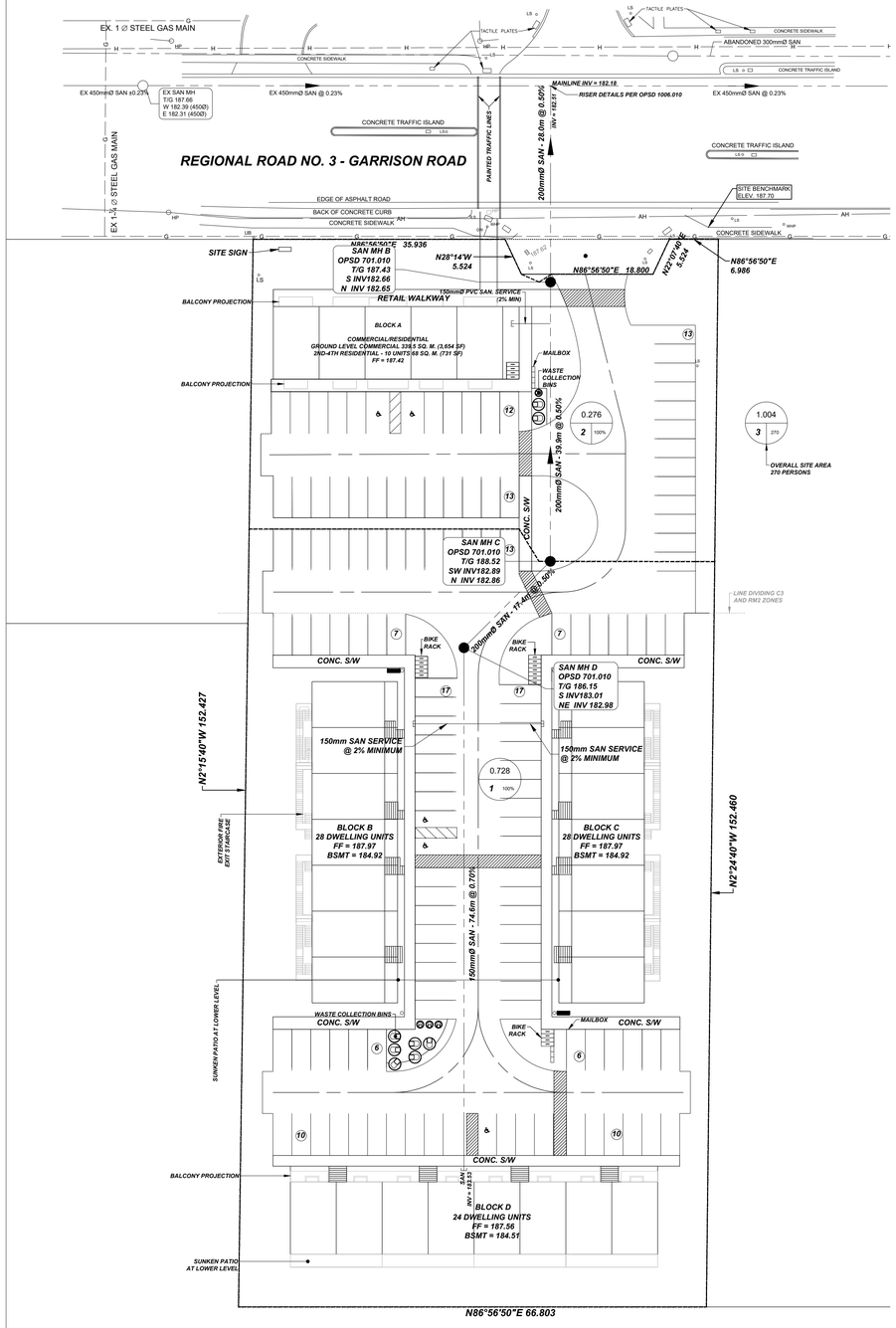

LEGEND

- EXISTING SANITARY
- PROPOSED SANITARY
- SAN — EXISTING SANITARY MAINTENANCE HOLE
- SAN — PROPOSED SANITARY MAINTENANCE HOLE
- PLUG — EXISTING PLUG
- PLUG — PROPOSED PLUG
- HYD — PROPOSED FIRE HYDRANT
- FH — EXISTING FIRE HYDRANT
- 0.077 / 1 / 141 — AREA (HECTARES) / POPULATION DENSITY / DRAINAGE AREA NO.

KEY PLAN N.T.S.

BENCHMARK NOTE:

ELEVATIONS HEREON ARE ORTHOMETRIC AND ARE RELATED TO CGVD28, HT2, AS PREVIOUSLY ESTABLISHED BY THE LAROQUE GROUP.

SITE BENCHMARK :

CONCRETE SIDEWALK CORNER, NORTH-EAST OF 1127 GARRISON ROAD.

ELEVATION = 187.70

GENERAL NOTES:

1. TENDERER SHALL SATISFY THEMSELVES AS TO THE NATURE OF THE GROUND AND BID ACCORDINGLY.
2. ALL ROCK LINE INDICATIONS SHOWN ON THE PLAN MUST BE VERIFIED BY THE CONTRACTOR.
3. CONTRACTOR SHALL VERIFY LOCATIONS AND INVERTS OF ALL EXISTING SANITARY AND STORM SEWERS AND WATERMAINS, PRIVATE DRAINS AND WATER SERVICES, GAS MAINS, CABLE TV, HYDRO AND TELEPHONE DUCTS ETC AT START OF CONSTRUCTION.

NO:	DATE:	DESCRIPTION:
1	2023-09-21	ISSUED WITH FSR
0	2023-03-14	FIRST SUBMISSION

REVISIONS

SEAL

LandSmith ENGINEERING & CONSULTING LTD.
LANDSMITH ENGINEERING & CONSULTING LTD.
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HAMILTON, ON L9C 3A6
ANDREW@LANDSMITHEC.COM
289-309-3632

CLIENT:

TRINITYSTAR AQUILA INC.

MUNICIPALITY:

TOWN OF FORT ERIE

PROJECT NAME:

1127 GARRISON RD.

TITLE:

SANITARY DRAINAGE AREA PLAN

SCALE: 1:400	DATE: 2022-09-29
CHECKED BY: AS	DESIGNED BY: BC
DWG No: 22038TSA	SHEET No: 6

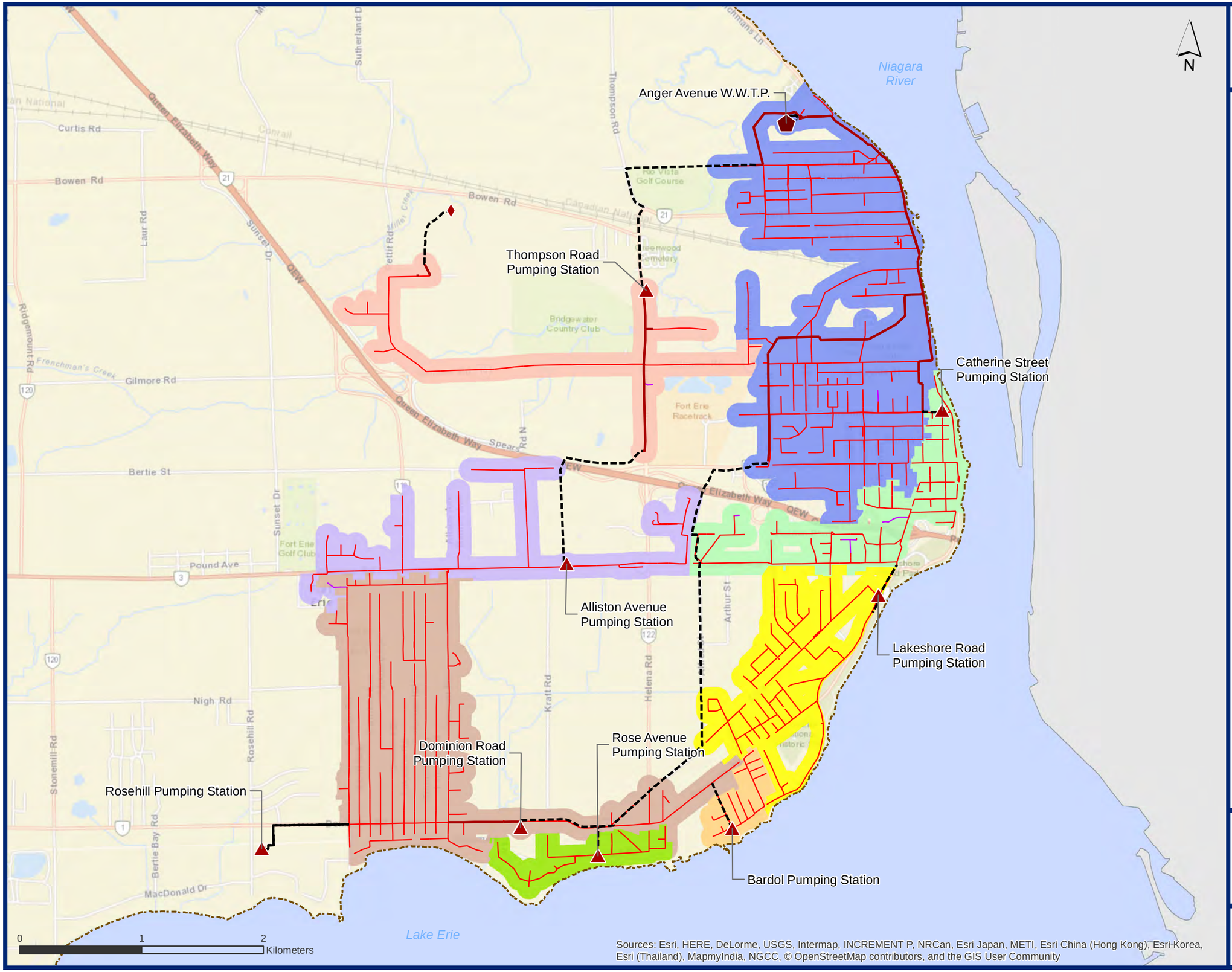
APPROVAL OF THIS DRAWING IS FOR MATERIAL ACCEPTABILITY AND COMPLIANCE WITH MUNICIPAL AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION BY THE CITY OF THE WORKS DOES NOT CERTIFY THE LINE AND GRADE OF THE WORKS AND IT IS THE OWNER'S RESPONSIBILITY TO HAVE THEIR ENGINEER CERTIFY THIS ACCORDINGLY.

NOTES re: SEPARATION DISTANCES:

1. MINIMUM HORIZONTAL SEPARATION BETWEEN WATER SERVICES / MAINS AND SEWER DRAINS AND MUNICIPAL SEWER MAINS SHALL BE 2.5M MEASURED FROM THE CLOSEST PIPE EDGE TO THE CLOSEST PIPE EDGE.
2. VERTICAL SEPARATION WHERE WATER SERVICE / MAIN PASSES OVER A SEWER DRAIN OR MUNICIPAL SEWER MAIN MUST BE A MINIMUM 0.25M UNLESS GREATER SEPARATION IS REQUIRED TO PROVIDE PROPER BEDDING AND STRUCTURAL SUPPORT. WATER SERVICES/MAINS PASSING UNDER SEWER DRAINS OR MUNICIPAL SEWER DRAINS MUST HAVE A SEPARATION OF 0.50M BETWEEN THE INVERT OF THE SEWER MAIN/DRAIN AND THE CROWN OF THE WATER SERVICE/MAIN.

NOTES:

1. LOCATIONS UNDERGROUND SERVICES ARE APPROXIMATE AND MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
2. ANY DISCREPANCIES BETWEEN SERVICE LOCATIONS AND THESE ENGINEERING DRAWINGS MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT ENGINEER.
3. THIS PLAN SHALL BE INTERPRETED IN CONJUNCTION WITH THE SITE PLAN DRAWING PREPARED BY CUSIMANO ARCHITECT (LATEST VERSION). ANY DISCREPANCIES MUST BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY.



Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Niagara Region

2016 MASTER SERVICING PLAN

Wastewater Facilities

- Wastewater Treatment Plant
- Combined Sewage Detention Facility
- Lagoon
- Odour Control Facility
- Leachate Pumping Station

Pumping Stations

- Regional
- Municipal
- Private

Wastewater Network

- Regional
- Local
- Private
- Forcemain

Wastewater Catchments*

*Catchment limits are shown based on property boundaries and are within 100 m of sewers.

- Anger Avenue W.W.T.P.
- Alliston Avenue
- Bardol
- Catherine Street
- Dominion Road
- Lakeshore Road
- Rose Avenue
- Thompson Road

Figure 4.H.1

Existing Wastewater System

Anger Avenue WWTP

BluePlan Engineering

June 2017
715023-WW-2-Existing System (Anger Avenue)
NAD 1983 UTM Zone 17N

Table 4.H.7 Existing Wastewater System Flows by Catchment

Catchment	Total Service Equivalent Population	Existing Average Dry Weather Flow (L/s)	Existing Design Peak Wet Weather Flow (L/s)	Existing 2-Year Flow (L/s)	Existing 5-Year Flow (L/s)
Anger Avenue Wastewater Treatment Plant (WWTP)	25,431	136.7	657.5	784.6	841.6
Anger Avenue WWTP	10,702	75.9	272.2	340.0	420.0
Thompson Road Sewage Pumping Station (SPS)	6,579	19.0	116.5	169.0	226.0
Thompson Road SPS	2,104	13.2	64.0	122.0	164.0
Alliston Avenue SPS	4,475	5.8	52.5	47.0	62.0
Catherine Street SPS	2,783	24.4	125.8	180.0	270.0
Catherine Street SPS	1,324	17.0	69.1	77.0	126.0
Lakeshore SPS	1,459	7.4	56.7	103.0	144.0
Dominion Road SPS	5,366	17.4	143.0	1107.0	1540.0
Dominion Road SPS	4,686	13.4	114.2	897.5	1248.5
Rose Avenue SPS	363	1.6	16.1	129.0	179.5
Bardol SPS	317	2.4	12.7	80.5	112.0

Note: Flow numbers may not sum due to rounding.

Table 4.H.10 Projected Peak Dry Weather Flow by Catchment

Catchment	2021 Design Peak Dry Weather Flow (L/s)	2026 Design Peak Dry Weather Flow (L/s)	2031 Design Peak Dry Weather Flow (L/s)	2036 Design Peak Dry Weather Flow (L/s)	2041 Design Peak Dry Weather Flow (L/s)
Anger Avenue Wastewater Treatment Plant	153.5	160.4	168.8	189.5	200.0
Alliston Avenue Sewage Pumping Station (SPS)	14.2	18.3	19.8	21.3	23.4
Bardol SPS	5.3	6.6	7.7	8.7	9.1
Catherine Street SPS	34.5	35.2	35.8	35.9	36.2
Dominion Road SPS	29.0	34.5	38.1	40.3	41.5
Lakeshore Road SPS	15.6	18.3	20.2	21.9	22.7
Rose Avenue SPS	3.4	4.3	5.1	5.6	5.8
Thompson Road SPS	35.3	40.4	46.8	53.8	60.9
Total	**290.9**	**318.1**	**342.3**	**377.1**	**399.5**

The following presents an example calculation of projected peak dry weather flow.

2041 Peak Dry Weather Flow for Lakeshore Road Sewage Pumping Station:
= (2014 Average Dry Weather Flow × Peaking Factor) +
(2041 Equivalent Population – 2014 Equivalent Population) × 275 L/cap/day ×
1 day/86400 s × Harmon Peaking Factor for Growth Population
= (7.41 L/s × 2.0) + (2,155 – 1,459 people) × 275 L/cap/day × 1 day/86400 s × 3.56
= 22.7 L/s

Table 4.H.11 Projected Peak Wet Weather Flow by Catchment

Catchment	2021 Design Peak Wet Weather Flow (L/s)	2026 Design Peak Wet Weather Flow (L/s)	2031 Design Peak Wet Weather Flow (L/s)	2036 Design Peak Wet Weather Flow (L/s)	2041 Design Peak Wet Weather Flow (L/s)
Anger Avenue Wastewater Treatment Plant	273.9	280.7	289.1	309.9	320.3
Alliston Avenue Sewage Pumping Station (SPS)	55.1	59.2	60.7	62.3	64.3
Bardol SPS	13.1	14.4	15.6	16.5	16.9
Catherine Street SPS	69.7	70.4	70.9	71.1	71.4
Dominion Road SPS	116.5	121.9	125.5	127.7	128.9
Lakeshore Road SPS (Fort Erie)	57.5	60.2	62.1	63.8	64.6
Rose Avenue SPS	16.2	17.2	18.0	18.5	18.7
Thompson Road SPS	72.9	78.1	84.4	91.4	98.5
Total	**675.0**	**702.1**	**726.4**	**761.2**	**783.6**

The following presents an example calculation of projected peak wet weather flow.

2041 Peak Wet Weather Flow for Lakeshore Road Sewage Pumping Station:
= 2041 Peak Dry Weather Flow + 2041 Design RDII
= 2041 Peak Dry Weather Flow + (2041 Catchment Area × 0.286 L/s/ha)
= 22.7 L/s + (146.4 ha × 0.286 L/s/ha)
= 64.6 L/s

Table 4.H.12 System Sewage Pumping Station Performance

Sewage Pumping Station	Contributing Catchments	Facility Operational Capacity (L/s)	Existing Design Peak Wet Weather Flow (L/s)	2041 Design Peak Wet Weather Flow (L/s)	2041 Surplus/ Deficit (L/s)
Thompson Road Sewage Pumping Station (SPS)	Thompson Road SPS (Including Sub Catchments) Alliston Avenue SPS	298.0	116.5	158.6	139.4
Alliston Avenue SPS	Alliston Avenue SPS	43.0	52.5	64.3	-21.3
Catherine Street SPS	Catherine Street SPS (Including Sub Catchments) Lakeshore Road SPS	117.0	125.8	135.3	-18.3
Lakeshore Road SPS	Lakeshore Road SPS	63.0	56.7	64.6	-1.6
Dominion Road SPS	Dominion Road SPS (Including Sub Catchments) Rose Avenue SPS Bardol SPS	215.0	143.0	162.7	52.3
Rose Avenue SPS	Rose Avenue SPS	48.0	16.1	18.7	29.3
Bardol SPS	Bardol SPS	45.0	12.7	16.9	28.1

The following sewage pumping stations have projected pumping deficits:

- Alliston Avenue Sewage Pumping Station
- Catherine Street Sewage Pumping Station
- Lakeshore Road Sewage Pumping Station

Table 4.H.14 Summary of Anger Avenue Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-FM-001	Upgrade Catherine Street Sewage Pumping Station (SPS) Forcemain	Upgrade Catherine Street SPS Forcemain in Fort Erie	300 mm	2032-2041	Fort Erie	A+	Satisfied	Forcemain	$467,000
WW-II-001	Wet weather reduction in East Fort Erie	Wet weather reduction in East Fort Erie	30 L/s reduction	2022-2031	Fort Erie	N/A	Dependent on outcome of wet weather flow study	Wet Weather Reduction	$4,500,000
WW-SPS-001	Alliston Avenue SPS Pump Replacement - Anger Avenue	Increase station capacity from 43 L/s to 129 L/s.	129 L/s	2022-2031	Fort Erie	A+	Satisfied	Pumping	$989,000
WW-SPS-002	Catherine Street SPS Expansion - Anger Avenue	Increase station capacity from 117 L/s to 140 L/s	140 L/s	2032-2041	Fort Erie	A+	Satisfied	Pumping	$2,945,000
WW-SPS-003	Lakeshore Road SPS Upgrade - Anger Avenue	Increase station capacity from 63 L/s to 70 L/s	70 L/s	2022-2031	Fort Erie	A+	Satisfied	Pumping	$2,618,000
Total									**$11,519,000**

Appendix 'D'

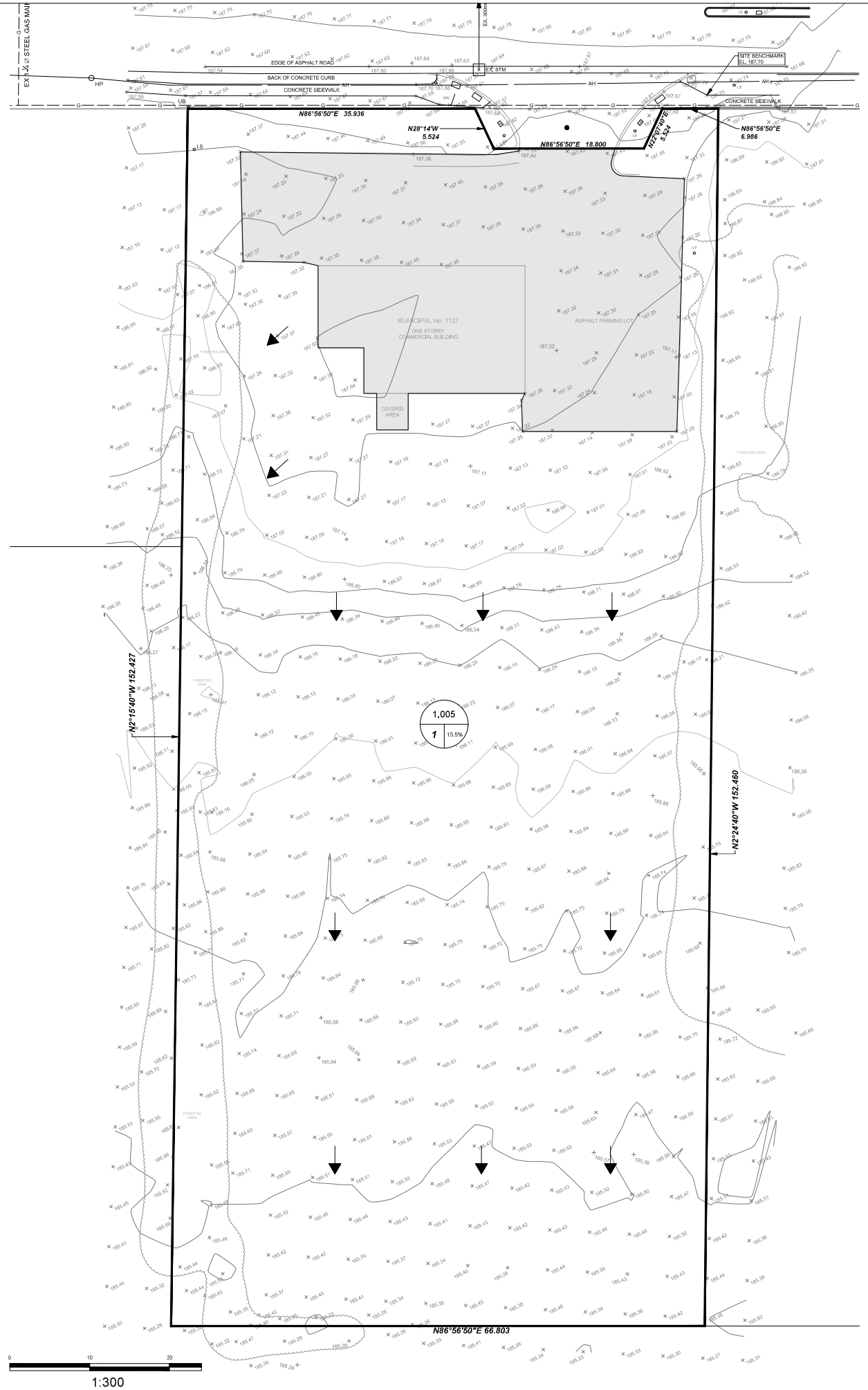
Pre-Development Drainage Area Plan

NPCA Figure re: Drainage Context

Post-Development Drainage Area Plan

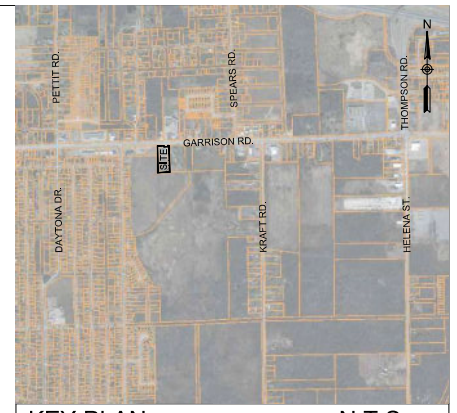
Permeable Paver Fact Sheet

Bio-Swale Fact Sheet



LEGEND

- 0.035 / 1 / 100% — DRAINAGE AREA (HECTARES) / IMPERVIOUSNESS (%) / DRAINAGE AREA NUMBER
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW ROUTE
- IMPERVIOUS SURFACE
- SHEET FLOW DIRECTION



KEY PLAN N.T.S.

BENCHMARK NOTE:

ELEVATIONS HEREON ARE ORTHOMETRIC AND ARE RELATED TO CGVD28, HT2, AS PREVIOUSLY ESTABLISHED BY THE LAROQUE GROUP.

SITE BENCHMARK :

CONCRETE SIDEWALK CORNER, NORTH-EAST OF 1127 GARRISON ROAD,

ELEVATION = 187.70m

GENERAL NOTES:

1. TENDERER SHALL SATISFY THEMSELVES AS TO THE NATURE OF THE GROUND AND BID ACCORDINGLY.
2. ALL ROCK LINE INDICATIONS SHOWN ON THE PLAN MUST BE VERIFIED BY THE CONTRACTOR.
3. CONTRACTOR SHALL VERIFY LOCATIONS AND INVERTS OF ALL EXISTING SANITARY AND STORM SEWERS AND WATERMAINS, PRIVATE DRAINS AND WATER SERVICES, GAS MAINS, CABLE TV, HYDRO AND TELEPHONE DUCTS ETC AT START OF CONSTRUCTION.

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NO:	DATE:	DESCRIPTION:
0	2023-03-14	FIRST SUBMISSION

REVISIONS

SEAL

LandSmith ENGINEERING & CONSULTING LTD.
LANDSMITH ENGINEERING & CONSULTING LTD.
1059 UPPER JAMES STREET, SUITE 207
HAMILTON, ON L9C 3A6
ANDREW@LANDSMITHEC.COM
289-309-3632

CLIENT:

TRINITYSTAR AQUILA INC.

MUNICIPALITY:

TOWN OF FORT ERIE

PROJECT NAME:

1127 GARRISON RD.

TITLE:

PRE-DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1:300	DATE: 2022-12-13
CHECKED BY: AS	DESIGNED BY: AS
DWG No: 22036TSA	SHEET No: 3

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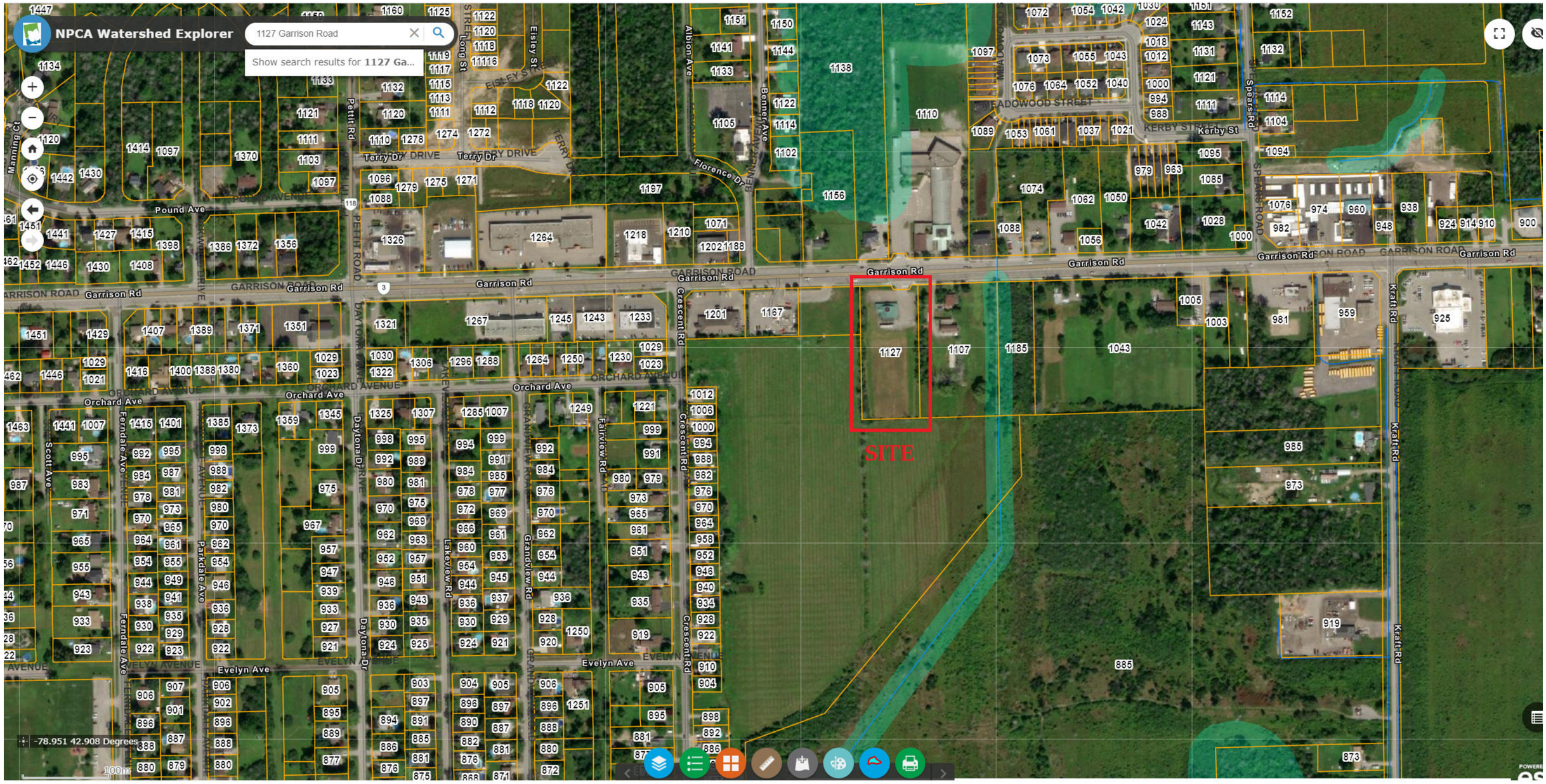
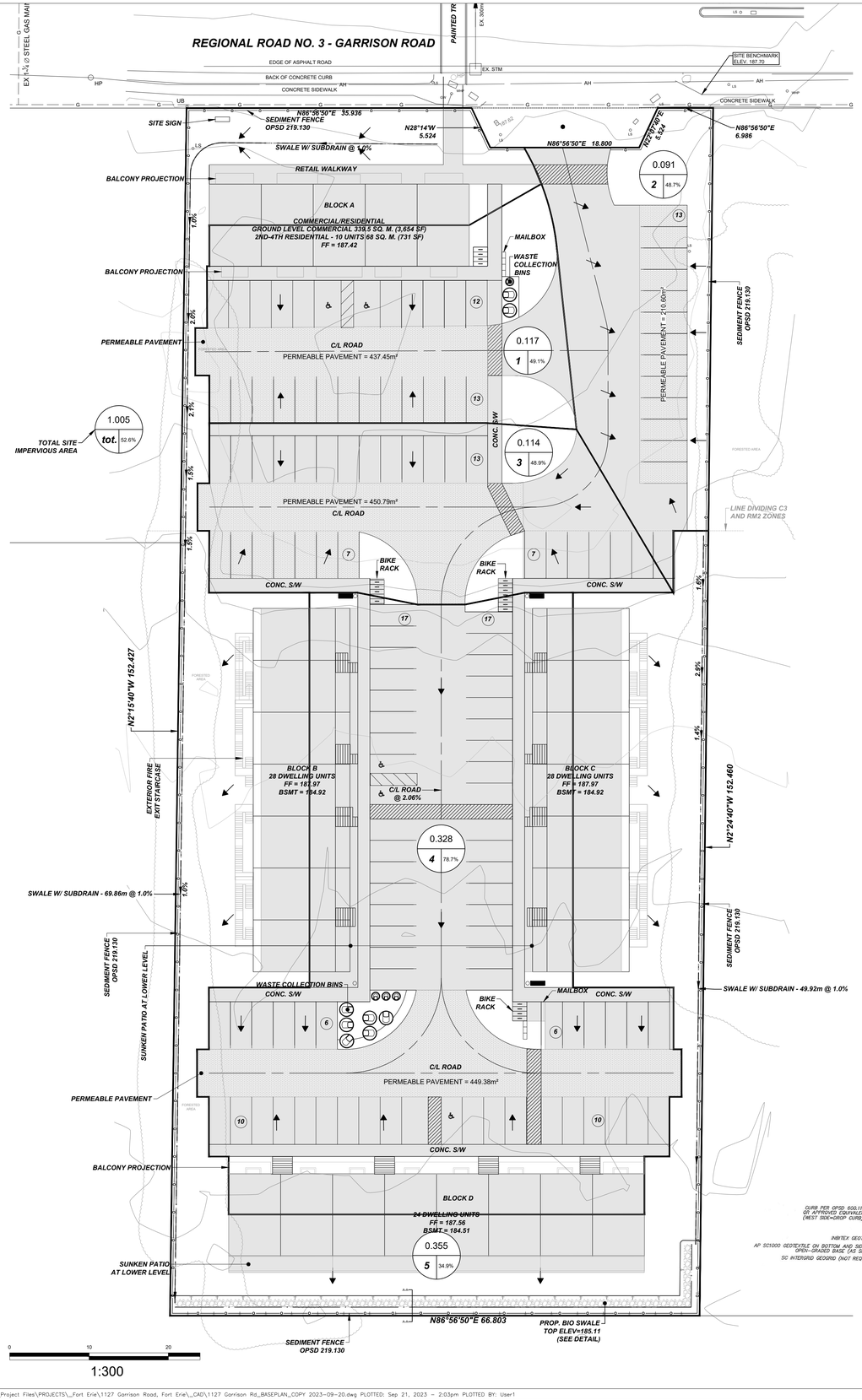


1127 Garrison Road, NPCA Watershed Explorer, Storm Drainage Context



LEGEND

- 0.035 / 1 / 100% — DRAINAGE AREA (HECTARES) / IMPERVIOUSNESS (%) / DRAINAGE AREA NUMBER
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW ROUTE
- IMPERVIOUS SURFACE
- SHEET FLOW DIRECTION

KEY PLAN N.T.S.

BENCHMARK NOTE:

ELEVATIONS HEREON ARE ORTHOMETRIC AND ARE RELATED TO CGVD28, HT2, AS PREVIOUSLY ESTABLISHED BY THE LAROQUE GROUP.

SITE BENCHMARK :

CONCRETE SIDEWALK CORNER, NORTH-EAST OF 1127 GARRISON ROAD.

ELEVATION = 187.70m

GENERAL NOTES:

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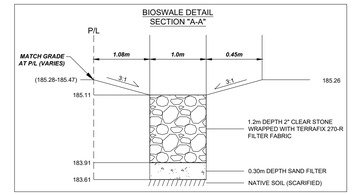
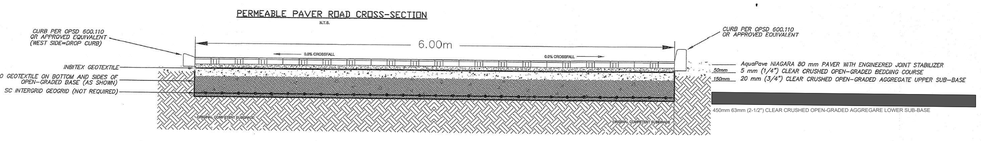
NO:	DATE:	DESCRIPTION:
1	2023-09-21	ISSUED WITH FSR
0	2023-03-14	FIRST SUBMISSION

REVISIONS

SEAL





TOTAL P.P. AREA = 1,558.59m²
P.P. VOLUME = 285m³

BIO-SWALE VOLUME = 35m³

NOTES:

1. LOCATIONS UNDERGROUND SERVICES ARE APPROXIMATE AND MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
2. ANY DISCREPANCIES BETWEEN SERVICE LOCATIONS AND THESE ENGINEERING DRAWINGS MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT ENGINEER.
3. THIS PLAN SHALL BE INTERPRETED IN CONJUNCTION WITH THE SITE PLAN DRAWING PREPARED BY CUSIMANO ARCHITECT (LATEST VERSION). ANY DISCREPANCIES MUST BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY.

LandSmith ENGINEERING & CONSULTING LTD.
LANDSMITH ENGINEERING & CONSULTING LTD.
1059 UPPER JAMES STREET, SUITE 207
HAMILTON, ON L9C 3A6
ANDREW@LANDSMITHEC.COM
289-309-3632

CLIENT:

TRINITYSTAR AQUILA INC.

MUNICIPALITY:

TOWN OF FORT ERIE

PROJECT NAME:

1127 GARRISON RD.

TITLE:

POST-DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1:300	DATE: 2022-12-13
CHECKED BY: AS	DESIGNED BY: AS
DWG No: 22038TSA	SHEET No: 4

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:             Z:\Project Files\PROJECTS\_Fort Erie\"
"                                   1127 Garrison Road, Fort Erie\SWM Calculations"
"                Output filename:                                  Pre_5year.out"
"                Licensee name:                                     Andrew Smith"
"                Company               LandSmith Engineering & Consulting Ltd."
"                Date & Time last used:               2023-03-14 at 1:57:15 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      628.050   Coefficient A"
"        6.652   Constant B"
"        0.796   Exponent C"
"        0.500   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            66.943    mm/hr"
"             Total depth                  29.334    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   No description"
"       15.000   % Impervious"
"        1.005   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.854   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.151   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.141   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.828   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.026     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.854      0.151      1.005      hectare"
"             Time of concentration  50.163     4.801      27.047     minutes"
"             Time to Centroid       177.653    106.056    141.168    minutes"
"             Rainfall depth         29.334     29.334     29.334     mm"
"             Rainfall volume        250.59     44.22      294.81     c.m"
"             Rainfall losses        25.209     5.046      22.185     mm"
"             Runoff depth           4.125      24.288     7.149      mm"
"             Runoff volume          35.24      36.61      71.85      c.m"
"             Runoff coefficient     0.141      0.828      0.244      "
"             Maximum flow           0.006      0.025      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.026     0.026     0.000     0.000"
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"                MIDUSS Output ------------------------------------------------>"
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"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:             Z:\Project Files\PROJECTS\_Fort Erie\"
"                                      1127 Garrison Road, Fort Erie\SWM Calculations"
"                Output filename:                                   Pre-5year.out"
"                Licensee name:                                      Andrew Smith"
"                Company               LandSmith Engineering & Consulting Ltd."
"                Date & Time last used:               2023-03-14 at 2:11:14 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      747.930   Coefficient A"
"        6.800   Constant B"
"        0.768   Exponent C"
"        0.500   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            85.669    mm/hr"
"             Total depth                  40.417    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   No description"
"       15.000   % Impervious"
"        1.005   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.854   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.151   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.216   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.864   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.036     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.854      0.151      1.005      hectare"
"             Time of concentration  38.154     4.310      24.168     minutes"
"             Time to Centroid       160.853    104.523    137.576    minutes"
"             Rainfall depth         40.417     40.417     40.417     mm"
"             Rainfall volume        345.26     60.93      406.19     c.m"
"             Rainfall losses        31.671     5.511      27.747     mm"
"             Runoff depth           8.747      34.906     12.670     mm"
"             Runoff volume          74.72      52.62      127.34     c.m"
"             Runoff coefficient     0.216      0.864      0.313      "
"             Maximum flow           0.016      0.034      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.036     0.036     0.000     0.000"
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"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:             Z:\Project Files\PROJECTS\_Fort Erie\"
"                                  1127 Garrison Road, Fort Erie\SWM Calculations"
"                Output filename:                                  Pre-100year.out"
"                Licensee name:                                       Andrew Smith"
"                Company               LandSmith Engineering & Consulting Ltd."
"                Date & Time last used:               2023-03-14 at 2:12:57 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1083.550   Coefficient A"
"        6.618   Constant B"
"        0.735   Exponent C"
"        0.500   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          137.317    mm/hr"
"             Total depth                 69.634    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   No description"
"       15.000   % Impervious"
"        1.005   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.854   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.151   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.368   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.900   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.078     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.854      0.151      1.005      hectare"
"             Time of concentration  25.692     3.539      19.011     minutes"
"             Time to Centroid       142.989    101.881    130.592    minutes"
"             Rainfall depth         69.634     69.634     69.634     mm"
"             Rainfall volume        594.85     104.97     699.82     c.m"
"             Rainfall losses        44.016     6.953      38.457     mm"
"             Runoff depth           25.618     62.681     31.177     mm"
"             Runoff volume          218.84     94.49      313.33     c.m"
"             Runoff coefficient     0.368      0.900      0.448      "
"             Maximum flow           0.064      0.057      0.078      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.078     0.078     0.000     0.000"
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```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                                February 7, 2010"
"          10   Units used:                                          ie METRIC"
"               Job folder:             Z:\Project Files\PROJECTS\_Fort Erie\"
"                                  1127 Garrison Road, Fort Erie\SWM Calculations"
"               Output filename:                         Post_2year_fixed.out"
"               Licensee name:                                    Andrew Smith"
"               Company               LandSmith Engineering & Consulting Ltd."
"               Date & Time last used:               2023-03-14 at 2:54:54 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"      628.050   Coefficient A"
"        6.652   Constant B"
"        0.796   Exponent C"
"        0.500   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            66.943    mm/hr"
"             Total depth                  29.334    mm"
"           6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   No description"
"       70.000   % Impervious"
"        1.005   Total Area"
"       80.000   Flow length"
"        1.000   Overland Slope"
"        0.302   Pervious Area"
"       80.000   Pervious length"
"        1.000   Pervious slope"
"        0.703   Impervious Area"
"       80.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.141   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.828   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.112     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.302      0.703      1.005      hectare"
"             Time of concentration  61.758     5.910      9.701      minutes"
"             Time to Centroid       192.168    107.539    113.283    minutes"
"             Rainfall depth         29.334     29.334     29.334     mm"
"             Rainfall volume        88.44      206.37     294.81     c.m"
"             Rainfall losses        25.208     5.049      11.097     mm"
"             Runoff depth           4.126      24.285     18.237     mm"
"             Runoff volume          12.44      170.84     183.28     c.m"
"             Runoff coefficient     0.141      0.828      0.622      "
"             Maximum flow           0.002      0.112      0.112      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.112     0.112     0.000     0.000"
" 54          POND DESIGN"
"        0.112   Current peak flow    c.m/sec"
"        0.078   Target outflow    c.m/sec"
"        183.3   Hydrograph volume    c.m"
"          11.   Number of stages"
```

```
"        0.000   Minimum water level    metre"
"        1.500   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.1500  1.00E-07    33.000"
"                 0.3000  1.00E-07    66.000"
"                 0.4500  1.00E-07    99.000"
"                 0.6000   0.01027   132.000"
"                 0.7500   0.03866   165.000"
"                 0.9000   0.05381   198.000"
"                  1.050   0.06555   231.000"
"                  1.200   0.07549   264.000"
"                  1.350   0.08426   297.000"
"                  1.500   0.09220   330.000"
(NOTE RATING CURVE DOES NOT REFLECT SITE DESIGN, ADDED FOR VOLUME ESTIMATES ONLY)
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                  0.450     0.630    0.2100     1.000"
"             Peak outflow                  0.011    c.m/sec"
"             Maximum level                 0.604    metre"
"             Maximum storage             132.983    c.m"
"             Centroidal lag                3.201   hours"
"                  0.112     0.112     0.011     0.000 c.m/sec"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:             Z:\Project Files\PROJECTS\_Fort Erie\"
"                                  1127 Garrison Road, Fort Erie\SWM Calculations"
"                Output filename:                         Post_5year_fixed.out"
"                Licensee name:                                   Andrew Smith"
"                Company               LandSmith Engineering & Consulting Ltd."
"                Date & Time last used:               2023-03-14 at 2:52:30 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"      747.930   Coefficient A"
"        6.800   Constant B"
"        0.768   Exponent C"
"        0.500   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           85.669    mm/hr"
"             Total depth                 40.417    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   No description"
"       70.000   % Impervious"
"        1.005   Total Area"
"       80.000   Flow length"
"        1.000   Overland Slope"
"        0.302   Pervious Area"
"       80.000   Pervious length"
"        1.000   Pervious slope"
"        0.703   Impervious Area"
"       80.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.217   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.871   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.154     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.302      0.703      1.005      hectare"
"             Time of concentration  46.973     5.306      9.318      minutes"
"             Time to Centroid       171.845    105.859    112.213    minutes"
"             Rainfall depth         40.417     40.417     40.417     mm"
"             Rainfall volume        121.86     284.33     406.19     c.m"
"             Rainfall losses        31.666     5.213      13.149     mm"
"             Runoff depth           8.751      35.204     27.268     mm"
"             Runoff volume          26.38      247.66     274.04     c.m"
"             Runoff coefficient     0.217      0.871      0.675      "
"             Maximum flow           0.005      0.154      0.154      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.154     0.154     0.000     0.000"
" 54          POND DESIGN"
"        0.154   Current peak flow    c.m/sec"
"        0.078   Target outflow    c.m/sec"
"        274.0   Hydrograph volume    c.m"
```

```
"          11.   Number of stages"
"       0.000   Minimum water level    metre"
"       1.500   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"                0.1500  1.00E-07    33.000"
"                0.3000  1.00E-07    66.000"
"                0.4500  1.00E-07    99.000"
"                0.6000   0.01027   132.000"
"                0.7500   0.03866   165.000"
"                0.9000   0.05381   198.000"
"                 1.050   0.06555   231.000"
"                 1.200   0.07549   264.000"
"                 1.350   0.08426   297.000"
"                 1.500   0.09220   330.000"
(NOTE RATING CURVE DOES NOT REFLECT SITE DESIGN, ADDED FOR VOLUME ESTIMATES ONLY)
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                 0.450     0.630    0.2100     1.000"
"             Peak outflow                  0.036    c.m/sec"
"             Maximum level                 0.736    metre"
"             Maximum storage             162.017    c.m"
"             Centroidal lag                2.791   hours"
"                  0.154     0.154     0.036     0.000 c.m/sec"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                                February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:             Z:\Project Files\PROJECTS\_Fort Erie\"
"                                  1127 Garrison Road, Fort Erie\SWM Calculations"
"                Output filename:                        Post_100year_fixed.out"
"                Licensee name:                                    Andrew Smith"
"                Company               LandSmith Engineering & Consulting Ltd."
"                Date & Time last used:                2023-03-14 at 2:45:44 PM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"    1083.550   Coefficient A"
"       6.618   Constant B"
"       0.735   Exponent C"
"       0.500   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"            Maximum intensity          137.317    mm/hr"
"            Total depth                 69.634    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   No description"
"      70.000   % Impervious"
"       1.005   Total Area"
"      80.000   Flow length"
"       1.000   Overland Slope"
"       0.302   Pervious Area"
"      80.000   Pervious length"
"       1.000   Pervious slope"
"       0.703   Impervious Area"
"      80.000   Impervious length"
"       1.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.368   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.914   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.266     0.000     0.000     0.000 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
"            Surface Area           0.302      0.703      1.005      hectare"
"            Time of concentration  31.630     4.357      8.374      minutes"
"            Time to Centroid       150.490    102.985    109.981    minutes"
"            Rainfall depth         69.634     69.634     69.634     mm"
"            Rainfall volume        209.95     489.87     699.82     c.m"
"            Rainfall losses        43.998     6.021      17.414     mm"
"            Runoff depth           25.636     63.613     52.220     mm"
"            Runoff volume          77.29      447.52     524.81     c.m"
"            Runoff coefficient     0.368      0.914      0.750      "
"            Maximum flow           0.020      0.263      0.266      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.266     0.266     0.000     0.000"
" 54          POND DESIGN"
```

```
"        0.266   Current peak flow    c.m/sec"
"        0.078   Target outflow    c.m/sec"
"        524.8   Hydrograph volume    c.m"
"          11.   Number of stages"
"        0.000   Minimum water level    metre"
"        1.500   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.1500  1.00E-07    33.000"
"                 0.3000  1.00E-07    66.000"
"                 0.4500  1.00E-07    99.000"
"                 0.6000   0.01027   132.000"
"                 0.7500   0.03866   165.000"
"                 0.9000   0.05381   198.000"
"                  1.050   0.06555   231.000"
"                  1.200   0.07549   264.000"
"                  1.350   0.08426   297.000"
"                  1.500   0.09220   330.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                  0.450     0.630    0.2100     1.000"
"             Peak outflow                 0.076    c.m/sec"
"             Maximum level                1.208    metre"
"             Maximum storage            265.839    c.m"
"             Centroidal lag               2.586   hours"
"                  0.266     0.266     0.076     0.000 c.m/sec"
```

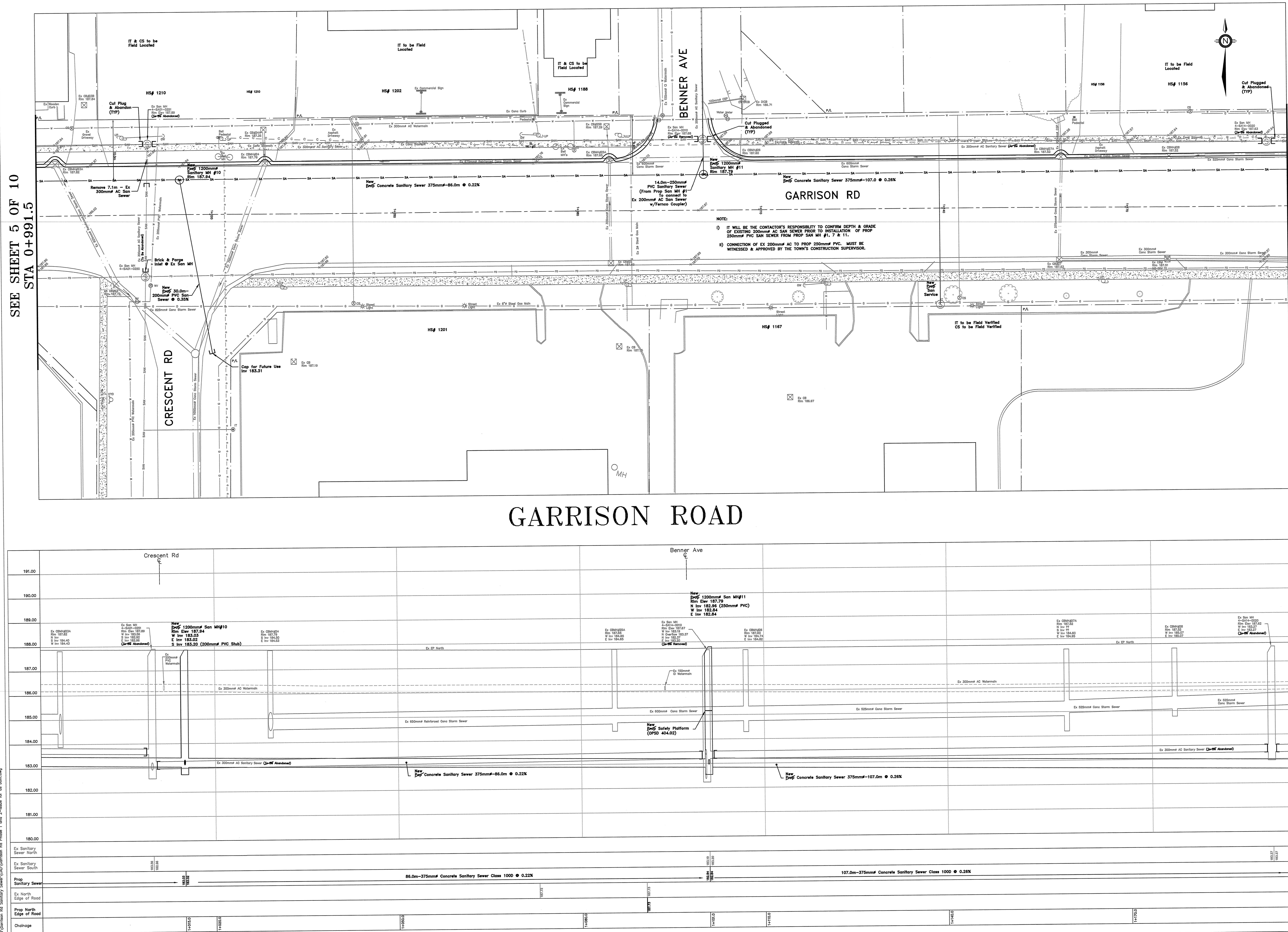
Appendix ‘E’

Garrison Road Plan & Profile, Sheet 6

Garrison Road Plan & Profile, Sheet 7

East Bertie Sewerage System Plan & Profile

LandSmith
ENGINEERING & CONSULTING LTD.



G:\PROJECTS\Projects 2008\Garrison Rd Sanitary Sewer\CAD\Garrison Rd Phase 1 and 2-issue for as built.dwg

LEGEND

EXISTING

Symbol	Description
—SAN—	Sanitary Sewer
—W—	Watermain
—GAS—GAS—	Gas Line
——	Edge of Asphalt Road
—B—B—	Bell Underground
—C—C—C—	Bell Conduit
—H—	Hydro Underground
× 189.82	Existing Elevations

CB	Catch Basin	SIB	Standard Iron Bar
WHP	Wood Hydro Pole	IP	Iron Pipe
WLP	Wood Light Pole	GV	Gas Valve
IB	Iron Bar	WV	Water Valve
BP	Bell Pedestal	CS	Curb Stop
CC	Cut Cross	HYD	Hydrant
RIB	Round Iron Bar	IT	Inspection Tee

PROPOSED

Symbol	Description
—SA—	Sanitary Sewer
◉	Sanitary Inspection Tee
═	Concrete Curb
(SA)	Sanitary Manhole

REV.	ISSUE	DATE	BY
5	ISSUED FOR AS BUILT	JUNE 13, 2013	YR
4	ISSUED FOR CONSTRUCTION	AUG 31, 2011	SB
3	ISSUED FOR MOE	JULY 21, 2011	SB
2	ISSUED FOR TENDER	JULY 13, 2011	SB
1	ISSUED TO REVIEW	JULY 7, 2011	SB

BENCH MARK

FROM INTERSECTION OF HWY 3 (GARRISON RD) AND THOMPSON RD, GO 1.4KM WEST TO GARRISON RD PUBLIC SCHOOL, CAP IS IN SOUTH FACE OF CONCRETE FOUNDATION IN EASTWARD PROJECTION, 36.80m NORTH OF CENTRE OF HWY 3, 0.30m WEST OF EASTERY CORNER. BM # V010895202
NORTHING 4752050
EASTING 666800
ELEVATION 188.281

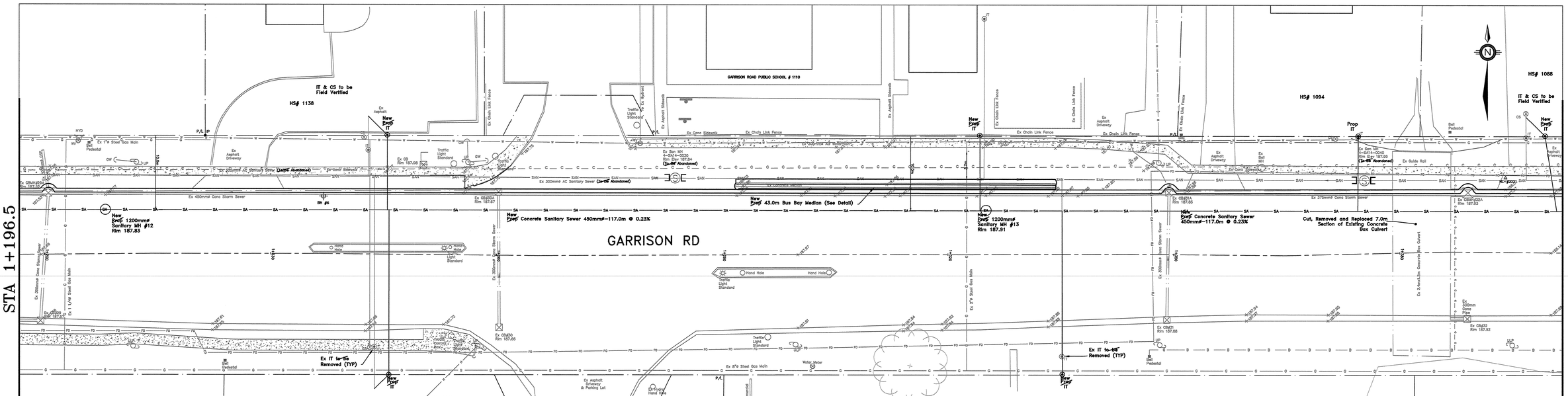
FORT ERIE ONTARIO
Our Focus: Your Future
INFRASTRUCTURE SERVICES

GARRISON ROAD SANITARY SEWER REPLACEMENT

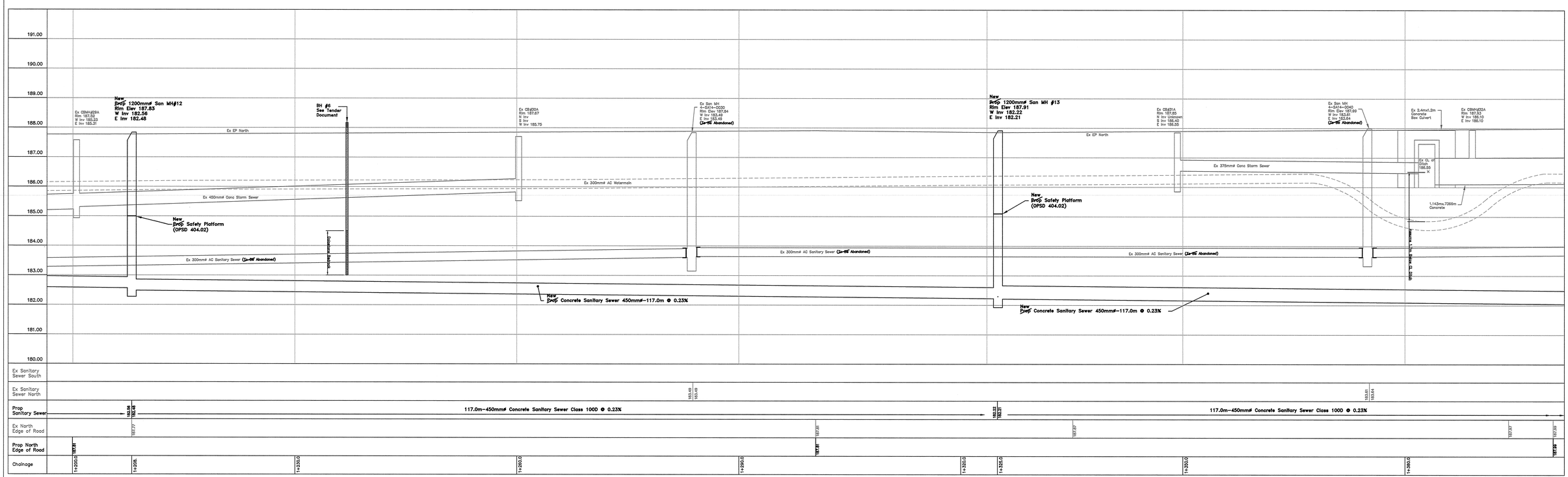
DSN. SMM	DSN. CKD. SMM	DWN. SB	DWG. CKD. SB
SCALE: HORIZONTAL 1:200, VERTICAL 1:50		PROJECT NO. IS10.GRSS	
DATE: MAY 2011		DWG. NO. 6 OF 11	REV. 3

SEE SHEET 6 OF 10
STA 1+196.5

SEE SHEET 8
STA 1+401.5



GARRISON ROAD



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LEGEND

EXISTING

- Sanitary Sewer
- Watermain
- Gas Line
- Edge of Asphalt Road
- Bell Underground
- Bell Conduit
- Hydro Underground
- 189.62 Existing Elevations

CB	Catch Basin	SIB	Standard Iron Bar
WHP	Wood Hydro Pole	IP	Iron Pipe
WLP	Wood Light Pole	GV	Gas Valve
IB	Iron Bar	WV	Water Valve
BP	Bell Pedestal	CS	Curb Stop
CC	Cut Cross	HYD	Hydrant
RIB	Round Iron Bar	IT	Inspection Tee

PROPOSED

- SA Sanitary Sewer
- Sanitary Inspection Tee
- Concrete Curb
- SA Sanitary Manhole

REV.	ISSUE	DATE	BY
5	ISSUED FOR AS BUILT	JUNE 13, 2013	YR
4	ISSUED FOR CONSTRUCTION	AUG 31, 2011	SB
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1	ISSUED TO REVIEW	JULY 7, 2011	SB

BENCH MARK

FROM INTERSECTION OF HWY 3 (GARRISON RD) AND THOMPSON RD, GO 1.4KM WEST TO GARRISON RD PUBLIC SCHOOL, CAP IS IN SOUTH FACE OF CONCRETE FOUNDATION IN EASTWARD PROJECTION, 36.80m NORTH OF CENTRE OF HWY 3, 0.30m WEST OF EASTERY CORNER. BM # V010895202
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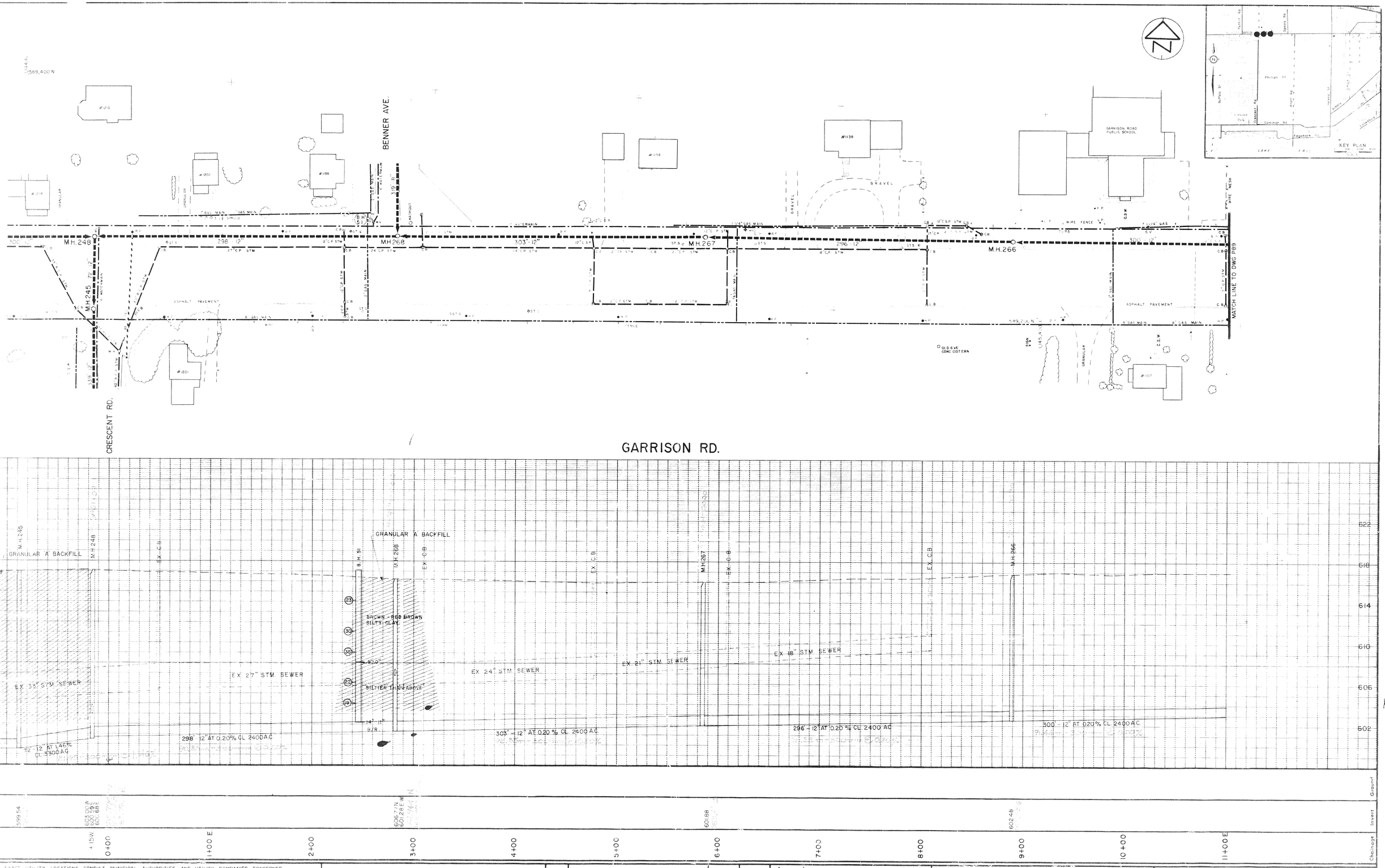
Our Focus: Your Future
INFRASTRUCTURE SERVICES

GARRISON ROAD
SANITARY SEWER REPLACEMENT

DSN. SMM	DSN. CKD. SMM	DWN. SB	DWG. CKD. SB
SCALE HORIZONTAL 1:200 VERTICAL 1:50		PROJECT NO. 1510.GRSS	
DATE MAY 2011		DWG. NO. 7 OF 11	REV. 3



Notes: 1) FOR EXACT UTILITY LOCATIONS, CONSULT MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

No.	Revision	Date	Initial
	FINALIZED TO AC BUILT	SEPT.1973	W.S.

Approved

REGISTERED PROFESSIONAL ENGINEER — W. D. GOODINGS — PROVINCE OF ONTARIO

TOWN OF FORT ERIE
EAST BERTIE SEWAGE WORKS AREA
GARRISON ROAD
CRESCENT RD. TO STA. 11+00 E

Proctor & Redfern Limited
Consulting Engineers
Toronto — St. Catharines

Scale Hor 1" = 40'
Vert 1" =
Date JUNE 1971
Drawn by W.S. (Cod. B)
Field Book
Drawing No. 69584-PR5