Planning Department Development Application Form

Complete Application

A complete development application consists of the following:

1. A properly completed and signed application form (signature must be original in planners file);
2. Supporting information adequate to illustrate your proposal as indicated in **Section H** of this application form (plans are required in paper copy and digital PDF format);
3. Written authorization from the registered owner of the subject lands where the applicant is not the owner as per Section N; and,
4. Cash, debit or cheque payable to Norfolk County in the amount set out in the user fees By-Law.

The above information is required to ensure that your application is given full consideration. An incomplete or improperly prepared application will not be accepted and may result in delays during the processing of the application. This application must be typed or printed in ink and completed in full.

Pre-Submission Consultation "Pre-consultation":

A pre-consultation meeting with staff is required for all applications; however, minor applications may be exempted depending on the nature of the proposal, with approval from the Director of Planning or delegate. The purpose of a pre-consultation meeting is to provide the applicant with an opportunity to present the proposed application, discuss potential issues, and for the County and Agency staff to identify the required information and materials to be submitted with the application in order for it to be considered complete. The applicant has the opportunity to make revisions to the application prior to submission, without the additional costs of recirculation fees. It may be necessary to seek the assistance of independent professional help (for example, a planning consultant or engineer) for complex applications. If a pre-consultation meeting has been held to discuss your development, please **include a copy of the Pre-consultation minutes with your application** as part of the submission package. It should be noted **that pre-consultation minutes are valid for one year after the meeting date**.

Development Application Process

Once an application has been deemed complete by a planner, it will be circulated to public agencies and County departments for review and comments. Notice of the application is also provided to adjacent land owners. The comments received assist the planner with the review and recommendation/approval of your application. The time involved in processing an application varies depending upon its complexity and its

acceptability to the other agencies and is subject to statutory *Planning Act* decision timeframes.

An additional fee will be required if a review by the Long Point Region Conservation Authority or by the Grand River Conservation Authority is deemed necessary by planning staff and/or by the Authority. A separate cheque payable to the Long Point Region Conservation Authority or the Grand River Conservation Authority is required in accordance with their fee schedule at the same time your application is submitted.

Additional studies required as part of the complete application shall be at the sole expense of the applicant. It should also be noted that in some instances peer reviews may be necessary to review particular studies and that the cost shall be at the expense of the applicant. The company to complete the peer review shall be selected by the County.

If the application is withdrawn prior to the circulation to commenting agencies, the entire original fee will be refunded. If withdrawn after the circulation to agencies, half the original fee will be refunded. If your drawings are required to be recirculated there will be an additional fee. Also, please note that if your engineering drawings require more than three reviews due to revisions by the owner or failure to revise your engineering drawings as requested, an additional fee will be charged. No refund is available after the public meeting and/or after approval of application.

Notification Sign Requirements

For the purpose of public notification and in order for staff to locate your lands for appropriate applications (zoning, subdivision, condominium or official plan) you will be given a sign to indicate the intent and purpose of your development application. It is your responsibility to:

1. Post one sign per frontage in a conspicuous location on the subject lands;
2. Ensure one sign is posted at the front of the subject lands at least three feet above ground level, not on a tree;
3. Notify the Planner when the sign is in place in order to avoid processing delays; and
4. Maintain the sign until the development application is finalized and thereafter removed.

Contact Us

For additional information or assistance in completing this application, please contact a planner at 519-426-5870 or 519-875-4485 extension 1842 or planning@norfolkcounty.ca. Please submit the completed application and fees to the attention of the Planning Department at 185 Robinson Street, Suite 200, Simcoe, ON N3Y 5L6.
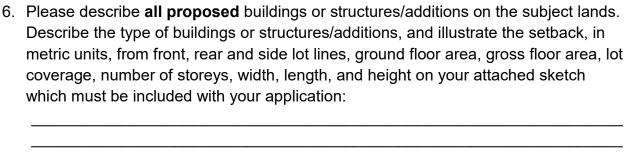
For Office Use Only:

File Number	_____	Public Notice Sign	_____
Related File Number	_____	Application Fee	_____
Pre-consultation Meeting	_____	Conservation Authority Fee	_____
Application Submitted	_____	Well & Septic Info Provided	_____
Complete Application	_____	Planner	_____

Check the type of planning application(s) you are submitting.

☐ Official Plan Amendment

☐ Zoning By-Law Amendment

☐ Temporary Use By-law

☐ Draft Plan of Subdivision/Vacant Land Condominium

☐ Condominium Exemption

☒ Site Plan Application

☐ Extension of a Temporary Use By-law

☐ Part Lot Control

☐ Cash-in-Lieu of Parking

☐ Renewable Energy Project or Radio Communication Tower

Please summarize the desired end result of this application (for example: a special zoning provision on the subject lands to include additional use(s), changing the zone and/or official plan designation of the subject lands, creating a certain number of lots, or similar)

_____
_____
_____
_____
_____
_____
_____

Property Assessment Roll Number: _____

A. Applicant Information

Name of Owner _____

It is the responsibility of the owner or applicant to notify the planner of any changes in ownership within 30 days of such a change.

Address _____

Town and Postal Code _____

Phone Number _____

Cell Number _____

Email _____

Name of Applicant _____

Address _____

Town and Postal Code _____

Phone Number _____

Cell Number _____

Email _____

Name of Agent _____

Address _____

Town and Postal Code _____

Phone Number _____

Cell Number _____

Email _____

Please specify to whom all communications should be sent. Unless otherwise directed, all correspondence and notices in respect of this application will be forwarded to both owner and agent noted above.

☐ Owner   ☐ Agent   ☐ Applicant

Names and addresses of any holder of any mortgagees, charges or other encumbrances on the subject lands:

_____

_____

B. Location, Legal Description and Property Information

1. Legal Description (include Geographic Township, Concession Number, Lot Number, Block Number and Urban Area or Hamlet):

    _____

    _____

    Municipal Civic Address: _____

    Present Official Plan Designation(s): _____

    Present Zoning: _____

2. Is there a special provision or site specific zone on the subject lands?

    ☐ Yes ☐ No   If yes, please specify corresponding number:

    _____

3. Present use of the subject lands:

    _____

    _____

4. Please describe **all existing** buildings or structures on the subject lands and whether they are to be retained, demolished or removed. If retaining the buildings or structures, please describe the type of buildings or structures, and illustrate the setback, in metric units, from front, rear and side lot lines, ground floor area, gross floor area, lot coverage, number of storeys, width, length, and height on your attached sketch which must be included with your application:

    _____

    _____

    _____

5. If an addition to an existing building is being proposed, please explain what it will be used for (for example: bedroom, kitchen, or bathroom). If new fixtures are proposed, please describe.

    _____

    _____

    _____

6. Please describe **all proposed** buildings or structures/additions on the subject lands. Describe the type of buildings or structures/additions, and illustrate the setback, in metric units, from front, rear and side lot lines, ground floor area, gross floor area, lot coverage, number of storeys, width, length, and height on your attached sketch which must be included with your application:

    _____

    _____

    _____

7. Are any existing buildings on the subject lands designated under the *Ontario Heritage Act* as being architecturally and/or historically significant?   Yes ☐ No ☐

   If yes, identify and provide details of the building:

   _____

   _____

8. If known, the length of time the existing uses have continued on the subject lands:

   _____

9. Existing use of abutting properties:

   _____

10. Are there any easements or restrictive covenants affecting the subject lands?

   ☐ Yes ☐ No If yes, describe the easement or restrictive covenant and its effect:

   _____

C. Purpose of Development Application

Note: Please complete all that apply.

1. Please explain what you propose to do on the subject lands/premises which makes this development application necessary:

   _____

   _____

   _____

   _____

2. Please explain why it is not possible to comply with the provision(s) of the Zoning By-law/and or Official Plan:

   _____

   _____

   _____

3. Does the requested amendment alter all or any part of the boundary of an area of settlement in the municipality or implement a new area of settlement in the municipality? ☐ Yes ☐ No If yes, describe its effect:

   _____

   _____

   _____

4. Does the requested amendment remove the subject land from an area of employment? ☐ Yes ☐ No If yes, describe its effect:

   _____

   _____

   _____

5. Does the requested amendment alter, replace, or delete a policy of the Official Plan? ☐ Yes ☐ No If yes, identify the policy, and also include a proposed text of the policy amendment (if additional space is required, please attach a separate sheet):

_____

_____

_____

6. Description of land intended to be severed in metric units:

Frontage: _____

Depth: _____

Width: _____

Lot Area: _____

Present Use: _____

Proposed Use: _____

Proposed final lot size (if boundary adjustment): _____

If a boundary adjustment, identify the assessment roll number and property owner of the lands to which the parcel will be added: _____

_____

Description of land intended to be retained in metric units:

Frontage: _____

Depth: _____

Width: _____

Lot Area: _____

Present Use: _____

Proposed Use: _____

Buildings on retained land: _____

7. Description of proposed right-of-way/easement:

Frontage: _____

Depth: _____

Width: _____

Area: _____

Proposed use: _____

8. Name of person(s), if known, to whom lands or interest in lands to be transferred, leased or charged (if known):

_____

9. Site Information   **Zoning**   **Proposed**

Please indicate unit of measurement, for example: m, m² or %

	Zoning	Proposed
Lot frontage	_____	_____
Lot depth	_____	_____
Lot width	_____	_____
Lot area	_____	_____
Lot coverage	_____	_____
Front yard	_____	_____
Rear yard	_____	_____
Left Interior side yard	_____	_____
Right Interior side yard	_____	_____
Exterior side yard (corner lot)	_____	_____
Landscaped open space	_____	_____
Entrance access width	_____	_____
Exit access width	_____	_____
Size of fencing or screening	_____	_____
Type of fencing	_____	_____

10. Building Size

	Zoning	Proposed
Number of storeys	_____	_____
Building height	_____	_____
Total ground floor area	_____	_____
Total gross floor area	_____	_____
Total useable floor area	_____	_____

11. Off Street Parking and Loading Facilities

Number of off street parking spaces	_____	_____
Number of visitor parking spaces	_____	_____
Number of accessible parking spaces	_____	_____
Number of off street loading facilities	_____	_____

12. Residential (if applicable)

Number of buildings existing: _____

Number of buildings proposed: _____

Is this a conversion or addition to an existing building? ☐ Yes ☐ No

If yes, describe: _____

Type	Number of Units	Floor Area per Unit in m2
Single Detached	_____	_____
Semi-Detached	_____	_____
Duplex	_____	_____
Triplex	_____	_____
Four-plex	_____	_____
Street Townhouse	_____	_____
Stacked Townhouse	_____	_____
Apartment - Bachelor	_____	_____
Apartment - One bedroom	_____	_____
Apartment - Two bedroom	_____	_____
Apartment - Three bedroom	_____	_____

Other facilities provided (for example: play facilities, underground parking, games room, or swimming pool):

13. Commercial/Industrial Uses (if applicable)

Number of buildings existing: _____

Number of buildings proposed: _____

Is this a conversion or addition to an existing building? ☐ Yes ☐ No

If yes, describe:

_____

Indicate the gross floor area by the type of use (for example: office, retail, or storage):

_____

_____

_____

Seating Capacity (for assembly halls or similar): _____

Total number of fixed seats: _____

Describe the type of business(es) proposed: _____

Total number of staff proposed initially: _____

Total number of staff proposed in five years: _____

Maximum number of staff on the largest shift: _____

Is open storage required: ☐ Yes ☐ No

Is a residential use proposed as part of, or accessory to commercial/industrial use?

☐ Yes ☐ No If yes please describe:

_____

_____

14. Institutional (if applicable)

Describe the type of use proposed: _____

Seating capacity (if applicable): _____

Number of beds (if applicable): _____

Total number of staff proposed initially: _____

Total number of staff proposed in five years: _____

Maximum number of staff on the largest shift: _____

Indicate the gross floor area by the type of use (for example: office, retail, or storage):

_____

_____

_____

15. Describe Recreational or Other Use(s) (if applicable)

_____

_____

_____

_____

_____

D. Previous Use of the Property

1. Has there been an industrial or commercial use on the subject lands or adjacent lands? ☐ Yes ☐ No ☐ Unknown
   If yes, specify the uses (for example: gas station or petroleum storage):
   _____
   _____

2. Is there reason to believe the subject lands may have been contaminated by former uses on the site or adjacent sites? ☐ Yes ☐ No ☐ Unknown

3. Provide the information you used to determine the answers to the above questions:
   _____
   _____
   _____

4. If you answered yes to any of the above questions in Section D, a previous use inventory showing all known former uses of the subject lands, or if appropriate, the adjacent lands, is needed. Is the previous use inventory attached? ☐ Yes ☐ No

E. Provincial Policy

1. Is the requested amendment consistent with the provincial policy statements issued under subsection 3(1) of the *Planning Act, R.S.O. 1990, c. P. 13*? ☐ Yes ☐ No

   If no, please explain:
   _____
   _____
   _____

2. It is owner's responsibility to be aware of and comply with all relevant federal or provincial legislation, municipal by-laws or other agency approvals, including the Endangered Species Act, 2007. Have the subject lands been screened to ensure that development or site alteration will not have any impact on the habitat for endangered or threatened species further to the provincial policy statement subsection 2.1.7? ☐ Yes ☐ No

   If no, please explain:
   _____
   _____
   _____

3. Have the subject lands been screened to ensure that development or site alteration will not have any impact on source water protection? ☐ Yes ☐ No

   If no, please explain:

   _____

   _____

   Note: If in an area of source water Wellhead Protection Area (WHPA) A, B or C please attach relevant information and approved mitigation measures from the Risk Manager Official.

4. Are any of the following uses or features on the subject lands or within 500 metres of the subject lands, unless otherwise specified? Please check boxes, if applicable.

   Livestock facility or stockyard (submit MDS Calculation with application)
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Wooded area
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Municipal Landfill
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Sewage treatment plant or waste stabilization plant
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Provincially significant wetland (class 1, 2 or 3) or other environmental feature
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Floodplain
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Rehabilitated mine site
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Non-operating mine site within one kilometre
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Active mine site within one kilometre
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Industrial or commercial use (specify the use(s))
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Active railway line
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Seasonal wetness of lands
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Erosion
   ☐ On the subject lands or ☐ within 500 meters – distance _____
   Abandoned gas wells
   ☐ On the subject lands or ☐ within 500 meters – distance _____

F. Servicing and Access

1. Indicate what services are available or proposed:
   Water Supply
   - ☐ Municipal piped water   ☐ Communal wells
   - ☐ Individual wells   ☐ Other (describe below)

   _____

   Sewage Treatment
   - ☐ Municipal sewers   ☐ Communal system
   - ☐ Septic tank and tile bed in good working order   ☐ Other (describe below)

   _____

   Storm Drainage
   - ☐ Storm sewers   ☐ Open ditches
   - ☐ Other (describe below)

   _____

2. Existing or proposed access to subject lands:
   - ☐ Municipal road   ☐ Provincial highway
   - ☐ Unopened road   ☐ Other (describe below)

   Name of road/street: _____

G. Other Information

1. Does the application involve a local business? ☐ Yes ☐ No
   If yes, how many people are employed on the subject lands?
   _____

2. Is there any other information that you think may be useful in the review of this application? If so, explain below or attach on a separate page.

   _____
   _____
   _____
   _____

H. Supporting Material to be submitted by Applicant

In order for your application to be considered complete, **folded** hard copies (number of paper copies as directed by the planner) and an **electronic version (PDF) of the properly named site plan drawings, additional plans, studies and reports** will be required, including but not limited to the following details:

1. Concept/Layout Plan
2. All measurements in metric
3. Key map
4. Scale, legend and north arrow
5. Legal description and municipal address
6. Development name
7. Drawing title, number, original date and revision dates
8. Owner's name, address and telephone number
9. Engineer's name, address and telephone number
10. Professional engineer's stamp
11. Existing and proposed easements and right of ways
12. Zoning compliance table – required versus proposed
13. Parking space totals – required and proposed
14. All entrances to parking areas marked with directional arrows
15. Loading spaces, facilities and routes (for commercial developments)
16. All dimensions of the subject lands
17. Dimensions and setbacks of all buildings and structures
18. Location and setbacks of septic system and well from all existing and proposed lot lines, and all existing and proposed structures
19. Gross, ground and useable floor area
20. Lot coverage
21. Floor area ratio
22. Building entrances, building type, height, grades and extent of overhangs
23. Names, dimensions and location of adjacent streets including daylighting triangles
24. Driveways, curbs, drop curbs, pavement markings, widths, radii and traffic directional signs
25. All exterior stairways and ramps with dimensions and setbacks
26. Retaining walls including materials proposed
27. Fire access and routes
28. Location, dimensions and number of parking spaces (including visitor and accessible) and drive aisles
29. Location of mechanical room, and other building services (e.g. A/C, HRV)
30. Refuse disposal and storage areas including any related screening (if indoors, need notation on site plan)
31. Winter snow storage location

32. Landscape areas with dimensions
33. Natural features, watercourses and trees
34. Fire hydrants and utilities location
35. Fencing, screening and buffering – size, type and location
36. All hard surface materials
37. Light standards and wall mounted lights (plus a note on the site plan that all outdoor lighting is to be dark sky compliant)
38. Business signs (make sure they are not in sight lines)
39. Sidewalks and walkways with dimensions
40. Pedestrian access routes into site and around site
41. Bicycle parking
42. Architectural elevations of all building sides
43. All other requirements as per the pre-consultation meeting

In addition, the following additional plans, studies and reports, including but not limited to, **may** also be required as part of the complete application submission:

☐ Zoning Deficiency Form

☐ On-Site Sewage Disposal System Evaluation Form (to verify location and condition)

☐ Architectural Plan

☐ Buildings Elevation Plan

☐ Cut and Fill Plan

☐ Erosion and Sediment Control Plan

☐ Grading and Drainage Control Plan (around perimeter and within site) (existing and proposed)

☐ Landscape Plan

☐ Photometric (Lighting) Plan

☐ Plan and Profile Drawings

☐ Site Servicing Plan

☐ Storm water Management Plan

☐ Street Sign and Traffic Plan

☐ Street Tree Planting Plan

☐ Tree Preservation Plan

☐ Archaeological Assessment

☐ Environmental Impact Study

☐ Functional Servicing Report

☐ Geotechnical Study / Hydrogeological Review

☐ Minimum Distance Separation Schedule

☐ Noise or Vibration Study

☐ Record of Site Condition

☐ Storm water Management Report

☐ Traffic Impact Study – please contact the Planner to verify the scope required

Site Plan applications will require the following supporting materials:

1. Two (2) complete sets of the site plan drawings folded to 8½ x 11 and an electronic version in PDF format
2. Letter requesting that the Holding be removed (if applicable)
3. A cost estimate prepared by the applicant's engineer
4. An estimate for Parkland dedication by a certified land appraiser
5. Property Identification Number (PIN) printout

Standard condominium exemptions will require the following supporting materials:

☐ Plan of standard condominium (2 paper copies and 1 electronic copy)

☐ Draft condominium declaration

☐ Property Identification Number (PIN) printout

Your development approval might also be dependent on Ministry of Environment and Climate Change, Ministry of Transportation or other relevant federal or provincial legislation, municipal by-laws or other agency approvals.

All final plans must include the owner's signature as well as the engineer's signature and seal.

I. Development Agreements

A development agreement may be required prior to approval for site plan, subdivision and condominium applications. Should this be necessary for your development, you will be contacted by the agreement administrator with further details of the requirements including but not limited to insurance coverage, professional liability for your engineer, additional fees and securities.

J. Transfers, Easements and Postponement of Interest

The owner acknowledges and agrees that if required it is their solicitor's responsibility on behalf of the owner for the registration of all transfer(s) of land to the County, and/or transfer(s) of easement in favour of the County and/or utilities. Also, the owner further acknowledges and agrees that it is their solicitor's responsibility on behalf of the owner for the registration of postponements of any charges in favour of the County.

K. Permission to Enter Subject Lands

Permission is hereby granted to Norfolk County officers, employees or agents, to enter the premises subject to this application for the purposes of making inspections associated with this application, during normal and reasonable working hours.

L. Freedom of Information

For the purposes of the *Municipal Freedom of Information and Protection of Privacy Act*, I authorize and consent to the use by or the disclosure to any person or public body any information that is collected under the authority of the *Planning Act, R.S.O. 1990, c. P. 13* for the purposes of processing this application.

Owner/Applicant Signature	Nov |04|2022
	Date

M. Owner's Authorization

If the applicant/agent is not the registered owner of the lands that is the subject of this application, the owner(s) must complete the authorization set out below.

I/We **Paul Van Benthem** am/are the registered owner(s) of the lands that is the subject of this application.

I/We authorize **G. Douglas Vallee Limited** to make this application on my/our behalf and to provide any of my/our personal information necessary for the processing of this application. Moreover, this shall be your good and sufficient authorization for so doing.

Owner	Nov |04|2022
	Date
Owner	Date

Norfolk
COUNTY

N. Declaration

I, __Paul Van Benthem__ of __Mississauga__

solemnly declare that:

all of the above statements and the statements contained in all of the exhibits transmitted herewith are true and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of *The Canada Evidence Act.*

Declared before me at:

__Regional Municipality of Peel__

In __Mississauga ONT__

_____
Owner/Applicant Signature

This ___04___ day of __November__

A.D., 20__22__

_____
A Commissioner, etc.
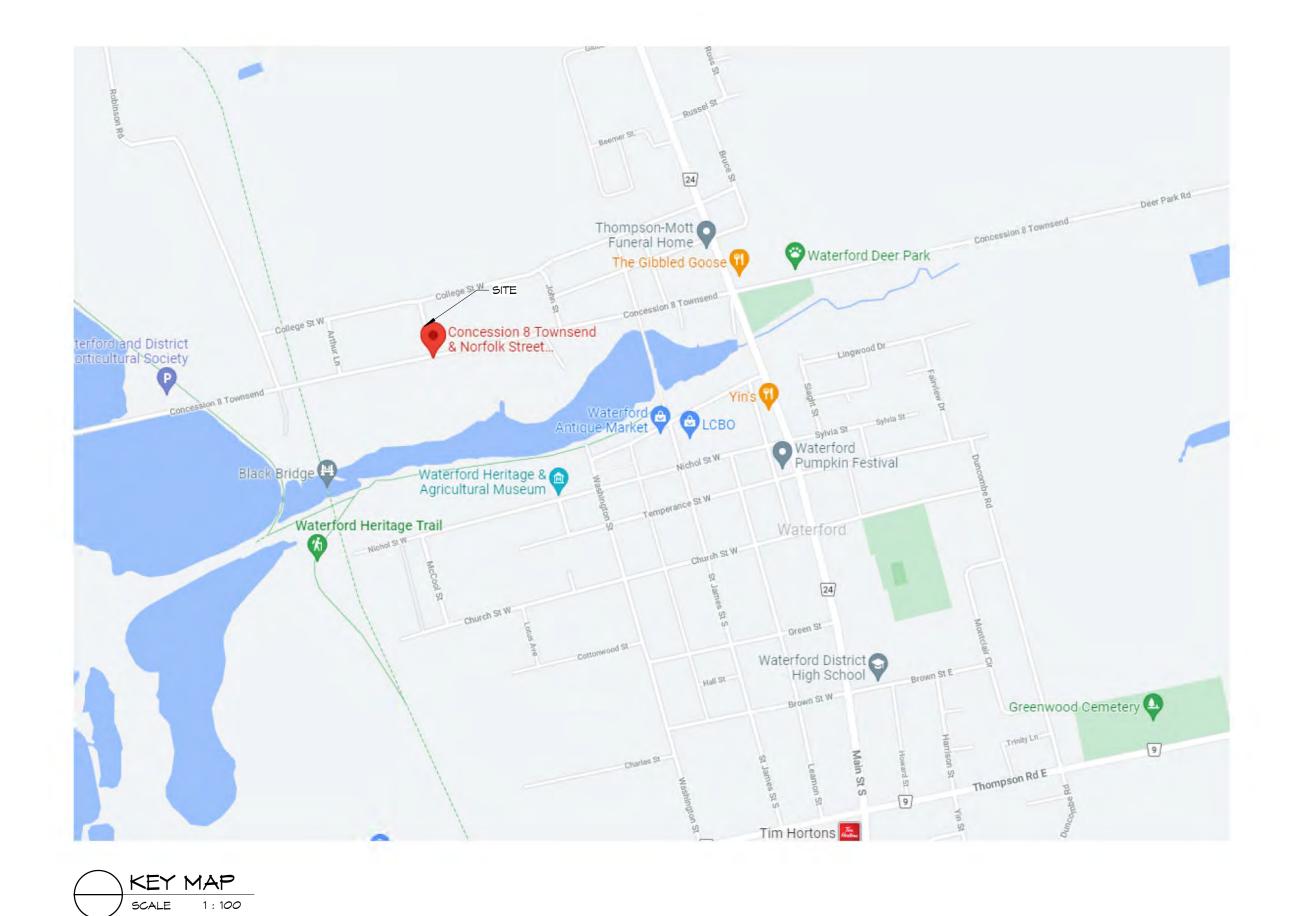
CONSULTANT LIST

ARCHITECTURAL / STRUCTURAL / CIVIL

vallee
Consulting Engineers,
Architects & Planners

CONTACTS:

ARCHITECTURE:
LESLEY HUTTON-RHORA
BRODI MARTIN, BARCHSC.

STRUCTURAL:
BEN BUCHWALD, M. ENG., P. ENG.,
ANDREW VALLEE, EIT

CIVIL ENGINEERING:
JOHN IEZZI, P.ENG.
NATALIE BIESINGER, EIT

KEY MAP
SCALE   1 : 100

SITE MAP
SCALE   1 : 100

Property Information:

Roll Number	33501004800
Town or Township	Waterford
Street Number	
Street Name	MECHANIC ST W
Unit Number	
Legal Description 1	WAT PLAN 19B BLK 17 PT LOT 1
Legal Description 2	RP 37R7056 PART 2
Legal Description 3	REG
Legal Description 4	2.57AC 346.08FR D
Legal	
Zoom to	

PRELIMINARY SITE OVERVIEW
A100   SCALE

NOTE: OVERVIEW IS FOR SCHEMATIC DEMONSTRATIVE PURPOSES ONLY AND DOES NOT
ACCURATELY REFLECT INTENDED LANDSCAPING, GRADING & SITE SERVICES

DO NOT SCALE DRAWINGS, CALL FOR ANY
CLARIFICATIONS THAT ARE REQUIRED, FIELD
VERIFY AT ALL BUILT CONDITIONS
ALL DWG.'S ARE TO BE READ IN COLOUR
ORIGINAL PAGE SIZE ARCH 'D' - 24" x 36"

NO.	DATE	ISSUANCE
1	2022.07.04	SPA PROGRESS
NO.	DATE	ISSUANCE

vallee
Consulting Engineers,
Architects & Planners

G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

STAMP ARCH.	STAMP STRUCT.

PROJECT TITLE:
SFO CAPITOL CONDOMINIUMS

MECHANIC STREET,
WATERFORD, ONTARIO,
N0E 1Y0

DRAWING TITLE:
COVER SHEET SPA

CHECKED BY:	DRAWN BY:
JI	BM
DRAWING SCALE:	DRAWING NO.:
As indicated	
PROJECT NO.:	A100
21-012	

SITE STATISTIC & ZONING REQ.'S

PROPERTY LEGAL DESCRIPTION:
PLAN 37R-xxxx, PART 4 ON PLAN OF SURVEY OF LOT 1, BLOCK 17 REG. PLAN 14-B IN THE TOWN OF WATERFORD, IN NORFOLK COUNTY

ZONING:
IN ACCORDANCE WITH NORFOLK COUNTY, ZONING BY-LAW 1-Z-2014
NORFOLK COUNTY - JULY-2020-CONSOLIDATION

PROVISION	LAND USE:		
5.4	URBAN RESIDENTIAL TYPE 4 ZONE (R4)		
5.4.1	PERMITTED USES		
	IN AN R4 ZONE, NO LAND, BUILDING OR STRUCTURE SHALL BE USED EXCEPT IN ACCORDANCE WITH THE FOLLOWING USES:		
	a) group townhouse		
	b) stacked townhouse		
	c) street townhouse		
	d) semi-detached, duplex, tri-plex and four-plex dwellings provided they are located on the same lot with, and in accordance with the Zone provisions of, group townhouse		
	e) home occupation		
	f) accessory residential dwelling unit, subject to Subsection 3.23.[1-Z-2020]		

PROVISION	SETBACKS (m - METERS):	REQUIRED (m) Group Townhouse	PROVIDED (m)
3.6c)	NO DECK SHALL BE CLOSER THAN 3 METRES FROM THE REAR LOT LINE	3	3
5.4.2a)	MIN. LOT AREA:		
	i) ATTACHED GARAGE	145m²	8,627m²
	ii) CORNER LOT	163m²	N/A
	iii) DETACHED GARAGE	215m²	N/A
5.4.2b)	MIN. LOT FRONTAGE:		
	i) INTERIOR LOT	30	117
	ii) CORNER LOT	30	N/A
	iii) CORNER LOT ACCESSED BY A REAR LANE		N/A
5.4.2c)	MIN. FRONT YARD:		
	i) ATTACHED GARAGE	6	6.8
	ii) DETACHED GARAGE OR REAR YARD PARKING	1.5	N/A
5.4.2d)	MIN. EXTERIOR SIDE YARD:		
	i) W/ A 6m FRONT YARD	6	N/A
	ii) W/ A 1.5m FRONT YARD	1.5	N/A
5.4.2e)	MIN. INTERIOR SIDE YARD	3	3
5.4.2f)	MIN. REAR YARD :		
	i) ATTACHED GARAGE	7.5	7.67
	ii) DETACHED GARAGE	7.5	N/A
5.4.2g)	MIN. SEPARATION BETWEEN DWELLINGS	2	14.5
5.4.2h)	MAX. BLDG. HEIGHT	11 [8-Z-2011]	9.8
5.4.3	MIN. MUTUAL SIDE LOT LINE	1.2	
5.4.4	MAX. UNITS IN A TOWNHOUSE DWELLING	8 UNITS	6 UNITS

SPECIAL PROVISIONS
14.469	IN THE R4 ZONE, A MAXIMUM OF TWENTY FIVE (25) DWELLING UNITS SHALL BE PERMITTED.		18 UNITS

PARKING REQ'D: RESIDENTIAL
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	SINGLE DETACHED, SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-PLEX, TOWNHOUSE DWELLINGS & VACATION HOME [8-Z-2011]	36 SPACE(S)	44 SPACE(S)
	2 SPACES / DWELLING UNIT 2 SPACES x 18 DWELLING UNITS = 36		
4.9f)	VISITOR PARKING:	6 SPACE(S)	6 SPACE(S)
	1 SPACE / 3 DWELLING UNITS 1 SPACE × (18 / 3) = 6		
	TOTAL	42 SPACE(S)	50 SPACE(S)

PARKING REQ'D - BARRIER FREE (PART OF REQ'D VISITOR PARKING)
4.3.3	BARRIER FREE PARKING REQ'D:		
	1-25 (VISITOR) PARKING SPACES =		
	TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S)	1 SPACE(S)
	TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	N/A	N/A

PARKING AREA REGULATIONS
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE	3 MIN.	3
	FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3.3 MIN.	3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING	5.8 MIN.	5.8
	FOR PARALLEL PARKING	7 MIN.	7
4.1.4	PARKING AISLE REQ'S		
4.1.4b)	TWO-WAY TRAFFIC	7.3 MIN.	7.5

LOT COVERAGE:
		PROVIDED (m²)	
BLDG. (GROSS / FOOTPRINT)		2714.0m²	32%
ASPHALT PARKING, PLAY & DRIVEWAY		2053.3m²	24%
SIDEWALKS & HARD SURFACE AREAS		255.5m²	3%
LANDSCAPED OPEN SPACE		3543.4m²	41%

BLDG. & OBC CLASSIFICATION:
PART 9, GROUP C - RESIDENTIAL
COMBUSTIBLE / NON-SPRINKLERED.

DISCLAIMER:
AN EX. SITE SURVEY (ONLY PROPERTY BOUNDARIES & INFO.) WAS PROVIDED BY JEWITT & DIXON ONTARIO LAND SURVEYORS IN THE FORM OF A PDF & ELECTRONIC FILE (COORD. W / A104 DWG.)

REFERENCE NOTE:
FOR OTHER SITE CONDITIONS, EXISTING TO REMAIN OR NEW TO BE PROVIDED, THIS DWG. IS TO BE READ IN CONJUNCTION W/ ALL OTHER DWG.'S LISTED ON A100 DWG. LIST

---

1 SITE PLAN
SCALE : 1 : 250

GENERAL NOTES:
(A) GENERAL CONTRACTOR TO COORDINATE ALL WORK WITHIN THE BOULEVARD W/ THE AUTHORITY HAVING JURISDICTION & OBTAIN ALL NECESSARY PERMITS & APPROVALS FROM LOCAL AUTHORITIES. EXECUTE ALL WORK AS PER THE MUNICIPAL REQUIREMENTS.

(B) GENERAL CONTRACTOR TO EXECUTE WORK TO DRIVEWAY ENTRANCE UNDER SUPERVISION OF THE AUTHORITY HAVING JURISDICTION. REFER TO ENTRANCE PERMIT REQUIREMENTS WHERE EXIST. DRIVEWAY ENTRANCE TO BE MODIFIED OR INSTALLATION OF NEW ENTRANCE AS PER MUNICIPAL REQUIREMENTS. PROVIDE NEW CONC. ENTRANCE CURBS TO MATCH EXISTING WHERE INDICATED.

(L) PLANTING BEDS, TREE PLANTINGS, LANDSCAPE FEATURES & SODDED AREAS

(SW) CONCRETE SIDEWALK

(CP) CANADA POST

(CP) COVERED PORCH DECK
D

(PAINTED GRAPHICS ON ASPHALT / CONC. (COORD. W/ THE CITY / TOWN HAVING JURISDICTION GUIDLINES.)

SITE PLAN LEGEND
- ▲ ENTRANCE / EXIT DOOR
- ▲ⁿ ENTRANCE / EXIT DOOR (OVERHEAD DOOR W/ OPERATOR)
- PROPERTY LINE
- SETBACKS
- WD. FENCE
- SNOW STORAGE (SS)
- FIRE / WASTE/RECYCLING PICK-UP ROUTE (7.5m WIDE / 13m CENTER RADIUS)
- ▲ SIGN (COORD. W/ SIGN LEGEND)

HATCH IDENTIFICATION LEGEND
- ASPHALT
- CONC. SIDEWALK / PAD / CROSSWALK / SIDEWALK / LANEWAY / STAIRS / ETC.
- EX. CONC. SIDEWALK / PAD / CROSSWALK / SIDEWALK / LANEWAY / STAIRS / ETC.
- AREA OF NEW SOD ON 200mm TOPSOIL (COORD. W/ CONST. FOR EXTENTS)
- WOOD DECK
- 1-STOREY RESIDENTIAL DWELLING (VEHICULAR - x1 GARAGE, x2 DRIVEWAY) (1150mm W x 18000mm D) (102m² (1100ft²) + GARAGE
- 2-STOREY RESIDENTIAL DWELLING (VEHICULAR - x1 GARAGE, x1 DRIVEWAY)(11000mm W x 11000mm D) (222m² (2400ft²) + GARAGE

SIGN LEGEND
(A) STOP SIGN
(N) NO PARKING - FIRE ROUTE
(L) NO PARKING, BY PERMIT ONLY, BARRIER-FREE PARKING, VAN ACCESSIBLE - TYPE 'A'
(O) VISITOR PARKING ONLY

NOTE:
CONFIRM LOCATIONS & CONTENT OF ALL SIGNAGE W/ THE OWNER & AUTHORITY HAVING JURISDICTION PRIOR TO FABRICATION & ERECTION. PROPOSED SITE SIGNAGE TO COMPLY W/ SIGNAGE BY-LAWS.
NOTE:
ALL SIGNS TO BE CENTERED ON POSTS TYP.

GENERAL NOTES:
- FIRE ACCESS ROUTE TO BE POSTED & DESIGNATED UNDER MUNICIPAL BY-LAW (FIRE ACCESS ROUTE TO BE MIN. 6 m WIDE W/ A MIN. 12 m CENTER LINE TURNING RADIUS & MAX. 6% SLOPE)
- COORD. W/ MECH. & ELEC. SITE PLANS FOR ALL EX. & NEW LOCATIONS OF SERVICES & ENTRY OF SERVICES INTO THE BLDG. ENVELOPE. (ALL MECH. & ELEC. INFORMATION INDICATED ON ARCH. SITE DWG. A101 IS FOR GENERAL REFERENCE & COORD. ONLY)
- COORD. W/ SITE GRADING PLAN FOR PROPOSED FINAL FINISH GRADE ELEV.'S & DRAINAGE SLOPES
- COORD. W/ LANDSCAPE SITE PLAN FOR LOCATIONS OF SEEDING, SODDING, PLANTING & OTHER HARD SURFACING.
- CONTRACTOR IS RESPONSIBLE FOR PLANTINGS, SOD, WATERING & MAINTENANCE UNTIL SUBSTANTIAL PERFORMANCE IS ACHIEVED. THE WARRANTY PERIOD WILL COMMENCE UPON SUBSTANTIAL PERFORMANCE OF THIS WORK
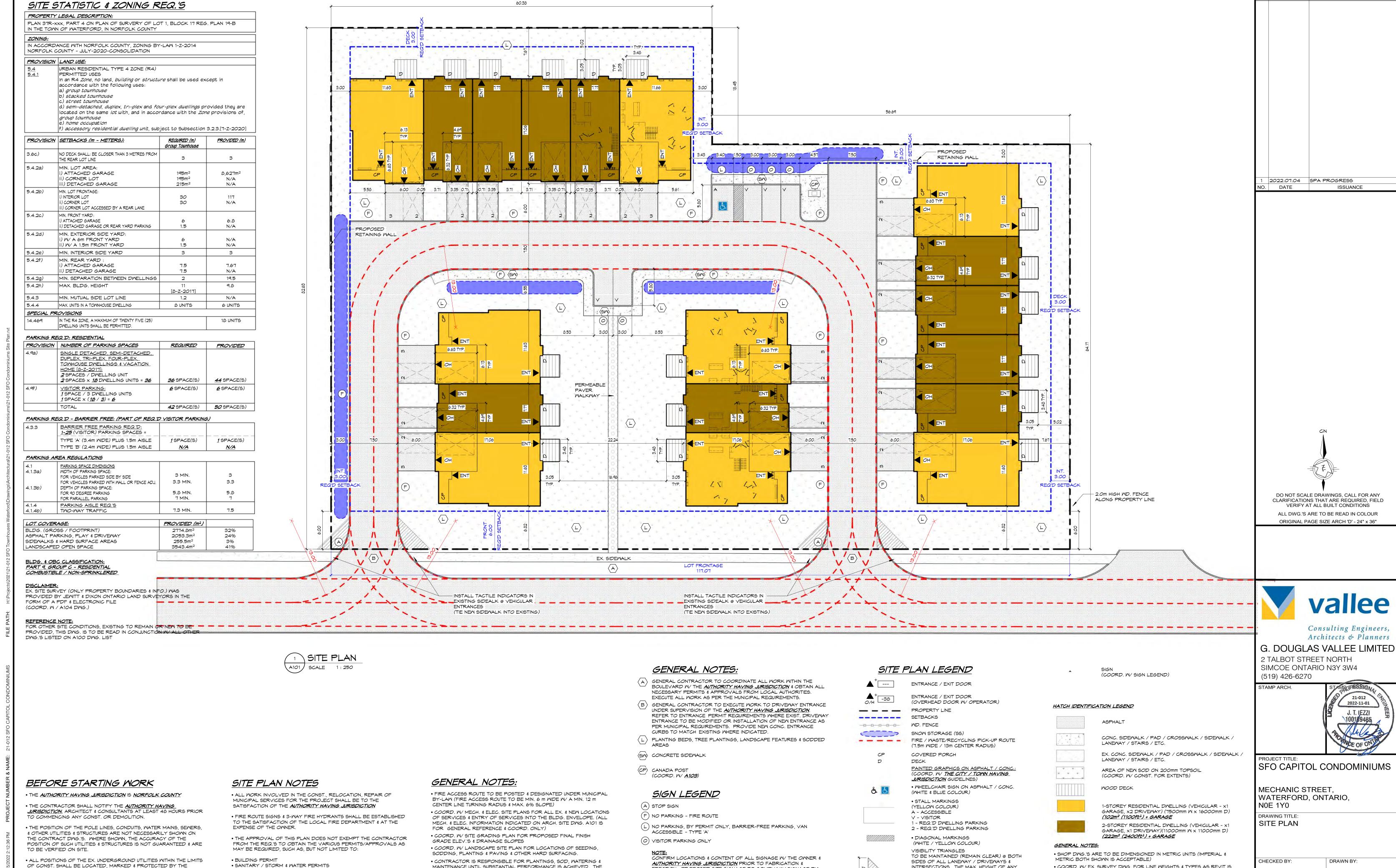

BEFORE STARTING WORK
- THE AUTHORITY HAVING JURISDICTION IS NORFOLK COUNTY
- THE CONTRACTOR SHALL NOTIFY THE AUTHORITY HAVING JURISDICTION, ARCHITECT & CONSULTANTS AT LEAST 48 HOURS PRIOR TO COMMENCING ANY CONST. OR DEMOLITION.
- THE POSITION OF THE POLE LINES, CONDUITS, WATER MAINS, SEWERS, & OTHER UTILITIES & STRUCTURES ARE NOT NECESSARILY KNOWN ON THE CONTRACT DWG.'S, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES & STRUCTURES IS NOT GUARANTEED & ARE TO BE VERIFIED ON SITE.
- ALL POSITIONS OF THE EX. UNDERGROUND UTILITIES WITHIN THE LIMITS OF CONST. SHALL BE LOCATED, MARKED & PROTECTED BY THE CONTRACTOR. COST SHALL BE REPAIRED OR DISTURBED DURING CONST. SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE ENGINEER, AT THE CONTRACTORS EXPENSE.
- PRIOR TO THE COMMENCEMENT OF CONST., ALL BENCHMARKS, ELEVATIONS, DIMENSIONS, & GRADES MUST BE CHECKED BY THE CONTRACTOR & ANY DISCREPANCIES REPORTED TO THE ENGINEER / ARCHITECT

SITE PLAN NOTES
- ALL WORK INVOLVED IN THE CONST., RELOCATION, REPAIR OF MUNICIPAL SERVICES FOR THE PROJECT SHALL BE TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION
- FIRE ROUTE SIGNS & 3-WAY FIRE HYDRANTS SHALL BE ESTABLISHED TO THE SATISFACTION OF THE LOCAL FIRE DEPARTMENT & AT THE EXPENSE OF THE OWNER.
- THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQ.'S TO OBTAIN THE VARIOUS PERMITS/APPROVALS AS MAY BE REQUIRED, SUCH AS, BUT NOT LIMITED TO:
  - BUILDING PERMIT
  - SANITARY / STORM & WATER PERMITS
  - ROAD CUT PERMITS
  - RELOCATION OF SERVICES
  - APPROACH APPROVAL PERMITS
  - ENCROACHMENT AGREEMENTS (IF REQ.'D)
  - COMMITTEE OF ADJUSTMENT
  - ROAD OCCUPANCY PERMIT
  - SITE ALTERATION

---

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Consulting Engineers, Architects & Planners

G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

STAMP ARCH.

PROJECT TITLE:
SFO CAPITOL CONDOMINIUMS

MECHANIC STREET,
WATERFORD, ONTARIO,
N0E 1Y0

DRAWING TITLE:
SITE PLAN

GENERAL NOTES:
- SHOP DWG.'S ARE TO BE DIMENSIONED IN METRIC UNITS (IMPERIAL & METRIC BOTH SHOWN IS ACCEPTABLE)
- COORD. W/ EX. SURVEY DWG. FOR LINE WEIGHTS & TYPES AS REVIT IS NOT COMPATIBLE WITH AUTOCAD LINE WEIGHTS & TYPES
- F/V ALL EX. DIMENSIONS TYP.
- ALL EX. ITEMS WILL BE LABELLED W/ 'EX' & NOTED IN DEMO PLANS TYP.
- ALL EX. ITEMS TO REMAIN U/N/O OR SHOWN & NOTED IN DEMO PLANS TYP.
- PATCH & REPAIR ALL EX. ITEMS WHERE DISTURBED / DAMAGED BY CONST. / DEMO. PROVIDE CLEAN TRANSITIONS TYP.
- (PROVIDE SOD @ ALL DISTURBED AREAS)

CHECKED BY:	DRAWN BY:
JI	LHR / BM
DRAWING SCALE:	DRAWING NO.:
As indicated	**A101**
PROJECT NO.:	
21-012	

PERMEABLE PAVER WALKWAY

EX. SIDEWALK

LOT FRONTAGE 117.01

PROPOSED RETAINING WALL

2.0m HIGH WD. FENCE ALONG PROPERTY LINE

INSTALL TACTILE INDICATORS IN EXISTING SIDEWALK @ VEHICULAR ENTRANCES (TIE NEW SIDEWALK INTO EXISTING)

Detail 1 — VERT. SIGNAGE (Scale 1:20)

NOTE:
THIS DETAIL APPLIES TO ALL OTHER TYPES OF POST MTD. SIGNS

NOTE:
ALL SIGNS TO BE CENTERED ON POSTS; USE GALV. COURSE THREAD BOLTS / WASHERS & NUTS - 14mm (9/16") HEX. HEAD) - TAMPER PROOF WHERE REQ'D BY *AUTHORITY HAVING JURISDICTION*

- Sign
- Washer
- 3 x 3 Ribbed Plate
- U-Channel Post
- Washer Nut
- Bolt
- H/D/G METAL 75mm (3") 'U' CHANNEL POST
- GRADE
- CAST VERT. POST INTO SUBSTRATE 1000mm (40") MIN. TYP.

NOTE:
COORD. *W AUTHORITY HAVING JURISDICTION* FOR ALL POST TYPES, MTG. REQ.'S & SIGNAGE

(1500 - 2000) 1524
(59"-79")
COORD. *W AUTHORITY HAVING JURISDICTION*

Detail 2 — ACCESSIBLE PARKING VERT. SIGNAGE – NORFOLK (Scale 1:20)

TYPE B   TYPE A
300 MIN.   300 MIN.
11 3/4"   11 3/4"

BY PERMIT ONLY
VAN ACCESSIBLE

NOTE:
THIS DETAIL APPLIES TO ALL OTHER TYPES OF POST MTD. SIGNS

NOTE:
ALL SIGNS TO BE CENTERED ON POSTS; USE GALV. COURSE THREAD BOLTS / WASHERS & NUTS - 14mm (9/16") HEX. HEAD) - TAMPER PROOF WHERE REQ.D BY *AUTHORITY HAVING JURISDICTION*

- Bolt
- Sign
- Washer
- 3 x 3 Ribbed Plate
- U Channel Post
- Washer Nut
- H/D/G METAL 75mm (3") 'U' CHANNEL POST
- GRADE
- CAST VERT. POST INTO SUBSTRATE 1000mm (40") MIN. TYP.

Detail 3 — PARKING STALL GUIDELINES – NORFOLK COUNTY (Scale 1:200)

- DROP CURB @ CURB & ADJ. RAISED SURFACE MATERIALS
- CURB OR SURFACE MATERIAL EDGE
- 2400x2400 CLEAR SPACE
- DROP CURB TACTILE
- RB-93 SIGN @ ALL ACCESSIBLE PARKING SPACES TYP.
- HIGH CONTRAST DIAGONAL PAVEMENT MARKINGS EXTEND THE FULL LENGTH OF THE SPACE
- CURB OR SURFACE MATERIAL EDGE

NOTE:
- DIMENSIONS FOR ACCESS AISLE IS OUTSIDE TO OUTSIDE THE PTD. LINE MARKINGS
- DIMENSIONS FOR INDIVIDUAL STALL LINES ARE TO CENTER LINES
- COORD. *W NORFOLK COUNTY* BY-LAWS & ACCESSIBILITY DESIGN GUIDELINES (NADS) FOR STD.'S

NOTE:
LIGHTING LEVELS TO BE 10 LUX MIN. @ ACCESSIBLE STALLS TYP.

PARALLEL PARKING
90 DEGREE PARKING

Detail 4 — ACCESSIBLE PARKING PAVEMENT MARKING (Scale 1:50)

NOTE:
ENSURE ALL SURFACE MARKINGS ARE SLIP-RESISTANT

NOTE:
LOCATE NEAR THE BACK OF THE SPACE FOR 90 DEGREE OR ANGLE PARKING SPACES & CENTERED FOR PARALLEL PARKING SPACES

- CONT. BORDER (WHITE COLOUR) *W BLUE FIELD COLOUR
- FIELD (BLUE COLOUR)
- INTERNATIONAL SYMBOL OF ACCESSIBILITY (WHITE COLOUR)

1524
5'-0"

Detail 5 — ASPHALT TO GRASS (Scale 1:10)

- LINE OF EXCAVATION CUT
- SOD AS REQ'D TO EDGE OF ASPHALT AFTER BACKFILLED *W TOPSOIL
- EDGE OF ASPHALT SURFACE
- TAMP SMOOTH THE VERT. EDGE OF ASPHALT SURFACE
- GRADE
- GRANULAR A
- GRANULAR B
- COORD. *W CIVIL DWG.'S FOR ASPHALT & SUB-BASE MAKE-UP
- EXTEND BASE GRANULARS 300mm MIN. BEYOND EDGE OF ASPHALT TYP.

300   300

NOTES (left column)

1. THIS DRAWING IS ONLY TO BE USED ON ROADS WITH POSTED LIMITS OF 60 KM/H OR LESS AND LOW TRAFFIC VOLUME (<750 ADT AS PER TRANSPORTATION ASSOCIATION OF CANADA'S GEOMETRIC DESIGN FOR CANADIAN ROADS- (CHAPTER 7- ROADSIDE DESIGN).

2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE NATIONAL BUILDING CODE. ABIDE BY LOCAL MUNICIPAL BY-LAWS AND REGULATORY AGENCIES THAT MAY AFFECT THE WORK.

3. THE CONTRACTOR SHALL REVIEW THE SITE CONDITIONS AND ASSUME RESPONSIBILITY FOR EXISTING SERVICES (WATER; POWER; SEWAGE; GAS ETC.) THAT EXIST AT THE SITE.

4. CONCRETE SLAB TO HAVE A MINIMUM THICKNESS OF 150 mm.

5. CONCRETE SLAB SHALL BE PLACED ON 150 mm MINIMUM THICK BASE OF GRANULAR MATERIAL (OPSS GRANULAR 'A' OR EQUIVALENT) COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY.

6. GRANULAR BASE SHALL BE PLACED ON SOIL CAPABLE OF SAFELY SUSTAINING A BEARING PRESSURE OF NOT LESS THAN 30 kPa.

7. CONCRETE CONSTRUCTION SHALL CONFORM TO CSA A23.1.

8. CONCRETE TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH CSA A23.1 AND CSA 23.2.

9. CSA A23.1 CONCRETE EXPOSURE CLASSIFICATION TO BE C-1 WITH THE FOLLOWING PROPERTIES:
   -MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS: 35 MPA
   -MINIMUM WATER TO CEMENTING MATERIALS RATIO: 0.40
   -MAXIMUM COARSE AGGREGATE SIZE: 20 mm
   -MAXIMUM SLUMP: 90 mm
   -AIR CONTENT: 5% TO 8%

10. SURFACE OF SLAB TO BE SLOPED 2% -0/+4% TO THE NEAREST PLUVIAL DRAIN.

11. TOP OF SLAB TO HAVE A TEXTURED BROOM FINISH TO CSA A23.1. EDGES OF SLAB TO HAVE A SMOOTH TOOLED FINISH.

12. SLAB REINFORCEMENT TO BE 152mm X 152mm, MW 25.8 X MW 25.8 WELDED WIRE FABRIC CONFORMING TO ASTM 1064M. REINFORCEMENT TO BE PLACED AT MID-DEPTH OF SLAB OR APPROVED EQUIVALENT.

13. APPLY PIGMENTED CURING COMPOUND TO SURFACE OR REBAR OF SLAB IN ACCORDANCE WITH ASTM C309 TYPE 2 (WHITE COLOUR), CLASS B (RESIN).

14. PROVIDE A MINIMUM SETBACK DISTANCE OF 2000 mm FROM ANY EDGE OF MAILBOX TO NEAREST EDGE OF TRAVELLED ROADWAY.

15. ALL SITE LOCATIONS REQUIRE CPC AND MUNICIPAL APPROVAL.

16. IF SITE CONDITIONS LIMIT PLACEMENT, CONTACT CPC FOR ASSISTANCE.

17. LARGER PADS AND NUMBER OF BOXES PERMITTED WITH CPC INPUT.

18. BOULEVARD CUT-THROUGH ONLY REQUIRED IF THERE IS NO ACCESS POINT WITHIN 30.5 METERS.

(Canada Post Detail)

1 OR 2 MODULES
DEVELOPPER SLAB 1000 x 1675
SIDEWALK/ PATH/ PARKING/ EDGE OF TRAVELLED WAY
BOULEVARD
SECTION A-A
OCCASIONAL BOULEVARD PATHWAY. MIN 1 METER WIDE SEE NOTE 18

COMMUNITY MAILBOX SHOWN WITH PEDESTAL INSTALLATION. PRECAST CONCRETE BALLASTED BASE COULD ALSO BE USED.

* EQUIPEMENT FLOORPRINT SHOWN FOR REFERENCE ONLY.

3 MODULES
DEVELOPPER SLAB 1000 x 2775
INCREMENT OF 900mm FOR EACH ADDITIONAL MODULE
SIDEWALK/ PATH/ PARKING/ EDGE OF TRAVELLED WAY
BOULEVARD
ROAD FACING
SECTION A-A

SECTION B-B
SURFACE UNDER CMB TO BE LEVELED. ± ±1%
CONCRETE SLAB FINISHED SLOPE 2% ±1%
LEVEL SLAB FLUSH WITH ADJACENT SURFACE
EXISTING CURB
SIDEWALK
RESTORE SURFACE TO MATCH EXISTING (TYP. ON 3 SIDES)
1V:3H MAX FORESLOPE (AS SHOWN) OR BACKSLOPE
BACKFILL
GRANULAR BASE TO EXTEND 150mm BEYOND ACCESS WAY AND PAD.
150mm MIN. DEPTH OF MATERIAL COMPLYING WITH GRANULAR "A" BASE MATERIAL UNDER PAD & ACCESS COMPACTED TO 95% STANDARD PROCTOR DENSITY.

CANADA POST / POSTES CANADA

ENGINEERING SERVICES / SERVICES D'INGÉNIERIE
CREATED BY / CRÉE PAR   M. ALLARD   29-03-2019
CHECKED BY / VERIFIÉ PAR   N. MOROZOVA   29-03-2019
ENGINEERING AUTH. / RESP. DU GÉNIE   K. CHAMPOUX   29-03-2019
CPC ID   E201-ENG-07
TITLE / TITRE   DEVELOPER PROVIDED CONCRETE PAD SPECIFICATIONS
    SIDEWALK INSTALLATION
SCALE / ÉCHELLE   NTS   SHEET / FEUILLE 1 OF / DE 1   REV: 00

REV # / # REV   DATE   BY / RM   CHKD / VER   EA / RG   DCC / CCD   DESCRIPTION
DATE DD-MM-YYYY / JJ-MM-AAAA

OPSD 310.039 — Concrete Sidewalk Ramps Tactile Walking Surface Indicators Component

Length Varies
Note 2
Plate with tactile walking surface indicators Note 3
610 Width
Detail A
Vent, Note 1 Typ
Truncated dome Typ
PLAN

ELEVATION
Ribs as specified by manufacturer

DETAIL A — TRUNCATED DOMES PLAN
18mm ±6mm
55mm ±14mm
29mm ±7mm, typ
55mm ±14mm

SECTION A-A
Truncated Dome
4mm +1mm
5mm min

NOTES:
1. Vents shall be as specified by the manufacturer.
2. Length of plate may be increased to suit the curb depression width.
3. Material of plate shall be as specified in Contract Documents.
A. Adjacent cast iron plates shall be permanently connected using a locking mechanism and any hardware shall be hot dipped galvanized.
B. All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
Nov 2019   Rev 1
CONCRETE SIDEWALK RAMPS TACTILE WALKING SURFACE INDICATORS COMPONENT
OPSD 310.039

Title Block

vallee
Consulting Engineers, Architects & Planners

G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

STAMP ARCH.
STAMP PROFESSIONAL ENGINEER
21-012
2022-11-01
J. T. IEZZI
100179485
LICENSED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

PROJECT TITLE:
SFO CAPITOL CONDOMINIUMS

MECHANIC STREET,
WATERFORD, ONTARIO,
N0E 1Y0

DRAWING TITLE:
SITE PLAN, CANADA POST & OPSD DETAILS

CHECKED BY: JI   DRAWN BY: BM
DRAWING SCALE: As indicated
PROJECT NO.: 21-012
DRAWING NO.: A102

TRENCH RESTORATION DETAIL
N.T.S.

40mm HL3 PROPOSED TOP ASPHALT
EXISTING BASE ASPHALT
50mm HL8 PROPOSED BASE ASPHALT
150mm MIN PROPOSED GRANULAR 'A' ROAD BASE
450mm PROPOSED GRANULAR 'B' BACKFILL
TRENCH WIDTH

LEGEND

— — — PROPOSED STORM MANHOLE & SEWER
———— PROPOSED SANITARY MANHOLE & SEWER
———— PROPOSED SANITARY SERVICE
— — — PROPOSED WATERMAIN
— — — PROPOSED WATER SERVICE
━ ━ ━ PROPERTY LINE

NO.	DATE	ISSUANCE
0	NOV 1, 2022	ISSUED FOR SITE PLAN APPROVAL
NO.	DATE	ISSUANCE

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

SCALE:

HORIZONTAL : 1:250

DO NOT SCALE DRAWINGS, CALL FOR ANY CLARIFICATIONS THAT ARE REQUIRED, FIELD VERIFY AT ALL BUILT CONDITIONS

ALL DRAWINGS ARE TO BE READ IN COLOUR ORIGINAL PAGE SIZE ARCH 'D' - 24" x 36"

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Consulting Engineers, Architects & Planners

G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

LICENSED PROFESSIONAL ENGINEER
J. T. IEZZI
100199485
PROVINCE OF ONTARIO
21-012
2022-11-01

PROJECT TITLE:
SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
NORFOLK STREET & MECHANIC STREET WEST

DRAWING TITLE:
SERVICING PLAN

CHECKED BY:	DRAWN BY:
JI	NLB
DRAWING SCALE:	DRAWING NO:
1:250	**C101**
PROJECT NO.:	
21-012	

Plan labels

GRAVEL DWY
GARAGE
BUILDING
SHED
CHICKEN COOP
FENCE
EXISTING 90m FIRE HYDRANT RADIUS
EXISTING 90m FIRE HYDRANT RADIUS
RIP-RAP AT MAX. 2:1 SLOPE
PROPOSED SWALE (TYP.)
PROPOSED SWALE (TYP.)
PROPOSED RETAINING WALL

STREET A

4 5 6 7 8 9
10 11 12 13 14 15
3 16
1 17
18

DCB1 T/G: 234.55 S INV. 233.12
DCB1
14.5m-375mm STORM AT 0.40%

SAMH2 1200Ø T/G: 235.58 S INV. 231.90 E INV. 231.82
SAMH2

STMH2 1200Ø T/G: 235.50 S INV. 233.18 E INV. 233.05
STMH2

SAMH3 1200Ø T/G: 235.24 W INV. 231.33 S INV. 231.25

81.9m-200mm SANITARY 0.60%
37.9m-300mm STORM 0.40%
37.9m-450mm STORM 0.40%
STMH4

150mm WATERMAIN
CBMH3 1200Ø T/G: 235.06 W INV. 232.90 E INV. 232.80 S INV. 232.72
CBMH3
6.0m-525mm STORM AT 0.40%
STMH7

STMH7 1200Ø T/G: 235.20 N INV. 232.70

STMH4 1200Ø T/G: 235.16 S INV. 233.10 N INV. 233.06 W INV. 232.96

150x150 TEE
FH

CBMH5 1200Ø T/G: 234.82 N INV. 233.18
CBMH5

CBMH1 1200Ø T/G: 234.78 N INV. 233.29
CBMH1

6.53 6.53

UNDERGROUND SWM FACILITY
- STORMTECH MODEL MC-3500
- 70 CHAMBERS WITH 8 END CAPS
- STORAGE VOLUME = 362m³
- BOTTOM OF STONE = 232.23m
- BOTTOM OF CHAMBER = 232.46m
- TOP OF STONE = 233.96m

REFER TO STORMTECH CHAMBER DRAWINGS FOR DETAILS.

PERMEABLE PAVER WALKWAY ABOVE STORMTECH CHAMBER SYSTEM. REFER TO DWG C105 FOR DETAILS.

WATER METER AND BACKFLOW CHAMBER PER DETAIL ON DWG C105.

SAMH1 1200Ø T/G: 234.20 N INV. 232.19
SAMH1

CBMH8 1200Ø T/G: 234.20 W INV. 232.46
CBMH8

STMH9 1500Ø T/G: 234.19 W INV. 232.46 E INV. 232.46 S INV. 232.41
STMH9

CB1 T/G: 233.98 E INV. 232.57

CB1
CBMH6 1200Ø T/G: 234.07 W INV. 232.61

CBMH6

DCB2 T/G: 233.66 W INV. 232.81
DCB2

32.5m-300mm STORM 0.40%

INSULATE ENTIRE RUN OF 300mm STORM AS PER DETAIL ON DWG C105.

SAMH4 1200Ø T/G: 234.19 S INV. 230.97
SAMH4

21.5m-375mm STORM 0.40%
10.3m-375mm STORM AT 0.40%

3.0m-450mm STORM AT 0.00%
14.0m-450mm STORM AT 0.30%
INSTALL ORIFICE PLATE AS PER DETAIL ON DWG C105.

RELOCATE EXISTING SIGN
RELOCATE EXISTING HYDRO POLE

CONNECT 450mm STORM TO EX STMH
CONNECT TO EXISTING WATERMAIN WITH 150x200 TEE
CONNECT TO EXISTING WATERMAIN WITH 150x200 TEE

13.7m-200mm SANITARY 0.50%

MH17 1500Ø T/G: 234.17 W INV. 232.26 N INV. 232.47 E INV. 232.23

CONNECT TO EXISTING WATERMAIN WITH 150x200 TEE

CONNECT EXISTING 200mm SANITARY TO NEW SAMH

SAMH5 1200Ø T/G: 233.77 N INV. 230.90 W INV. 230.75 E INV. 230.78
SAMH5

SAW CUT AND REMOVE EXISTING ASPHALT. BACKFILL AND RESTORE PER COUNTY STANDARD AS SHOWING IN DETAIL ON THIS SHEET TYP.

MECHANIC STREET WEST

BM #1
BM #2

42.1m-200mm SANITARY 0.70%
28.2m-300mm STORM 0.40%
150mm WATERMAIN
18.2m-300mm STORM 0.50%
5.2m-200mm SANITARY 0.40%

LEGEND

247.20 — PROPOSED SPOT ELEVATION

◄ — EMERGENCY OVERLAND FLOW DIRECTION

— TOP OF SLOPE

— EXISTING GROUND CONTOUR

235.58 — MINIMUM TOP OF SOD ELEVATION AT FRONT OF UNIT

2R — NUMBER OF RISERS IN GARAGE

T/F 235.45 WO — TOP OF FOUNDATION/FINISH FLOOR WO = WALKOUT BASEMENT

30 — UNIT NUMBER

2R — NUMBER OF RISERS FROM FLOOR TO SOD ELEVATION AT REAR OF HOUSE

235.23 — MINIMUM TOP OF SOD ELEVATION AT REAR OF HOUSE

235.18 — ROAD C/L ELEVATION

10m—2.0% — FLOW DIRECTION WITH GRADE AND DISTANCE BETWEEN POINTS

— PROPOSED GRADE BREAK

— PROPOSED SWALE

— PROPOSED MATCH LINE

TOP OF SOD AT THE HOUSE
THE TOP OF SOD ELEVATIONS AT THE HOUSE ARE MINIMUMS THAT MAY BE EXCEEDED. IN ACCORDANCE WITH THE ONTARIO BUILDING CODE, AT LEAST 0.15m OF FOUNDATION WALL MUST REMAIN EXPOSED.

EROSION & SEDIMENT CONTROL NOTE:
ALL ROAD CATCH BASINS TO HAVE FILTER CLOTH COVER IN PLACE UNTIL BASE ASPHALT IS IN PLACE. STORMWATER INLET STRUCTURES (DITCH INLET CATCH BASINS, CATCH BASINS, CATCH BASIN MANHOLES ETC.) TO HAVE SILT PROTECTION. ALL EROSION CONTROL TO BE TO THE SATISFACTION OF ENGINEER AND L.P.R.C.A.

ROOF WATER DRAINAGE:
ROOF WATER DRAINAGE TO OUTLET TO SPLASH PADS AS PER DRAWING STM — STORM DRAINAGE AREAS.

MATCH ELEVATIONS:
MATCH ELEVATIONS AT THE PROPERTY LINE ARE BASED ON INTERPOLATED TOPOGRAPHIC DATA. CONTRACTOR TO CONFIRM MATCH ELEVATIONS AND REPORT ANY DISCREPANCY TO THE ENGINEER PRIOR TO CONSTRUCTION.

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

SCALE:

HORIZONTAL : 1:250

DO NOT SCALE DRAWINGS, CALL FOR ANY CLARIFICATIONS THAT ARE REQUIRED, FIELD VERIFY AT ALL BUILT CONDITIONS

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G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

LICENSED PROFESSIONAL ENGINEER
21-012
2022-11-01
J. T. IEZZI
100129485
PROVINCE OF ONTARIO

PROJECT TITLE:
SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
NORFOLK STREET & MECHANIC STREET WEST

DRAWING TITLE:
GRADING PLAN

CHECKED BY:	DRAWN BY:
JI	NLB
DRAWING SCALE:	DRAWING NO:
1:250	**C102**
PROJECT NO.:	
21-012	

STREET A

MECHANIC STREET WEST

Unit numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

RIP-RAP AT MAX. 2:1 SLOPE
PROPOSED SWALE (TYP.)
PROPOSED SWALE (TYP.)

100mm PERFORATED SUBDRAIN WHERE SWALE SLOPE IS LESS THAN 1.0% AS PER DETAIL ON SHEET C105 TYP.

PERMEABLE PAVER WALKWAY ABOVE STORMTECH CHAMBER SYSTEM. REFER TO DWG C105 FOR DETAILS.

BM #1   BM #2

EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR DESIGN AND PROVISION OF ALL SEDIMENT CONTROL MEASURES AS MAY BE REQUIRED TO PROTECT THE WORK SITE OR THE ADJACENT LANDS, REGARDLESS OF THE SOURCE OR ORIGIN OF EROSION OR SEDIMENTS. IF THE ENGINEER IS NOT SATISFIED WITH THE EXTENT OF THE MEASURES TAKEN, THE ENGINEER MAY DIRECT THAT ADDITIONAL CONTROLS BE PUT IN PLACE.

   THE ENGINEERS REQUIREMENTS FOR SEDIMENT AND EROSION CONTROL SHALL BE CONSIDERED ABSOLUTE MINIMUMS. THE ULTIMATE RESPONSIBILITY TO ENSURE THAT THE MEASURES ARE ADEQUATE SHALL LIE SOLELY ON THE CONTRACTOR. ANY DAMAGE RESULTING FROM FAILURE OF THESE MEASURES SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.

2. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.

3. ALL EROSION CONTROL MEASURES TO BE IN PLACE UNTIL RESTORATION IS COMPLETE.

4. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.

5. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.

6. MINIMIZE AREA DISTURBED DURING CONSTRUCTION.

7. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.

8. PROTECT ALL CATCH BASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE AND MAINTAIN IN FREE FLOWING STATE (TERRAFIX 270R OR APPROVED EQUIVALENT). REFER TO DETAIL THIS PAGE.

9. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION INCLUDING OIL GRIT SEPARATOR.

10. PREVENT WIND-BLOWN DUST.

11. CONTRACTOR TO PROVIDE MUD MAT AT ALL CONSTRUCTION ENTRANCES.

MUD MAT – CONSTRUCTION ACCESS
N.T.S.

EXISTING ROAD
15.0m MIN.
4.0m MIN.
150mm – 200mm CLEAR STONE TO 300mm (MIN) DEPTH WITH FILTER FABRIC BENEATH STONES. MAINTAIN DURING CONSTRUCTION.

LEGEND

EXISTING GROUND CONTOUR
PROPOSED SWALE
PROPOSED LIGHT DUTY SILT FENCE AS PER OPSD 219.110
PROPOSED GRADING MATCH LINE
○ PROPOSED STORM MANHOLE

CATCHBASIN SEDIMENT PROTECTION DETAIL
N.T.S.

GRATE TO BE DOUBLE WRAPPED WITH WOVEN GEOTEXTILE
CATCH BASIN FRAME AND GRATE

NOTES:
- FILTER CLOTH WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
- WOVEN GEOTEXTILE TO HAVE A MINIMUM EQUIVALENT OPENING SIZE OF 0.15mm AND A MAXIMUM EQUIVALENT OPENING SIZE OF 0.25mm.
- WOVEN GEOTEXTILE TO BE REPLACED PERIODICALLY WHEN ACCUMULATED SEDIMENTS INTERFERES WITH DRAINAGE.
- CLEAR STONE TO BE PLACED ON TOP OF WRAPPED CATCHBASIN TO PROTECT GEOTEXTILE FROM LARGE OBJECTS.

NO.	DATE	ISSUANCE
0	NOV 1, 2022	ISSUED FOR SITE PLAN APPROVAL
NO.	DATE	ISSUANCE

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FOR CONSTRUCTION

SCALE:
HORIZONTAL : 1:250

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G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

LICENSED PROFESSIONAL ENGINEER
21-012
2022-11-01
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

PROJECT TITLE:
SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
NORFOLK STREET & MECHANIC STREET WEST

DRAWING TITLE:
EROSION & SEDIMENT CONTROL PLAN

CHECKED BY:	DRAWN BY:
JI	NLB
DRAWING SCALE:	DRAWING NO:
1:250	**C103**
PROJECT NO.:	
21-012	

Site Plan Labels

RIP-RAP AT MAX. 2:1 SLOPE
PROPOSED SWALE (TYP.)
LIGHT DUTY SILT FENCE PER OPSD 219.110
PROVIDE FILTER CLOTH AS PER DETAIL THIS PAGE
PROPOSED SWALE (TYP.)

STREET A

4 5 6 7 8 9
10 11 12 13 14 15
3 2 1
16 18

LIGHT DUTY SILT FENCE PER OPSD 219.110

PROVIDE FILTER CLOTH AS PER DETAIL THIS PAGE

LIGHT DUTY SILT FENCE PER OPSD 219.110

PERMEABLE PAVER WALKWAY ABOVE STORMTECH CHAMBER SYSTEM. REFER TO DWG C105 FOR DETAILS. PROTECT WITH FILTER CLOTH DURING CONSTRUCTION.

PROVIDE MUD MAT AS PER DETAIL THIS PAGE
PROVIDE FILTER CLOTH AS PER DETAIL THIS PAGE
PROVIDE FILTER CLOTH AS PER DETAIL THIS PAGE

BM #1
BM #2

MECHANIC STREET WEST

NOTES:

1. PROPOSED SEWERS TO ADHERE TO THE FOLLOWING OPSD:

   1200mm MAINTENANCE HOLE STRUCTURE — OPSD 701.010
   1200mm CATCH BASIN MAINTENANCE HOLE GRATE — OPSD 400.010

   ALL COMPONENTS OF THE PROPOSED STORM SEWERS ARE TO ADHERE TO DIVISION 700 OF THE OPSD.

2. RESTORE EXISTING COUNTY INFRASTRUCTURE TO COUNTY STANDARDS:

   • REFER TO TRENCHING RESTORATION DETAIL ON DRAWING GN.
   • CONCRETE CURB TO MATCH EXISTING.
   • CONCRETE SIDEWALK TO MATCH EXISTING WIDTH.
   • CONSTRUCTION PER OPSS AND OPSD.

3. ALL WATERMAIN TO BE RESTRAINED AT ALL BENDS, TEES, REDUCERS, DEAD-ENDS, AND VALVES AS PER DETAILS ON DWG. GN.

LEGEND

PROPOSED STORM MANHOLE & SEWER	STMH5
PROPOSED SANITARY MANHOLE & SEWER	SAMH3
PROPOSED SANITARY SERVICE	
PROPOSED WATERMAIN	
PROPOSED WATER SERVICE	
PROPERTY LINE	

STREET A

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

SCALE:

HORIZONTAL : 1:250

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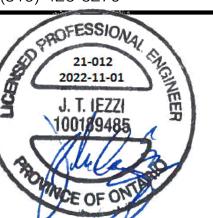
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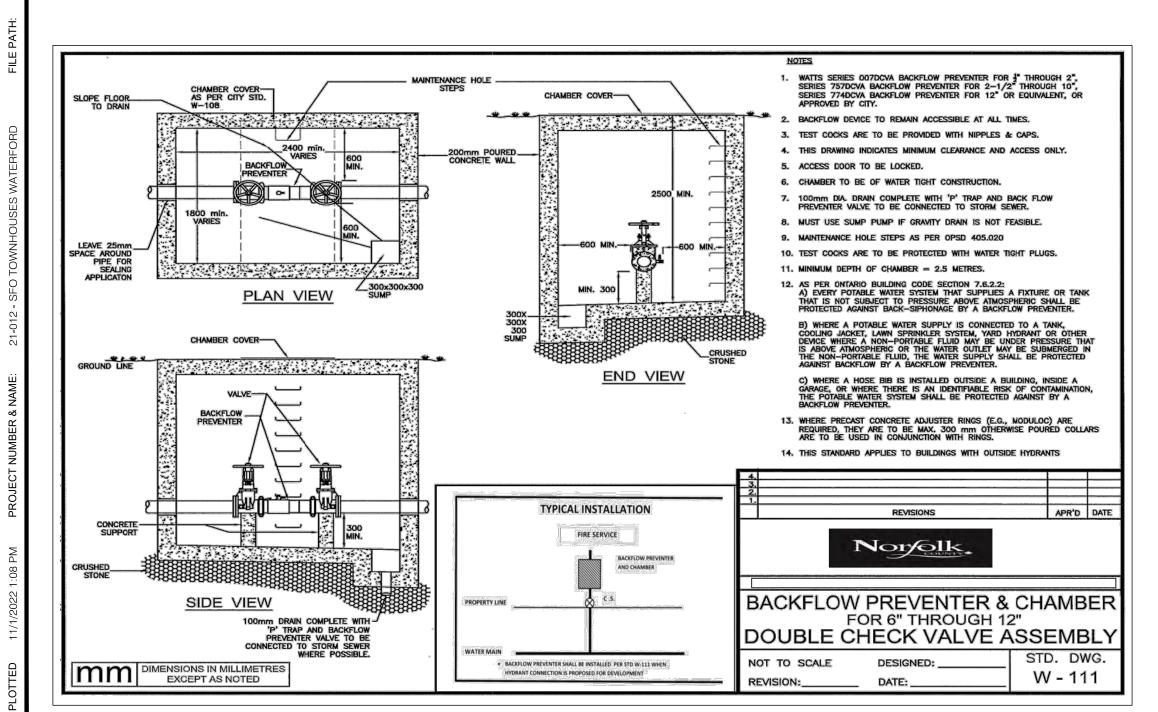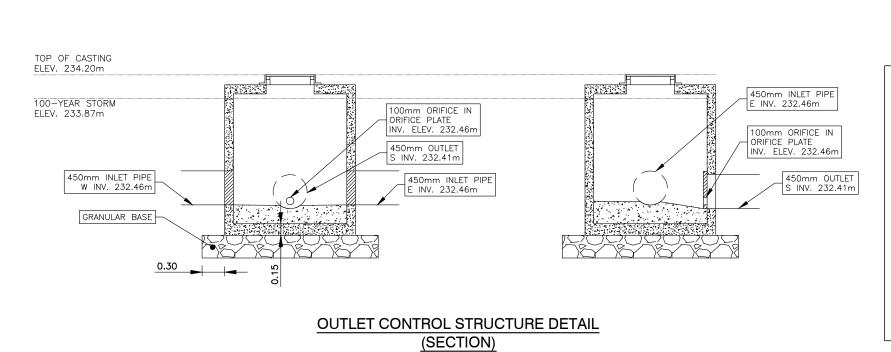2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

J. T. IEZZI
100189485

PROJECT TITLE:
SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
NORFOLK STREET & MECHANIC STREET WEST

DRAWING TITLE:
PLAN & PROFILE STREET A

CHECKED BY:	DRAWN BY:
JI	NLB
DRAWING SCALE:	DRAWING NO.:
1:250	
PROJECT NO.:	**C104**
21-012	

GENERAL NOTES

1. PRIOR TO CLOSING ANY STREET, THE CONTRACTOR SHALL OBTAIN CLEARANCE BY FILLING OUT THE COUNTY'S NOTICE OF ROAD CLOSURE FORM AND NOTIFY SCHOOL BUS OPERATORS OF STREETS USED FOR DETOUR AND THE DURATION OF THE DETOUR. THE CONTRACTOR MUST SUPPLY AND MAINTAIN ADEQUATE LOCAL DETOUR SIGNS AND LIGHTS. THE CONTRACTOR MUST MAINTAIN ACCESS TO ALL PROPERTIES AS DIRECTED BY THE ENGINEER.

2. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY MEASURES TO CONTROL SILT ENTERING THE STORM DRAINAGE SYSTEM TO THE SPECIFICATIONS OUTLINED IN THE GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES PREPARED BY THE MINISTRY OF NATURAL RESOURCES. THESE MEASURES ARE TO BE INSTALLED PRIOR TO COMMENCING ANY CONSTRUCTION FOR THIS STREET AND ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION HAS BEEN COMPLETED TO THE SPECIFICATIONS OF THE ENGINEER.

3. THE CONTRACTOR IS TO MEET ALL THE REQUIREMENTS OF THE OWNERS OF THE UTILITIES ON THIS PLAN, AND MUST MAKE SATISFACTORY ARRANGEMENTS WITH THE UTILITY COMPANIES FOR CROSSING THEIR INSTALLATIONS AND FOR PROVIDING ADEQUATE PROTECTION DURING CONSTRUCTION.

4. PRIOR TO COMMENCING ANY CONSTRUCTION, ALL EXISTING UNDERGROUND UTILITIES SHALL BE LOCATED AND MARKED. ANY UTILITIES DAMAGED OR DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE OWNER AT THE CONTRACTORS EXPENSE.

5. ALL ORGANIC, SUITABLE OR UNSUITABLE MATERIALS BENEATH THE ROAD ALLOWANCES MUST BE REMOVED AND THESE AREAS BACKFILLED WITH AN APPROVED FILL MATERIAL, ALL TO THE SATISFACTION OF THE ENGINEER.

6. PRIOR TO COMMENCING ANY CONSTRUCTION, ALL EXISTING SEWER OUTLET INFORMATION, BENCHMARKS, DIMENSIONS, ELEVATIONS AND GRADES MUST BE CHECKED AND VERIFIED AND ANY DISCREPANCIES REPORTED TO THE ENGINEER IMMEDIATELY.

7. ALL CATCH BASIN LEADS FOR SINGLE CATCH BASINS SHALL BE 250mm ø PVC SDR35 WITH CLASS 'B' BEDDING. ALL CATCH BASIN LEADS FOR TWIN INLET CATCH BASINS SHALL BE 300mm ø PVC SDR35 WITH CLASS 'B' BEDDING.

8. ALL PVC WATERMAIN SHALL HAVE TWU 10 COPPER TRACING WIRE LAID ALONG ENTIRE LENGTH. WATERMAIN SHALL HAVE 1.7m TO 1.9m COVER WITH CLASS 'B' BEDDING.

9. ALL NEW WATERSERVICES SHALL BE TYPE 19mm (3/4") SOFT 'K' COPPER.

10. WATERMAIN FITTINGS SHALL BE MECHANICAL JOINT OR PUSH-ON JOINT INSTALLED WITH APPROVED MECHANICAL THRUST RESTRAINTS.

11. ALL MECHANICAL THRUST RESTRAINTS SHALL CONFORM TO CONTRACT DOCUMENT SPECIFICATIONS.

GENERAL SEDIMENT CONTROL MEASURES

1. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION

2. ALL EROSION CONTROL MEASURES TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE.

3. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION

4. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION

5. MINIMIZE AREA DISTURBED DURING CONSTRUCTION

6. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED LOCATION

7. PROTECT ALL CATCHBASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE (TERRAFIX 270R OR APPROVED EQUIVALENT)

8. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION

9. PREVENT WIND-BLOWN DUST

10. STRAW BALES TO BE USED IN LOCALIZED AREAS AS SHOWN AND AND AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION

ROAD & BOULEVARD RESTORATION

ALL DISTURBED AREAS SHALL BE RESTORED AS FOLLOWS:
i. ALL ROAD CUTS SHALL BE RESTORED WITH
  —40mm HL3 SURFACE ASPHALT (97% MARSHALL)
  —50mm HL8 BASE ASPHALT (97% MARSHALL)
  —150mm GRANULAR 'A' BASE (100% SPMDD)
  —300mm GRANULAR 'B' TYPE 2 SUBBASE (100% SPMDD)
  GRANULAR 'B' TO BE EXTENDED 0.3m BEHIND EDGE OF THE PAVEMENT

ii. BOULEVARDS SHALL BE RESTORED WITH SOD OVER 100mm TOPSOIL (min) UNLESS OTHERWISE NOTED

iii. ASPHALT DRIVEWAYS SHALL BE RESTORED WITH 150mm OF GRANULAR 'A' (100% SPMDD) WITH 50mm OF HL3A ASPHALT (97% MARSHALL)

iv. GRAVEL DRIVEWAYS SHALL BE RESTORED WITH 150mm OF GRANULAR 'A' (100% SPMDD)

v. CONCRETE DRIVEWAYS SHALL BE RESTORED WITH 150mm OF GRANULAR 'A' (100% SPMDD) WITH 150mm OF CONCRETE (OPSS MIX. 30MPa MINIMUM)

LEGEND

- EX. STORM SEWER
- PROPOSED STORM SEWER
- EX. SANITARY SEWER
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- EX. MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED TWIN INLET CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- EX. CATCHBASIN
- PROPOSED WATERMAIN
- EX. WATERMAIN
- PROPOSED 3-WAY FIRE HYDRANT C/W STORZ CONNECTION
- EX. FIRE HYDRANT
- PROPOSED FIRE HYDRANT
- PROPOSED WATERVALVE
- EX. WATERVALVE
- EX. BURIED GAS LINE
- EX. BURIED BELL LINE
- EX. BURIED CABLE LINE
- EX. UNDERGROUND HYDRO LINE

SUBDRAIN DETAIL

GRAN 'A'
100mm PERFORATED P.E. PIPE WITH FILTER SOCK
50mm MIN

STONE BEDDING

TRENCH BACKFILL (SEE NOTE)
GRANULAR 'A' BEDDING
19mm CLEAR STONE BEDDING

NOTES:
1. 19mm CLEAR STONE STONE BEDDING SHALL BE USED IN PLACE OF THE STANDARD BEDDING WHERE HIGH HYDRAULIC GRADIENT CONDITIONS ARE ENCOUNTERED DURING CONSTRUCTION.

CLASS B BEDDING

TRENCH BACKFILL (SEE NOTE)
GRANULAR 'A' BEDDING
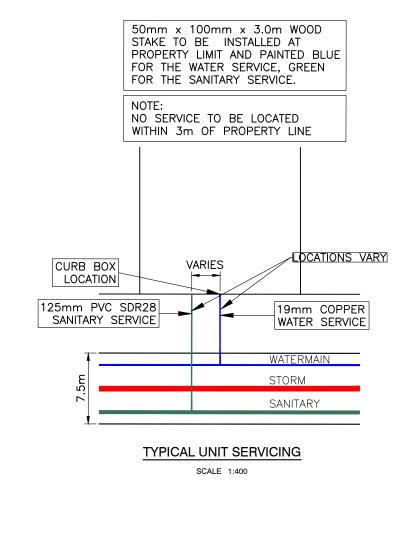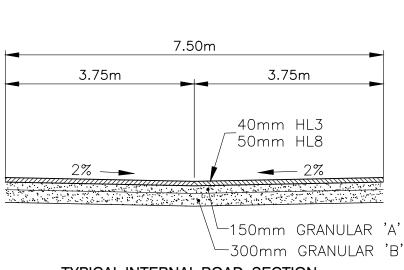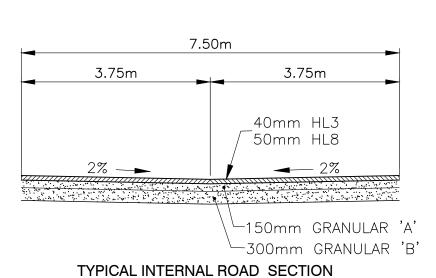
NOTES:
1. PIPE BEDDING AS SPECIFIED ON PLAN AND PROFILE DRAWINGS COMPACTED TO 95% SPMDD IN LAYERS NOT EXCEEDING 150mm, TO 300mm ABOVE TOP OF PIPE.
2. TRENCH BACKFILL FROM TOP OF PIPE BEDDING TO UNDERSIDE OF GRANULAR 'B' SUBBASE SHALL CONSIST OF APPROVED NATIVE MATERIALS COMPACTED TO 95% SPMDD IN LAYERS NOT EXCEEDING 300mm.
3. PRIOR TO PLACING THE GRANULAR SUBBASE MATERIAL, ALL TOPSOIL, SOFT OR OTHERWISE COMPRESSIBLE MATERIAL MUST BE REMOVED FROM THE SUBGRADE AREA, AND THE SUBGRADE SHALL BE PROOF-ROLLED TO COMPACT ANY LOOSE SURFACE ZONES. ALL EXCAVATED AREAS MUST BE BACKFILLED WITH APPROVED ON-SITE NATIVE MATERIALS OR IMPORTED
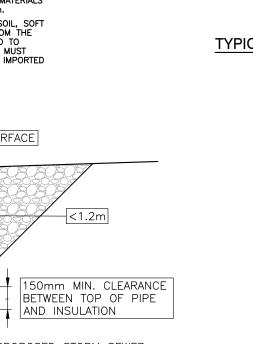
TYPICAL UNIT SERVICING
SCALE 1:400

CURB BOX LOCATION
125mm PVC SDR28 SANITARY SERVICE
19mm COPPER WATER SERVICE
LOCATIONS VARY
WATERMAIN
STORM
SANITARY

50mm x 100mm x 3.0m WOOD STAKE TO BE INSTALLED AT PROPERTY LIMIT AND PAINTED BLUE FOR THE WATER SERVICE, GREEN FOR THE SANITARY SERVICE.
NOTE:
NO SERVICE TO BE LOCATED WITHIN 3m OF PROPERTY LINE

TYPICAL INTERNAL ROAD SECTION
SCALE 1:75

7.50m — 3.75m / 3.75m
2% / 2%
40mm HL3
50mm HL8
150mm GRANULAR 'A'
300mm GRANULAR 'B'

END VIEW / PLAN VIEW / BOX COVER

TRACER WIRE HAND HOLE DETAIL
N.T.S.

COVER BOLTDOWN OPTION
BOX COVER SECTION

DRAWING LIST

21-012 - C101 - SERVICING PLAN
21-012 - C102 - GRADING PLAN
21-012 - C103 - EROSION & SEDIMENT CONTROL PLAN
21-012 - C104 - PLAN & PROFILE STREET A
21-012 - C105 - GENERAL NOTES & DETAILS
21-012 - C106 - SANITARY DRAINAGE AREAS
21-012 - C107 - STORM DRAINAGE AREAS

LEGAL DESCRIPTION

ROLL NUMBER 1: 3350100480D
ROLL NUMBER 2: 335010001850
LEGAL DESCRIPTION 1: WAT PLAN 19B BLK 17 PT LOT 1 RP 37R7056 PART 2
LEGAL DESCRIPTION 2: WAT PLAN 19B BLK 17 PT LOT 1 RP 37R7056 PART 1

APPLICANT INFORMATION

PAUL VAN BENTHEM
SFO CAPITAL INC.
(416)-363-3833
47 COLBORNE STREET, SUITE 307, TORONTO, ON M5E 1P8

BENCHMARKS

BM #1
TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON NORTHEAST CORNER OF INTERSECTION OF MECHANIC STREET WEST AND NORFOLK STREET.
ELEV. 236.18m

BM #2
TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON NORTH SIDE OF MECHANIC STREET WEST ACROSS FROM #160 MECHANIC STREET WEST.
ELEV. 234.82m

SUBDRAIN PLAN DETAIL / SUBDRAIN SECTION DETAIL
N.T.S.

CATCH BASIN OR CATCH BASIN MANHOLE
PAVEMENT STRUCTURE
19mm CLEAR STONE
100mm ø PERFORATED P.E. PIPE WITH FILTER SOCK
19mm CLEAR STONE
STORM PIPE
CATCH BASIN OR CATCH BASIN MANHOLE

TYPICAL STORM INSULATION FOR STORM WITH <1.2m COVER
N.T.S.

PROPOSED SURFACE
<1.2m
TRENCH BACKFILL – AS SPECIFIED
150mm MIN. CLEARANCE BETWEEN TOP OF PIPE AND INSULATION
HI-60—50mm THICK X 1200mm WIDE XPS FOAM INSULATION TAPED JOINTS
PROPOSED STORM SEWER
GRANULAR 'A' CLASS 'B' BEDDING 100% CRUSHED LIMESTONE

PERMEABLE PAVER WALKWAY
N.T.S.

50mm CLEAR STONE WRAPPED WITH TERRAFIX 270R GEOTEXTILE FILTER CLOTH
150mm TOPSOIL AND SOD
2% MIN. 6% MAX
DEPTH OF STONE UNDER WALKWAY VARIES
MIN. 350mm OF STONE ABOVE CHAMBERS

PERMEABLE PAVERS SHALL MEET THE MINIMUM MATERIAL AND STANDARD SPECIFICATIONS FOR PRECAST CONCRETE PAVERS (CSA A231.2). MINIMUM PAVER THICKNESS IS 60mm AND JOINT WIDTHS SHOULD BE NO GREATER THAN 15mm. 5mm CRUSHED AGGREGATE TO BE USED FOR FILL IN PAVER JOINTS.

WATERMAIN DEFLECTION DETAIL

OUTLET CONTROL STRUCTURE DETAIL (SECTION)
SCALE 1:50

TOP OF CASTING ELEV. 234.20m
100-YEAR STORM ELEV. 233.87m
100mm ORIFICE IN ORIFICE PLATE S. INV. 232.46m
450mm INLET PIPE E. INV. 232.46m
450mm OUTLET S. INV. 232.46m
450mm INLET PIPE W. INV. 232.41m
450mm OUTLET S. INV. 232.41m
GRANULAR BASE

NOTE:
ORIFICE PLATE TO BE BOLTED TO MANHOLE FACE AND SEALED WITH NON-SHRINK GROUT.
ORIFICE CONTROL TO BE UNIFORM STEEL SECTION WITH NO OPEN SEAMS. MATERIAL TO BE MIN. 3mm THICK GALVANIZED STEEL OR ALUMINUM.
CONTROL FEATURE MUST BE INSTALLED AND INSPECTED BY THE ENGINEER PRIOR TO PAVING TO ENSURE STORMWATER RUNOFF FLOW CONTROLS ARE IN PLACE TO PROTECT DOWNSTREAM SYSTEM.

WATERMAIN RESTRAINTS TABLE

DIAMETER (mm)	MINIMUM LENGTH TO BE RESTRAINED ON EACH SIDE OF FITTINGS (m)					
	11-1/4°	22-1/2°	45°	90° BENDS AND TEES	REDUCER (ON DIRECTION OF LARGER PIPE)	DEAD END AND VALVES
150		2		9	N/A	12

NOTES:

1. ALL JOINTS WITHIN DISTANCES SHOWN SHALL BE RESTRAINED WITH A MEG-A-LUG JOINT RESTRAINT.
2. ALL TEES SHALL HAVE A MINIMUM OF 1.0m SOLID PIPE OUT EACH SIDE OF THE MAIN RUN OF THE TEE.
3. ALL DISTANCES TO BE CONFIRMED TO THE MANUFACTURERS STANDARDS FOR ALTERNATE RESTRAINTS TO MEGALUG.

BACKFLOW PREVENTER & CHAMBER FOR 6" THROUGH 12" DOUBLE CHECK VALVE ASSEMBLY

PLAN VIEW / END VIEW / SIDE VIEW

NOTES:
1. WATTS SERIES 007DCDA BACKFLOW PREVENTER FOR 2" THROUGH 3", SERIES 757DCDA BACKFLOW PREVENTER FOR 2-1/2" THROUGH 10", SERIES 774DCDA BACKFLOW PREVENTER FOR 12" OR EQUIVALENT, OR APPROVED BY CITY.
2. BACKFLOW DEVICE TO REMAIN ACCESSIBLE AT ALL TIMES.
3. TEST COCKS ARE TO BE PROVIDED WITH NIPPLES & CAPS.
4. THIS DRAWING INDICATES MINIMUM CLEARANCE AND ACCESS ONLY.
5. ACCESS DOOR TO BE LOCKED.
6. CHAMBER TO BE OF WATER TIGHT CONSTRUCTION.
7. 100mm DIA. DRAIN COMPLETE WITH "P" TRAP AND BACK FLOW PREVENTER VALVE TO BE CONNECTED TO STORM SEWER.
8. MUST USE SUMP PUMP IF GRAVITY DRAIN IS NOT FEASIBLE.
9. MAINTENANCE HOLE STEPS AS PER OPSD 405.020
10. TEST COCKS ARE TO BE PROVIDED WITH WATER TIGHT PLUGS.
11. MINIMUM DEPTH OF CHAMBER = 2.5 METRES.

TYPICAL INSTALLATION
FIRE SERVICE
PROPERTY LINE
WATER MAIN
BACKFLOW PREVENTER AND CHAMBER

NORFOLK
DIMENSIONS IN MILLIMETRES EXCEPT AS NOTED
NOT TO SCALE
STD. DWG. W-111

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

SCALE:
HORIZONTAL : 1:250

DO NOT SCALE DRAWINGS, CALL FOR ANY CLARIFICATIONS THAT ARE REQUIRED, FIELD VERIFY AT ALL BUILT CONDITIONS
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vallee
Consulting Engineers, Architects & Planners

G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

LICENSED PROFESSIONAL ENGINEER
21-012
2022-11-01
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

PROJECT TITLE:
SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
Norfolk Street & Mechanic Street West

DRAWING TITLE:
GENERAL NOTES & DETAILS

CHECKED BY: JI
DRAWN BY: NLB
DRAWING SCALE: 1:250
DRAWING NO.: C105
PROJECT NO.: 21-012

NO.	DATE	ISSUANCE
0	NOV 1, 2022	ISSUED FOR SITE PLAN APPROVAL

SANITARY SEWER DESIGN SHEET

Date: 9/14/2022
Project: 21-012 SFO
Town/County: Waterford, Norfolk County

Pipe Material: PVC
N 0.013

Designed by: NLB
Checked by: JI
Sheet: 1 of 1

Area	Location			Area				Total Pop.	M=Peak Factor	Flow			Material	Sewer Design							
	Street	From MH	To MH	Section Ha	Cumul. Ha	Section Units	Cumul Units			Q(i) L/s	Q(s) L/s	Q(d) L/s		Size mm	Length m	N	Slope %	Cap L/s	Q(d)/Cap %	Full V m/s	
SA1	Street A	SAMH1	SAMH2	0.20	0.20	3	3	8	4.4223	0.056	0.19	0.246	PVC	200	42.1	0.013	0.70%	27.4	0.9%	0.87	
SA2	Street A	SAMH2	SAMH3	0.26	0.46	6	9	25	4.3676	0.1288	0.563	0.6918	PVC	200	81.9	0.013	0.60%	25.4	2.7%	0.81	
SA3	Street A	SAMH3	SAMH4	0.40	0.86	9	18	50	4.3156	0.2408	1.1126	1.3534	PVC	200	51.2	0.013	0.50%	23.2	5.8%	0.74	
-	Street A	SAMH4	SAMH5		0.86		18	50	4.3156	0.2408	1.1126	1.3534	PVC	200	13.7	0.013	0.50%	23.2	5.8%	0.74	

Design Information:
$Q(s)$ = Sewage Flow = P q M / 86.4
$Q(i)$ = Infiltration Flow = I A
$Q(d)$ = Peak Design Flow = $Q(s)$ + $Q(i)$

P = Population in thousands
M = Peaking Factor = 1 + 14 / (4 + P^.5)
A = Tributary Area

q = Per Capita Flow= 450 L/cap d
I = Peak Extraneous Flow = 0.28 L/s/ha
Population Density 55 persons /ha
Population Density 2.75 persons /unit

STREET A

MECHANIC STREET WEST

SAMH1 SAMH2 SAMH3 SAMH4 SAMH5

SA5 0.26 6
SA5 0.40 9
SA1 0.20 3

81.9m—200mm SANITARY 0.60%
42.1m—200mm SANITARY 0.70%
51.2m—200mm SANITARY 0.50%
13.7m—200mm SANITARY 0.50%

MH17
1500Ø
T/G: 234.17
W INV. 232.26
N INV. 232.47
E INV. 232.43

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(519) 426-6270

21-012
2022-11-01
J. T. IEZZI
100189485

SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
NORFOLK STREET & MECHANIC STREET WEST

DRAWING TITLE:
SANITARY DRAINAGE AREAS

LEGEND

SA1 0.99 4 — SANITARY DRAINAGE AREA NUMBER
AREA (ha) — NUMBER OF UNITS
→ SANITARY SEWER FLOW
SAMH5 — PROPOSED SANITARY SEWER
- - - SANITARY DRAINAGE BOUNDARY

CHECKED BY: JI
DRAWN BY: NLB
DRAWING SCALE: 1:250
DRAWING NO.: C106
PROJECT NO.: 21-012

NO.	DATE	ISSUANCE
0	NOV 1, 2022	ISSUED FOR SITE PLAN APPROVAL

LEGEND

ST1 — STORM DRAINAGE AREA NUMBER
0.99 | 0.45
— RUN–OFF COEFFICIENT
— AREA (ha)

⇨ OVERLAND FLOW (MAJOR)

→ STORM SEWER FLOW (MINOR)

STMH5 — PROPOSED STORM MANHOLE

◉ PROPOSED SINGLE CATCH BASIN MH

▣ PROPOSED DOUBLE CATCH BASIN MH

▬ ▬ STORM DRAINAGE BOUNDARY

NO.	DATE	ISSUANCE
0	NOV 1, 2022	ISSUED FOR SITE PLAN APPROVAL
NO.	DATE	ISSUANCE

LEGAL DESCRIPTION
ROLL NUMBER 1: 33501004800
ROLL NUMBER 2: 33501001850
LEGAL DESCRIPTION 1: WAT PLAN 19B BLK 17 PT LOT 1 RP 37R7056 PART 2
LEGAL DESCRIPTION 2: WAT PLAN 19B BLK 17 PT LOT 1 RP 37R7056 PART 1

APPLICANT INFORMATION
PAUL VAN BENTHAM
SFO CAPITAL INC.
(416)-363-3833
47 COLBORNE STREET, SUITE 307, TORONTO, ON M5E 1P8

BENCHMARKS
BM #1
TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON NORTHEAST CORNER OF INTERSECTION OF MECHANIC STREET WEST AND NORFOLK STREET.
ELEV: 236.18m

BM #2
TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON NORTH SIDE OF MECHANIC STREET WEST ACROSS FROM #160 MECHANIC STREET WEST.
ELEV: 234.82m

DRAWING LIST
21-012 - C101 - SERVICING PLAN
21-012 - C102 - GRADING PLAN
21-012 - C103 - EROSION & SEDIMENT CONTROL PLAN
21-012 - C104 - PLAN & PROFILE STREET A
21-012 - C105 - GENERAL NOTES & DETAILS
21-012 - C106 - SANITARY DRAINAGE AREAS
21-012 - C107 - STORM DRAINAGE AREAS

SCALE:
HORIZONTAL   1:250

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(519) 426-6270

LICENSED PROFESSIONAL ENGINEER
21-012
2022-11-01
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

PROJECT TITLE:
SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
NORFOLK STREET & MECHANIC STREET WEST

DRAWING TITLE:
STORM DRAINAGE AREAS

CHECKED BY:	DRAWN BY:
JI	NLB
DRAWING SCALE:	DRAWING NO.:
1:250	**C107**
PROJECT NO.: 21-012	

ST3 0.49 | 0.44

ST4 0.14 | 0.75

STREET A

ST2 0.15 | 0.75

ST5 0.34 | 0.46

ST1 0.08 | 0.75

ST7 0.02 | 0.25

ST6 0.05 | 0.75

STMH2   37.9m–300mm STORM 0.40%   CBMH3   37.9m–450mm STORM 0.40%   STMH4

6.0m–525mm STORM AT 0.40%   STMH7

14.5m–375mm STORM AT 0.40%

28.2m–300mm STORM 0.40%

8.2m–300mm STORM 0.40%

CBMH1

CBMH5

CBMH8   STMH9   21.5m–375mm STORM 0.40%   CB1   CBMH6   32.5m–300mm STORM 0.40%   DCB2

3.0m–450mm STORM AT 0.00%

10.3m–375mm STORM AT 0.40%

14.0m–450mm STORM AT 0.30%

DCB1

MECHANIC STREET WEST

STORM SEWER DESIGN SHEET

Date: 9/7/2022
Project: 21-012 SFO Condos
Town/County: Waterford, Norfolk County

Return: 100-year
A: 801.041
B: 1.501
C: 0.657

Pipe Material: PVC<=450, Concrete >450
n: 0.013

Designed by: NLB
Checked by: JI

Sheet: 1 of 1

Area	Location			Area			Composite Runoff Coeff.	Total Area	Individual C*A	Cumulative C*A	Time of Concentration	Rainfall	Flow	Sewer Design						
	Street	From	To	Ha 0.25	Ha 0.45	Ha 0.75		Ha			min	mm/hr	2.78*I*A*C L/s	Size mm	Slope %	Capacity (Full) L/s	Vel (Full) m/s	Length m	Time min	Cap %
ST1	Street A	CBMH1	STMH2			0.08	0.75	0.08	0.06	0.06	15.00	126.98	21.2	300	0.40%	61.2	0.87	28.2	0.54	35%
-	Street A	STMH2	CBMH3					0.00	0.00	0.06	15.54	124.31	20.7	300	0.40%	61.2	0.87	37.9	0.73	34%
ST2	Street A	CBMH5	STMH4			0.15	0.75	0.15	0.11	0.11	15.00	126.98	39.7	300	0.40%	61.2	0.87	18.2	0.35	65%
ST3	Street A	STMH4	STMH3	0.18	0.20	0.11	0.44	0.49	0.22	0.22	15.00	126.98	76.8	375	0.40%	110.9	1.00	14.5	0.24	69%
-	Street A	STMH3	CBMH3					0.00	0.00	0.33	15.35	125.24	114.9	450	0.40%	180.3	1.1	37.9	0.56	64%
ST4	Street A	CBMH3	STMH7			0.14	0.75	0.14	0.11	0.50	16.27	120.93	166.4	525	0.40%	272.0	1.26	6.0	0.08	61%
ST5	-	DCB2	CBMH6	0.16	0.06	0.12	0.46	0.34	0.16	0.16	15.00	126.98	55.4	300	0.40%	61.2	0.87	32.5	0.63	91%
ST6	-	CBMH6	CB1			0.05	0.75	0.05	0.04	0.19	15.63	123.92	67.0	375	0.40%	110.9	1.00	10.3	0.17	60%
ST7	-	CB1	STMH9	0.02				0.02	0.01	0.20	15.80	123.11	68.3	375	0.40%	110.9	1.00	21.5	0.36	62%
-	-	STMH9	EX STMH										28.0	450	0.30%	156.2	0.98	13.2	0.22	18%

LEGEND:
= 100-year flow rate from underground chamber facility (obtained from Visual OTTHYMO Model)

September 23, 2022

Mr. Paul VanBenthem
47 Colborne Street, Suite 307
Toronto, ON
M5E 1P8

Attention: **Mr. Paul VanBenthem**

Reference: **Functional Servicing Report**
SFO Townhouses
Waterford – Norfolk County
Project No. 21-012

Introduction

This Functional Servicing Report has been prepared in support of the site plan application required for the construction of an 18-unit townhouse condominium development located on Mechanic Street West in Waterford – Norfolk County. This report presents the functional serving for the proposed development, including sanitary servicing, storm servicing and domestic and fire water servicing.

Background

The 0.86 ha proposed development site is situated on the north side of Mechanic Street West and east of Norfolk Street in Waterford – Norfolk County. The subject lands are bound by Mechanic Street West to the south, proposed semi-detached units to the west, existing residential properties to the north, and an existing car dealership to the east. Refer to Figure 1.

Figure 1 - Site Location

G. **D o u g l a s   V a l l e e   L i m i t e d**

The development site is currently vacant land, primarily comprised of grassed meadow. The proposed residential developments shall consist of the following construction:

- 8 – 1-storey residential dwelling units;
- 10 – 2-storey residential dwelling units;
- Storm and sanitary infrastructure to support proposed construction;
- Stormwater management facility;
- Curbs, sidewalks, swales, and other miscellaneous items to support proposed construction.

Sanitary Servicing

As-constructed drawings from Norfolk County indicate existing 200mm diameter asbestos cement sanitary gravity sewers along Mechanic Street West. Sanitary flows from the development site are proposed to discharge to the existing 200mm sanitary sewer along Mechanic Street West.

Sanitary design flows for the proposed development were calculated using the Norfolk County Design Criteria, as presented in Table 1. In summary, the development site is anticipated to generate an additional sanitary flow of approximately 1.35 L/s to the existing sanitary sewer along Mechanic Street West.

Table 1 Sanitary Design Flow Information	
Total Number of Units	Total: 22 units Proposed: 6 semi-detached and 16 townhouse units
Population Density (persons/units)	2.75
Per Capita Flow (L/person/day)	450
Peak Extraneous Flow (L/sec/hectare)	0.28
Development Area (ha)	0.86
Infiltration Flow (L/s)	0.24
Sewage Flow (L/s)	1.11
Peak Design Flow (L/s)	1.35

In 2012, G. Douglas Vallee Ltd. completed the design for the reconstruction of Mechanic Street West (Vallee Project No. 12-128/ Norfolk County Project No. PW-E-13-060). The corresponding sanitary drainage area drawing and design sheet for the existing sanitary sewer on Mechanic Street West from Robinson Road to Main Street North is provided in Appendix A. These have been updated to include the proposed development, as presented in Figure 2 - Mechanic Street Sanitary Drainage Areas, attached in Appendix A. Based on these calculations it can be concluded that the existing sanitary sewer along Mechanic Street West has adequate capacity to support the proposed development.

To confirm the calculations presented, it is recommended that sanitary hydraulic modelling be completed by the Norfolk County consultant to determine if the existing County infrastructure provides adequate capacity to accommodate the estimated sanitary design flow from the proposed development further downstream.

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Consulting Engineers, Architects & Planners

Stormwater Management

Complete details of the proposed stormwater management design are provided in the Stormwater Management Report dated September 20, 2022 included with the site plan submission.

Water Servicing

As-constructed drawings indicate an existing 200mm diameter watermain along the north side of Mechanic Street West. The proposed development will utilize the existing 200mm watermain on Mechanic Street West as the water supply.

An analysis of the hydraulic modelling will be conducted by the County consultants to determine the water servicing capacity and constraints on the existing water system to ensure adequate system flows and pressure for the domestic and fire demands. Norfolk County's design criteria stipulates the following requirements for system pressures, and the system shall be designed to meet the greater of either of the following requirements;

- Fire flow conditions– not less than 140 kPa
- Normal operating conditions – not less than 280 kPa

Domestic Water Demand

The following summarizes the domestic water flow information for the proposed development:

- Total Number of Units: 18
- Population Density: 2.75 persons per unit
- Population: 50 people
- Average Daily Water Demand (per person) 0.450 m^3/person/day
- Average Daily Water Demand: 22.50 m^3/day (0.32 L/s)
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand: 50.63 m^3/day (0.59 L/s)
- Peak Hourly Demand Factor (Residential)   4.00
- Peak Hourly Demand   3.75 m^3/hour (1.04 L/s)

Fire Water Service

According to the County GIS online mapping and County record drawings, there are two existing fire hydrants located in proximity to the development site. Both hydrants are located on the north side of Mechanic Street West; one just east of Norfolk Street, and the second in front of #151 Mechanic Street West. However, both hydrants are greater than 90 m away from the furthest proposed unit. Consequently, a fire hydrant will be installed on subject property to service the proposed development.

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Typically, available fire flow during the maximum day demand is the critical criteria when evaluating a watermain distribution system's ability to service a residential subdivision. The estimated fire flow requirement for the development has been determined using both the recommendations of the Fire Underwriters Survey – 1999 (FUS) and the Ontario Building Code (OBC) method. Using the FUS recommendations and the OBC fire flow calculation procedure, the minimum required fire flow was determined to be 150 L/s and 75 L/s, respectively. It should be noted that the FUS method is generally conservative. As such, the required flow for proposed development is estimated to be 75 L/s. Supporting calculations for both methods are detailed in Appendix B. Firewalls have been utilized to decrease the required fire flow, and will be refined further in the detailed design process.

The Norfolk County ISMP estimates that the available fire flow in the existing watermain on Mechanic Street West ranges from 83 L/s to 159 L/s, as displayed in Appendix B. Therefore, the available municipal watermain is anticipated to provide sufficient flow to service the development. It should be noted that the ISMP modeling is from 2015, consequently, it is recommended that Norfolk County review against their current model and provide more current available demands to confirm that the supply is adequate.

Conclusions and Recommendations

The functional servicing design for the proposed development can be summarized as follows:

- The proposed development will be service by a new sanitary sewer network that connects to the existing 200mm sanitary sewer along Mechanic Street West.

- A peak sanitary design flow of approximately 1.35 L/s is anticipated from the proposed development.

- An analysis of the existing sanitary sewer network on Mechanic Street West indicates that there is sufficient capacity to support the sanitary flows from the proposed development. However, modelling from the Norfolk County's consultant is recommended to determine the impact of the proposed additional sanitary flows further downstream.

- Complete details of the proposed stormwater management design are provided in the Stormwater Management Report dated September 20, 2022.

- The existing 200mm watermain on Mechanic Street West shall serve as the water supply for the proposed development.

- An analysis of the hydraulic modelling will be conducted by the County consultants to determine the water servicing capacity and constraints on the existing water system to ensure adequate system flows and pressure for the aforementioned domestic and fire demands.

- The domestic maximum day demand and peak hourly demand were found to be 0.59 L/s and 1.04 L/s, respectively.

- The required fire flow demand for the proposed development was determined using both the FUS method and OBC method and was found to be 150 L/s and 75 L/s, respectively, which is within the estimated range of available fire flow.

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Consulting Engineers, Architects & Planners

Professional Engineers
Ontario

Authorized by the Association of Professional Engineers of Ontario
to offer professional engineering services.

Ontario Association
of Architects

It is recommended that this report be provided to the Norfolk County and the Long Point Region Conservation Authority in support of the application for site plan approval of the proposed development.

We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact us

Respectfully submitted,

Natalie Biesinger, B.A.Sc., EIT
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

John Iezzi, P.Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

Appendix A
– 12-128 SAN1 – Sanitary Areas
– 12-128 Sanitary Sewer Design Sheet
– 21-012 FIG2 – Mechanic Street Sanitary Drainage Areas

Appendix B
– Domestic Water Demand
– 21-012 FIG3 – Fire Separation Distances
– FUS Calculations
– OBC Calculations
– Norfolk ISMP Map

G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects & Planners

APPENDIX A

12-128 SAN1 – Sanitary Areas
12-128 Sanitary Sewer Design Sheet
21-012 FIG2 – Mechanic Street Sanitary Drainage Areas

SANITARY SEWER DESIGN SHEET

Date   28-Jan-13

Pipe Material AC   Project: Mechanic Street Existing Sanitary   Designed by

N 0.013   Checked by

Job No.   12128   Sheet of :   1   of   1

Area	Location			Area				Total	M=Peak	Flow			Sewer Design						
	Street	From	To	Section	Cumul.	Section	Cumul	Pop.	Factor	Q(i)	Q(s)	Q(d)	Material	Size	Length	N	Slope	Cap	Full V
Area		MH	MH	Ha	Ha	Units	Units	Pop.	Factor	L/s	L/s	L/s		mm	m		%	L/s	m/s
A2	Mechanic St	114	113	2.7	2.7	7	7	19	4.4	0.8	0.4	1.2	PVC	200		0.013	0.40%	20.7	0.66
A3	Mechanic St	113	112	1.7	4.4	13	20	55	4.3	1.2	1.2	2.5	PVC	200		0.013	2.77%	54.6	1.74
A4	Mechanic St	112	111	3.3	7.7	7	27	74	4.3	2.2	1.7	3.8	PVC	200		0.013	2.49%	51.8	1.65
A5	Mechanic St	111	110	3.4	11.1	6	33	91	4.3	3.1	2.0	5.1	PVC	200		0.013	3.38%	60.3	1.92
A6	Mechanic St	110	109	3.6	14.7	6	39	107	4.2	4.1	2.4	6.5	PVC	200		0.013	1.87%	44.9	1.43
A7	Mechanic St	109	108	1.8	16.5	4	43	118	4.2	4.6	2.6	7.2	PVC	200		0.013	0.51%	23.4	0.75
A8	Mechanic St	108	107	1.4	17.9	6	49	135	4.2	5.0	3.0	8.0	PVC	200		0.013	0.40%	20.7	0.66
A9	Mechanic St	107	106	1.3	19.2	11	60	165	4.2	5.4	3.6	9.0	PVC	300		0.013	0.15%	37.5	0.53
A1	Mechanic St	106	105	27.6	46.8	120	180	495	4.0	13.1	10.3	23.4	PVC	300		0.013	0.26%	49.3	0.70
A10	Mechanic St	105	104	1.1	47.9	8	188	517	4.0	13.4	10.7	24.1	PVC	300		0.013	0.12%	33.5	0.47
A11	Mechanic St	104	103	0.7	48.6	5	193	531	4.0	13.6	10.9	24.6	PVC	300		0.013	0.16%	38.7	0.55
A12	Mechanic St	103	102	3.1	51.7	30	223	613	3.9	14.5	12.5	27.0	PVC	300		0.013	0.03%	16.7	0.24
A13	Mechanic St	118	102	1.1	1.10	10	10	28	4.4	0.3	0.6	0.9	PVC	200		0.013	4.97%	73.1	2.33
	Shadow Lake	102	101	1	52.80	2	235	646	3.9	14.8	13.2	28.0	PVC	300		0.013	0.26%	49.3	0.70

Design Information:

Q(s) = Sewage Flow = P q M / 86.4   P = Population in thousands   q = Per Capita Flow=   450   L/cap d

Q(i) = Infiltration Flow = I A   M = Peaking Factor = $1 + 14 / (4 + P^{.5})$ I = Peak Extraneous Flow =   0.28   L/s/ha

Q(d) = Peak Design Flow = Q(s) + Q(i)   A = Tributary Area   Population Density   55   persons /ha

Population Density   2.75   persons /unit

LEGEND

A1 — SANITARY AREA NUMBER
NUMBER OF UNITS
AREA (ha)

Project Title	MECHANIC STREET RECONSTRUCTION
Location	WATERFORD
Drawing Title	SANITARY AREAS

Stamp	

REV. No.	DATE	REVISION	REV. No.	DATE	REVISION

Designed by : ---
Drawn By : ---
Checked by : ---
Date Started : January 25, 2013
Drawing Scale : NTS

Project No. 12-128

Drawing No. SAN1

SANITARY SEWER DESIGN SHEET
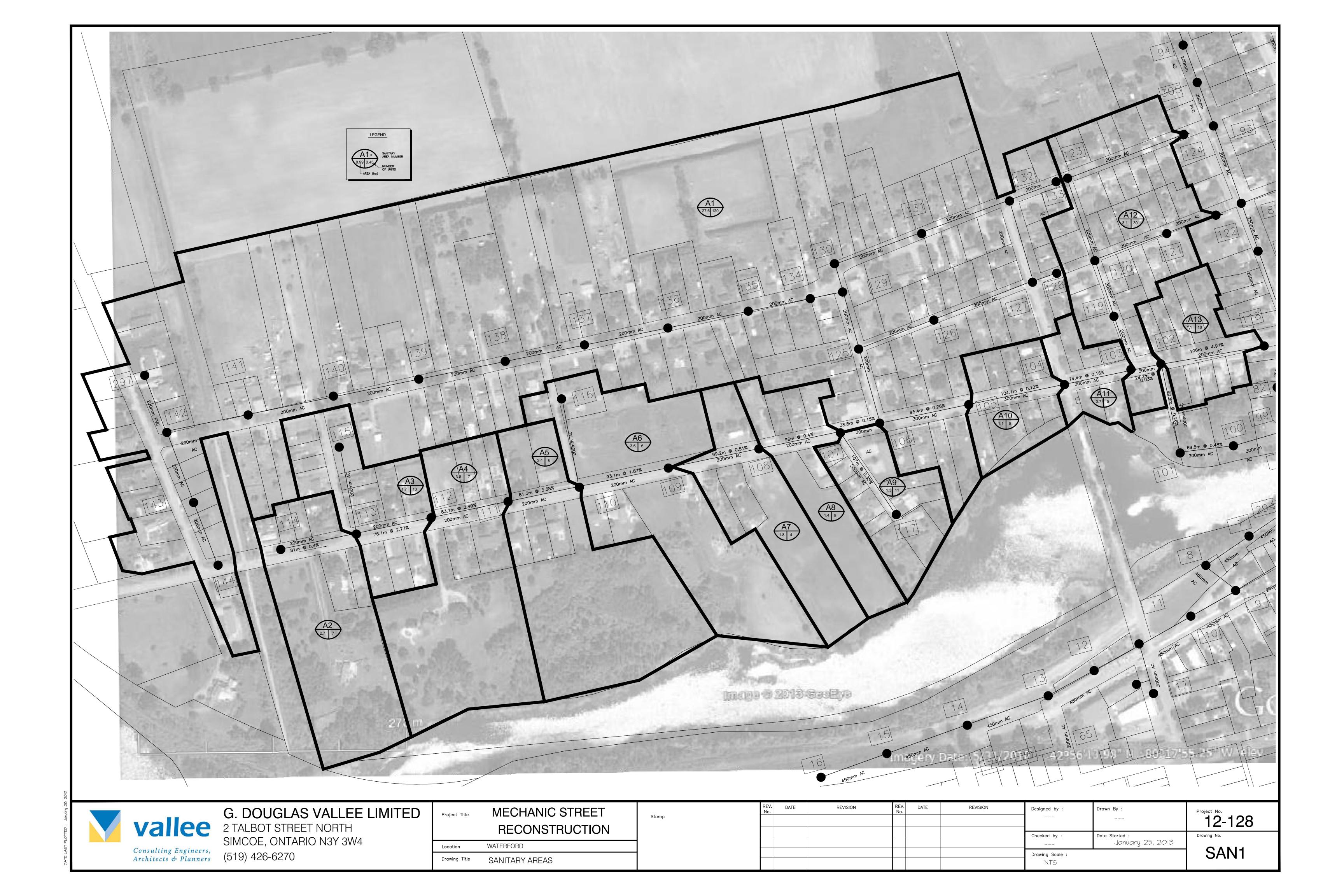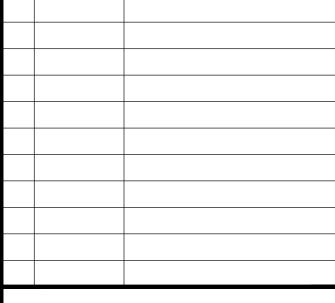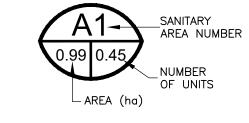
Pipe Material AC
N 0.013

Project: SFO Townhouses
Job No. 21-012

Date 12-Oct-21
Designed by NLB
Checked by JI
Sheet of : 1 of 1

Location				Area					Flow					Sewer Design					
Area	Street	From MH	To MH	Section Ha	Cumul. Ha	Section Units	Cumul Units	Total Pop.	M=Peak Factor	Q(i) L/s	Q(s) L/s	Q(d) L/s	Material	Size mm	N	Slope %	Cap L/s	Q(d)/Cap L/s	Full V m/s
A2	Mechanic St	114	113	2.7	2.7	7	7	19	4.4	0.8	0.4	1.2	AC	200	0.013	0.40%	20.7	5.8%	0.66
A3	Mechanic St	113	112	1.7	4.4	13	20	55	4.3	1.2	1.2	2.5	AC	200	0.013	2.77%	54.6	4.5%	1.74
A4	Mechanic St	112	111	3.3	7.7	7	27	74	4.3	2.2	1.7	3.8	AC	200	0.013	2.49%	51.8	7.4%	1.65
A5	Mechanic St	111	110	3.4	11.1	6	33	91	4.3	3.1	2.0	5.1	AC	200	0.013	3.38%	60.3	8.5%	1.92
A6	Mechanic St	110	109	3.6	14.7	29	62	171	4.2	4.1	3.7	7.8	AC	200	0.013	1.87%	44.9	17.4%	1.43
A7	Mechanic St	109	108	1.8	16.5	4	66	182	4.2	4.6	3.9	8.6	AC	200	0.013	0.51%	23.4	36.5%	0.75
A8	Mechanic St	108	107	1.4	17.9	6	72	198	4.1	5.0	4.3	9.3	AC	200	0.013	0.40%	20.7	44.8%	0.66
A9	Mechanic St	107	106	1.3	19.2	11	83	228	4.1	5.4	4.9	10.3	AC	300	0.013	0.15%	37.5	27.5%	0.53
A1	Mechanic St	106	105	27.6	46.8	120	203	558	3.9	13.1	11.5	24.6	AC	300	0.013	0.26%	49.3	49.9%	0.70
A10	Mechanic St	105	104	1.1	47.9	8	211	580	3.9	13.4	11.9	25.3	AC	300	0.013	0.12%	33.5	75.6%	0.47
A11	Mechanic St	104	103	0.7	48.6	5	216	594	3.9	13.6	12.2	25.8	AC	300	0.013	0.16%	38.7	66.7%	0.55
A12	Mechanic St	103	102	3.1	51.7	30	246	677	3.9	14.5	13.8	28.2	AC	300	0.013	0.21%	44.3	63.7%	0.63
A13	Mechanic St	118	102	1.1	1.10	10	10	28	4.4	0.3	0.6	0.9	AC	200	0.013	4.97%	73.1	1.3%	2.33
	Shadow Lake	102	101	1	52.80	2	258	710	3.9	14.8	14.4	29.2	AC	300	0.013	0.26%	49.3	59.1%	0.70

Design Information:

$Q(s)$ = Sewage Flow = P q M / 86.4   P = Population in thousands
$Q(i)$ = Infiltration Flow = I A   M = Peaking Factor = $1 + 14 / (4 + P^{0.5})$
$Q(d)$ = Peak Design Flow = $Q(s) + Q_i$ A = Tributary Area

q = Per Capita Flow = 450 L/cap d
I = Peak Extraneous Flow = 0.28 L/s/ha
Population Density = 55 persons /ha
Population Density = 2.75 persons /unit

Note:
Area A6 has been modified be 29 units which includes:
- 18 proposed units as part of the SFO condominium site
- 6 proposed semi-detached units on the east side of Norfolk Street
- 1 proposed single-detached units on the east side of Norfolk Street
- 5 existing units

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

Project Title
SFO TOWNHOUSES
WATERFORD, NORFOLK COUNTY

Drawing Title
MECHANIC STREET SANITARY DRAINAGE AREAS

Designed by : NLB
Drawn By : NLB
Checked by : JI
Date Started : OCT 12, 2021
Drawing Scale : NTS
Drawing No. FIG2
Project No. 21-012

APPENDIX B

Domestic Water Demand
21-012 FIG3 – Fire Separation Distances
FUS Calculations
OBC Calculations
Norfolk ISMP Map

Maximum Daily Demand

Total Number of Units	18	units
Zoning of Land	Residential	
Equiv. Population Density	2.75	ppl/unit
Equiv. Population	50	
Av. Daily Demand Per Capita	0.45	m³/capita/day
Maximum Daily Demand Peaking Factor	2.25	
Maximum Daily Demand	50.63	m³/day
	0.59	l/s

Maximum Hourly Demand

Total Number of Units	18	units
Zoning of Land	Residential	
Equiv. Population Density	2.75	ppl/ha
Equiv. Population	50	
Av. Daily Demand Per Capita	0.45	m³/capita/day
Maximum Hourly Demand Peaking Factor	4	
Maximum Hourly Demand	3.75	m³/hour
	1.04	l/s
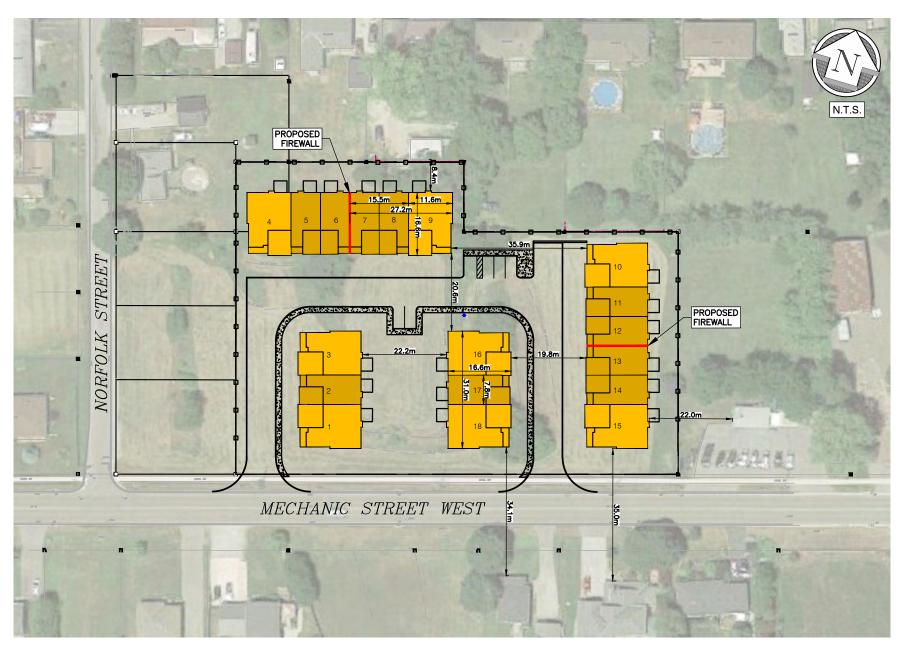
FIGURE 3 - FIRE SEPARTION DISTANCES

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Subject:	SFO Condos		
Date:	Sep-22	By:	N.L.B
Project #:	21-012	Page:	1

Units 7-9

1)   Fire Flow Requirement

$F_1 = 220C(A^{1/2})$ (L/min)

     C=   1.5   Construction coefficient for wood frame construction

     451.5 Floor Area m^2 = main floor area

     257.3 Floor Area m^2 = second floor area

     A=   708.8 Fire Area m^2 = main floor area + second floor area

     F_1=   8786 L/min

     F_1=   9000 L/min   (Round to the nearest 1,000 l/min)

2)   Occupancy

Occupancy Type: Residential Non-Combustible

Reduction: 25%

Surcharge: 0%

$F_2 = F_1 + (F_1 * Reduction/Surcharge)$ (L/min)

     F_2=   6750 L/min

3)   Sprinkler System

Sprikler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$F_3 = F_2 * Reduction$ (L/min)

     F_3=   0 L/min

4)   Seperation

Location	Direction	Distance (m)	Surcharge		Separation Surcharges	
Front	South	20.6	10%		0 to 3m	25%
Side	East	35.9	5%		3.1m to 10m	20%
Side	West	9999.0	0%		10.1m to 20m	15%
Rear	North	8.4	20%		20.1 to 30m	10%
		Total:	35%		30.1 to 45m	5%

$F4 = (TOTAL) * F2$ (L/min)

     F_4=   2363 L/min

Total Fire Flow

$F = F_2 - F_3 + F_4$ =   9113 L/min

     =   9000 L/min   (Round to the nearest 1,000 l/min)

     =   **150.0 L/s**

Notes: *1) All calculations and factors from "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 1999*

2) 9999 denotes either the nearest building > 45m away or a fire wall is provided

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Units 13-15

1) Fire Flow Requirement

$F_1 = 220C(A^{1/2})$ (L/min)

C = 1.5   Construction coefficient for wood frame construction

451.5 Floor Area m^2 = main floor area
257.3 Floor Area m^2 = second floor area
A = 708.8 Fire Area m^2 = main floor area + second floor area

F_1 = 8786 L/min
F_1 = 9000 L/min   (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Non-Combustible
Reduction: 25%
Surcharge: 0%

$F_2 = F_1 + (F_1 * \text{Reduction/Surcharge})$ (L/min)
F_2 = 6750 L/min

3) Sprinkler System

Sprikler System: Not Applicable (assumed no sprinkler system in service)
Reduction: 0%

$F_3 = F_2 * \text{Reduction}$ (L/min)
F_3 = 0 L/min

4) Seperation

Location	Direction	Distance (m)	Surcharge		Separation Surcharges	
Front	West	19.8	15%		0 to 3m	25%
Side	North	9999.0	0%		3.1m to 10m	20%
Side	South	35.0	5%		10.1m to 20m	15%
Rear	East	22.0	10%		20.1 to 30m	10%
		Total:	30%		30.1 to 45m	5%

F4 = (TOTAL)*F2   (L/min)
F_4 = 2025 L/min

Total Fire Flow

$F = F_2 - F_3 + F_4$ = 8775 L/min
= **9000 L/min** (Round to the nearest 1,000 l/min)
= **150.0 L/s**

Notes: 1) All calculations and factors from "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 1999
2) 9999 denotes either the nearest building > 45m away or a fire wall is provided

Units 16-18

1)   Fire Flow Requirement

$F_1 = 220C(A^{1/2})$ (L/min)

     C=   1.5   Construction coefficient for wood frame construction

       514.6   Floor Area m^2 = main floor area

       129.5   Floor Area m^2 = second floor area

  A=   644.1   Fire Area m^2 = main floor area + second floor area

    F_1=   8375   L/min

    F_1=   8000 L/min   (Round to the nearest 1,000 l/min)

2)   Occupancy

Occupancy Type: Residential Non-Combustible

Reduction: 25%

Surcharge: 0%

$F_2 = F_1 + (F_1 * \text{Reduction/Surcharge})$ (L/min)

    F_2=   6000 L/min

3)   Sprinkler System

Sprikler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$F_3 = F_2 * \text{Reduction}$ (L/min)

    F_3=   0 L/min

4)   Seperation

Location	Direction	Distance (m)	Surcharge		Separation Surcharges	
Front	East	19.8	15%		0 to 3m	25%
Side	North	20.6	10%		3.1m to 10m	20%
Side	South	34.1	5%		10.1m to 20m	15%
Rear	West	22.2	10%		20.1 to 30m	10%
		Total:	40%		30.1 to 45m	5%

$F4 = (\text{TOTAL}) * F2$ (L/min)

    F_4=   2400 L/min

Total Fire Flow

$F = F_2 - F_3 + F_4$ =   8400 L/min

          =   8000 L/min   (Round to the nearest 1,000 l/min)

          =   **133.3 L/s**

Notes: *1) All calculations and factors from "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 1999*

             2) 9999 denotes either the nearest building > 45m away or a fire wall is provided

ON-SITE FIRE PROTECTION SUPPLY CALCULATION

Per Fire Protection Water Supply Guideline, Ontario Building Code Division 3, Part B, 3.2.5.7

Project:	21-012 SFO Townhouses	Building/Block #:	Units 7-9
Project Location:	Waterford, ON	Firewalls/Sprinkler:	

Conditions not requiring On-Site Fire Protection:

Building area is Less than 200 m² or Less	☐
Building height is 2 Storeys or Less	☑
Building does not have a Group B Occupancy (Care or Detention)	☑
Building does not require a sprinkler system or standpipe and hose system	☑
Limiting distance from the property line is at least 13 m if the building has an F-1 (high hazard industrial) occupancy	☑
Building constitutes no significant environmental contamination potential under fire conditions	☑

On-Site Supply Required?   **YES**

Calculation Information:

$$Q = K* V * S_{Tot}$$

where:
- Q = Minimum supply of water in litres (L)
- V = Total Building Volume in cubic metres
- K = Water supply coefficient from Table 1
- S_{Tot} = total of spatial coefficient values from property line exposures on all sides, as obtained from the formula:

$$S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + ... etc.]$$

where:
- S_{Side} = values are obtained from Figure 1, as modified by Sections 6.3 (e) and 6.3 (f) of the OBC Guideline
- S_{Tot} = need not exceed 2.0 (see Section 7.0 of the OBC Guideline)

Determining K Value:

Major Occupancy Classification	Residential Occupancies
Group	C
Division	-

Building is of combustible construction. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire resistance rating.   **K Factor**   **23**

Determining Building Volume:

Average Length (m)	27.2
Average Width (m)	16.6
Height, including basements (m)	13.0

Building Volume (m³)   **5870**

Total Spatial Coefficient:

	Exposure Distance (m)	Factor
North Side	8.4	0.1
East Side	>10	0
South Side	>10	0
West Side	Firewall	0

S_{Tot} Factor   **1.1**

Minimum Water Supply Flow:

Q (L)   **148,505**

Minimum Water Supply Flow Rate OBC:	4500	L/min
	75.0	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]

Note: [1] **Q=KVS$_{Tot}$** as referenced in Section 3(a)

ON-SITE FIRE PROTECTION SUPPLY CALCULATION

Per Fire Protection Water Supply Guideline, Ontario Building Code Division 3, Part B, 3.2.5.7

Project:	21-012 SFO Townhouses	Building/Block #:	Units 13-15
Project Location:	Waterford, ON	Firewalls/Sprinkler:	

Conditions not requiring On-Site Fire Protection:

Building area is Less than 200 m² or Less	☐
Building height is 2 Storeys or Less	☑
Building does not have a Group B Occupancy (Care or Detention)	☑
Building does not require a sprinkler system or standpipe and hose system	☑
Limiting distance from the property line is at least 13 m if the building has an F-1 (high hazard industrial) occupancy	☑
Building constitutes no significant environmental contamination potential under fire conditions	☑

On-Site Supply Required?   **YES**

Calculation Information:

$$Q = K * V * S_{Tot}$$

where: Q = Minimum supply of water in litres (L)
V = Total Building Volume in cubic metres
K = Water supply coefficient from Table 1
S_{Tot} = total of spatial coefficient values from property line
exposures on all sides, as obtained from the formula:

$$S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + ... etc.]$$

where: S_{Side} = values are obtained from Figure 1, as modified by Sections
6.3 (e) and 6.3 (f) of the OBC Guideline

S_{Tot} = need not exceed 2.0 (see Section 7.0 of the OBC Guideline)

Determining K Value:

Major Occupancy Classification	Residential Occupancies
Group	C
Division	-

Building is of combustible construction. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire resistance rating.   **K Factor**   **23**

Determining Building Volume:

Average Length (m)	27.2
Average Width (m)	16.6
Height, including basements (m)	13.0

Building Volume (m³)   **5870**

Total Spatial Coefficient:

	Exposure Distance (m)	Factor
North Side	Firewall	0
East Side	>10	0
South Side	>10	0
West Side	>10	0

S_{Tot} Factor   **1**

Minimum Water Supply Flow:

Q (L)   **135,004**

Minimum Water Supply Flow Rate OBC:	4500	L/min
	75.0	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 $Q \leq 108,000L$)[1]
	3600 (If $Q > 108,000L$ and $\leq 135,000L$)[1]
	4500 (If $Q > 135,000L$ and $\leq 162,000L$)[1]
	5400 (If $Q > 162,000L$ and $\leq 190,000L$)[1]
	6300 (If $Q > 190,000L$ and $\leq 270,000L$)[1]
	9000 (If $Q > 270,000L$)[1]

Note: [1] $Q = KVS_{Tot}$ as referenced in Section 3(a)

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ON-SITE FIRE PROTECTION SUPPLY CALCULATION

Per Fire Protection Water Supply Guideline, Ontario Building Code Division 3, Part B, 3.2.5.7

Project:	21-012 SFO Townhouses	Building/Block #:	Units 16-18
Project Location:	Waterford, ON	Firewalls/Sprinkler:	

Conditions not requiring On-Site Fire Protection:

Building area is Less than 200 m^2 or Less	☐
Building height is 2 Storeys or Less	☑
Building does not have a Group B Occupancy (Care or Detention)	☑
Building does not require a sprinkler system or standpipe and hose system	☑
Limiting distance from the property line is at least 13 m if the building has an F-1 (high hazard industrial) occupancy	☑
Building constitutes no significant environmental contamination potential under fire conditions	☑
On-Site Supply Required?	**YES**

Calculation Information:

$$Q = K * V * S_{Tot}$$

where:
- Q = Minimum supply of water in litres (L)
- V = Total Building Volume in cubic metres
- K = Water supply coefficient from Table 1
- S_{Tot} = total of spatial coefficient values from property line exposures on all sides, as obtained from the formula:

$$S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + ... etc.]$$

where:
- S_{Side} = values are obtained from Figure 1, as modified by Sections 6.3 (e) and 6.3 (f) of the OBC Guideline
- S_{Tot} = need not exceed 2.0 (see Section 7.0 of the OBC Guideline)

Determining K Value:

Major Occupancy Classification	Residential Occupancies
Group	C
Division	-
Building is of combustible construction. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire resistance rating.	
K Factor	**23**

Determining Building Volume:

Average Length (m)	31.0
Average Width (m)	16.6
Height, including basements (m)	13.0
Building Volume (m^3)	**6690**

Total Spatial Coefficient:

	Exposure Distance (m)	Factor
North Side	>10	0
East Side	>10	0
South Side	>10	0
West Side	>10	0
S$_{Tot}$ Factor		**1**

Minimum Water Supply Flow:

Q (L)	**153,865**

Minimum Water Supply Flow Rate OBC:	4500	L/min
	75.0	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]

Note: [1] **Q=KVS$_{Tot}$** as referenced in Section 3(a)

Ontario Building Code Tables and Figures

xx

Table 3.1.2.1.
Major Occupancy Classification
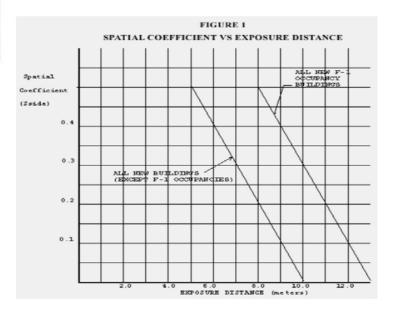
Forming Part of Sentences 3.1.2.1.(1), 3.1.2.2.(1) and 3.11.2.1.(3)
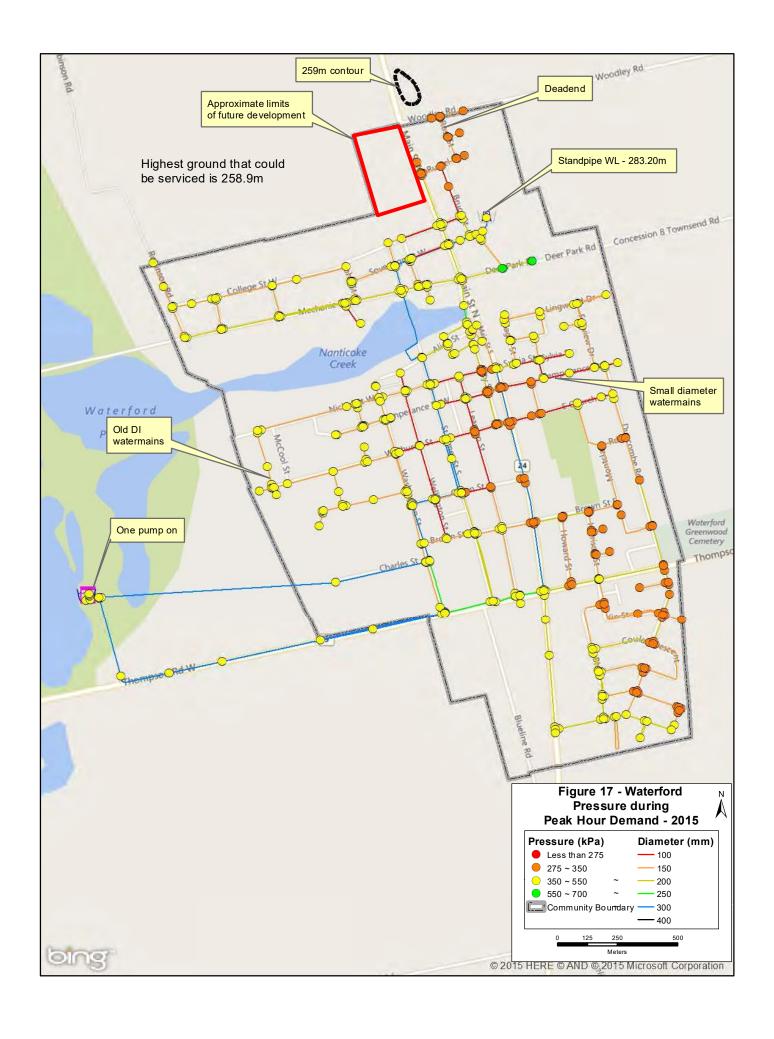
Item	Column 1	Column 2	Column 3
	Group	Division	Description of *Major Occupancies*
1.	A	1	*Assembly occupancies* intended for the production and viewing of the performing arts
2.	A	2	*Assembly occupancies* not elsewhere classified in Group A
3.	A	3	*Assembly occupancies* of the arena type
4.	A	4	*Assembly occupancies* in which occupants are gathered in the open air
5.	B	1	Detention occupancies
6.	B	2	Care and treatment occupancies
7.	B	3	Care occupancies
8.	C	---	Residential occupancies
9.	D	---	Business and personal services occupancies
10.	E	---	Mercantile occupancies
11.	F	1	High hazard industrial occupancies
12.	F	2	Medium hazard industrial occupancies
13.	F	3	Low hazard industrial occupancies
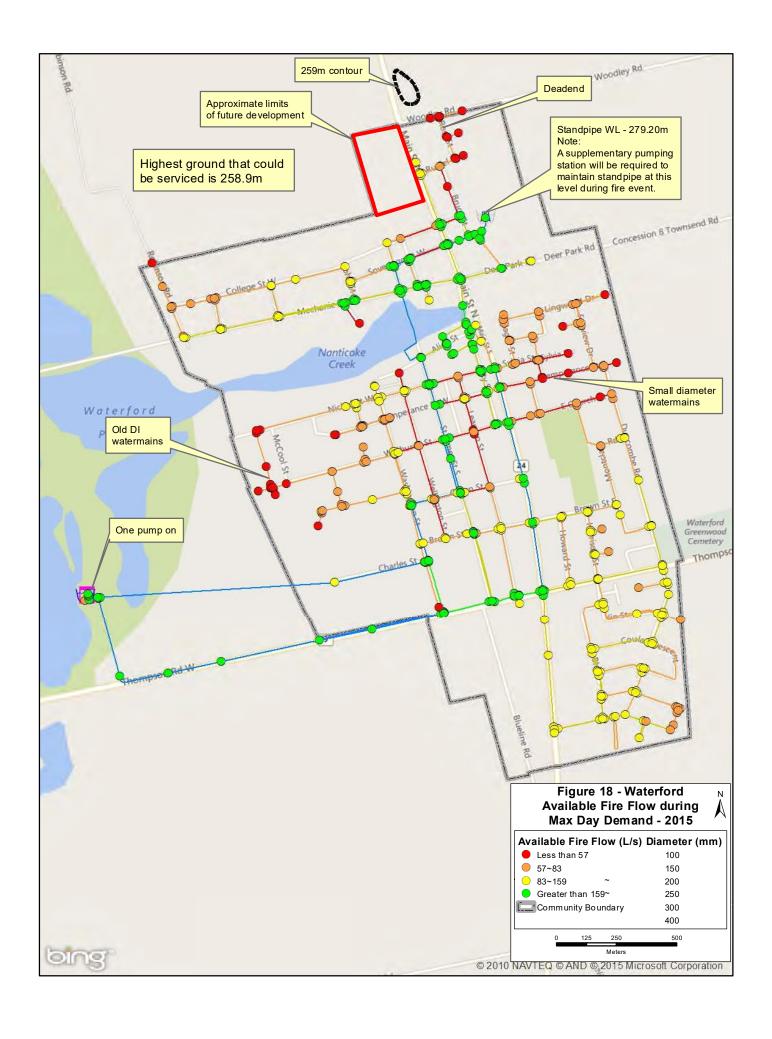
Table 1:
Water Supply Coefficient - K

TYPE OF CONSTRUCTION	A-2 B-1 B-2 B-3 C D	A-4 F-3	A-1 A-3<	E F-2	F-1
Building is of noncombustible 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.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. of the OBC. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	16	19	22	27	37
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.	18	22	25	31	41
Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	23	28	32	39	53
Column 1	2	3	4	5	6

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 600m³ (excluding F-1 occupancies)	1800
All other buildings	2700 (If $Q \leq 108,000L$)[1]
	3600 (If $Q > 108,000L$ **and** $\leq 135,000L$)[1]
	4500 (If $Q > 135,000L$ **and** $\leq 162,000L$)[1]
	5400 (If $Q > 162,000L$ **and** $\leq 190,000L$)[1]
	6300 (If $Q > 190,000L$ **and** $\leq 270,000L$)[1]
	9000 (If $Q > 270,000L$)[1]

Note: [1] $Q=KVS_{Tot}$ as referenced in Section 3(a)

FIGURE 1
SPATIAL COEFFICIENT VS EXPOSURE DISTANCE

Figure 17 - Waterford Pressure during Peak Hour Demand - 2015

Figure 18 - Waterford Available Fire Flow during Max Day Demand - 2015

259m contour

Deadend

Approximate limits of future development

Standpipe WL - 279.20m
Note:
A supplementary pumping station will be required to maintain standpipe at this level during fire event.

Highest ground that could be serviced is 258.9m

Small diameter watermains

Old DI watermains

One pump on

Available Fire Flow (L/s) **Diameter (mm)**

Available Fire Flow (L/s)	Diameter (mm)
Less than 57	100
57~83	150
83~159 ~	200
Greater than 159~	250
Community Boundary	300
	400

0   125   250   500

Meters

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September 23, 2022

Mr. Paul VanBenthem
47 Colborne Street, Suite 307
Toronto, ON
M5E 1P8

Attention: **Mr. Paul VanBenthem**

Reference: **Stormwater Management Report**
SFO Townhouses
Waterford – Norfolk County
Project No. 21-012

Introduction

This Stormwater Management (SWM) Report has been prepared in support of the site plan approval application for the construction of an 18-unit townhouse condominium development located on Mechanic Street West in Waterford – Norfolk County. It is the intention to submit this report to Norfolk County and the Long Point Region Conservation Authority (LPRCA) for review and approval of the proposed site plan.

The subject property is located on the north side of Mechanic Street West, east of Norfolk Street in Waterford – Norfolk County. The subject lands are bound by Mechanic Street West to the south, proposed semi-detached units to the west, existing residential properties to the north, and an existing car dealership to the east, as shown in Figure 1.

Figure 1 - Site Location

Original Design Condition and Stormwater Management Design Criteria

Under existing conditions, the development site is primarily comprised of grassed meadow. Runoff from the development site drains uncontrolled, overland in a southerly direction towards Mechanic Street West, and ultimately releases to the existing Mechanic Street West storm sewer. In addition, runoff from an external drainage area located directly north of the subject lands flows overland onto the proposed development site, and ultimately discharges to the Mechanic Street West storm sewer. Refer to Figure 2, in Appendix E.

As part of the Mechanic Street West reconstruction project completed in 2013 (Vallee Project No. 12-128/Norfolk County Project No. PW-E-13-060), the Mechanic Street West storm sewer system was designed to convey flows during the 5-year storm event. The storm sewer drainage area plan and design sheet for this design can be found in Appendix E. The proposed development site is included within the drainage areas from this design, and was assigned a runoff coefficient of 0.45, corresponding to single-detached residential land use. Consequently, this condition has been utilized as the design target for the stormwater management design for the proposed development.

The design criteria for the proposed development are as follows:
- Quantity Control: Reduce or control the post development peak flow rates from the site to levels that do not exceed the original design condition 5-year flow rate, for all storm events up to and including the 100-year storm event.
- Quality Control: Stormwater to be treated to a Normal Protection Level as defined in the MOECC Ministry of Environment and Climate Change Design Manual - March 2003.

The Norfolk County rainfall IDF curve data has been used for the storm analysis using the parameters in Table 1 below.

Table 1 Norfolk County Rainfall IDF Parameters			
Event	A	B	C
2-year	529.711	4.501	0.745
5-year	583.017	3.007	0.703
10-year	670.324	3.007	0.698
25-year	721.533	2.253	0.679
50-year	766.038	1.898	0.668
100-year	801.041	1.501	0.657

A Visual OTTHYMO computer model was used to simulate the original design condition for the development site. The model uses a modified SCS procedure to estimate losses that occur naturally during a rainfall event such as evaporation and infiltration. Table 2 summarizes the original design input parameters utilized in the computer model for both the external and development site catchments. Supporting calculations can be found in Appendix A and information regarding the site soil conditions was obtained from Ontario Soil Mapping as shown in Appendix B.

Table 2 Original Design OTTHYMO Input Parameters		
Parameter	**Original External**	**Original Site**
Soil Type	Mainly Lacustrine sand and loamy sand	
Hydrologic Soil Group	AB	
SCS Curve Number	62	
Initial Abstraction (mm)	13.6	
Catchment Area (ha)	0.60	0.84
Runoff Coefficient	0.45	0.45
Impervious Percentage	31%	31%

Table 3 presents the original design peak runoff rates from the existing catchment based on the pre-development drainage parameters identified in Table 2. The 5-year original design peak flow rate of 0.029 m³/s will be utilized as the allowable release rate for the post-development site, for all storm events up to and including the 100-year storm event.

Table 3 Original Design Runoff Rates (cms)		
Event	**Original Design (cms)**	**Allowable Release Rate (cms)**
2-year	0.011	
5-year	**0.029**	
10-year	0.047	**0.029**
25-year	0.077	
50-year	0.102	
100-year	0.134	

Post Development Condition

The overall stormwater management (SWM) strategy is to reduce post-development peak flow rates from the site to less than or equal to the allowable release rate, corresponding to the 5-year original design peak runoff rate, for all storm events up to and including the 100-year storm event. To meet this quantity control target, runoff from the post-development site will be directed to an underground stormwater management chamber facility at the south side of the property, and released at a rate such that the allowable release rate is not exceeded.

In addition, runoff from the external drainage area to the north of the subject property will be captured by the swales on the north side of the development, and conveyed to the underground SWM chamber facility. Runoff released from the SWM facility will be conveyed to the existing municipal 675mm diameter storm sewer along Mechanic Street West. All storm events up to and including the 100-year storm event will be conveyed to the proposed stormwater management facility through the proposed storm sewer network. Runoff from the rear and side yards for Units 1-3 and 16-18 will enter the underground chamber system through the proposed permeable paver walkway. Refer to Figure 2, in Appendix E.

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Visual OTTHYMO was used to simulate the post-development system for the subject site. Table 4 presents the post-development OTTHYMO input parameters, the post-development catchment areas, the total impervious percentage and the directly connected impervious percentage associated with each catchment. Land area that is considered to be directly connected to the storm sewer system includes the proposed driveways, parking spaces and roads.

Table 4 Post-Development OTTHYMO Input Parameters		
Parameter	Post External	Post Site
Soil Type	Mainly Lacustrine sand and loamy sand	
Hydrologic Soil Group	AB	
SCS Curve Number	62	
Initial Abstraction (mm)	13.6	
Catchment Area (ha)	0.60	0.84
Impervious Percentage	20%	62%
Directly Connected Impervious Percentage	0%	25%

The proposed underground chamber system utilizes 70 StormTech MC-3500 chambers with a 350mm stone reservoir above the chambers, resulting in a total storage volume of 362 m^3. The stone below the chambers has not been included as storage, due to the lack of geotechnical information at this stage. Drawings and specifications for the proposed StormTech chamber facility can be found in Appendix C. To control the release rate from the proposed facility, a 100mm orifice at an elevation of 232.46m will be installed in the outlet control structure (STMH9). The following equation was used to estimate discharge, and corresponding calculations can be found in Appendix A.

$$Q = C * A * \sqrt{2 * g * h}$$

where:
      Q = Discharge in cms
      C = constant, 0.63
      A = orifice area in m^2
      g = gravitational constant, 9.81 m/s^2
      h = height above orifice, m

Table 5 summarizes the peak post-development runoff rates found using Visual OTTHYMO and compares them to the allowable release rate for each storm event up to and including the 100-year storm event. The utilized storage volumes in the StormTech chamber facility and corresponding ponding elevations for each storm event are also presented in Table 5.

Event	Allowable Release Rate (cms)	Post-Development (cms)	Net Change (cms)	Utilized Storage Volume (cm)	Ponding Elevation (m)
2-year	0.029	0.010	-0.019	66	232.67
5-year		0.014	-0.015	127	232.87
10-year		0.016	-0.013	163	232.99
25-year		0.020	-0.009	245	233.29
50-year		0.023	-0.006	301	233.56
100-year		0.026	-0.003	348	233.87

**Table 5
Post-Development Flow Rates,
Storage Volumes & Ponding Elevations**

As presented above in Table 5, the peak post development flow rates have been attenuated to less than or equal to the allowable release rate of 0.029 m^3/s, for all storm events up to and including the 100-year storm event. All corresponding calculations completed during the development of the Visual OTTHYMO model can be found in Appendix A and the results from the Visual OTTHYMO analysis are detailed in Appendix D.

The original storm drainage areas drawing and design sheet from Vallee Project No. 12-128/Norfolk County Project No. PW-E-13-060 have been updated to reflect the proposed post-development condition, as shown in Figure 3 in Appendix E. Based on these calculations, it can be concluded, the existing storm sewer has adequate capacity to support the flows from the proposed development, for all storm events up to and including the 100-year storm event.

Quality Control

The selection of the level of water quality treatment is based on the proposed outlet for a SWM facility. For this site, the proposed outlet is the Mechanic Street West storm sewer, therefore a normal level of protection has been selected. The Ministry of the Environment Stormwater Management Planning and Design Manual defines a normal level of protection as the removal of 70% of the total suspended solids (TSS).

Quality control will be provided by the StormTech Isolator PLUS Row, which is a row of standard StormTech chambers surrounded by filter fabric. The isolator row creates a detention basin that allows water to egress through the surrounding filter fabric while sediment is trapped within. In addition, a flared end ramp is attached to the inlet pipe inside of the chamber end cap to provide a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance over time by distributing sediment and debris that would otherwise collect at the inlet.

Each MC-3500 isolator row chamber has a ETV verified treated flow rate of 11.19 L/s corresponding to greater than 81% TSS removal. The proposed chamber facility features 17 isolator row chambers, which allows for a total treated inlet flow rate of approximately 134.28 L/s. The maximum flow rate entering the chambers during the 2-year storm event (quality control event) was determined to be 44 L/s using Visual OTTHYMO. Consequently, it can be concluded that the proposed chamber facility provides more than sufficient capacity to provide a normal level of water quality protection, corresponding to 70% TSS removal. The StormTech Isolator Row Sizing Chart can be found in Appendix C.

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Inspection and maintenance are fundamental to the long-term performance of any stormwater quality treatment device. StormTech recommends that the chamber system be inspected annually at a minimum, and every six months for the first year of operation to determine the sediment accumulation rate. In subsequent years inspections can be based on observations or local requirements. The unit should be inspected immediately after an oil, fuel or chemical spill, and a licensed waste management company should remove oil and sediment for proper disposal.

Similarly, the permeable paver walkway will require regular inspection and maintenance to ensure proper functioning. Runoff from the rear and side yards of Units 1-3 and 16-18, will have relatively low sediment accumulation, however, it is recommended that the permeable pavers be inspected annually at a minimum to determine the sediment accumulation rate. In subsequent years inspections and maintenance can be based on observations or local requirements.

Conclusions and Recommendations

Based on the review presented by this Stormwater Management Report, the stormwater management design for the proposed development can be summarized as follows:

- A combination of swales and storm sewers will convey stormwater from the subject site and external drainage area to the proposed underground SWM chamber facility located at the south side of the development.
- Runoff released from the SWM facility will be conveyed to the existing municipal 675mm diameter storm sewer along Mechanic Street West.
- The underground storage chamber facility uses 70 StormTech MC-3500 chambers and has a total storage volume of 362 m^3.
- The required storage volume in the chamber facility ranges between 66 m^3 to 348 m^3 for the 2-year and 100-year storm event, respectively.
- Discharge from the chamber facility is controlled by a 100mm orifice at an elevation of 232.46m.
- The proposed stormwater management facility has sufficient volume to detain runoff such that discharge associated with the post-development site is controlled to less than or equal to the allowable release rate of 0.029 m^3/s for all storm events up to and including the 100-year storm event.
- During events greater than the 100-year storm, runoff from the site will surcharge the SWM facility, and flow overland towards to Mechanic Street West as it does under pre-development conditions.
- The proposed StormTech Isolator PLUS Row shall be utilized to achieve a normal level of water quality protection, corresponding to 70% TSS removal.

It is recommended that this report be provided to the Norfolk County and the Long Point Region Conservation Authority in support of the application for site plan approval of the proposed development.

We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact us.

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of Architects

Respectfully submitted,

Natalie Biesinger

Natalie Biesinger, B.A.Sc.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

John Iezzi, P.Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

Appendix A
– Catchment Parameters
– Target Volumes
– Chamber Stage-Storage-Discharge
– Initial to Post Flows and Ponding Depths

Appendix B
– Soil Parameters

Appendix C
– ADS StormTech Chamber Drawings & Specifications
– ADS StormTech Isolator Row Sizing Chart

Appendix D
– Visual OTTHYMO Summary Outputs

Appendix E
– 21-012 FIG2 – Stormwater Management Areas
– 12-128 DWG STM – Mechanic Street Reconstruction Storm Areas (Feb 2013)
– 12-128 Mechanic Street Reconstruction Storm Sewer Design Sheet (Feb 2013)
– 21-012 FIG3 – Mechanic Street Storm Drainage Areas

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APPENDIX A
Catchment Parameters
Target Volumes
Chamber Stage-Storage-Discharge
Initial to Post Flows and Ponding Depths

Subject:	Catchment Parameters
Date:	9/13/2022 By: NLB
Project #:	21-012 Page 1

Original Design Catchment Parameters

Drainage Area (ha)	Area (ha)	Runoff Coeff.	TIMP (%)	XIMP (%)
Initial External	0.60	0.45	31%	0%
Initial Site	0.84	0.45	31%	0%

$$C = 0.9\,(\%\ imperv) + 0.25\,(1 - \%\ Imperv)$$

$$\%\ Imperv = \frac{C - 0.25}{0.65} \times 100$$

Post-Development Catchment Parameters

Drainage Area (ha)	Area (ha)	Imperv. Area (ha)	Directly Connected Imperv. (ha)	TIMP (%)	XIMP (%)
		(2)	(3)	(2)/(1)	(3)/(1)
Post External	0.60	0.12	0.00	20%	0%
Post Site	0.84	0.52	0.21	62%	25%

Soil Parameters & Infiltration Trench Depth

Soil Type	AB - Mainly gravelly sandy till, sandy textures over gravelly sandy till
CN (-)	62
Ia (mm)	13.6
Infiltration Rate (i) (m/hr)	0.0114
Void Ratio (Vr)	0.4
Drainage Time (ts) (hr)	48
Max allowable stone depth (drmax) (m)	1.37

Original Design Flow Rates

Design Storm	Q (m3/s)	
2	0.011	
5	0.029	= Allowable Release Rate
10	0.047	
25	0.077	
50	0.102	
100	0.134	

Original Design Rainfall Volumes

Return Period	Pre-Development		
	Area (ha.)	Vol. (mm)	Vol. (m3)
2	1.44	4.986	71.8
5		10.676	153.7

Post-Development Rainfall Volumes

Return Period	Remaining Post Area		
	Area (ha.)	Vol. (mm)	Vol. (m3)
2		9.900	142.6
5	1.44	17.141	246.8
100		42.291	609.0

100 YR Post - 5 YR Initial (m3)	455.3

	Subject:	Chamber Stage-Storage-Discharge		
	Date:	9/13/2022	By:	NLB
	Project #:	21-012	Page	3

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Chamber Parameters

Model	Stormtech MC-3500	
Number of Chambers	70	
Number of End Caps	8	
Depth of Stone Above Chamber	350	mm
Depth of Stone Below Chambers	229	mm (Not used for Storage)
Base of Stone Elev.	232.23	m
Base of Chamber Elev.	232.46	m
Height of Chambers	1143	mm
Top of Chamber Elv.	233.60	m
Top of Stone Elev.	233.95	m
Min. Cover (For Vehicles)	0.60	m (Unpaved)
Min Surface Elev.	234.20	m
Max. Cover	2.40	m
Max Surface Elev.	236.00	m
Perimeter Stone Offset	450	mm
System Footprint	382.46	m2
Impermeable liner?	Yes	
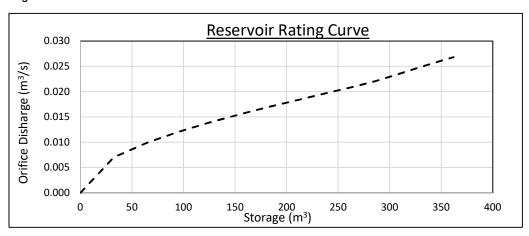
Orifice Parameters

	Diameter	0.100	m
Orifice #1	Area	0.0079	m2
	Depth	0.00	m
	Elevation	232.46	m

Stage-Storage-Discharge

Description	Elevation (m)	Stage (mm)	Stage (m)	Volume (m3)	Height Above Invert (m)	Q (m³/s)
Base of Chamber/Orifice #1	232.46	0	0.00	0.00	0.00	0.000
	232.56	102	0.10	32.35	0.10	0.007
	232.66	203	0.20	64.26	0.20	0.010
	232.76	305	0.31	95.65	0.31	0.012
	232.87	406	0.41	126.41	0.41	0.014
	232.97	508	0.51	156.40	0.51	0.016
	233.07	610	0.61	185.45	0.61	0.017
	233.17	711	0.71	213.33	0.71	0.018
	233.27	813	0.81	239.78	0.81	0.020
	233.37	914	0.91	264.36	0.91	0.021
	233.48	1016	1.02	286.24	1.02	0.022
Top of Chamber	233.58	1118	1.12	303.68	1.12	0.023
	233.68	1219	1.22	319.29	1.22	0.024
	233.78	1321	1.32	334.83	1.32	0.025
	233.88	1422	1.42	350.37	1.42	0.026
Top of Stone Storage	233.96	1499	1.50	362.02	1.50	0.027

Storage volumes obtained from OTTHYMO

Reservoir Rating Curve

Initial Design to Post-Development Flow Rates

Return Period	Q (m3/s)				Check
	Initial	Allowable	Post	Net	
2	0.011		0.010	-0.019	✔
5	0.029		0.014	-0.015	✔
10	0.047	0.029	0.016	-0.013	✔
25	0.077		0.020	-0.009	✔
50	0.102		0.023	-0.006	✔
100	0.134		0.026	-0.003	✔

Stage-Storage

Description	Elevation (m)	Stage Depth (m)	Total Volume (m^3)	Q (m^3/s) Total
Base of Chamber/Orifice #1	232.46	0.00	0.0	0.000
	232.56	0.10	32.4	0.007
	232.66	0.20	64.3	0.010
	232.76	0.31	95.6	0.012
	232.87	0.41	126.4	0.014
	232.97	0.51	156.4	0.016
	233.07	0.61	185.4	0.017
	233.17	0.71	213.3	0.018
	233.27	0.81	239.8	0.020
	233.37	0.91	264.4	0.021
	233.48	1.02	286.2	0.022
Top of Chamber	233.58	1.12	303.7	0.023
	233.68	1.22	319.3	0.024
	233.78	1.32	334.8	0.025
	233.88	1.42	350.4	0.026
Top of Stone Storage	233.96	1.50	362.0	0.027
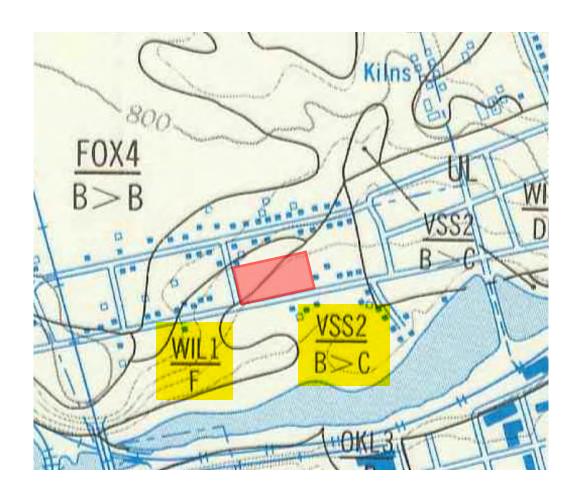
Storage volumes obtained from OTTHYMO

Approximate Storage and Ponding Depths

Return Period	Q (m^3/s) Total	Storage (m)	Ponding Depth (m)	Elev. (m)
2	0.010	65.6	0.21	232.67
5	0.014	127.0	0.41	232.87
10	0.016	163.3	0.53	232.99
25	0.020	244.7	0.83	233.29
50	0.023	300.9	1.10	233.56
100	0.026	348.1	1.41	233.87

APPENDIX B
Soil Parameters

VSS - Vanessa						
VSS 1	VSS	None	40-100 cm sandy textures over gravelly sandy till		Imperfect	
VSS 2	VSS	STD	see VSS 1	see STD 1	Imperfect	Rapid to well

WIL - Wilsonville						
WIL 1	WIL	None	Mainly gravelly sandy till		Rapid to well	

CHART C2-8 - SOIL/LAND USE CURVE NUMBERS

Land Use	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66*	70	74	78	82	84	86
Pasture & other unimproved land	58*	62*	65	71	76	79	81
Woodlots and forest	50*	54*	58	65	71	74	77
Impervious areas (paved)	98						
Bare rock draining directly to stream	98						
Bare rock draining indirectly to stream	70						
Water surfaces	100	(use in special cases only)					

Notes

1. Figures are based on average antecedent moisture condition (AMC II) except those marked *, which are initially wet (AMC III) or an intermediate condition. For definition of AMC's see Chart C2-10.

2. Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.

3. For detailed values in urban areas see Table 2.2 of ref. 14.

4. Source: SCS Handbook of Hydrology, Chapter 9 (9), with modifications.

CHART C2-9 - PERCENT IMPERVIOUSNESS OF URBAN AREAS

Urban Land Use	% Imperviousness
Business - Commercial	40 - 90
Industrial - Light	45 - 65
Industrial - Heavy	50 - 70
Residential - Low density	20 - 30
Residential - Medium density	25 - 35
Residential - High density	30 - 40

Source: SCS Handbook of Hydrology, Chapter 15 (9)

CHART C2-2 - HYDROLOGIC SOIL GROUPS FOR GENERAL SOIL TYPES

Sands, sandy loams, and gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- Shallow, overlying precambrian bedrock or clay subsoil	B
Coarse loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying precambrian bedrock or clay subsoil	B
Medium textured loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt loams, some loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, clay loams, silty clay loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Note: Soils are classified on the basis of bare soil having
maximum swelling at the end of a long storm whose rain-
~~l~~ exceeds infiltration into soil. Classifications
~~wn~~ are subject to modification as experience dictates.

Classifications are based on S.C.S. definitions (9)
modified to suit Ontario conditions.

APPENDIX C

ADS StormTech Chamber Drawings & Specifications
ADS StormTech Isolator Row Sizing Chart

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FOR STORMTECH
INSTALLATION INSTRUCTIONS
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21-012 SFO MC-3500 (SEPT 21, 2022)
WATERFORD, CANADA

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.

2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.

3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.

4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.

5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.

7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 75 mm (3").
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.

9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.

2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".

3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.

4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.

5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.

6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.

7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.

8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm)..

9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.

10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.

11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.
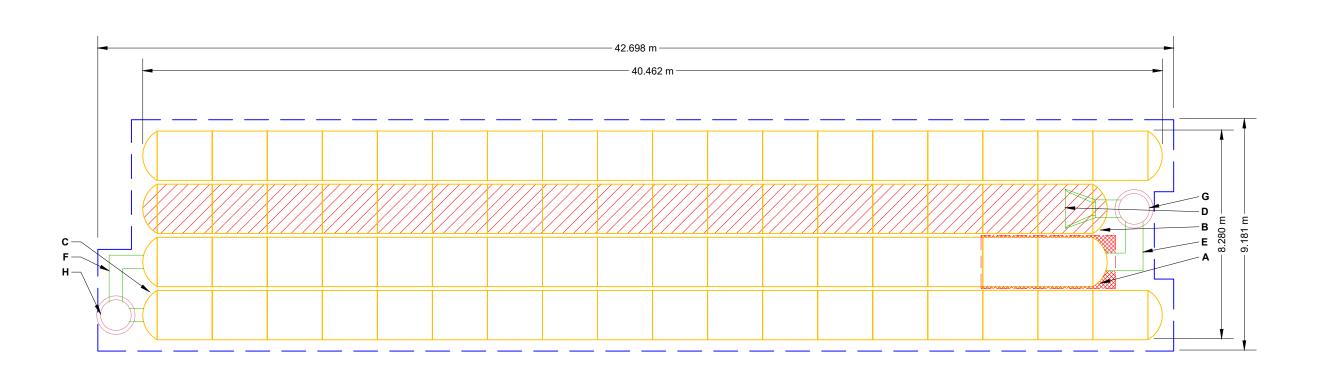
NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".

2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".

3. FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT

70	STORMTECH MC-3500 CHAMBERS
8	STORMTECH MC-3500 END CAPS
350	STONE ABOVE (mm)
229	STONE BELOW (mm)
40	STONE VOID
397.0	INSTALLED SYSTEM VOLUME (m³) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
382.5	SYSTEM AREA (m²)
105.3	SYSTEM PERIMETER (m)

PROPOSED ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	236.040
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	234.211
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	234.059
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	234.059
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	234.059
TOP OF STONE:	233.951
TOP OF MC-3500 CHAMBER:	233.601
600 mm x 600 mm TOP MANIFOLD INVERT:	232.826
600 mm ISOLATOR ROW PLUS INVERT:	232.511
450 mm x 450 mm BOTTOM MANIFOLD INVERT:	232.503
450 mm BOTTOM CONNECTION INVERT:	232.503
BOTTOM OF MC-3500 CHAMBER:	232.458
BOTTOM OF STONE:	232.230

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm TOP CORED END CAP, PART#: MC3500IEPP24TC / TYP OF ALL 600 mm TOP CONNECTIONS	368 mm	
PREFABRICATED END CAP	B	600 mm BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	52 mm	
PREFABRICATED END CAP	C	450 mm BOTTOM CORED END CAP, PART#: MC3500IEPP18BC / TYP OF ALL 450 mm BOTTOM CONNECTIONS	45 mm	
FLAMP	D	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MC350024RAMP		
MANIFOLD	E	600 mm x 600 mm TOP MANIFOLD, ADS N-12	368 mm	
MANIFOLD	F	450 mm x 450 mm BOTTOM MANIFOLD, ADS N-12	45 mm	
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		241 L/s IN
CONCRETE STRUCTURE	H	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		227 L/s OUT

42.698 m

40.462 m

8.280 m

9.181 m

G
D
B
E
A

C
F
H

StormTech®
Chamber System

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//ADS.

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 150

ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 5.334 m OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES
- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.
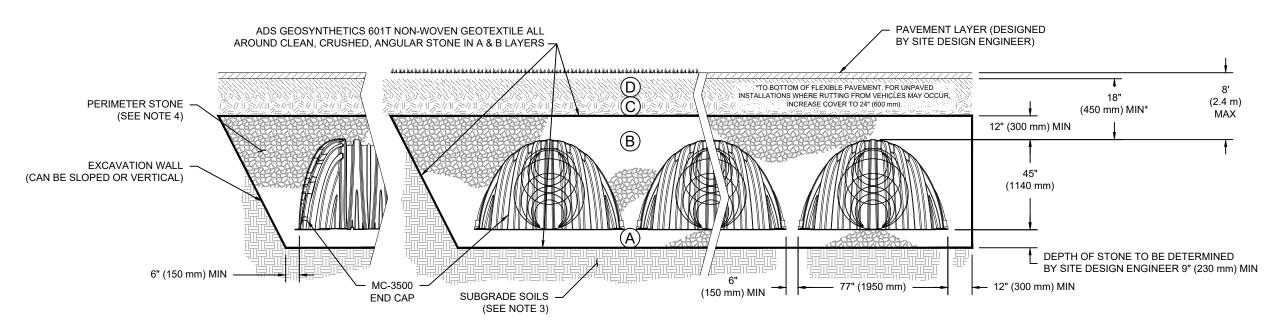
SHEET
2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

PAVEMENT LAYER (DESIGNED BY SITE DESIGN ENGINEER)

ADS GEOSYNTHETICS 601T NON-WOVEN GEOTEXTILE ALL AROUND CLEAN, CRUSHED, ANGULAR STONE IN A & B LAYERS

*TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

PERIMETER STONE (SEE NOTE 4)

EXCAVATION WALL (CAN BE SLOPED OR VERTICAL)

18" (450 mm) MIN*

8' (2.4 m) MAX

12" (300 mm) MIN

45" (1140 mm)

6" (150 mm) MIN

MC-3500 END CAP

SUBGRADE SOILS (SEE NOTE 3)

6" (150 mm) MIN

77" (1950 mm)

12" (300 mm) MIN

DEPTH OF STONE TO BE DETERMINED BY SITE DESIGN ENGINEER 9" (230 mm) MIN

NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

COVER PIPE CONNECTION TO END CAP WITH ADS GEOSYNTHETICS 601T NON-WOVEN GEOTEXTILE

INSTALL FLAMP ON 24" (600 mm) ACCESS PIPE PART #: MC350024RAMP

OPTIONAL INSPECTION PORT

MC-3500 CHAMBER

MC-3500 END CAP

STORMTECH HIGHLY RECOMMENDS FLEXSTORM INSERTS IN ANY UPSTREAM STRUCTURES WITH OPEN GRATES

CATCH BASIN OR MANHOLE

SUMP DEPTH TBD BY SITE DESIGN ENGINEER (24" [600 mm] MIN RECOMMENDED)

24" (600 mm) HDPE ACCESS PIPE REQUIRED USE FACTORY PRE-CORED END CAP PART #: MC3500IEPP24BC OR MC3500IEPP24BW

ONE LAYER OF ADSPLUS175 WOVEN GEOTEXTILE BETWEEN FOUNDATION STONE AND CHAMBERS 8.25' (2.51 m) MIN WIDE CONTINUOUS FABRIC WITHOUT SEAMS

MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1)   INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
    A.   INSPECTION PORTS (IF PRESENT)
      A.1.   REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
      A.2.   REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
      A.3.   USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
      A.4.   LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
      A.5.   IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
    B.   ALL ISOLATOR PLUS ROWS
      B.1.   REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
      B.2.   USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
        i)   MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
        ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
      B.3.   IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
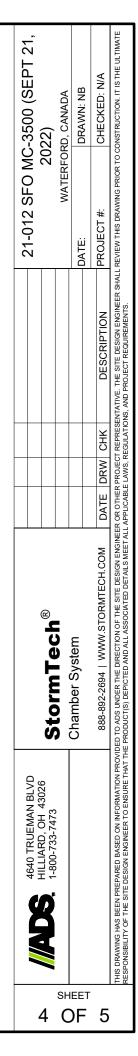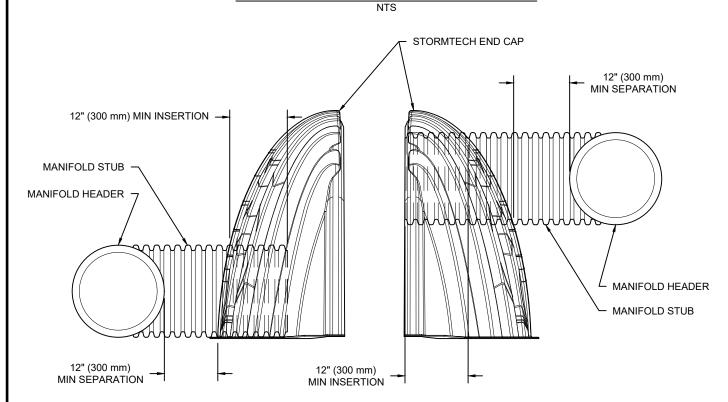
STEP 2)   CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
    A.   A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
    B.   APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
    C.   VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3)   REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4)   INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1.   INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2.   CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

21-012 SFO MC-3500 (SEPT 21, 2022)

WATERFORD, CANADA

DRAWN: NB

CHECKED: N/A

DATE:

PROJECT #:

DATE | DRW | CHK | DESCRIPTION

StormTech®
Chamber System

888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

//ADS.

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

SHEET

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MC-3500 TECHNICAL SPECIFICATION
NTS

VALLEY STIFFENING RIB
CREST
CREST STIFFENING RIB
WEB
LOWER JOINT CORRUGATION
FOOT
UPPER JOINT CORRUGATION

BUILD ROW IN THIS DIRECTION ➡

86.0" (2184 mm) INSTALLED

90.0" (2286 mm) ACTUAL LENGTH

45.0" (1143 mm)

77.0" (1956 mm)

45.0" (1143 mm)

75.0" (1905 mm)

22.2" (564 mm) INSTALLED

25.7" (653 mm)

NOMINAL CHAMBER SPECIFICATIONS
SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

MC-SERIES END CAP INSERTION DETAIL
NTS

STORMTECH END CAP

12" (300 mm) MIN SEPARATION

12" (300 mm) MIN INSERTION

MANIFOLD STUB

MANIFOLD HEADER

MANIFOLD HEADER

MANIFOLD STUB

12" (300 mm) MIN SEPARATION

12" (300 mm) MIN INSERTION

NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)
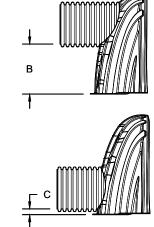
NOTE: ALL DIMENSIONS ARE NOMINAL

B

C

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

21-012 SFO MC-3500 (SEPT 21, 2022)

WATERFORD, CANADA

DRAWN: NB

CHECKED: N/A

DATE:

PROJECT #:

DESCRIPTION

DATE | DRW | CHK

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

SHEET

5 OF 5

StormTech Isolator Row Sizing Chart

StormTech Isolator Row - Water Quality Flowrate for >81% TSS Removal						
	SC-160	SC-310	SC-740	DC-780	MC-3500	MC-4500
Chamber Bottom Area (m²)	1.06	1.64	2.58	2.58	3.99	2.80
Treated Flowrate / Chamber (L/s)	2.97	4.62	7.25	7.25	11.19	7.84
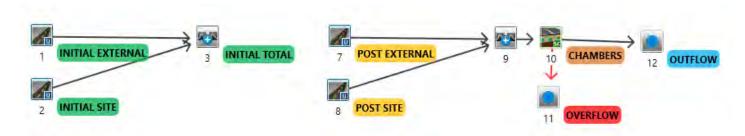
Notes:

- Results per ETV verified results, independently verifed by VerifiGlobal:
  https://www.verifiglobal.com/media/knubjbej/verifiglobal-verification-statement-for-stormtech-isolator-row-plus-final-2020-10-27-for-posting.pdf

- ETV verified treated flowrate = 4.13 GPM/ft² (2.80 L/s/m²)

- Above rates based on 81.2% removal of ETV/NJDEP particle size distribution.

APPENDIX D
Visual OTTHYMO Summary Outputs

2-YEAR STORM

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===============================================================================
   V     V   I    SSSSS  U   U   A     L           (v 6.2.2007)
   V     V   I    SS     U   U   A A   L
   V     V   I      SS   U   U  AAAAA  L
   V   V     I      SS   U   U  A   A  L
    VV       I    SSSSS  UUUUU  A   A  LLLLL

   OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM
  O   O    T      T    H   H   Y Y   MM MM  O   O
  O   O    T      T    H H H    Y    M M M  O   O
   OOO     T      T    H   H    Y    M   M   OOO
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            *****  D E T A I L E D   O U T P U T  *****


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DATE: 09/23/2022                     TIME: 08:20:32

USER:


COMMENTS: _____


-------------------------------------------------------------------------------
   ***********************************************
   ** SIMULATION : 01_2-Year Norfolk            **
   ***********************************************

--------------------
| CHICAGO STORM    |   IDF curve parameters: A= 529.711
| Ptotal= 35.21 mm |                         B=   4.501
--------------------                         C=   0.745
                       used in:   INTENSITY = A / (t + B)^C

                       Duration of storm  = 4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio = 0.33

        TIME    RAIN | TIME    RAIN |' TIME    RAIN | TIME    RAIN
        hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
        0.00    2.68 | 1.00   17.69 | 2.00    5.90 | 3.00    3.14
        0.17    3.04 | 1.17   72.24 | 2.17    5.09 | 3.17    2.94
        0.33    3.53 | 1.33   22.78 | 2.33    4.50 | 3.33    2.76
        0.50    4.26 | 1.50   12.62 | 2.50    4.04 | 3.50    2.60
        0.67    5.49 | 1.67    8.98 | 2.67    3.68 | 3.67    2.47
        0.83    8.02 | 1.83    7.08 | 2.83    3.39 | 3.83    2.35


-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0002) |   Area    (ha)= 0.84
|ID= 1 DT= 5.0 min |   Total Imp(%)=  31.00   Dir. Conn.(%)=   0.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
        Surface Area   (ha)=      0.26          0.58
        Dep. Storage   (mm)=      1.00         13.60
        Average Slope  (%)=       1.00          2.00
        Length         (m)=      74.83         40.00
        Mannings n     =         0.013         0.250

   NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.

                      ---- TRANSFORMED HYETOGRAPH ----
        TIME    RAIN | TIME    RAIN |' TIME    RAIN | TIME    RAIN
        hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
        0.083   2.68 | 1.083  17.69 | 2.083   5.90 | 3.08    3.14
        0.167   2.68 | 1.167  17.69 | 2.167   5.90 | 3.17    3.14
        0.250   3.04 | 1.250  72.24 | 2.250   5.09 | 3.25    2.94
        0.333   3.04 | 1.333  72.24 | 2.333   5.09 | 3.33    2.94
        0.417   3.53 | 1.417  22.78 | 2.417   4.50 | 3.42    2.76
        0.500   3.53 | 1.500  22.78 | 2.500   4.50 | 3.50    2.76
        0.583   4.26 | 1.583  12.62 | 2.583   4.04 | 3.58    2.60
        0.667   4.26 | 1.667  12.62 | 2.667   4.04 | 3.67    2.60
        0.750   5.49 | 1.750   8.98 | 2.750   3.68 | 3.75    2.47
```

```
        0.833   5.49 | 1.833   8.98 | 2.833   3.68 | 3.83    2.47
        0.917   8.02 | 1.917   7.08 | 2.917   3.39 | 3.92    2.35
        1.000   8.02 | 2.000   7.08 | 3.000   3.39 | 4.00    2.35

        Max.Eff.Inten.(mm/hr)=       72.24          6.70
                  over (min)=         5.00         25.00
        Storage Coeff.  (min)=       2.44 (ii)    23.25 (ii)
        Unit Hyd. Tpeak (min)=       5.00         25.00
        Unit Hyd. peak  (cms)=       0.30          0.05

                                                          *TOTALS*
        PEAK FLOW       (cms)=       0.00          0.01     0.006 (iii)
        TIME TO PEAK    (hrs)=       1.33          1.83      1.83
        RUNOFF VOLUME   (mm)=       34.21          5.01      4.99
        TOTAL RAINFALL  (mm)=       35.21         35.21     35.21
        RUNOFF COEFFICIENT =         0.97          0.14      0.14

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN*  = 62.0   Ia = Dep. Storage  (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0001) |   Area    (ha)=  0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)= 31.00   Dir. Conn.(%)=   0.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
        Surface Area   (ha)=      0.19          0.41
        Dep. Storage   (mm)=      1.00         13.60
        Average Slope  (%)=       1.00          2.00
        Length         (m)=      63.25         40.00
        Mannings n     =         0.013         0.250

   NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.

                      ---- TRANSFORMED HYETOGRAPH ----
        TIME    RAIN | TIME    RAIN |' TIME    RAIN | TIME    RAIN
        hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
        0.083   2.68 | 1.083  17.69 | 2.083   5.90 | 3.08    3.14
        0.167   2.68 | 1.167  17.69 | 2.167   5.90 | 3.17    3.14
        0.250   3.04 | 1.250  72.24 | 2.250   5.09 | 3.25    2.94
        0.333   3.04 | 1.333  72.24 | 2.333   5.09 | 3.33    2.94
        0.417   3.53 | 1.417  22.78 | 2.417   4.50 | 3.42    2.76
        0.500   3.53 | 1.500  22.78 | 2.500   4.50 | 3.50    2.76
        0.583   4.26 | 1.583  12.62 | 2.583   4.04 | 3.58    2.60
        0.667   4.26 | 1.667  12.62 | 2.667   4.04 | 3.67    2.60
        0.750   5.49 | 1.750   8.98 | 2.750   3.68 | 3.75    2.47
        0.833   5.49 | 1.833   8.98 | 2.833   3.68 | 3.83    2.47
        0.917   8.02 | 1.917   7.08 | 2.917   3.39 | 3.92    2.35
        1.000   8.02 | 2.000   7.08 | 3.000   3.39 | 4.00    2.35

        Max.Eff.Inten.(mm/hr)=       72.24          6.70
                  over (min)=         5.00         25.00
        Storage Coeff.  (min)=       2.21 (ii)    23.02 (ii)
        Unit Hyd. Tpeak (min)=       5.00         25.00
        Unit Hyd. peak  (cms)=       0.31          0.05

                                                          *TOTALS*
        PEAK FLOW       (cms)=       0.00          0.00     0.005 (iii)
        TIME TO PEAK    (hrs)=       1.33          1.83      1.83
        RUNOFF VOLUME   (mm)=       34.21          5.01      4.98
        TOTAL RAINFALL  (mm)=       35.21         35.21     35.21
        RUNOFF COEFFICIENT =         0.97          0.14      0.14

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN*  = 62.0   Ia = Dep. Storage  (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD ( 0003)  |
|  1 + 2 = 3       |        AREA    QPEAK    TPEAK    R.V.
--------------------       (ha)    (cms)    (hrs)    (mm)
        ID1= 1 ( 0001):    0.60    0.005    1.83     4.98
      + ID2= 2 ( 0002):    0.84    0.006    1.83     4.99
        =================================================
```

```
          ID = 3 (  0003):    1.44   0.011    1.83    4.99

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD ( 0007)| Area    (ha)=   0.60
|ID= 1 DT= 5.0 min | Total Imp(%)=  20.00   Dir. Conn.(%)=   0.00
-------------------
                            IMPERVIOUS   PERVIOUS (i)
      Surface Area   (ha)=      0.12        0.48
      Dep. Storage   (mm)=      1.00       13.60
      Average Slope  (%)=       1.00        2.00
      Length         (m)=      63.25       40.00
      Mannings n     =         0.013       0.250

      NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                       ---- TRANSFORMED HYETOGRAPH ----
            TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
            hrs   mm/hr |  hrs   mm/hr |' hrs   mm/hr |  hrs   mm/hr
            0.083   2.68 | 1.083  17.69 | 2.083   5.90 | 3.08   3.14
            0.167   2.68 | 1.167  17.69 | 2.167   5.90 | 3.17   3.14
            0.250   3.04 | 1.250  72.24 | 2.250   5.09 | 3.25   2.94
            0.333   3.04 | 1.333  72.24 | 2.333   5.09 | 3.33   2.94
            0.417   3.53 | 1.417  22.78 | 2.417   4.50 | 3.42   2.76
            0.500   3.53 | 1.500  22.78 | 2.500   4.50 | 3.50   2.76
            0.583   4.26 | 1.583  12.62 | 2.583   4.04 | 3.58   2.60
            0.667   4.26 | 1.667  12.62 | 2.667   4.04 | 3.67   2.60
            0.750   5.49 | 1.750   8.98 | 2.750   3.68 | 3.75   2.47
            0.833   5.49 | 1.833   8.98 | 2.833   3.68 | 3.83   2.47
            0.917   8.02 | 1.917   7.08 | 2.917   3.39 | 3.92   2.35
            1.000   8.02 | 2.000   7.08 | 3.000   3.39 | 4.00   2.35

      Max.Eff.Inten.(mm/hr)=    72.24        4.38
                over (min)=      5.00       30.00
      Storage Coeff.  (min)=    2.21 (ii)  26.86 (ii)
      Unit Hyd. Tpeak (min)=    5.00       30.00
      Unit Hyd. peak  (cms)=    0.31        0.04
                                                   *TOTALS*
      PEAK FLOW      (cms)=     0.00        0.00     0.003 (iii)
      TIME TO PEAK   (hrs)=     1.33        2.00     2.00
      RUNOFF VOLUME  (mm)=     34.21        3.98     3.95
      TOTAL RAINFALL (mm)=     35.21       35.21    35.21
      RUNOFF COEFFICIENT =     0.97        0.11     0.11

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  = 62.0   Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD ( 0008)| Area    (ha)=   0.84
|ID= 1 DT= 5.0 min | Total Imp(%)=  62.00   Dir. Conn.(%)=  25.00
-------------------
                            IMPERVIOUS   PERVIOUS (i)
      Surface Area   (ha)=      0.52        0.32
      Dep. Storage   (mm)=      1.00       13.60
      Average Slope  (%)=       1.00        2.00
      Length         (m)=      74.83       40.00
      Mannings n     =         0.013       0.250

      NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                       ---- TRANSFORMED HYETOGRAPH ----
            TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
            hrs   mm/hr |  hrs   mm/hr |' hrs   mm/hr |  hrs   mm/hr
            0.083   2.68 | 1.083  17.69 | 2.083   5.90 | 3.08   3.14
            0.167   2.68 | 1.167  17.69 | 2.167   5.90 | 3.17   3.14
            0.250   3.04 | 1.250  72.24 | 2.250   5.09 | 3.25   2.94
            0.333   3.04 | 1.333  72.24 | 2.333   5.09 | 3.33   2.94
            0.417   3.53 | 1.417  22.78 | 2.417   4.50 | 3.42   2.76
            0.500   3.53 | 1.500  22.78 | 2.500   4.50 | 3.50   2.76
            0.583   4.26 | 1.583  12.62 | 2.583   4.04 | 3.58   2.60
            0.667   4.26 | 1.667  12.62 | 2.667   4.04 | 3.67   2.60
            0.750   5.49 | 1.750   8.98 | 2.750   3.68 | 3.75   2.47
            0.833   5.49 | 1.833   8.98 | 2.833   3.68 | 3.83   2.47
            0.917   8.02 | 1.917   7.08 | 2.917   3.39 | 3.92   2.35
            1.000   8.02 | 2.000   7.08 | 3.000   3.39 | 4.00   2.35

      Max.Eff.Inten.(mm/hr)=    72.24       18.28
                over (min)=      5.00       20.00
      Storage Coeff.  (min)=    2.44 (ii)  16.37 (ii)
      Unit Hyd. Tpeak (min)=    5.00       20.00
      Unit Hyd. peak  (cms)=    0.30        0.06
                                                   *TOTALS*
      PEAK FLOW      (cms)=     0.04        0.01     0.044 (iii)
      TIME TO PEAK   (hrs)=     1.33        1.67     1.33
      RUNOFF VOLUME  (mm)=     34.21        7.48    14.15
      TOTAL RAINFALL (mm)=     35.21       35.21    35.21
      RUNOFF COEFFICIENT =     0.97        0.21     0.40

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  = 62.0   Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD ( 0009)|
|  1 + 2 = 3     |         AREA   QPEAK   TPEAK    R.V.
```

```
--------------------          (ha)   (cms)  (hrs)    (mm)
    ID1= 1 (  0007):    0.60   0.003   2.00    3.95
  + ID2= 2 (  0008):    0.84   0.044   1.33   14.15
    =================================================
    ID = 3 (  0009):    1.44   0.044   1.33    9.90

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-----------------
| CHAMBER( 0010)| OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: OFF
|IN= 2--> OUT= 3 | CHAMBER:
| DT=  5.0 min   | MAX STO VOL (cu.m.)=  362.02  Bottom Area(m2)  = 382.46
-----------------
            DEPTH      STORAGE       |   DEPTH      STORAGE
            (mm)       (cu.m.)       |   (mm)       (cu.m.)
            0.00        0.00         |  762.00      226.76
           25.00        8.13         |  787.00      233.32
           51.00       16.23         |  813.00      239.78
           76.00       24.31         |  838.00      246.12
          102.00       32.35         |  864.00      252.34
          127.00       40.37         |  889.00      258.42
          152.00       48.36         |  914.00      264.36
          178.00       56.33         |  940.00      270.14
          203.00       64.26         |  965.00      275.73
          229.00       72.16         |  991.00      281.12
          254.00       80.03         | 1016.00      286.24
          279.00       87.86         | 1041.00      290.95
          305.00       95.65         | 1067.00      295.32
          330.00      103.40         | 1092.00      299.56
          356.00      111.12         | 1118.00      303.68
          381.00      118.79         | 1143.00      307.63
          406.00      126.41         | 1168.00      311.52
          432.00      133.99         | 1194.00      315.40
          457.00      141.51         | 1219.00      319.29
          483.00      148.99         | 1245.00      323.17
          508.00      156.40         | 1270.00      327.06
          533.00      163.76         | 1295.00      330.94
          559.00      171.06         | 1321.00      334.83
          584.00      178.29         | 1346.00      338.71
          610.00      185.45         | 1372.00      342.60
          635.00      192.54         | 1397.00      346.48
          660.00      199.55         | 1422.00      350.37
          686.00      206.48         | 1448.00      354.25
          711.00      213.33         | 1473.00      358.14
          737.00      220.09         | 1499.00      362.02

            DEPTH     DISCHARGE      |   DEPTH     DISCHARGE
            (m)        (cms)         |   (m)        (cms)
            0.000      0.000         |  0.910       0.021
            0.100      0.007         |  1.020       0.022
            0.200      0.010         |  1.120       0.023
            0.310      0.012         |  1.220       0.024
            0.410      0.014         |  1.320       0.025
            0.510      0.016         |  1.420       0.026
            0.610      0.017         |  1.520       0.027
            0.710      0.018         |  1.600       0.028
            0.810      0.020         |  0.000       0.000

                     AREA      QPEAK      TPEAK      R.V.
                     (ha)      (cms)      (hrs)      (mm)
      INFLOW:ID= 2   1.44      0.044      1.33       9.90
     OUTFLOW:ID= 1   1.44      0.010      2.42       9.90
    OVERFLOW:ID= 3   0.00      0.000      0.00       0.00

           Volume Reduction Rate[(RVin-RVout)/RVin](%)=      0.00
           Time to reach Max storage          (Hr)=         2.42
           Volume of water for drawdown in LID (cu.m.)=     16.62
           Volume of maximum water storage     (cu.m.)=     57.56
           ***** After simulation, water volume is not zero.

------------------------
| Junction Command(0011) |
------------------------

                          AREA     QPEAK    TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
   INFLOW : ID= 3( 0010)   0.00     0.00     0.00      0.00
   OUTFLOW: ID= 2( 0011)   0.00     0.00     0.00      0.00

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------------------------
| Junction Command(0012) |
------------------------

                          AREA     QPEAK    TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
   INFLOW : ID= 1( 0010)   1.44     0.01     2.42      9.90
   OUTFLOW: ID= 2( 0012)   1.44     0.01     2.42      9.90

--------------------------------------------------------------------------------
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5-YEAR STORM

```
================================================================================
   V    V  I   SSSSS U   U  A   L                    (v 6.2.2007)
   V    V  I   SS    U   U  A A  L
    V  V   I   SS    U   U AAAAA L
    V  V   I   SS    U   U A   A L
     VV    I   SSSSS UUUUU A   A LLLLL

   OOO   TTTTT TTTTT H  H Y   Y M   M  OOO    TM
  O   O    T     T   H  H  Y Y  MM MM O   O
  O   O    T     T   HHHH   Y   M M M O   O
  O   O    T     T   H  H   Y   M   M O   O
   OOO     T     T   H  H   Y   M   M  OOO
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           *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\d41bdd21-e9d7-4469-98c8-9a0ce045326d\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\d41bdd21-e9d7-4469-98c8-9a0ce045326d\scen


DATE: 09/23/2022                     TIME: 08:20:32

USER:


COMMENTS: _____


--------------------------------------------------------------------------------
  **********************************************
  ** SIMULATION : 02_5-Year Norfolk          **
  **********************************************

--------------------
| CHICAGO STORM    |   IDF curve parameters: A= 583.017
| Ptotal= 49.03 mm |                         B=   3.007
--------------------                         C=   0.703
                      used in:   INTENSITY = A / (t + B)^C

                      Duration of storm  = 4.00 hrs
                      Storm time step    = 10.00 min
                      Time to peak ratio = 0.33

        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
        0.00   4.20 | 1.00   23.22 | 2.00   8.64 | 3.00   4.87
        0.17   4.72 | 1.17   96.03 | 2.17   7.56 | 3.17   4.58
        0.33   5.42 | 1.33   29.33 | 2.33   6.76 | 3.33   4.32
        0.50   6.44 | 1.50   17.13 | 2.50   6.13 | 3.50   4.10
        0.67   8.09 | 1.67   12.62 | 2.67   5.63 | 3.67   3.90
        0.83  11.39 | 1.83   10.19 | 2.83   5.22 | 3.83   3.72


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--------------------
| CALIB            |
| STANDHYD ( 0002)|   Area     (ha)=  0.84
|ID= 1 DT= 5.0 min |   Total Imp(%)= 31.00  Dir. Conn.(%)=  0.00
--------------------
                        IMPERVIOUS   PERVIOUS (i)
    Surface Area  (ha)=    0.26        0.58
    Dep. Storage  (mm)=    1.00       13.60
    Average Slope (%)=     1.00        2.00
    Length        (m)=    74.83       40.00
    Mannings n     =      0.013        0.250

    NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                      ---- TRANSFORMED HYETOGRAPH ----
        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
        0.083   4.20 | 1.083   23.22 | 2.083   8.64 | 3.08   4.87
        0.167   4.20 | 1.167   23.22 | 2.167   8.64 | 3.17   4.87
        0.250   4.72 | 1.250   96.03 | 2.250   7.56 | 3.25   4.58
        0.333   4.72 | 1.333   96.03 | 2.333   7.56 | 3.33   4.58
        0.417   5.42 | 1.417   29.33 | 2.417   6.76 | 3.42   4.32
        0.500   5.42 | 1.500   29.33 | 2.500   6.76 | 3.50   4.32
        0.583   6.44 | 1.583   17.13 | 2.583   6.13 | 3.58   4.10
        0.667   6.44 | 1.667   17.13 | 2.667   6.13 | 3.67   4.10
        0.750   8.09 | 1.750   12.62 | 2.750   5.63 | 3.75   3.90
        0.833   8.09 | 1.833   12.62 | 2.833   5.63 | 3.83   3.90
        0.917  11.39 | 1.917   10.19 | 2.917   5.22 | 3.92   3.72
        1.000  11.39 | 2.000   10.19 | 3.000   5.22 | 4.00   3.72

    Max.Eff.Inten.(mm/hr)=     96.03       17.64
              over (min)       5.00        20.00
    Storage Coeff.  (min)=     2.18 (ii)   16.31 (ii)
    Unit Hyd. Tpeak (min)=     5.00        20.00
    Unit Hyd. peak  (cms)=     0.31        0.06
                                                   *TOTALS*
    PEAK FLOW      (cms)=      0.00        0.02     0.017 (iii)
    TIME TO PEAK   (hrs)=      1.33        1.67      1.67
    RUNOFF VOLUME   (mm)=     48.03       10.69     10.68
    TOTAL RAINFALL  (mm)=     49.03       49.03     49.03
    RUNOFF COEFFICIENT  =      0.98        0.22      0.22

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN*  = 62.0   Ia = Dep. Storage  (Above)
```

```
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0001)|   Area     (ha)=  0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)= 31.00  Dir. Conn.(%)=  0.00
--------------------
                        IMPERVIOUS   PERVIOUS (i)
    Surface Area  (ha)=    0.19        0.41
    Dep. Storage  (mm)=    1.00       13.60
    Average Slope (%)=     1.00        2.00
    Length        (m)=    63.25       40.00
    Mannings n     =      0.013        0.250

    NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                      ---- TRANSFORMED HYETOGRAPH ----
        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
        0.083   4.20 | 1.083   23.22 | 2.083   8.64 | 3.08   4.87
        0.167   4.20 | 1.167   23.22 | 2.167   8.64 | 3.17   4.87
        0.250   4.72 | 1.250   96.03 | 2.250   7.56 | 3.25   4.58
        0.333   4.72 | 1.333   96.03 | 2.333   7.56 | 3.33   4.58
        0.417   5.42 | 1.417   29.33 | 2.417   6.76 | 3.42   4.32
        0.500   5.42 | 1.500   29.33 | 2.500   6.76 | 3.50   4.32
        0.583   6.44 | 1.583   17.13 | 2.583   6.13 | 3.58   4.10
        0.667   6.44 | 1.667   17.13 | 2.667   6.13 | 3.67   4.10
        0.750   8.09 | 1.750   12.62 | 2.750   5.63 | 3.75   3.90
        0.833   8.09 | 1.833   12.62 | 2.833   5.63 | 3.83   3.90
        0.917  11.39 | 1.917   10.19 | 2.917   5.22 | 3.92   3.72
        1.000  11.39 | 2.000   10.19 | 3.000   5.22 | 4.00   3.72

    Max.Eff.Inten.(mm/hr)=     96.03       17.64
              over (min)       5.00        20.00
    Storage Coeff.  (min)=     1.97 (ii)   16.10 (ii)
    Unit Hyd. Tpeak (min)=     5.00        20.00
    Unit Hyd. peak  (cms)=     0.31        0.06
                                                   *TOTALS*
    PEAK FLOW      (cms)=      0.00        0.01     0.012 (iii)
    TIME TO PEAK   (hrs)=      1.33        1.67      1.67
    RUNOFF VOLUME   (mm)=     48.03       10.69     10.67
    TOTAL RAINFALL  (mm)=     49.03       49.03     49.03
    RUNOFF COEFFICIENT  =      0.98        0.22      0.22

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN*  = 62.0   Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ADD HYD ( 0003)|
|  1 + 2 = 3      |       AREA   QPEAK   TPEAK    R.V.
--------------------       (ha)   (cms)   (hrs)   (mm)
    ID1= 1 ( 0001):  0.60   0.012   1.67   10.67
  + ID2= 2 ( 0002):  0.84   0.017   1.67   10.68
    ===============================================
    ID = 3 ( 0003):  1.44   0.029   1.67   10.68

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0007)|   Area     (ha)=  0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)= 20.00  Dir. Conn.(%)=  0.00
--------------------
                        IMPERVIOUS   PERVIOUS (i)
    Surface Area  (ha)=    0.12        0.48
    Dep. Storage  (mm)=    1.00       13.60
    Average Slope (%)=     1.00        2.00
    Length        (m)=    63.25       40.00
    Mannings n     =      0.013        0.250

    NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                      ---- TRANSFORMED HYETOGRAPH ----
        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
        0.083   4.20 | 1.083   23.22 | 2.083   8.64 | 3.08   4.87
        0.167   4.20 | 1.167   23.22 | 2.167   8.64 | 3.17   4.87
        0.250   4.72 | 1.250   96.03 | 2.250   7.56 | 3.25   4.58
        0.333   4.72 | 1.333   96.03 | 2.333   7.56 | 3.33   4.58
        0.417   5.42 | 1.417   29.33 | 2.417   6.76 | 3.42   4.32
        0.500   5.42 | 1.500   29.33 | 2.500   6.76 | 3.50   4.32
        0.583   6.44 | 1.583   17.13 | 2.583   6.13 | 3.58   4.10
        0.667   6.44 | 1.667   17.13 | 2.667   6.13 | 3.67   4.10
        0.750   8.09 | 1.750   12.62 | 2.750   5.63 | 3.75   3.90
        0.833   8.09 | 1.833   12.62 | 2.833   5.63 | 3.83   3.90
        0.917  11.39 | 1.917   10.19 | 2.917   5.22 | 3.92   3.72
        1.000  11.39 | 2.000   10.19 | 3.000   5.22 | 4.00   3.72

    Max.Eff.Inten.(mm/hr)=     96.03       10.96
              over (min)       5.00        20.00
    Storage Coeff.  (min)=     1.97 (ii)   19.06 (ii)
    Unit Hyd. Tpeak (min)=     5.00        20.00
    Unit Hyd. peak  (cms)=     0.31        0.06
                                                   *TOTALS*
    PEAK FLOW      (cms)=      0.00        0.01     0.009 (iii)
    TIME TO PEAK   (hrs)=      1.33        1.75      1.75
    RUNOFF VOLUME   (mm)=     48.03        8.95      8.93
    TOTAL RAINFALL  (mm)=     49.03       49.03     49.03
    RUNOFF COEFFICIENT  =      0.98        0.18      0.18
```

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***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 62.0   Ia = Dep. Storage  (Above)
   (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
                          (m)       (cms)    |     (m)       (cms)
                        0.000      0.000     |   0.910      0.021
                        0.100      0.007     |   1.020      0.022
                        0.200      0.010     |   1.120      0.023
                        0.310      0.012     |   1.220      0.024
                        0.410      0.014     |   1.320      0.025
                        0.510      0.016     |   1.420      0.026
                        0.610      0.017     |   1.520      0.027
                        0.710      0.018     |   1.600      0.028
                        0.810      0.020     |   0.000      0.000

                        AREA      QPEAK       TPEAK      R.V.
                        (ha)      (cms)       (hrs)      (mm)
       INFLOW:ID= 2     1.44      0.067        1.33      17.14
      OUTFLOW:ID= 1     1.44      0.014        2.75      17.14
     OVERFLOW:ID= 3     0.00      0.000        0.00       0.00

        Volume Reduction Rate[(RVin-RVout)/RVin](%)=     0.00
        Time to reach Max storage           (Hr)=       2.75
        Volume of water for drawdown in LID (cu.m.)=    62.32
        Volume of maximum water storage     (cu.m.)=   117.45
        ***** After simulation, water volume is not zero.
```

```
-------------------------
| Junction Command(0011) |
-------------------------

                        AREA      QPEAK     TPEAK     R.V.
                        (ha)      (cms)     (hrs)     (mm)
  INFLOW : ID= 3( 0010)  0.00      0.00      0.00      0.00
  OUTFLOW: ID= 2( 0011)  0.00      0.00      0.00      0.00

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-------------------------
| Junction Command(0012) |
-------------------------

                        AREA      QPEAK     TPEAK     R.V.
                        (ha)      (cms)     (hrs)     (mm)
  INFLOW : ID= 1( 0010)  1.44      0.01      2.75     17.14
  OUTFLOW: ID= 2( 0012)  1.44      0.01      2.75     17.14

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--------------------
| CALIB            |
| STANDHYD ( 0008) |   Area     (ha)=  0.84
|ID= 1 DT= 5.0 min |   Total Imp(%)= 62.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
      Surface Area   (ha)=    0.52         0.32
      Dep. Storage   (mm)=    1.00        13.60
      Average Slope  (%)=     1.00         2.00
      Length         (m)=    74.83        40.00
      Mannings n      =       0.013        0.250

      NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                    ---- TRANSFORMED HYETOGRAPH ----
           TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs    mm/hr |  hrs    mm/hr |'  hrs    mm/hr |  hrs    mm/hr
          0.083    4.20 | 1.083   23.22 | 2.083    8.64 | 3.08    4.87
          0.167    4.20 | 1.167   23.22 | 2.167    8.64 | 3.17    4.87
          0.250    4.72 | 1.250   96.03 | 2.250    7.56 | 3.25    4.58
          0.333    4.72 | 1.333   96.03 | 2.333    7.56 | 3.33    4.58
          0.417    5.42 | 1.417   29.33 | 2.417    6.76 | 3.42    4.32
          0.500    5.42 | 1.500   29.33 | 2.500    6.76 | 3.50    4.32
          0.583    6.44 | 1.583   17.13 | 2.583    6.13 | 3.58    4.10
          0.667    6.44 | 1.667   17.13 | 2.667    6.13 | 3.67    4.10
          0.750    8.09 | 1.750   12.62 | 2.750    5.63 | 3.75    3.90
          0.833    8.09 | 1.833   12.62 | 2.833    5.63 | 3.83    3.90
          0.917   11.39 | 1.917   10.19 | 2.917    5.22 | 3.92    3.72
          1.000   11.39 | 2.000   10.19 | 3.000    5.22 | 4.00    3.72

      Max.Eff.Inten.(mm/hr)=     96.03         44.65
              over (min)=         5.00         15.00
      Storage Coeff.  (min)=      2.18 (ii)    11.93 (ii)
      Unit Hyd. Tpeak (min)=      5.00         15.00
      Unit Hyd. peak  (cms)=      0.31          0.09
                                                     *TOTALS*
      PEAK FLOW      (cms)=       0.06          0.02     0.066 (iii)
      TIME TO PEAK   (hrs)=       1.33          1.50      1.33
      RUNOFF VOLUME   (mm)=      48.03         14.67     23.01
      TOTAL RAINFALL  (mm)=      49.03         49.03     49.03
      RUNOFF COEFFICIENT  =       0.98          0.30      0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 62.0   Ia = Dep. Storage  (Above)
   (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.


--------------------------------------------------------------------------------
--------------------
| ADD HYD ( 0009)|
|  1 + 2 = 3     |       AREA     QPEAK    TPEAK      R.V.
--------------------    (ha)     (cms)    (hrs)     (mm)
    ID1= 1 ( 0007):     0.60     0.009     1.75      8.93
  + ID2= 2 ( 0008):     0.84     0.066     1.33     23.01
    ======================================================
    ID = 3 ( 0009):     1.44     0.067     1.33     17.14

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-----------------
| CHAMBER( 0010)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: OFF
|IN= 2--> OUT= 3 |  CHAMBER:
| DT= 5.0 min   |  MAX STO VOL (cu.m.)= 362.02 Bottom Area(m2)  = 382.46
-----------------
                    DEPTH      STORAGE    |    DEPTH      STORAGE
                    (mm)       (cu.m.)    |    (mm)       (cu.m.)
                      0.00        0.00    |   762.00      226.76
                     25.00        8.13    |   787.00      233.32
                     51.00       16.23    |   813.00      239.78
                     76.00       24.31    |   838.00      246.12
                    102.00       32.35    |   864.00      252.34
                    127.00       40.37    |   889.00      258.42
                    152.00       48.36    |   914.00      264.36
                    178.00       56.33    |   940.00      270.14
                    203.00       64.26    |   965.00      275.73
                    229.00       72.16    |   991.00      281.12
                    254.00       80.03    |  1016.00      286.24
                    279.00       87.86    |  1041.00      290.95
                    305.00       95.65    |  1067.00      295.32
                    330.00      103.40    |  1092.00      299.56
                    356.00      111.12    |  1118.00      303.68
                    381.00      118.79    |  1143.00      307.63
                    406.00      126.41    |  1168.00      311.52
                    432.00      133.99    |  1194.00      315.40
                    457.00      141.51    |  1219.00      319.29
                    483.00      148.99    |  1245.00      323.17
                    508.00      156.40    |  1270.00      327.06
                    533.00      163.76    |  1295.00      330.94
                    559.00      171.06    |  1321.00      334.83
                    584.00      178.29    |  1346.00      338.71
                    610.00      185.45    |  1372.00      342.60
                    635.00      192.54    |  1397.00      346.48
                    660.00      199.55    |  1422.00      350.37
                    686.00      206.48    |  1448.00      354.25
                    711.00      213.33    |  1473.00      358.14
                    737.00      220.09    |  1499.00      362.02

                    DEPTH     DISCHARGE   |   DEPTH     DISCHARGE
```

10-YEAR STORM

===

```
    V   V   I   SSSSS  U   U   A    L                    (v 6.2.2007)
    V   V   I   SS     U   U   A A  L
     V V   I   SS     U   U  AAAAA  L
     V V   I   SS     U   U  A   A  L
      VV   I   SSSSS  UUUUU  A   A  LLLLL

    OOO   TTTTT  TTTTT  H  H  Y  Y  M   M   OOO     TM
   O   O    T      T    H  H  YY   MM MM  O   O
   O   O    T      T    H  H   Y   M M M  O   O
    OOO     T      T    H  H   Y   M   M   OOO
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         ***** D E T A I L E D   O U T P U T *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\d41bdd21-e9d7-4469-98c8-9a0ce045326d\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\d41bdd21-e9d7-4469-98c8-9a0ce045326d\scen

DATE: 09/23/2022   TIME: 08:20:32

USER:

COMMENTS: _____

 ****
 ** SIMULATION : 02_5-Year Norfolk   **
 ****

| CHICAGO STORM | IDF curve parameters: A= 583.017
| Ptotal= 49.03 mm | B=   3.007
--------------------   C=   0.703
                       used in: INTENSITY = A / (t + B)^C

                       Duration of storm = 4.00 hrs
                       Storm time step   = 10.00 min
                       Time to peak ratio = 0.33

       TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
       hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
       0.00   4.20 | 1.00   23.22 | 2.00   8.64 | 3.00   4.87
       0.17   4.72 | 1.17   96.03 | 2.17   7.56 | 3.17   4.58
       0.33   5.42 | 1.33   29.33 | 2.33   6.76 | 3.33   4.32
       0.50   6.44 | 1.50   17.13 | 2.50   6.13 | 3.50   4.10
       0.67   8.09 | 1.67   12.62 | 2.67   5.63 | 3.67   3.90
       0.83   11.39 | 1.83   10.19 | 2.83   5.22 | 3.83   3.72

| CALIB |
| STANDHYD (0002)| Area   (ha)= 0.84
|ID= 1 DT= 5.0 min | Total Imp(%)= 31.00   Dir. Conn.(%)= 0.00

                        IMPERVIOUS   PERVIOUS (i)
     Surface Area   (ha)=   0.26   0.58
     Dep. Storage   (mm)=   1.00   13.60
     Average Slope (%)=   1.00   2.00
     Length   (m)=   74.83   40.00
     Mannings n   =   0.013   0.250

     NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

                     ---- TRANSFORMED HYETOGRAPH ----
       TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
       hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
       0.083   4.20 | 1.083 23.22 | 2.083   8.64 | 3.08   4.87
       0.167   4.20 | 1.167 23.22 | 2.167   8.64 | 3.17   4.87
       0.250   4.72 | 1.250 96.03 | 2.250   7.56 | 3.25   4.58
       0.333   4.72 | 1.333 96.03 | 2.333   7.56 | 3.33   4.58
       0.417   5.42 | 1.417 29.33 | 2.417   6.76 | 3.42   4.32
       0.500   5.42 | 1.500 29.33 | 2.500   6.76 | 3.50   4.32
       0.583   6.44 | 1.583 17.13 | 2.583   6.13 | 3.58   4.10
       0.667   6.44 | 1.667 17.13 | 2.667   6.13 | 3.67   4.10
       0.750   8.09 | 1.750 12.62 | 2.750   5.63 | 3.75   3.90
       0.833   8.09 | 1.833 12.62 | 2.833   5.63 | 3.83   3.90
       0.917 11.39 | 1.917 10.19 | 2.917   5.22 | 3.92   3.72
       1.000 11.39 | 2.000 10.19 | 3.000   5.22 | 4.00   3.72

     Max.Eff.Inten.(mm/hr)=   96.03   17.64
             over (min)   5.00   20.00
     Storage Coeff. (min)=   2.18 (ii)   16.31 (ii)
     Unit Hyd. Tpeak (min)=   5.00   20.00
     Unit Hyd. peak (cms)=   0.31   0.06
                                                         TOTALS
     PEAK FLOW   (cms)=   0.00   0.02   0.017 (iii)
     TIME TO PEAK (hrs)=   1.33   1.67   1.67
     RUNOFF VOLUME   (mm)=   48.03   10.69   10.68
     TOTAL RAINFALL (mm)=   49.03   49.03   49.03
     RUNOFF COEFFICIENT =   0.98   0.22   0.22

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
            YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 62.0   Ia = Dep. Storage (Above)

     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (0001)| Area   (ha)= 0.60
|ID= 1 DT= 5.0 min | Total Imp(%)= 31.00   Dir. Conn.(%)= 0.00

                        IMPERVIOUS   PERVIOUS (i)
     Surface Area   (ha)=   0.19   0.41
     Dep. Storage   (mm)=   1.00   13.60
     Average Slope (%)=   1.00   2.00
     Length   (m)=   63.25   40.00
     Mannings n   =   0.013   0.250

     NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

                     ---- TRANSFORMED HYETOGRAPH ----
       TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
       hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
       0.083   4.20 | 1.083 23.22 | 2.083   8.64 | 3.08   4.87
       0.167   4.20 | 1.167 23.22 | 2.167   8.64 | 3.17   4.87
       0.250   4.72 | 1.250 96.03 | 2.250   7.56 | 3.25   4.58
       0.333   4.72 | 1.333 96.03 | 2.333   7.56 | 3.33   4.58
       0.417   5.42 | 1.417 29.33 | 2.417   6.76 | 3.42   4.32
       0.500   5.42 | 1.500 29.33 | 2.500   6.76 | 3.50   4.32
       0.583   6.44 | 1.583 17.13 | 2.583   6.13 | 3.58   4.10
       0.667   6.44 | 1.667 17.13 | 2.667   6.13 | 3.67   4.10
       0.750   8.09 | 1.750 12.62 | 2.750   5.63 | 3.75   3.90
       0.833   8.09 | 1.833 12.62 | 2.833   5.63 | 3.83   3.90
       0.917 11.39 | 1.917 10.19 | 2.917   5.22 | 3.92   3.72
       1.000 11.39 | 2.000 10.19 | 3.000   5.22 | 4.00   3.72

     Max.Eff.Inten.(mm/hr)=   96.03   17.64
             over (min)   5.00   20.00
     Storage Coeff. (min)=   1.97 (ii)   16.10 (ii)
     Unit Hyd. Tpeak (min)=   5.00   20.00
     Unit Hyd. peak (cms)=   0.31   0.06
                                                         TOTALS
     PEAK FLOW   (cms)=   0.00   0.01   0.012 (iii)
     TIME TO PEAK (hrs)=   1.33   1.67   1.67
     RUNOFF VOLUME   (mm)=   48.03   10.69   10.67
     TOTAL RAINFALL (mm)=   49.03   49.03   49.03
     RUNOFF COEFFICIENT =   0.98   0.22   0.22

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
            YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 62.0   Ia = Dep. Storage (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0003)|
| 1 + 2 = 3 | AREA   QPEAK   TPEAK   R.V.
--------------------   (ha)   (cms)   (hrs)   (mm)
     ID1= 1 (0001):   0.60   0.012   1.67   10.67
   + ID2= 2 (0002):   0.84   0.017   1.67   10.68
     ==
       ID = 3 (0003):   1.44   0.029   1.67   10.68

     NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| STANDHYD (0007)| Area   (ha)= 0.60
|ID= 1 DT= 5.0 min | Total Imp(%)= 20.00   Dir. Conn.(%)= 0.00

                        IMPERVIOUS   PERVIOUS (i)
     Surface Area   (ha)=   0.12   0.48
     Dep. Storage   (mm)=   1.00   13.60
     Average Slope (%)=   1.00   2.00
     Length   (m)=   63.25   40.00
     Mannings n   =   0.013   0.250

     NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

                     ---- TRANSFORMED HYETOGRAPH ----
       TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
       hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
       0.083   4.20 | 1.083 23.22 | 2.083   8.64 | 3.08   4.87
       0.167   4.20 | 1.167 23.22 | 2.167   8.64 | 3.17   4.87
       0.250   4.72 | 1.250 96.03 | 2.250   7.56 | 3.25   4.58
       0.333   4.72 | 1.333 96.03 | 2.333   7.56 | 3.33   4.58
       0.417   5.42 | 1.417 29.33 | 2.417   6.76 | 3.42   4.32
       0.500   5.42 | 1.500 29.33 | 2.500   6.76 | 3.50   4.32
       0.583   6.44 | 1.583 17.13 | 2.583   6.13 | 3.58   4.10
       0.667   6.44 | 1.667 17.13 | 2.667   6.13 | 3.67   4.10
       0.750   8.09 | 1.750 12.62 | 2.750   5.63 | 3.75   3.90
       0.833   8.09 | 1.833 12.62 | 2.833   5.63 | 3.83   3.90
       0.917 11.39 | 1.917 10.19 | 2.917   5.22 | 3.92   3.72
       1.000 11.39 | 2.000 10.19 | 3.000   5.22 | 4.00   3.72

     Max.Eff.Inten.(mm/hr)=   96.03   10.96
             over (min)   5.00   20.00
     Storage Coeff. (min)=   1.97 (ii)   19.06 (ii)
     Unit Hyd. Tpeak (min)=   5.00   20.00
     Unit Hyd. peak (cms)=   0.31   0.06
                                                         TOTALS
     PEAK FLOW   (cms)=   0.00   0.01   0.009 (iii)
     TIME TO PEAK (hrs)=   1.33   1.75   1.75
     RUNOFF VOLUME   (mm)=   48.03   8.95   8.93
     TOTAL RAINFALL (mm)=   49.03   49.03   49.03
     RUNOFF COEFFICIENT =   0.98   0.18   0.18

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  62.0   Ia = Dep. Storage  (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
                (m)       (cms)    |    (m)       (cms)
              0.000      0.000     |  0.910      0.021
              0.100      0.007     |  1.020      0.022
              0.200      0.010     |  1.120      0.023
              0.310      0.012     |  1.220      0.024
              0.410      0.014     |  1.320      0.025
              0.510      0.016     |  1.420      0.026
              0.610      0.017     |  1.520      0.027
              0.710      0.018     |  1.600      0.028
              0.810      0.020     |  0.000      0.000
```

```
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD ( 0008)  |  Area    (ha)=  0.84
|ID= 1 DT= 5.0 min  |  Total Imp(%)= 62.00   Dir. Conn.(%)=  25.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area    (ha)=    0.52         0.32
    Dep. Storage    (mm)=    1.00        13.60
    Average Slope   (%)=     1.00         2.00
    Length          (m)=    74.83        40.00
    Mannings n      =        0.013        0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                ---- TRANSFORMED HYETOGRAPH ----
         TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
         hrs    mm/hr |  hrs    mm/hr |'  hrs    mm/hr |  hrs    mm/hr
        0.083    4.20 | 1.083   23.22 | 2.083    8.64 | 3.08    4.87
        0.167    4.20 | 1.167   23.22 | 2.167    8.64 | 3.17    4.87
        0.250    4.72 | 1.250   96.03 | 2.250    7.56 | 3.25    4.58
        0.333    4.72 | 1.333   96.03 | 2.333    7.56 | 3.33    4.58
        0.417    5.42 | 1.417   29.33 | 2.417    6.76 | 3.42    4.32
        0.500    5.42 | 1.500   29.33 | 2.500    6.76 | 3.50    4.32
        0.583    6.44 | 1.583   17.13 | 2.583    6.13 | 3.58    4.10
        0.667    6.44 | 1.667   17.13 | 2.667    6.13 | 3.67    4.10
        0.750    8.09 | 1.750   12.62 | 2.750    5.63 | 3.75    3.90
        0.833    8.09 | 1.833   12.62 | 2.833    5.63 | 3.83    3.90
        0.917   11.39 | 1.917   10.19 | 2.917    5.22 | 3.92    3.72
        1.000   11.39 | 2.000   10.19 | 3.000    5.22 | 4.00    3.72

    Max.Eff.Inten.(mm/hr)=     96.03        44.65
          over (min)=          5.00        15.00
    Storage Coeff.  (min)=     2.18 (ii)   11.93 (ii)
    Unit Hyd. Tpeak (min)=     5.00        15.00
    Unit Hyd. peak  (cms)=     0.31         0.09
                                                      *TOTALS*
    PEAK FLOW      (cms)=      0.06         0.02       0.066 (iii)
    TIME TO PEAK   (hrs)=      1.33         1.50       1.33
    RUNOFF VOLUME   (mm)=     48.03        14.67      23.01
    TOTAL RAINFALL  (mm)=     49.03        49.03      49.03
    RUNOFF COEFFICIENT  =      0.98         0.30       0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  62.0   Ia = Dep. Storage  (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
                    AREA     QPEAK      TPEAK      R.V.
                    (ha)     (cms)      (hrs)      (mm)
     INFLOW:ID= 2   1.44     0.067      1.33      17.14
     OUTFLOW:ID= 1  1.44     0.014      2.75      17.14
     OVERFLOW:ID= 3 0.00     0.000      0.00       0.00

        Volume Reduction Rate[(RVin-RVout)/RVin](%)=    0.00
        Time to reach Max storage         (Hr)=         2.75
        Volume of water for drawdown in LID (cu.m.)=   62.32
        Volume of maximum water storage    (cu.m.)=   117.45
        ***** After simulation, water volume is not zero.

        -------------------------
        | Junction Command(0011) |
        -------------------------

                         AREA    QPEAK   TPEAK    R.V.
                         (ha)    (cms)   (hrs)    (mm)
        INFLOW : ID= 3( 0010)   0.00    0.00    0.00    0.00
        OUTFLOW: ID= 2( 0011)   0.00    0.00    0.00    0.00

--------------------------------------------------------------------------------

        -------------------------
        | Junction Command(0012) |
        -------------------------

                         AREA    QPEAK   TPEAK    R.V.
                         (ha)    (cms)   (hrs)    (mm)
        INFLOW : ID= 1( 0010)   1.44    0.01    2.75   17.14
        OUTFLOW: ID= 2( 0012)   1.44    0.01    2.75   17.14

--------------------------------------------------------------------------------
```

```
--------------------------------------------------------------------------------
--------------------
| ADD HYD ( 0009)|
|  1 + 2 = 3     |         AREA    QPEAK    TPEAK    R.V.
--------------------       (ha)    (cms)    (hrs)    (mm)
     ID1= 1 ( 0007):       0.60    0.009    1.75     8.93
   + ID2= 2 ( 0008):       0.84    0.066    1.33    23.01
     ==================================================
     ID = 3 ( 0009):       1.44    0.067    1.33    17.14

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
------------------
| CHAMBER( 0010)| OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: OFF
|IN= 2--> OUT= 3| CHAMBER:
| DT= 5.0 min   | MAX STO VOL (cu.m.)=  362.02  Bottom Area(m2)  = 382.46
------------------
                   DEPTH      STORAGE    |   DEPTH      STORAGE
                   (mm)       (cu.m.)    |   (mm)       (cu.m.)
                     0.00       0.00     |  762.00     226.76
                    25.00       8.13     |  787.00     233.32
                    51.00      16.23     |  813.00     239.78
                    76.00      24.31     |  838.00     246.12
                   102.00      32.35     |  864.00     252.34
                   127.00      40.37     |  889.00     258.42
                   152.00      48.36     |  914.00     264.36
                   178.00      56.33     |  940.00     270.14
                   203.00      64.26     |  965.00     275.73
                   229.00      72.16     |  991.00     281.12
                   254.00      80.03     | 1016.00     286.24
                   279.00      87.86     | 1041.00     290.95
                   305.00      95.65     | 1067.00     295.32
                   330.00     103.40     | 1092.00     299.56
                   356.00     111.12     | 1118.00     303.68
                   381.00     118.79     | 1143.00     307.63
                   406.00     126.41     | 1168.00     311.52
                   432.00     133.99     | 1194.00     315.40
                   457.00     141.51     | 1219.00     319.29
                   483.00     148.99     | 1245.00     323.17
                   508.00     156.40     | 1270.00     327.06
                   533.00     163.76     | 1295.00     330.94
                   559.00     171.06     | 1321.00     334.83
                   584.00     178.29     | 1346.00     338.71
                   610.00     185.45     | 1372.00     342.60
                   635.00     192.54     | 1397.00     346.48
                   660.00     199.55     | 1422.00     350.37
                   686.00     206.48     | 1448.00     354.25
                   711.00     213.33     | 1473.00     358.14
                   737.00     220.09     | 1499.00     362.02

                   DEPTH     DISCHARGE   |   DEPTH     DISCHARGE
```

25-YEAR STORM

```
===============================================================================
    V   V  I   SSSSS  U   U  A    L                    (v 6.2.2007)
    V   V  I   SS     U   U  A A   L
     V V   I   SS     U   U  AAAAA  L
     V V   I   SS     U   U  A   A   L
      VV   I   SSSSS  UUUUU  A   A   LLLLL

     OOO   TTTTT TTTTT  H   H  Y   Y  M   M   OOO    TM
    O   O    T     T    H   H   Y Y   MM MM  O   O
    O   O    T     T    H   H    Y    M M M  O   O
     OOO     T     T    H   H    Y    M   M   OOO
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             *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\2f9283f5-c977-46f5-a695-519c8c9cff5c\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\2f9283f5-c977-46f5-a695-519c8c9cff5c\scen


DATE: 09/23/2022                     TIME: 08:20:32

USER:


COMMENTS: _____


-------------------------------------------------------------------------------
   *********************************************
   ** SIMULATION : 04_25-Year Norfolk        **
   *********************************************

--------------------
| CHICAGO STORM    |   IDF curve parameters: A= 721.533
| Ptotal= 69.38 mm |                         B=   2.253
--------------------                         C=   0.679
                        used in:  INTENSITY = A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

           TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
           hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
           0.00   6.34 | 1.00  31.84 | 2.00  12.58 | 3.00   7.30
           0.17   7.08 | 1.17 131.63 | 2.17  11.08 | 3.17   6.87
           0.33   8.07 | 1.33  39.74 | 2.33   9.96 | 3.33   6.50
           0.50   9.51 | 1.50  23.97 | 2.50   9.08 | 3.50   6.18
           0.67  11.82 | 1.67  17.98 | 2.67   8.38 | 3.67   5.90
           0.83  16.33 | 1.83  14.70 | 2.83   7.79 | 3.83   5.64


-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0002)|   Area    (ha)=  0.84
|ID= 1 DT= 5.0 min |   Total Imp(%)= 31.00  Dir. Conn.(%)=   0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
      Surface Area   (ha)=     0.26        0.58
      Dep. Storage   (mm)=     1.00       13.60
      Average Slope  (%)=      1.00        2.00
      Length         (m)=     74.83       40.00
      Mannings n      =       0.013       0.250

      NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.



                      ---- TRANSFORMED HYETOGRAPH ----
           TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
           hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
          0.083   6.34 | 1.083  31.84 | 2.083  12.58 | 3.08   7.30
          0.167   6.34 | 1.167  31.84 | 2.167  12.58 | 3.17   7.30
          0.250   7.08 | 1.250 131.63 | 2.250  11.08 | 3.25   6.87
          0.333   7.08 | 1.333 131.63 | 2.333  11.08 | 3.33   6.87
          0.417   8.07 | 1.417  39.74 | 2.417   9.96 | 3.42   6.50
          0.500   8.07 | 1.500  39.74 | 2.500   9.96 | 3.50   6.50
          0.583   9.51 | 1.583  23.97 | 2.583   9.08 | 3.58   6.18
          0.667   9.51 | 1.667  23.97 | 2.667   9.08 | 3.67   6.18
          0.750  11.82 | 1.750  17.98 | 2.750   8.38 | 3.75   5.90
          0.833  11.82 | 1.833  17.98 | 2.833   8.38 | 3.83   5.90
          0.917  16.33 | 1.917  14.70 | 2.917   7.79 | 3.92   5.64
          1.000  16.33 | 2.000  14.70 | 3.000   7.79 | 4.00   5.64

      Max.Eff.Inten.(mm/hr)=    131.63         46.87
               over (min)       5.00          15.00
      Storage Coeff. (min)=     1.92 (ii)     11.48 (ii)
      Unit Hyd. Tpeak (min)=    5.00          15.00
      Unit Hyd. peak  (cms)=    0.32           0.09
                                                        *TOTALS*
      PEAK FLOW     (cms)=      0.00           0.04      0.045 (iii)
      TIME TO PEAK  (hrs)=      1.33           1.50       1.50
      RUNOFF VOLUME    (mm)=   68.38          21.50      21.49
      TOTAL RAINFALL   (mm)=   69.38          69.38      69.38
      RUNOFF COEFFICIENT  =     0.99           0.31       0.31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  = 62.0   Ia = Dep. Storage  (Above)
```

```
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0001)|   Area    (ha)=  0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)= 31.00  Dir. Conn.(%)=   0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
      Surface Area   (ha)=     0.19        0.41
      Dep. Storage   (mm)=     1.00       13.60
      Average Slope  (%)=      1.00        2.00
      Length         (m)=     63.25       40.00
      Mannings n      =       0.013       0.250

      NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.



                      ---- TRANSFORMED HYETOGRAPH ----
           TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
           hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
          0.083   6.34 | 1.083  31.84 | 2.083  12.58 | 3.08   7.30
          0.167   6.34 | 1.167  31.84 | 2.167  12.58 | 3.17   7.30
          0.250   7.08 | 1.250 131.63 | 2.250  11.08 | 3.25   6.87
          0.333   7.08 | 1.333 131.63 | 2.333  11.08 | 3.33   6.87
          0.417   8.07 | 1.417  39.74 | 2.417   9.96 | 3.42   6.50
          0.500   8.07 | 1.500  39.74 | 2.500   9.96 | 3.50   6.50
          0.583   9.51 | 1.583  23.97 | 2.583   9.08 | 3.58   6.18
          0.667   9.51 | 1.667  23.97 | 2.667   9.08 | 3.67   6.18
          0.750  11.82 | 1.750  17.98 | 2.750   8.38 | 3.75   5.90
          0.833  11.82 | 1.833  17.98 | 2.833   8.38 | 3.83   5.90
          0.917  16.33 | 1.917  14.70 | 2.917   7.79 | 3.92   5.64
          1.000  16.33 | 2.000  14.70 | 3.000   7.79 | 4.00   5.64

      Max.Eff.Inten.(mm/hr)=    131.63         46.87
               over (min)       5.00          15.00
      Storage Coeff. (min)=     1.74 (ii)     11.30 (ii)
      Unit Hyd. Tpeak (min)=    5.00          15.00
      Unit Hyd. peak  (cms)=    0.32           0.09
                                                        *TOTALS*
      PEAK FLOW     (cms)=      0.00           0.03      0.032 (iii)
      TIME TO PEAK  (hrs)=      1.33           1.50       1.50
      RUNOFF VOLUME    (mm)=   68.38          21.50      21.49
      TOTAL RAINFALL   (mm)=   69.38          69.38      69.38
      RUNOFF COEFFICIENT  =     0.99           0.31       0.31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  = 62.0   Ia = Dep. Storage  (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| ADD HYD ( 0003)|
|  1 + 2 = 3      |        AREA    QPEAK   TPEAK    R.V.
--------------------        (ha)   (cms)   (hrs)    (mm)
     ID1= 1 ( 0001):  0.60    0.032   1.50    21.49
   + ID2= 2 ( 0002):  0.84    0.045   1.50    21.49
     =================================================
     ID = 3 ( 0003):  1.44    0.077   1.50    21.49

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0007)|   Area    (ha)=  0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)= 20.00  Dir. Conn.(%)=   0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
      Surface Area   (ha)=     0.12        0.48
      Dep. Storage   (mm)=     1.00       13.60
      Average Slope  (%)=      1.00        2.00
      Length         (m)=     63.25       40.00
      Mannings n      =       0.013       0.250

      NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.



                      ---- TRANSFORMED HYETOGRAPH ----
           TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
           hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
          0.083   6.34 | 1.083  31.84 | 2.083  12.58 | 3.08   7.30
          0.167   6.34 | 1.167  31.84 | 2.167  12.58 | 3.17   7.30
          0.250   7.08 | 1.250 131.63 | 2.250  11.08 | 3.25   6.87
          0.333   7.08 | 1.333 131.63 | 2.333  11.08 | 3.33   6.87
          0.417   8.07 | 1.417  39.74 | 2.417   9.96 | 3.42   6.50
          0.500   8.07 | 1.500  39.74 | 2.500   9.96 | 3.50   6.50
          0.583   9.51 | 1.583  23.97 | 2.583   9.08 | 3.58   6.18
          0.667   9.51 | 1.667  23.97 | 2.667   9.08 | 3.67   6.18
          0.750  11.82 | 1.750  17.98 | 2.750   8.38 | 3.75   5.90
          0.833  11.82 | 1.833  17.98 | 2.833   8.38 | 3.83   5.90
          0.917  16.33 | 1.917  14.70 | 2.917   7.79 | 3.92   5.64
          1.000  16.33 | 2.000  14.70 | 3.000   7.79 | 4.00   5.64

      Max.Eff.Inten.(mm/hr)=    131.63         27.59
               over (min)       5.00          15.00
      Storage Coeff. (min)=     1.74 (ii)     13.55 (ii)
      Unit Hyd. Tpeak (min)=    5.00          15.00
      Unit Hyd. peak  (cms)=    0.32           0.08
                                                        *TOTALS*
      PEAK FLOW     (cms)=      0.00           0.02      0.024 (iii)
      TIME TO PEAK  (hrs)=      1.33           1.50       1.50
      RUNOFF VOLUME    (mm)=   68.38          18.70      18.68
      TOTAL RAINFALL   (mm)=   69.38          69.38      69.38
      RUNOFF COEFFICIENT  =     0.99           0.27       0.27
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN*  = 62.0   Ia = Dep. Storage  (Above)
   (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
              (m)        (cms)    |    (m)        (cms)
            0.000       0.000     |  0.910       0.021
            0.100       0.007     |  1.020       0.022
            0.200       0.010     |  1.120       0.023
            0.310       0.012     |  1.220       0.024
            0.410       0.014     |  1.320       0.025
            0.510       0.016     |  1.420       0.026
            0.610       0.017     |  1.520       0.027
            0.710       0.018     |  1.600       0.028
            0.810       0.020     |  0.000       0.000

                    AREA     QPEAK    TPEAK      R.V.
                    (ha)     (cms)    (hrs)      (mm)
   INFLOW:ID= 2     1.44     0.127     1.33     29.84
  OUTFLOW:ID= 1     1.44     0.020     3.08     29.84
 OVERFLOW:ID= 3     0.00     0.000     0.00      0.00

        Volume Reduction Rate[(RVin-RVout)/RVin](%)=    0.00
        Time to reach Max storage          (Hr)=        3.08
        Volume of water for drawdown in LID (cu.m.)=  171.47
        Volume of maximum water storage    (cu.m.)=   233.89
        ***** After simulation, water volume is not zero.
```

```
--------------------------
| CALIB           |
| STANDHYD ( 0008)|    Area    (ha)=  0.84
|ID= 1 DT= 5.0 min|    Total Imp(%)= 62.00  Dir. Conn.(%)= 25.00
--------------------------
                      IMPERVIOUS   PERVIOUS (i)
   Surface Area   (ha)=    0.52       0.32
   Dep. Storage   (mm)=    1.00      13.60
   Average Slope   (%)=    1.00       2.00
   Length          (m)=   74.83      40.00
   Mannings n       =     0.013      0.250

      NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.
```

```
                     ---- TRANSFORMED HYETOGRAPH ----
           TIME   RAIN |  TIME   RAIN | ' TIME   RAIN |  TIME   RAIN
            hrs   mm/hr|   hrs   mm/hr|   hrs   mm/hr|   hrs   mm/hr
           0.083   6.34| 1.083  31.84| 2.083  12.58| 3.08    7.30
           0.167   6.34| 1.167  31.84| 2.167  12.58| 3.17    7.30
           0.250   7.08| 1.250 131.63| 2.250  11.08| 3.25    6.87
           0.333   7.08| 1.333 131.63| 2.333  11.08| 3.33    6.87
           0.417   8.07| 1.417  39.74| 2.417   9.96| 3.42    6.50
           0.500   8.07| 1.500  39.74| 2.500   9.96| 3.50    6.50
           0.583   9.51| 1.583  23.97| 2.583   9.08| 3.58    6.18
           0.667   9.51| 1.667  23.97| 2.667   9.08| 3.67    6.18
           0.750  11.82| 1.750  17.98| 2.750   8.38| 3.75    5.90
           0.833  11.82| 1.833  17.98| 2.833   8.38| 3.83    5.90
           0.917  16.33| 1.917  14.70| 2.917   7.79| 3.92    5.64
           1.000  16.33| 2.000  14.70| 3.000   7.79| 4.00    5.64

   Max.Eff.Inten.(mm/hr)=    131.63       89.78
          over (min)=         5.00       10.00
   Storage Coeff.  (min)=    1.92 (ii)    9.29 (ii)
   Unit Hyd. Tpeak (min)=    5.00        10.00
   Unit Hyd. peak  (cms)=    0.31         0.12
                                            *TOTALS*
   PEAK FLOW      (cms)=     0.08         0.05      0.117 (iii)
   TIME TO PEAK   (hrs)=     1.33         1.42       1.33
   RUNOFF VOLUME   (mm)=    68.38        27.62      37.80
   TOTAL RAINFALL  (mm)=    69.38        69.38      69.38
   RUNOFF COEFFICIENT  =     0.99         0.40       0.54
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN*  = 62.0   Ia = Dep. Storage  (Above)
   (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------
| Junction Command(0011) |
--------------------------

                    AREA     QPEAK    TPEAK      R.V.
                    (ha)     (cms)    (hrs)      (mm)
 INFLOW : ID= 3( 0010)     0.00     0.00     0.00     0.00
 OUTFLOW: ID= 2( 0011)     0.00     0.00     0.00     0.00
```

```
--------------------------
| Junction Command(0012) |
--------------------------

                    AREA     QPEAK    TPEAK      R.V.
                    (ha)     (cms)    (hrs)      (mm)
 INFLOW : ID= 1( 0010)     1.44     0.02     3.08    29.84
 OUTFLOW: ID= 2( 0012)     1.44     0.02     3.08    29.84
```

```
--------------------
| ADD HYD ( 0009)|
|  1 + 2 = 3     |      AREA    QPEAK   TPEAK    R.V.
--------------------      (ha)    (cms)   (hrs)    (mm)
    ID1= 1 ( 0007):     0.60    0.024    1.50    18.68
  + ID2= 2 ( 0008):     0.84    0.117    1.33    37.80
    =========================================
    ID = 3 ( 0009):     1.44    0.127    1.33    29.84

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
------------------
| CHAMBER( 0010)| OUTFLOW: ON,  UNDERDRAIN: OFF,  INFIL: OFF
|IN= 2--> OUT= 3 | CHAMBER:
| DT= 5.0 min   | MAX STO VOL (cu.m.)=  362.02  Bottom Area(m2)  = 382.46
------------------
                    DEPTH     STORAGE   |  DEPTH     STORAGE
                    (mm)      (cu.m.)   |  (mm)      (cu.m.)
                     0.00       0.00    | 762.00     226.76
                    25.00       8.13    | 787.00     233.32
                    51.00      16.23    | 813.00     239.78
                    76.00      24.31    | 838.00     246.12
                   102.00      32.35    | 864.00     252.34
                   127.00      40.37    | 889.00     258.42
                   152.00      48.36    | 914.00     264.36
                   178.00      56.33    | 940.00     270.14
                   203.00      64.26    | 965.00     275.73
                   229.00      72.16    | 991.00     281.12
                   254.00      80.03    | 1016.00    286.24
                   279.00      87.86    | 1041.00    290.95
                   305.00      95.65    | 1067.00    295.32
                   330.00     103.40    | 1092.00    299.56
                   356.00     111.12    | 1118.00    303.68
                   381.00     118.79    | 1143.00    307.63
                   406.00     126.41    | 1168.00    311.52
                   432.00     133.99    | 1194.00    315.40
                   457.00     141.51    | 1219.00    319.29
                   483.00     148.99    | 1245.00    323.17
                   508.00     156.40    | 1270.00    327.06
                   533.00     163.76    | 1295.00    330.94
                   559.00     171.06    | 1321.00    334.83
                   584.00     178.29    | 1346.00    338.71
                   610.00     185.45    | 1372.00    342.60
                   635.00     192.54    | 1397.00    346.48
                   660.00     199.55    | 1422.00    350.37
                   686.00     206.48    | 1448.00    354.25
                   711.00     213.33    | 1473.00    358.14
                   737.00     220.09    | 1499.00    362.02

                    DEPTH    DISCHARGE   |  DEPTH    DISCHARGE
```

50-YEAR STORM

```
================================================================================

     V   V   I   SSSSS  U   U   A     L              (v 6.2.2007)
     V   V   I   SS     U   U   A A   L
      V V   I    SS     U   U  AAAAA  L
      V V   I     SS    U   U  A   A  L
       VV   I   SSSSS   UUUUU  A   A  LLLLL

     OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
    O   O    O      T    H   H   Y Y   MM MM  O   O
    O   O    O      T    HHHHH    Y    M M M  O   O
     OOO     T      T    H   H    Y    M   M   OOO

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            *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\fc9b53a9-01c3-4d74-bbb6-bcace3dacd00\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\fc9b53a9-01c3-4d74-bbb6-bcace3dacd00\scen


DATE: 09/23/2022                    TIME: 08:20:32

USER:


COMMENTS: _____


--------------------------------------------------------------------------
  ********************************************
  ** SIMULATION : 05_50-Year Norfolk        **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 766.038
| Ptotal= 78.32 mm |                          B=   1.898
--------------------                          C=   0.668
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  = 4.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio = 0.33

          TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
          hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
          0.00   7.35 | 1.00   35.40 | 2.00   14.38 | 3.00   8.44
          0.17   8.19 | 1.17  146.50 | 2.17   12.71 | 3.17   7.96
          0.33   9.32 | 1.33   43.93 | 2.33   11.45 | 3.33   7.55
          0.50  10.95 | 1.50   26.91 | 2.50   10.46 | 3.50   7.18
          0.67  13.53 | 1.67   20.36 | 2.67    9.66 | 3.67   6.85
          0.83  18.53 | 1.83   16.73 | 2.83    9.00 | 3.83   6.56


--------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0002)|  Area    (ha)=  0.84
|ID= 1 DT= 5.0 min |  Total Imp(%)= 31.00  Dir. Conn.(%)=  0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area   (ha)=    0.26          0.58
     Dep. Storage   (mm)=    1.00         13.60
     Average Slope   (%)=    1.00          2.00
     Length          (m)=   74.83         40.00
     Mannings n       =     0.013         0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                   ---- TRANSFORMED HYETOGRAPH ----
          TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
          hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
          0.083  7.35 | 1.083  35.40 | 2.083  14.38 | 3.08   8.44
          0.167  7.35 | 1.167  35.40 | 2.167  14.38 | 3.17   8.44
          0.250  8.19 | 1.250 146.50 | 2.250  12.71 | 3.25   7.96
          0.333  8.19 | 1.333 146.50 | 2.333  12.71 | 3.33   7.96
          0.417  9.32 | 1.417  43.93 | 2.417  11.45 | 3.42   7.55
          0.500  9.32 | 1.500  43.93 | 2.500  11.45 | 3.50   7.55
          0.583 10.95 | 1.583  26.91 | 2.583  10.46 | 3.58   7.18
          0.667 10.95 | 1.667  26.91 | 2.667  10.46 | 3.67   7.18
          0.750 13.53 | 1.750  20.36 | 2.750   9.66 | 3.75   6.85
          0.833 13.53 | 1.833  20.36 | 2.833   9.66 | 3.83   6.85
          0.917 18.53 | 1.917  16.73 | 2.917   9.00 | 3.92   6.56
          1.000 18.53 | 2.000  16.73 | 3.000   9.00 | 4.00   6.56

     Max.Eff.Inten.(mm/hr)=   146.50        60.11
               over (min)     5.00         15.00
     Storage Coeff.  (min)=   1.84 (ii)    10.49 (ii)
     Unit Hyd. Tpeak (min)=   5.00         15.00
     Unit Hyd. peak  (cms)=   0.32          0.09
                                                 *TOTALS*
     PEAK FLOW      (cms)=    0.00          0.06       0.059 (iii)
     TIME TO PEAK   (hrs)=    1.33          1.50       1.50
     RUNOFF VOLUME  (mm)=    77.32         26.95      26.94
     TOTAL RAINFALL (mm)=    78.32         78.32      78.32
```

```
RUNOFF COEFFICIENT   =      0.99        0.34        0.34

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
            YOU SHOULD CONSIDER SPLITTING THE AREA.

   (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN*  = 62.0   Ia = Dep. Storage  (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0001)|  Area    (ha)=  0.60
|ID= 1 DT= 5.0 min |  Total Imp(%)= 31.00  Dir. Conn.(%)=  0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area   (ha)=    0.19          0.41
     Dep. Storage   (mm)=    1.00         13.60
     Average Slope   (%)=    1.00          2.00
     Length          (m)=   63.25         40.00
     Mannings n       =     0.013         0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                   ---- TRANSFORMED HYETOGRAPH ----
          TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
          hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
          0.083  7.35 | 1.083  35.40 | 2.083  14.38 | 3.08   8.44
          0.167  7.35 | 1.167  35.40 | 2.167  14.38 | 3.17   8.44
          0.250  8.19 | 1.250 146.50 | 2.250  12.71 | 3.25   7.96
          0.333  8.19 | 1.333 146.50 | 2.333  12.71 | 3.33   7.96
          0.417  9.32 | 1.417  43.93 | 2.417  11.45 | 3.42   7.55
          0.500  9.32 | 1.500  43.93 | 2.500  11.45 | 3.50   7.55
          0.583 10.95 | 1.583  26.91 | 2.583  10.46 | 3.58   7.18
          0.667 10.95 | 1.667  26.91 | 2.667  10.46 | 3.67   7.18
          0.750 13.53 | 1.750  20.36 | 2.750   9.66 | 3.75   6.85
          0.833 13.53 | 1.833  20.36 | 2.833   9.66 | 3.83   6.85
          0.917 18.53 | 1.917  16.73 | 2.917   9.00 | 3.92   6.56
          1.000 18.53 | 2.000  16.73 | 3.000   9.00 | 4.00   6.56

     Max.Eff.Inten.(mm/hr)=   146.50        60.11
               over (min)     5.00         15.00
     Storage Coeff.  (min)=   1.67 (ii)    10.32 (ii)
     Unit Hyd. Tpeak (min)=   5.00         15.00
     Unit Hyd. peak  (cms)=   0.32          0.09
                                                 *TOTALS*
     PEAK FLOW      (cms)=    0.00          0.04       0.043 (iii)
     TIME TO PEAK   (hrs)=    1.33          1.50       1.50
     RUNOFF VOLUME  (mm)=    77.32         26.95      26.94
     TOTAL RAINFALL (mm)=    78.32         78.32      78.32
     RUNOFF COEFFICIENT   =   0.99          0.34       0.34

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
            YOU SHOULD CONSIDER SPLITTING THE AREA.

   (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN*  = 62.0   Ia = Dep. Storage  (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
--------------------
| ADD HYD ( 0003)|
|  1 + 2 = 3     |        AREA   QPEAK   TPEAK    R.V.
--------------------       (ha)   (cms)   (hrs)    (mm)
     ID1= 1 (  0001):     0.60   0.043   1.50    26.94
   + ID2= 2 (  0002):     0.84   0.059   1.50    26.94
     ==================================================
     ID = 3 (  0003):     1.44   0.102   1.50    26.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0007)|  Area    (ha)=  0.60
|ID= 1 DT= 5.0 min |  Total Imp(%)= 20.00  Dir. Conn.(%)=  0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area   (ha)=    0.12          0.48
     Dep. Storage   (mm)=    1.00         13.60
     Average Slope   (%)=    1.00          2.00
     Length          (m)=   63.25         40.00
     Mannings n       =     0.013         0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                   ---- TRANSFORMED HYETOGRAPH ----
          TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
          hrs    mm/hr | hrs    mm/hr |' hrs    mm/hr | hrs    mm/hr
          0.083  7.35 | 1.083  35.40 | 2.083  14.38 | 3.08   8.44
          0.167  7.35 | 1.167  35.40 | 2.167  14.38 | 3.17   8.44
          0.250  8.19 | 1.250 146.50 | 2.250  12.71 | 3.25   7.96
          0.333  8.19 | 1.333 146.50 | 2.333  12.71 | 3.33   7.96
          0.417  9.32 | 1.417  43.93 | 2.417  11.45 | 3.42   7.55
          0.500  9.32 | 1.500  43.93 | 2.500  11.45 | 3.50   7.55
          0.583 10.95 | 1.583  26.91 | 2.583  10.46 | 3.58   7.18
          0.667 10.95 | 1.667  26.91 | 2.667  10.46 | 3.67   7.18
```

```
    0.750   13.53 | 1.750   20.36 | 2.750    9.66 |  3.75    6.85
    0.833   13.53 | 1.833   20.36 | 2.833    9.66 |  3.83    6.85
    0.917   18.53 | 1.917   16.73 | 2.917    9.00 |  3.92    6.56
    1.000   18.53 | 2.000   16.73 | 3.000    9.00 |  4.00    6.56

  Max.Eff.Inten.(mm/hr)=    146.50        43.37
           over (min)        5.00         15.00
  Storage Coeff.  (min)=     1.67 (ii)    11.52 (ii)
  Unit Hyd. Tpeak (min)=     5.00         15.00
  Unit Hyd. peak  (cms)=     0.32          0.09
                                                  *TOTALS*
  PEAK FLOW      (cms)=      0.00          0.03      0.034 (iii)
  TIME TO PEAK   (hrs)=      1.33          1.50      1.50
  RUNOFF VOLUME   (mm)=     77.32         23.69     23.68
  TOTAL RAINFALL  (mm)=     78.32         78.32     78.32
  RUNOFF COEFFICIENT =       0.99          0.30      0.30

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
          YOU SHOULD CONSIDER SPLITTING THE AREA.

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 62.0   Ia = Dep. Storage  (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| CALIB           |
| STANDHYD ( 0008)|  Area   (ha)=  0.84
|ID= 1 DT= 5.0 min|  Total Imp(%)= 62.00  Dir. Conn.(%)= 25.00
--------------------
                      IMPERVIOUS   PERVIOUS (i)
  Surface Area   (ha)=    0.52        0.32
  Dep. Storage   (mm)=    1.00       13.60
  Average Slope  (%)=     1.00        2.00
  Length         (m)=    74.83       40.00
  Mannings n      =      0.013       0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                      ---- TRANSFORMED HYETOGRAPH ----
         TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
         hrs    mm/hr| hrs    mm/hr|  hrs    mm/hr| hrs    mm/hr
        0.083   7.35 | 1.083  35.40| 2.083  14.38| 3.08   8.44
        0.167   7.35 | 1.167  35.40| 2.167  14.38| 3.17   8.44
        0.250   8.19 | 1.250 146.50| 2.250  12.71| 3.25   7.96
        0.333   8.19 | 1.333 146.50| 2.333  12.71| 3.33   7.96
        0.417   9.32 | 1.417  43.93| 2.417  11.45| 3.42   7.55
        0.500   9.32 | 1.500  43.93| 2.500  11.45| 3.50   7.55
        0.583  10.95 | 1.583  26.91| 2.583  10.46| 3.58   7.18
        0.667  10.95 | 1.667  26.91| 2.667  10.46| 3.67   7.18
        0.750  13.53 | 1.750  20.36| 2.750   9.66| 3.75   6.85
        0.833  13.53 | 1.833  20.36| 2.833   9.66| 3.83   6.85
        0.917  18.53 | 1.917  16.73| 2.917   9.00| 3.92   6.56
        1.000  18.53 | 2.000  16.73| 3.000   9.00| 4.00   6.56

  Max.Eff.Inten.(mm/hr)=    146.50       111.64
           over (min)        5.00         10.00
  Storage Coeff.  (min)=     1.84 (ii)     8.60 (ii)
  Unit Hyd. Tpeak (min)=     5.00         10.00
  Unit Hyd. peak  (cms)=     0.32          0.12
                                                  *TOTALS*
  PEAK FLOW      (cms)=      0.09          0.07      0.139 (iii)
  TIME TO PEAK   (hrs)=      1.33          1.42      1.33
  RUNOFF VOLUME   (mm)=     77.32         33.94     44.78
  TOTAL RAINFALL  (mm)=     78.32         78.32     78.32
  RUNOFF COEFFICIENT =       0.99          0.43      0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 62.0   Ia = Dep. Storage  (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD ( 0009)|
|  1 + 2 = 3      |      AREA    QPEAK    TPEAK    R.V.
--------------------      (ha)   (cms)    (hrs)    (mm)
     ID1= 1 ( 0007):     0.60   0.034    1.50     23.68
   + ID2= 2 ( 0008):     0.84   0.139    1.33     44.78
     ============================================
     ID = 3 ( 0009):     1.44   0.154    1.33     35.99

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| CHAMBER( 0010)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: OFF
|IN= 2--> OUT= 3 |  CHAMBER:
| DT= 5.0 min   |  MAX STO VOL (cu.m.)= 362.02  Bottom Area(m2)  = 382.46
--------------------
               DEPTH     STORAGE    |  DEPTH     STORAGE
               (mm)      (cu.m.)    |  (mm)      (cu.m.)
               0.00      0.00       |  762.00    226.76
               25.00     8.13       |  787.00    233.32
               51.00    16.23       |  813.00    239.78
               76.00    24.31       |  838.00    246.12
               102.00   32.35       |  864.00    252.34
               127.00   40.37       |  889.00    258.42
```

```
   152.00    48.36   |   914.00    264.36
   178.00    56.33   |   940.00    270.14
   203.00    64.26   |   965.00    275.73
   229.00    72.16   |   991.00    281.12
   254.00    80.03   |  1016.00    286.24
   279.00    87.86   |  1041.00    290.95
   305.00    95.65   |  1067.00    295.32
   330.00   103.40   |  1092.00    299.56
   356.00   111.12   |  1118.00    303.68
   381.00   118.79   |  1143.00    307.63
   406.00   126.41   |  1168.00    311.52
   432.00   133.99   |  1194.00    315.40
   457.00   141.51   |  1219.00    319.29
   483.00   148.99   |  1245.00    323.17
   508.00   156.40   |  1270.00    327.06
   533.00   163.76   |  1295.00    330.94
   559.00   171.06   |  1321.00    334.83
   584.00   178.29   |  1346.00    338.71
   610.00   185.45   |  1372.00    342.60
   635.00   192.54   |  1397.00    346.48
   660.00   199.55   |  1422.00    350.37
   686.00   206.48   |  1448.00    354.25
   711.00   213.33   |  1473.00    358.14
   737.00   220.09   |  1499.00    362.02

         DEPTH     DISCHARGE  |    DEPTH     DISCHARGE
          (m)        (cms)    |     (m)        (cms)
         0.000      0.000     |    0.910      0.021
         0.100      0.007     |    1.020      0.022
         0.200      0.010     |    1.120      0.023
         0.310      0.012     |    1.220      0.024
         0.410      0.014     |    1.320      0.025
         0.510      0.016     |    1.420      0.026
         0.610      0.017     |    1.520      0.027
         0.710      0.018     |    1.600      0.028
         0.810      0.020     |    0.000      0.000

                     AREA      QPEAK     TPEAK     R.V.
                     (ha)      (cms)     (hrs)     (mm)
     INFLOW:ID= 2    1.44      0.154     1.33      35.99
     OUTFLOW:ID= 1   1.44      0.023     3.25      35.99
     OVERFLOW:ID= 3  0.00      0.000     0.00      0.00

       Volume Reduction Rate[(RVin-RVout)/RVin](%)=     0.00
       Time to reach Max storage          (Hr)=         3.25
       Volume of water for drawdown in LID (cu.m.)=    228.45
       Volume of maximum water storage     (cu.m.)=    292.45
       ***** After simulation, water volume is not zero.

--------------------------
| Junction Command(0011) |
--------------------------

                    AREA      QPEAK     TPEAK     R.V.
                    (ha)      (cms)     (hrs)     (mm)
INFLOW : ID= 3( 0010)  0.00   0.00      0.00      0.00
OUTFLOW: ID= 2( 0011)  0.00   0.00      0.00      0.00

--------------------------------------------------------------------------------

--------------------------
| Junction Command(0012) |
--------------------------

                    AREA      QPEAK     TPEAK     R.V.
                    (ha)      (cms)     (hrs)     (mm)
INFLOW : ID= 1( 0010)  1.44   0.02      3.25      35.99
OUTFLOW: ID= 2( 0012)  1.44   0.02      3.25      35.99

--------------------------------------------------------------------------------
```

100-YEAR STORM

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================================================================================

   V   V  I   SSSSS  U   U   A    L                    (v 6.2.2007)
   V   V  I   SS     U   U   A A  L
    V V   I    SS    U   U  AAAAA L
    V V   I    SS    U   U  A   A L
     VV   I   SSSSS  UUUUU  A   A LLLLL

    OOO  TTTTT TTTTT H   H Y   Y M   M  OOO    TM
   O   O   T     T   H   H  Y Y  MM MM O   O
   O   O   T     T   HHHHH   Y   M M M O   O
   O   O   T     T   H   H   Y   M   M O   O
    OOO    T     T   H   H   Y   M   M  OOO
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          *****  D E T A I L E D   O U T P U T *****


  Input  filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\385ebb3f-5815-4c1f-8919-655d33a6d031\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\0b2eea46-62d9-4eea-
a807-32bb8131e9bf\385ebb3f-5815-4c1f-8919-655d33a6d031\scen


DATE: 09/23/2022                    TIME: 08:20:32

USER:



COMMENTS: _____


--------------------------------------------------------------------------------
   ********************************************
   ** SIMULATION : 06_100-Year Norfolk       **
   ********************************************

--------------------
| CHICAGO STORM    |   IDF curve parameters: A= 801.041
| Ptotal= 87.09 mm |                         B=   1.501
--------------------                         C=   0.657
                      used in:   INTENSITY = A / (t + B)^C

                      Duration of storm  = 4.00 hrs
                      Storm time step    = 10.00 min
                      Time to peak ratio = 0.33

        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs   mm/hr  | hrs   mm/hr  | hrs   mm/hr | hrs   mm/hr
        0.00   8.40 | 1.00  38.70 | 2.00  16.17 | 3.00   9.61
        0.17   9.34 | 1.17 160.97 | 2.17  14.33 | 3.17   9.08
        0.33  10.59 | 1.33  47.72 | 2.33  12.95 | 3.33   8.61
        0.50  12.39 | 1.50  29.71 | 2.50  11.86 | 3.50   8.20
        0.67  15.24 | 1.67  22.67 | 2.67  10.97 | 3.67   7.84
        0.83  20.69 | 1.83  18.74 | 2.83  10.24 | 3.83   7.51


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0002)|   Area   (ha)= 0.84
|ID= 1 DT= 5.0 min |   Total Imp(%)= 31.00   Dir. Conn.(%)=  0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area  (ha)=    0.26         0.58
     Dep. Storage  (mm)=    1.00        13.60
     Average Slope  (%)=    1.00         2.00
     Length        (m)=    74.83        40.00
     Mannings n     =     0.013         0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.



                     ---- TRANSFORMED HYETOGRAPH ----
        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs   mm/hr  | hrs   mm/hr  | hrs   mm/hr | hrs   mm/hr
        0.083   8.40 | 1.083  38.70 | 2.083  16.17 | 3.08   9.61
        0.167   8.40 | 1.167  38.70 | 2.167  16.17 | 3.17   9.61
        0.250   9.34 | 1.250 160.97 | 2.250  14.33 | 3.25   9.08
        0.333   9.34 | 1.333 160.97 | 2.333  14.33 | 3.33   9.08
        0.417  10.59 | 1.417  47.72 | 2.417  12.95 | 3.42   8.61
        0.500  10.59 | 1.500  47.72 | 2.500  12.95 | 3.50   8.61
        0.583  12.39 | 1.583  29.71 | 2.583  11.86 | 3.58   8.20
        0.667  12.39 | 1.667  29.71 | 2.667  11.86 | 3.67   8.20
        0.750  15.24 | 1.750  22.67 | 2.750  10.97 | 3.75   7.84
        0.833  15.24 | 1.833  22.67 | 2.833  10.97 | 3.83   7.84
        0.917  20.69 | 1.917  18.74 | 2.917  10.24 | 3.92   7.51
        1.000  20.69 | 2.000  18.74 | 3.000  10.24 | 4.00   7.51

     Max.Eff.Inten.(mm/hr)=    160.97        73.97
              over (min)        5.00         10.00
     Storage Coeff. (min)=     1.77 (ii)    9.74 (ii)
     Unit Hyd. Tpeak (min)=    5.00         10.00
     Unit Hyd. peak (cms)=     0.32          0.11
                                                      *TOTALS*
     PEAK FLOW     (cms)=      0.00          0.08      0.078 (iii)
     TIME TO PEAK  (hrs)=      1.33          1.42       1.42
     RUNOFF VOLUME  (mm)=     86.09         32.62      32.61
     TOTAL RAINFALL (mm)=     87.09         87.09      87.09
     RUNOFF COEFFICIENT =      0.99          0.37       0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN*  =  62.0   Ia = Dep. Storage  (Above)
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```
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
       THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0001)|   Area   (ha)= 0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)= 31.00   Dir. Conn.(%)=  0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area  (ha)=    0.19         0.41
     Dep. Storage  (mm)=    1.00        13.60
     Average Slope  (%)=    1.00         2.00
     Length        (m)=    63.25        40.00
     Mannings n     =     0.013         0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.



                     ---- TRANSFORMED HYETOGRAPH ----
        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs   mm/hr  | hrs   mm/hr  | hrs   mm/hr | hrs   mm/hr
        0.083   8.40 | 1.083  38.70 | 2.083  16.17 | 3.08   9.61
        0.167   8.40 | 1.167  38.70 | 2.167  16.17 | 3.17   9.61
        0.250   9.34 | 1.250 160.97 | 2.250  14.33 | 3.25   9.08
        0.333   9.34 | 1.333 160.97 | 2.333  14.33 | 3.33   9.08
        0.417  10.59 | 1.417  47.72 | 2.417  12.95 | 3.42   8.61
        0.500  10.59 | 1.500  47.72 | 2.500  12.95 | 3.50   8.61
        0.583  12.39 | 1.583  29.71 | 2.583  11.86 | 3.58   8.20
        0.667  12.39 | 1.667  29.71 | 2.667  11.86 | 3.67   8.20
        0.750  15.24 | 1.750  22.67 | 2.750  10.97 | 3.75   7.84
        0.833  15.24 | 1.833  22.67 | 2.833  10.97 | 3.83   7.84
        0.917  20.69 | 1.917  18.74 | 2.917  10.24 | 3.92   7.51
        1.000  20.69 | 2.000  18.74 | 3.000  10.24 | 4.00   7.51

     Max.Eff.Inten.(mm/hr)=    160.97        73.97
              over (min)        5.00         10.00
     Storage Coeff. (min)=     1.60 (ii)    9.57 (ii)
     Unit Hyd. Tpeak (min)=    5.00         10.00
     Unit Hyd. peak (cms)=     0.33          0.11
                                                      *TOTALS*
     PEAK FLOW     (cms)=      0.00          0.06      0.056 (iii)
     TIME TO PEAK  (hrs)=      1.33          1.42       1.42
     RUNOFF VOLUME  (mm)=     86.09         32.62      32.61
     TOTAL RAINFALL (mm)=     87.09         87.09      87.09
     RUNOFF COEFFICIENT =      0.99          0.37       0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN*  =  62.0   Ia = Dep. Storage  (Above)
   (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ADD HYD ( 0003)|
| 1 + 2 = 3       |      AREA   QPEAK   TPEAK    R.V.
--------------------      (ha)   (cms)   (hrs)    (mm)
    ID1= 1 ( 0001):   0.60   0.056   1.42    32.61
  + ID2= 2 ( 0002):   0.84   0.078   1.42    32.61
    ================================================
    ID = 3 ( 0003):   1.44   0.134   1.42    32.61

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0007)|   Area   (ha)= 0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)= 20.00   Dir. Conn.(%)=  0.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area  (ha)=    0.12         0.48
     Dep. Storage  (mm)=    1.00        13.60
     Average Slope  (%)=    1.00         2.00
     Length        (m)=    63.25        40.00
     Mannings n     =     0.013         0.250

     NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.



                     ---- TRANSFORMED HYETOGRAPH ----
        TIME   RAIN | TIME   RAIN |' TIME   RAIN | TIME   RAIN
        hrs   mm/hr  | hrs   mm/hr  | hrs   mm/hr | hrs   mm/hr
        0.083   8.40 | 1.083  38.70 | 2.083  16.17 | 3.08   9.61
        0.167   8.40 | 1.167  38.70 | 2.167  16.17 | 3.17   9.61
        0.250   9.34 | 1.250 160.97 | 2.250  14.33 | 3.25   9.08
        0.333   9.34 | 1.333 160.97 | 2.333  14.33 | 3.33   9.08
        0.417  10.59 | 1.417  47.72 | 2.417  12.95 | 3.42   8.61
        0.500  10.59 | 1.500  47.72 | 2.500  12.95 | 3.50   8.61
        0.583  12.39 | 1.583  29.71 | 2.583  11.86 | 3.58   8.20
        0.667  12.39 | 1.667  29.71 | 2.667  11.86 | 3.67   8.20
        0.750  15.24 | 1.750  22.67 | 2.750  10.97 | 3.75   7.84
        0.833  15.24 | 1.833  22.67 | 2.833  10.97 | 3.83   7.84
        0.917  20.69 | 1.917  18.74 | 2.917  10.24 | 3.92   7.51
        1.000  20.69 | 2.000  18.74 | 3.000  10.24 | 4.00   7.51

     Max.Eff.Inten.(mm/hr)=    160.97        54.16
              over (min)        5.00         15.00
     Storage Coeff. (min)=     1.60 (ii)   10.62 (ii)
     Unit Hyd. Tpeak (min)=    5.00         15.00
     Unit Hyd. peak (cms)=     0.33          0.09
                                                      *TOTALS*
     PEAK FLOW     (cms)=      0.00          0.04      0.044 (iii)
     TIME TO PEAK  (hrs)=      1.33          1.50       1.50
     RUNOFF VOLUME  (mm)=     86.09         28.93      28.92
     TOTAL RAINFALL (mm)=     87.09         87.09      87.09
     RUNOFF COEFFICIENT =      0.99          0.33       0.33
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 62.0   Ia = Dep. Storage (Above)
   (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
        THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD ( 0008)|   Area     (ha)=   0.84
|ID= 1 DT= 5.0 min |   Total Imp(%)= 62.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS   PERVIOUS (i)
     Surface Area   (ha)=    0.52        0.32
     Dep. Storage   (mm)=    1.00       13.60
     Average Slope   (%)=    1.00        2.00
     Length          (m)=   74.83       40.00
     Mannings n       =     0.013       0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO  5.0 MIN. TIME STEP.


                     ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN  | TIME   RAIN  |' TIME  RAIN  | TIME   RAIN
          hrs    mm/hr  | hrs   mm/hr  |  hrs  mm/hr  | hrs   mm/hr
         0.083   8.40   | 1.083  38.70 | 2.083  16.17 | 3.08   9.61
         0.167   8.40   | 1.167  38.70 | 2.167  16.17 | 3.17   9.61
         0.250   9.34   | 1.250 160.97 | 2.250  14.33 | 3.25   9.08
         0.333   9.34   | 1.333 160.97 | 2.333  14.33 | 3.33   9.08
         0.417  10.59   | 1.417  47.72 | 2.417  12.95 | 3.42   8.61
         0.500  10.59   | 1.500  47.72 | 2.500  12.95 | 3.50   8.61
         0.583  12.39   | 1.583  29.71 | 2.583  11.86 | 3.58   8.20
         0.667  12.39   | 1.667  29.71 | 2.667  11.86 | 3.67   8.20
         0.750  15.24   | 1.750  22.67 | 2.750  10.97 | 3.75   7.84
         0.833  15.24   | 1.833  22.67 | 2.833  10.97 | 3.83   7.84
         0.917  20.69   | 1.917  18.74 | 2.917  10.24 | 3.92   7.51
         1.000  20.69   | 2.000  18.74 | 3.000  10.24 | 4.00   7.51

     Max.Eff.Inten.(mm/hr)=   160.97       134.11
              over (min)       5.00        10.00
     Storage Coeff. (min)=     1.77 (ii)   8.05 (ii)
     Unit Hyd. Tpeak (min)=    5.00        10.00
     Unit Hyd. peak  (cms)=    0.32         0.13
                                                    *TOTALS*
     PEAK FLOW      (cms)=     0.09         0.08      0.161 (iii)
     TIME TO PEAK   (hrs)=     1.33         1.42      1.33
     RUNOFF VOLUME   (mm)=    86.09        40.43     51.84
     TOTAL RAINFALL  (mm)=    87.09        87.09     87.09
     RUNOFF COEFFICIENT  =     0.99         0.46      0.60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

     (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* = 62.0   Ia = Dep. Storage (Above)
    (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
         THAN THE STORAGE COEFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  ( 0009)|
|   1 + 2 = 3     |      AREA    QPEAK   TPEAK    R.V.
--------------------      (ha)    (cms)   (hrs)    (mm)
       ID1= 1 ( 0007):   0.60    0.044    1.50    28.92
     + ID2= 2 ( 0008):   0.84    0.161    1.33    51.84
                         ==================================
       ID = 3 ( 0009):   1.44    0.182    1.33    42.29

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

-----------------
| CHAMBER( 0010)|  OUTFLOW: ON,  UNDERDRAIN: OFF,  INFIL: OFF
|IN= 2--> OUT= 3 |  CHAMBER:
| DT= 5.0 min   |  MAX STO VOL (cu.m.)= 362.02 Bottom Area(m2)  = 382.46
-----------------
                   DEPTH    STORAGE     |  DEPTH    STORAGE
```

```
            (mm)      (cu.m.)  |    (mm)      (cu.m.)
           0.00       0.00     |  762.00     226.76
          25.00       8.13     |  787.00     233.32
          51.00      16.23     |  813.00     239.78
          76.00      24.31     |  838.00     246.12
         102.00      32.35     |  864.00     252.34
         127.00      40.37     |  889.00     258.42
         152.00      48.36     |  914.00     264.36
         178.00      56.33     |  940.00     270.14
         203.00      64.26     |  965.00     275.73
         229.00      72.16     |  991.00     281.12
         254.00      80.03     | 1016.00     286.24
         279.00      87.86     | 1041.00     290.95
         305.00      95.65     | 1067.00     295.32
         330.00     103.40     | 1092.00     299.56
         356.00     111.12     | 1118.00     303.68
         381.00     118.79     | 1143.00     307.63
         406.00     126.41     | 1168.00     311.52
         432.00     133.99     | 1194.00     315.40
         457.00     141.51     | 1219.00     319.29
         483.00     148.99     | 1245.00     323.17
         508.00     156.40     | 1270.00     327.06
         533.00     163.76     | 1295.00     330.94
         559.00     171.06     | 1321.00     334.83
         584.00     178.29     | 1346.00     338.71
         610.00     185.45     | 1372.00     342.60
         635.00     192.54     | 1397.00     346.48
         660.00     199.55     | 1422.00     350.37
         686.00     206.48     | 1448.00     354.25
         711.00     213.33     | 1473.00     358.14
         737.00     220.09     | 1499.00     362.02

         DEPTH     DISCHARGE   |   DEPTH     DISCHARGE
          (m)       (cms)      |    (m)       (cms)
         0.000     0.000       |  0.910      0.021
         0.100     0.007       |  1.020      0.022
         0.200     0.010       |  1.120      0.023
         0.310     0.012       |  1.220      0.024
         0.410     0.014       |  1.320      0.025
         0.510     0.016       |  1.420      0.026
         0.610     0.017       |  1.520      0.027
         0.710     0.018       |  1.600      0.028
         0.810     0.020       |  0.000      0.000

                  AREA     QPEAK      TPEAK      R.V.
                  (ha)     (cms)      (hrs)      (mm)
  INFLOW:ID= 2    1.44     0.182      1.33      42.29
 OUTFLOW:ID= 1    1.44     0.026      3.33      42.29
 OVERFLOW:ID= 3   0.00     0.000      0.00       0.00

     Volume Reduction Rate[(RVin-RVout)/RVin](%)=   -0.00
     Time to reach Max storage         (Hr)=        3.33
     Volume of water for drawdown in LID (cu.m.)=  277.22
     Volume of maximum water storage   (cu.m.)=    349.18
     ***** After simulation, water volume is not zero.

--------------------------
| Junction Command(0011) |
--------------------------

                  AREA     QPEAK   TPEAK    R.V.
                  (ha)     (cms)   (hrs)    (mm)
 INFLOW : ID= 3( 0010)    0.00     0.00    0.00    0.00
 OUTFLOW: ID= 2( 0011)    0.00     0.00    0.00    0.00

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--------------------------
| Junction Command(0012) |
--------------------------

                  AREA     QPEAK   TPEAK    R.V.
                  (ha)     (cms)   (hrs)    (mm)
 INFLOW : ID= 1( 0010)    1.44     0.03    3.33   42.29
 OUTFLOW: ID= 2( 0012)    1.44     0.03    3.33   42.29

--------------------------------------------------------------------------------

 FINISH
================================================================================
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APPENDIX E

STORM SEWER DESIGN SHEET

Storm 5-year Simcoe   Date Feb 19/13

A= 583.017 B= 3.007 C= 0.703

Pipe Material PVC<=450, Concrete >450   Project Mechanic Street to Mechanic St Drain   Designed by TGS

n 0.013   Checked by JDV

Town/County Waterford - Norfolk County   Sheet of : 1 of

Location			Area		Individual	Cumlative	Time	Rainfall	Flow	Sewer Design					
Area	From	To			R*A	R*A	of		2.78*I*A*R	Size	Slope	Cap	Vel	Length	Time
			Ha	Ha			Concentration	mm/hr		mm	%	L/s	m/s	m	
			0.45				min		L/s						min
1-2	1	2	0.61		0.27	0.27	15.00	76.40	58.3	300	0.59%	74.3	1.051	98.5	1.56
Stub -2	Stub (CBMH1)	2	5.21		2.34	2.62	72.00	28.02	204.0	450	0.40%	180	1.134	14	0.21
2-3	2	3	0.61		0.27	2.89	72.21	27.97	225.0	450	1.18%	310	1.947	97.4	0.83
3-4	3	4	0.32		0.14	3.04	73.04	27.75	234.3	450	3.50%	533	3.354	69.3	0.34
4-5	4	5	1.04		0.47	3.51	73.38	27.66	269.6	450	4.60%	611	3.845	74.4	0.32
Stub-5	Stub (CBMH2)	5	7.35		3.31	6.81	73.71	27.58	522.4	600	1.70%	801	2.831	13.4	0.08
5-6	5	6	0.59		0.27	7.08	73.79	27.56	542.4	600	0.82%	556	1.966	79.5	0.67
6-7	6	7	2.39		1.08	8.15	74.46	27.39	620.9	675	0.56%	629	1.758	100.7	0.95
7-Out	7	Outlet	0.07		0.03	8.19	75.41	27.16	618.0	675	0.55%	623	1.742	206.4	1.97

NOTE:

CONTOUR DATA TAKEN FROM ONTARIO
BASE MAP 10 17 5550 47500
(MNR 1986)

STUB-MH5
7.35 | 0.45

MANHOLE #5

AREA IN HECTARES — RUNOFF COEFFICIENT

STUB-MH2
5.21 | 0.45

STUB-MH3
7.35 | 0.45

STUB-MH4
21.71 | 0.45

MH3-MH1
0.32 | 0.45

MH2-MH3
0.40 | 0.45

MH4-MH5
1.04 | 0.45

MH5-MH6
0.59 | 0.45

MH6-MH2
0.61 | 0.45

MH8-MH9
2.36 | 0.45

MH6A-MH7
2.39 | 0.45

MH9A-MH10
0.52 | 0.45

MH10-MH11
0.84 | 0.45

STUB-MH11
14.43 | 0.45

MH12-MH11
1.42 | 0.45

MH13-MH12
0.23 | 0.45

MH14-MH13
0.17 | 0.45

EX-OUT
0.07 | 0.45

Tc = 71 MIN (AIRPORT)
Tc = 71 MIN (AIRPORT)
Tc = 55 MIN (AIRPORT)
Tc = 54 MIN (AIRPORT)
Tc = 54 MIN (AIRPORT)

Tc @ STMH2 72 MIN
Tc @ STMH5 73 MIN
Tc @ STMH9 58 MIN
Tc @ STMH11 56 MIN

ARTHUR STREET TRAVEL TIME 1 MIN (ASSUMED BY PIPE) 450mm STORM 0.8%

TRAVEL TIME 2 MIN (ASSUMED BY PIPE)
COLLEGE STREET TRAVEL TIME 3 MIN (ASSUMED BY PIPE)
ST. JAMES ST. TRAVEL TIME 2 MIN (ASSUMED BY PIPE)

98.0m-300mm STORM 0.40%
97.9m-450mm STORM 1.80%
69.3m-450mm STORM 3.5%
67.7m-450mm STORM 4.70%
85.7m-600mm STORM 0.80%
99.3m-675mm STORM 0.60%
105.2m-525mm STORM 0.40%
93.7m-900mm STORM 0.35%
105.7m-900mm STORM 0.35%
80.6m-450mm STORM 1.00%
23.6m-450mm STDRM 1.00%
86.3m-300mm STORM 5.50%
12.5m-450mm STDRM 1.00%
206.4m-675mm STORM 0.50%
29.1m-900mm STORM
80.3m-900mm STORM
13.2m-450mm STORM

STMH1 STMH2 STMH3 STMH4 STMH5 STMH6 STMH7 STMH8 STMH9 STMH10 STMH11 STMH12 STMH13 STMH14

Street labels: COLLEGE STREET, MECHANIC STREET, ROBINSON ROAD, L.E. AND N. TRAIL, NORFOLK STREET, JOHN STREET, FACTORY ALLEY, ST. JAMES ST., SOVEREIGN STREET, COTTAGE STREET, SHADOW LAKE LANE, MAIN STREET

Contour values: 245.0, 246.5, 247.5, 250.0, 243.0, 242.5, 240.0, 235.0, 230.0

MECHANIC STREET STORM SEWER DESIGN SHEET

Date Sept 22/22

Storm 5-year Simcoe
A= 583.017   B= 3.007   C= 0.703
Pipe Material PVC<=450, Concrete >450
n   0.013

Project: SFO Townhouses
Town/County: Waterford - Norfolk County

Designed by NLB
Checked by JI
Sheet   1   of   1

Location			Area			Individual R*A	Cumlative R*A	Time of Concentration	Rainfall	Flow 2.78*I*A*R	Sewer Design						Flow/Cap
Area	From	To	Ha	Ha	Ha			min	mm/hr	L/s	Size mm	Slope %	Cap L/s	Vel m/s	Length m	Time min	%
			0.45	0.6	0.75												
1-2	1	2	0.61			0.27	0.27	15.00	76.40	58.3	300	0.59%	74.28	1.051	98.5	1.56229	78.5%
Stub -2	Stub (CBMH1)	2	5.21			2.34	2.34	72.00	28.02	182.6	450	0.40%	180.3	1.134	14	0.2058	101.3%
2-3	2	3	0.61			0.27	2.89	72.21	27.97	225.0	450	1.18%	309.7	1.947	97.4	0.83363	72.6%
3-4	3	4	0.32			0.14	3.04	73.04	27.75	234.3	450	3.50%	533.4	3.354	69.3	0.34439	43.9%
4-5	4	5	1.04			0.47	3.51	73.38	27.66	269.6	450	4.60%	611.5	3.845	74.4	0.32252	44.1%
Stub-5	Stub (CBMH2)	5	7.35			3.31	3.31	73.71	27.58	253.6	600	1.70%	800.6	2.831	13.4	0.07888	31.7%
5-6	5	6	0.59			0.27	7.08	73.79	27.56	542.4	600	0.82%	556	1.966	79.5	0.67379	97.5%
CHAMBERS	6	7								28.0							
6-7	6	7	0.62	0.33		0.48	7.56	74.46	27.39	603.4	675	0.56%	629	1.758	100.7	0.95477	95.9%
7-Out	7	Outlet	0.07			0.03	7.59	75.41	27.16	600.8	675	0.55%	623.4	1.742	206.4	1.97466	96.4%

Notes:

12-128 Orginal Design: Area 6-7 is 2.39 ha with a runoff coefficient of 0.45.

21-012 Proposed Design: Area 6-7 has been modified to represent the following catchment areas:
  Single-detached area on Mechanic Street = 0.62 ha
  Semi-detached area fronting on Norfolk Street = 0.33 ha
  External Area (0.61 ha) and Proposed Development Site (0.84 ha) are controlled with an on-site chamber system.

 = 100-year post-development release rate from on-site chamber system is 28 L/s
 = Flow Rate from uncontrolled areas + 100-year post-development release rate from on-site chamber system

AREA DESCRIBED
A1
RUN-OFF COEFFICIENT   0.5   5.25
AREA IN HECTARES

vallee
Consulting Engineers,
Architects & Planners

G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270

Stamp

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

Project Title
SFO TOWNHOUSES
WATERFORD, NORFOLK COUNTY

Drawing Title
MECHANIC STREET STORM
DRAINAGE AREAS

Designed by: NLB
Drawn By: NLB
Checked by: JI
Date Started: OCT 12, 2021
Drawing Scale: NTS
Drawing No.: **FIG3**
Project No.: **21-012**

REV. No.	DATE	REVISION
0	NOV 1, 2022	ISSUED FOR SITE PLAN APPROVAL

ORIGINAL DESIGN CONDITION

POST DEVELOPMENT CONDITION

LEGEND

→ OVERLAND FLOW (MAJOR)

—— DRAINAGE BOUNDARY

▧ EXTERNAL IMPERVIOUS AREA

SWM — SWM DRAINAGE AREA
0.99 | 35.0% — TOTAL IMPERVIOUS PERCENTAGE (%)
— AREA (ha)

SCALE:

5   10   15   20

HORIZONTAL :   1:500

DO NOT SCALE DRAWINGS, CALL FOR ANY
CLARIFICATIONS THAT ARE REQUIRED, FIELD
VERIFY AT ALL BUILT CONDITIONS

ALL DRAWINGS ARE TO BE READ IN COLOUR
ORIGINAL PAGE SIZE ARCH 'D' - 24" x 36"

PRELIMINARY
NOT TO BE USED
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▼ vallee
Consulting Engineers,
Architects & Planners

G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

PROJECT TITLE:
SFO TOWNHOUSES WATERFORD
WATERFORD - NORFOLK COUNTY
NORFOLK STREET & MECHANIC STREET WEST

DRAWING TITLE:
STORMWATER MANAGEMENT AREAS

CHECKED BY:	DRAWN BY:
JI	NLB
DRAWING SCALE:	DRAWING NO.:
1:250	
PROJECT NO.:	**FIG2**
21-012	

ORIGINAL DESIGN CONDITION

ORIGINAL EXTERNAL AREA

DRAINAGE AREA = 0.60 ha
RUNOFF COEFFICIENT = 0.45
IMPERVIOUS PERCENTAGE = 31%
DIRECTLY CONNECTED IMPERVIOUS PERCENTAGE = 0%

ORIGINAL SITE AREA

DRAINAGE AREA = 0.84 ha
RUNOFF COEFFICIENT = 0.45
IMPERVIOUS PERCENTAGE = 31%
DIRECTLY CONNECTED IMPERVIOUS PERCENTAGE = 0%
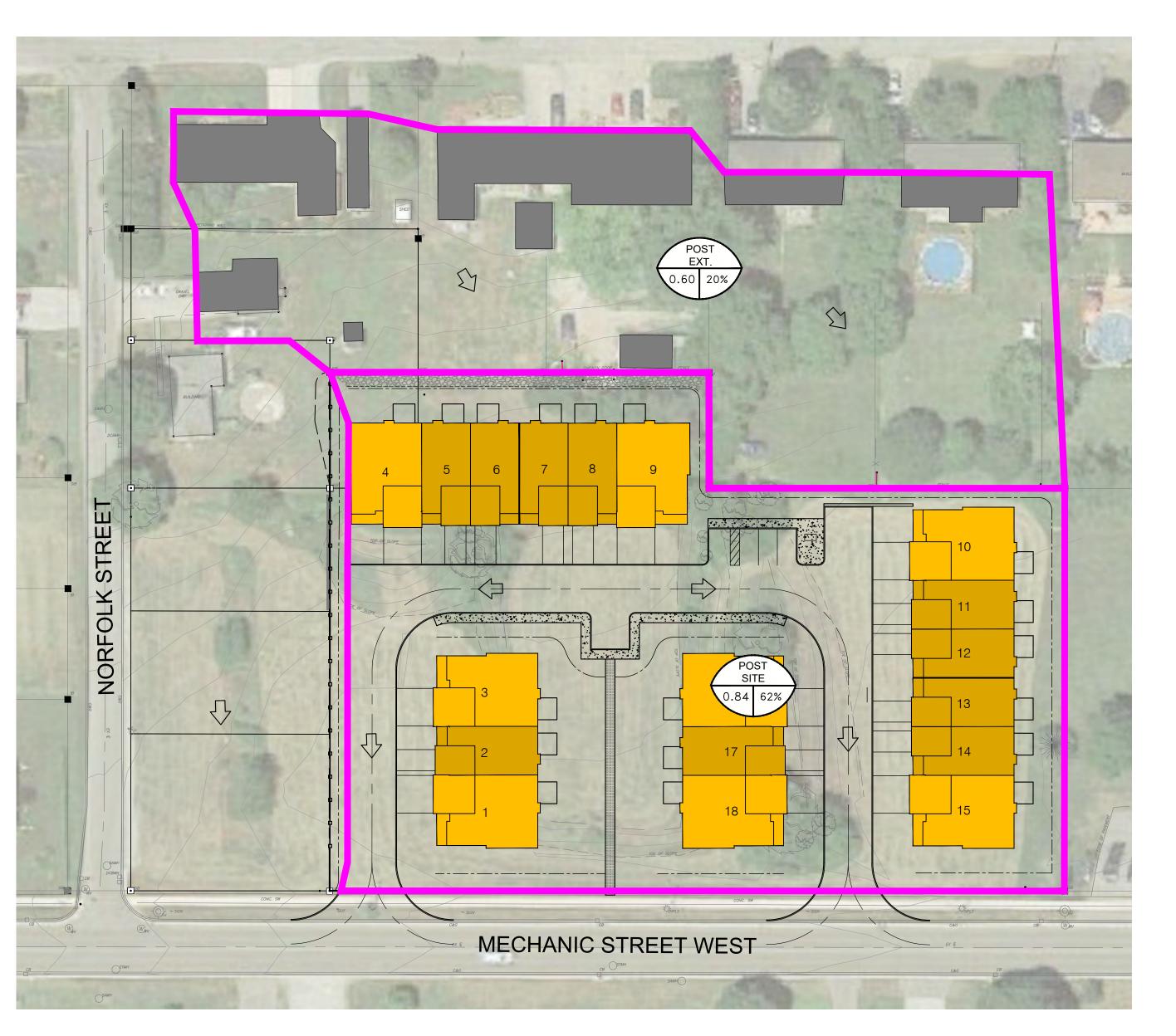
POST-DEVELOPMENT CONDITION

POST EXTERNAL AREA

DRAINAGE AREA = 0.60 ha
IMPERVIOUS AREA = 0.12 ha
IMPERVIOUS PERCENTAGE = 20%
DIRECTLY CONNECTED IMPERVIOUS PERCENTAGE = 0%

POST SITE AREA

DRAINAGE AREA = 0.84 ha
IMPERVIOUS AREA = 0.52 ha
IMPERVIOUS PERCENTAGE = 62%
DIRECTLY CONNECTED IMPERVIOUS PERCENTAGE = 25%

INITIAL EXT. 0.60 | 31%

INITIAL SITE 0.84 | 31%

POST EXT. 0.60 | 20%

POST SITE 0.84 | 62%

NORFOLK STREET

MECHANIC STREET WEST

NORFOLK STREET

DEVELOPMENT

WATERFORD, ON

TRAFFIC IMPACT BRIEF

RC SPENCER ASSOCIATES INC.
Consulting Engineers

Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6
London: 660 Inverness Avenue – London ON N6H 5R4

File No.: 21-1184   October 2021

NORFOLK STREET DEVELOPMENT, WATERFORD, ON

TRAFFIC IMPACT BRIEF (OCTOBER 2021)

Table of Contents

Figure 1: Study Area
Figure 2: Site Plan
Figure 3: Site Generated Traffic (AM / PM Peak Hour)
Figure 4: Existing Traffic (AM / PM Peak Hour)
Figure 5: Existing + Site Generated Traffic (AM / PM Peak Hour)
Figure 6A: Sight Line Analysis: Westerly Site Access at Mechanic Street West
Figure 6B: Sight Line Analysis: Easterly Site Access at Mechanic Street West

Appendix A: Traffic Counts

- Norfolk Street at Mechanic Street West
- Mechanic Street West at Main Street North

Appendix B: ITE Trip Generation Manual – 10th Edition References

- Single Family Detached Housing AM Peak
- Single Family Detached Housing PM Peak
- Proposed Site Development Trip Generation and Distribution

Appendix C: Traffic Projection Figures

- Norfolk Street at Mechanic Street West
- Westerly Site Access at Mechanic Street West
- Easterly Site Access at Mechanic Street West
- Mechanic Street West at Main Street North

Appendix D: Detailed Synchro Results

- Norfolk Street at Mechanic Street West
- Westerly Site Access at Mechanic Street West
- Easterly Site Access at Mechanic Street West
- Mechanic Street West at Main Street North

Appendix E: Sight Line Calculations

- Westerly Site Access at Mechanic Street West
- Easterly Site Access at Mechanic Street West

INTRODUCTION AND BACKGROUND

A residential development has been proposed for lands in the northwest area of the Community of Waterford, Ontario, specifically at the northeast corner of Norfolk Street at Mechanic Street West. Waterford is situated in Norfolk County, approximately 10 km north of the Town of Simcoe.

As may be noted on Figure 1, Main Street North (Old Highway 24) and Mechanic Street West (Concession 8 Townsend) are part of the arterial grid system in Waterford and the principal means of external access to and from the area. Mechanic Street West is an east / west roadway which intersects with Main Street North (Old Highway 24) in Waterford, approximately 800m east of the development site, and with (new) Highway 24 approximately 3 km to the west. Main Street North is a north / south roadway which runs from (new) Highway 24 near Simcoe, northerly through Waterford, toward Brantford. Norfolk Street is a north / south local roadway which is just one block long, between Mechanic Street West and College Street West.

The study area includes the stop-controlled intersection of Norfolk Street at Mechanic Street West (Concession 8 Townsend), the two proposed site accesses at Mechanic Street West, and the stop-controlled intersection of Mechanic Street West at Main Street North, noting that Mechanic Street West becomes Deer Park Road east of Main Street.

The preliminary site plan is provided on Figure 2 and consists of six semi-detached homes and 16 townhomes, which totals 22 dwelling units. This development is proposed for construction in a single phase. According to Norfolk County's Transportation Impact Study Guidelines, a Traffic Impact Study (TIS) will be required if any of the following conditions are met:

> *"A transportation impact study (TIS) should be completed for every development proposal within Norfolk County that may have an impact on the County road network. Generally speaking, developments that are expected to produce 75 vehicle trips to and from a development would constitute as having an impact. However, the County may request a TIS for developments that produce less than 75 trips in situations where other issues, including but not limited: to safety concerns, significant traffic peaking, and other operational concerns are identified, at the discretion of County staff."*

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The anticipated number of trips generated by the proposed development is described in more detail below, but preliminary estimates suggest that 22 dwelling units will generate much less trips than the threshold of 75 total vehicle trips per hour specified in the Norfolk County TIS Guidelines. Therefore, it is concluded that a full transportation impact study is not warranted; a traffic impact brief will suffice. The purpose of this brief is to examine the proposed development and its effect on area traffic operations, particularly on Mechanic Street West.

TRAFFIC DATA COLLECTION

As provided in Appendix A, turning movement counts were obtained by Pyramid Traffic Inc. on 28 September 2021 for the intersections of:

- Norfolk Street at Mechanic Street West; and
- Concession 8 Townsend at Main Street North (Old Highway 24).

METHODOLOGY

The baseline traffic counts provided the basis for industry-standard traffic operations analysis; the software package utilized for the analysis (Synchro 11) calculates various parameters of intersection performance, such as level of service (LOS), intersection capacity utilization (ICU), control delay, and queue lengths on individual approaches.

Unsignalized level of service results are reported based on the following industry standard:

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

TRIP GENERATION AND DISTRIBUTION

Trip generation for the proposed development was estimated from the Institute of Transportation Engineers Trip Generation Manual (10th Edition). The dataset's average rate was used instead of the fitted curve because the value of the independent variables is in the lower range of the dataset; the fitted curve equation does not pass through the origin.

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ITE Land Use Code 210 (Single-Family Detached Housing) is the most appropriate and conservative code for the 22 proposed residential units. Land Use Code 210 provides generation rates of 0.74 trips per unit in the AM peak hour with 25% entering and 75% exiting, and 0.99 trips per unit in the PM peak hour, with 63% entering and 37% exiting.

The details of the trip generation analysis are provided in Appendix B, noting that separate estimates were developed for AM and PM peak hours. The total trips generated by these uses are estimated to be 4 entering and 12 exiting during the AM peak hour, and 14 entering and 8 exiting during the PM peak hour.

Site generated traffic was distributed to the adjacent streets at the proposed site accesses based on the proximity of the units to the proposed accesses. The distribution of turning movements resulting from the trip generation at each proposed access was based on the directional flow of existing traffic volumes on Mechanic Street West, as taken from the turning movement counts. Figure 3 illustrates the site generated traffic volumes during the respective AM and PM peak hours.

CAPACITY AND LEVEL OF SERVICE ANALYSIS

Detailed analysis was carried out for all intersections for AM and PM peak hours with respect to the following traffic scenarios:

- Existing Traffic;
- Existing + Site Generated Traffic.

Figures 4 to 5 summarize total traffic estimates that result from the addition of site generated traffic to the existing traffic in the study area. The effect of adding site generated traffic from the proposed development to existing traffic volumes at each specific intersection can be found in Appendix C. The resulting Synchro 10 simulation reports are provided in Appendix D.

To quantify the effect of traffic growth on individual intersections within the study area and to assess the need for geometric or traffic infrastructure improvements, the Synchro results were summarized as follows:

Norfolk Street at Mechanic Street West

Under existing volumes, the existing tee intersection of Norfolk Street at Mechanic Street West is a tee intersection controlled by a southbound stop condition. Under existing volumes, all approaches operate at an excellent level of service. As observed from Table 1, traffic generated by the proposed development will result in no change to the level of service.

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Table 1: Level of Service by Approach – Norfolk Street at Mechanic Street West

Scenario	Norfolk Street at Mechanic Street West							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing Traffic	A	A	-	A	A	A	-	A
Existing + Site Generated Traffic	A	A	-	A	A	A	-	A

Westerly Site Access at Mechanic Street West

The proposed tee intersection of the Westerly Site Access at Mechanic Street West will be controlled by a southbound stop condition. Based on the results provided in Table 2, it is anticipated that the new intersection will operate at a good level of service.

Table 2: Level of Service by Approach – Westerly Site Access at Mechanic Street West

Scenario	Westerly Site Access at Mechanic Street West							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing + Site Generated Traffic	A	A	-	A	A	A	-	A

Easterly Site Access at Mechanic Street West

The proposed tee intersection of the Easterly Site Access at Mechanic Street West will be controlled by a southbound stop condition. Based on the results provided in Table 3, it is anticipated that the new intersection will operate at a good level of service.

Table 3: Level of Service by Approach – Easterly Site Access at Mechanic Street West

Scenario	Easterly Site Access at Mechanic Street West							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing + Site Generated Traffic	A	A	-	A	A	A	-	A

Mechanic Street West / Deer Park Road at Main Street North

The existing intersection of Mechanic Street West / Deer Park Road at Main Street North (Old Highway 24) is an eastbound / westbound stop-controlled intersection. Based on the results provided in Table 4, all approaches are anticipated to operate satisfactorily with the addition of site generated traffic; the addition of site generated traffic will not result in a change to the approach levels of service.

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Table 4: Level of Service by Approach – Mechanic Street West / Deer Park Road at Main Street North

Scenario	Mechanic St. W. / Deer Park Rd. at Main St. N.							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing Traffic	B	B	A	A	B	C	A	A
Existing + Site Generated Traffic	B	B	A	A	B	C	A	A

GEOMETRIC AND TRAFFIC CONTROL IMPROVEMENTS

Based on the level of service results and the low volumes of traffic generated by the residential development, it is the engineers' opinion that geometric and traffic control improvements are not required. As a result, no additional warrant evaluations were undertaken.

SIGHT LINE ANALYSIS

Sight line analyses were completed for the following intersections:

- Westerly Site Access at Mechanic Street West; and
- Easterly Site Access at Mechanic Street West.

The analyses were completed in accordance with the TAC Geometric Design Guide for Canadian Roads (2017). The posted speed limit on Mechanic Street West is 50 km/h, so the analysis was completed for a 60 km/h design speed. As calculated in Appendix E, the intersection sight distance is determined to be 125m for the worst-case left turn egress maneuver. Intersection sight distance for a right turn egress maneuver is determined to be 108m.

As illustrated on Figures 6A and 6B, there is sufficient sight distance in both directions for safe egress from the site accesses; however, the developer and road authority should assure themselves that all boulevard areas within the right-of-way are clear of potential obstructions.

SUMMARY AND CONCLUSIONS

A residential development has been proposed for lands situated at the northeast corner of Norfolk Street and Mechanic Street West in the Community of Waterford, Ontario, which is situated approximately 10 km north of the Town of Simcoe. The development site is located in the northwest area of the community. Main Street North (Old Highway 24) and Mechanic Street West (Concession 8 Townsend) are part of the arterial grid system in Waterford and the principal means of external access to and from the area.

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Norfolk Street is a north / south local roadway which is just one block long. Mechanic Street West is an east / west roadway which intersects with Highway 24 approximately 3 km to the east of Waterford and with Main Street North (Old Highway 24) to the west. Mechanic Street West is known as Deer Park Road to the east of Main Street North. Main Street North is a north / south roadway which joins Highway 24 south of Waterford and north of Simcoe.

The study area includes the stop-controlled intersection of Norfolk Street at Mechanic Street West (Concession 8 Townsend), the site accesses, and the stop-controlled intersection of Mechanic Street West at Main Street North. The proposed site plan consists of six semi-detached homes and 16 townhomes, totalling 22 dwelling units; the development is proposed for construction in a single phase.

Using recently obtained turning movement counts and applying the best available trip generation and distribution data and methodologies, an analysis was completed to measure the operational impact of the proposed development on area traffic operations. Upon completion of the analysis, it was concluded that:

- The southbound stop-controlled tee intersection of Norfolk Street at Mechanic Street West is currently operating at good levels of service; following the construction of the proposed development, these levels of service will not be adversely affected;

- Both proposed Mechanic Street West site accesses will operate at good levels of service;

- The eastbound / westbound stop-controlled intersection of Mechanic Street West at Main Street North (Old Highway 24) is operating at satisfactory levels of service under existing traffic conditions; following the construction of the proposed development, these levels of service will not be adversely affected;

- Geometric and / or traffic control improvements are not required;

- There is sufficient decision sight distance to accommodate safe all-directional egress from both proposed site accesses; however, the developer and road authority should assure themselves that all boulevard areas within the right-of-way are clear of potential obstructions.

Therefore, based on the results of the technical work, it is the engineers' opinion that the proposed development will not adversely impact area traffic operations.
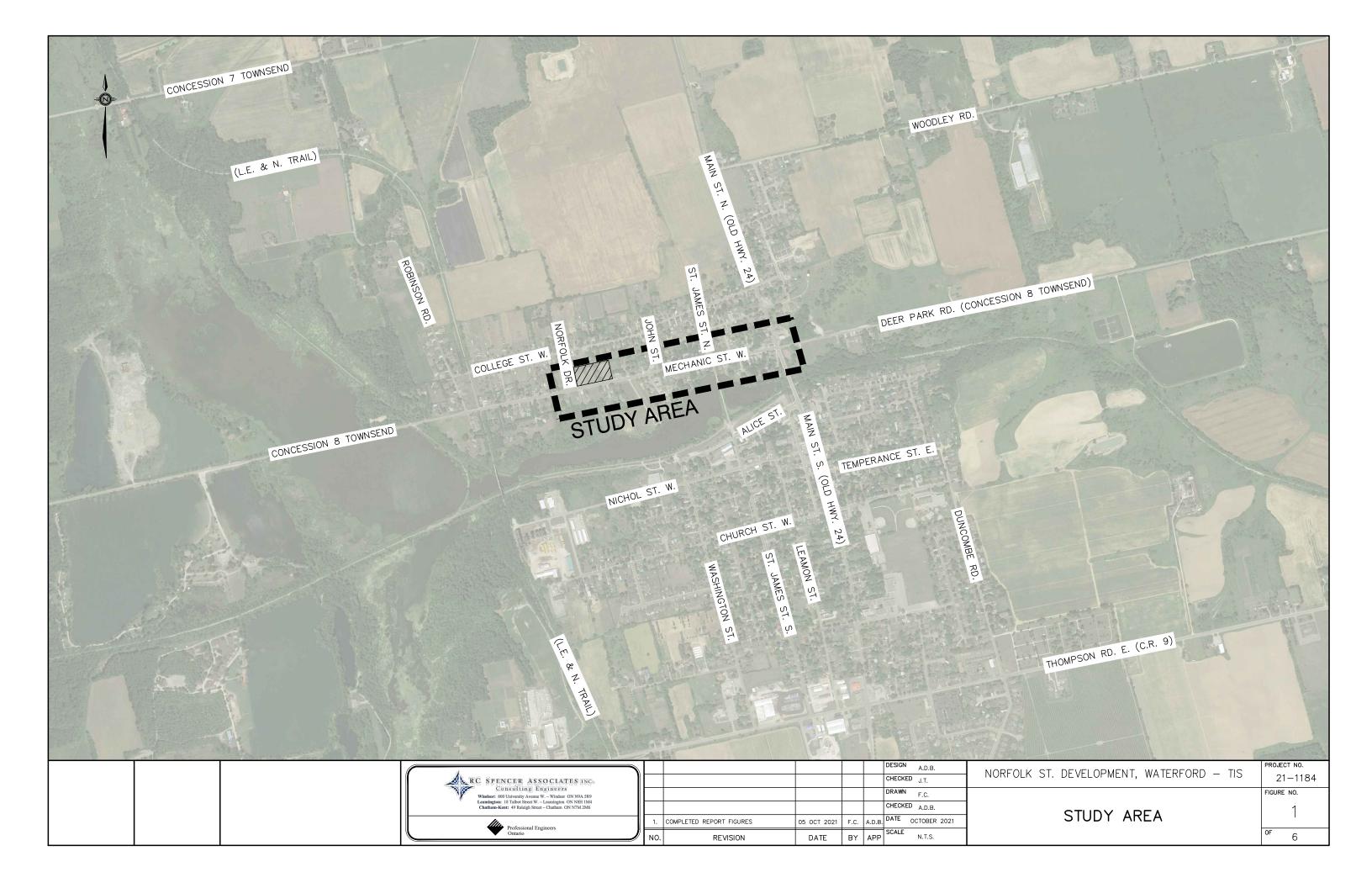
RC SPENCER ASSOCIATES INC.
Consulting Engineers
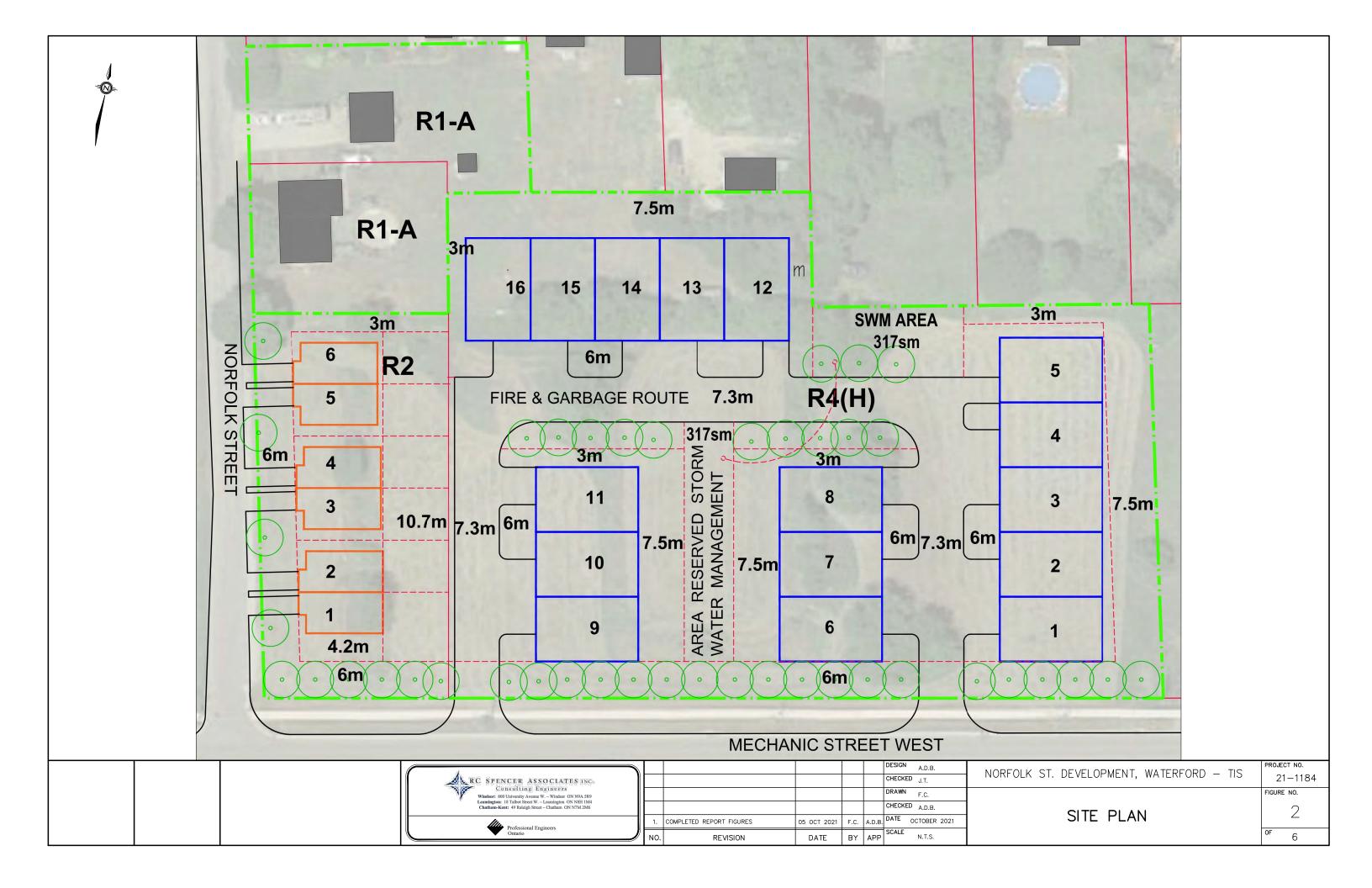
All of which is respectfully submitted,

RC Spencer Associates Inc.

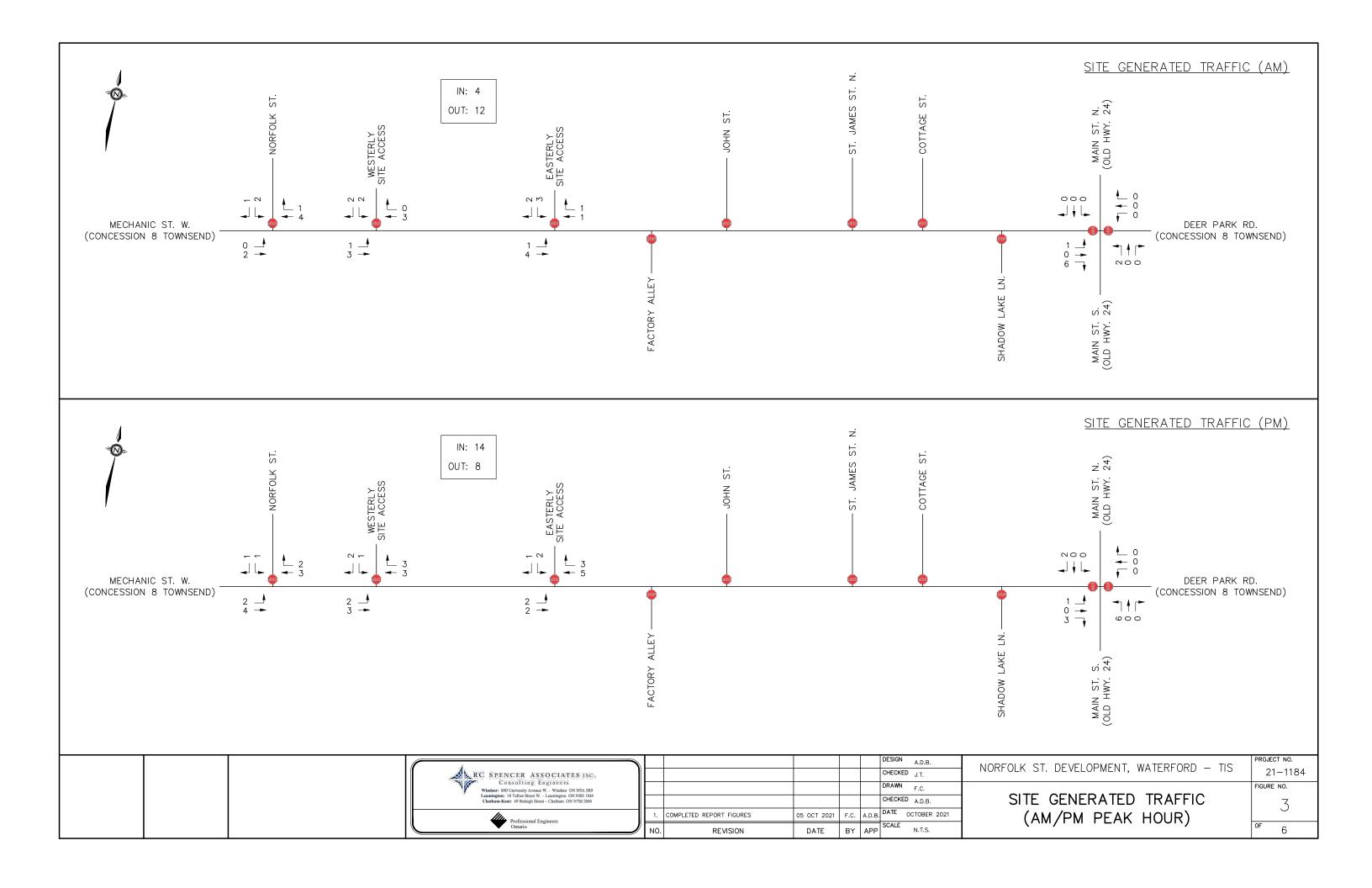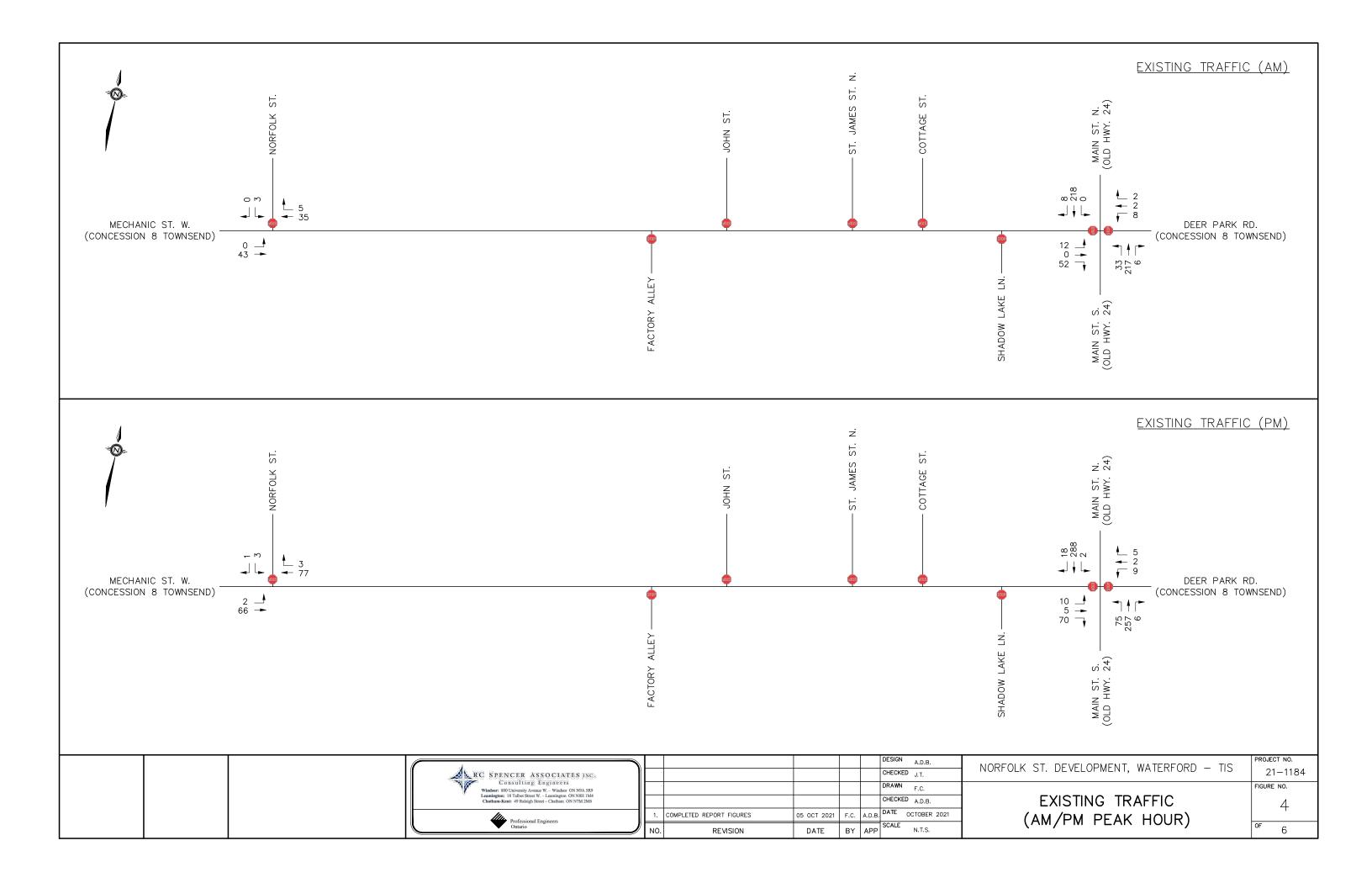**John D. Tofflemire, M.A.Sc., P.Eng.**
Manager, Leamington Office

Aaron D. Blata, M.Eng., P.Eng., PTOE
Associate / Traffic Operations Project Engineer
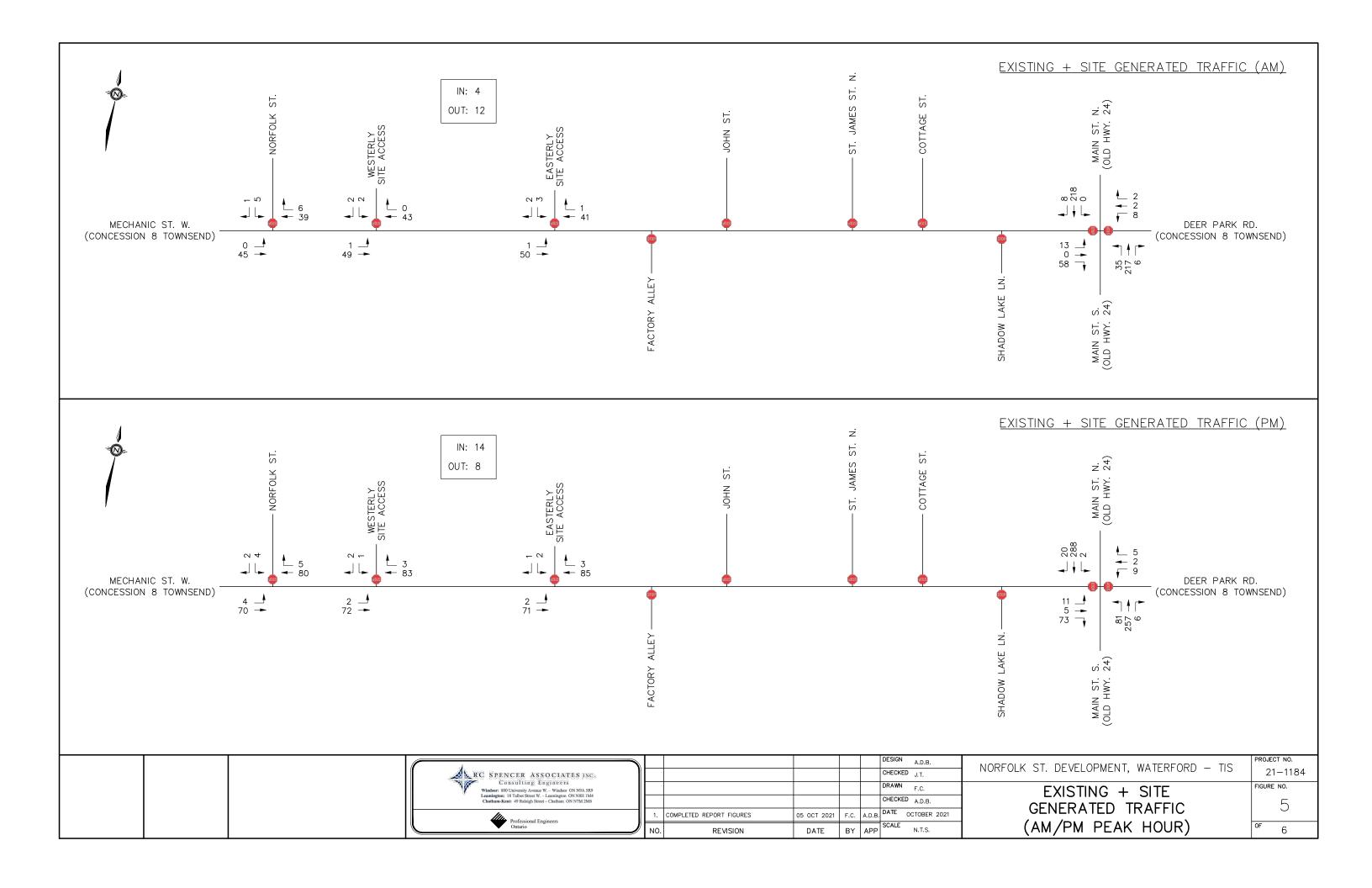
CONCESSION 7 TOWNSEND

(L.E. & N. TRAIL)

WOODLEY RD.

MAIN ST. N. (OLD HWY. 24)

ROBINSON RD.

ST. JAMES ST. N.

DEER PARK RD. (CONCESSION 8 TOWNSEND)

NORFOLK DR.

JOHN ST.

COLLEGE ST. W.

MECHANIC ST. W.

STUDY AREA

CONCESSION 8 TOWNSEND

ALICE ST.

MAIN ST. S (OLD HWY. 24)

TEMPERANCE ST. E.

NICHOL ST. W.

CHURCH ST. W.

DUNCOMBE RD.

WASHINGTON ST.

ST. JAMES ST. S.

LEAMON ST.

(L.E. & N. TRAIL)

THOMPSON RD. E. (C.R. 9)

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

Professional Engineers
Ontario

	21–1184				DESIGN	A.D.B.	NORFOLK ST. DEVELOPMENT, WATERFORD – TIS	PROJECT NO.
					CHECKED	J.T.		21–1184
					DRAWN	F.C.		FIGURE NO.
					CHECKED	A.D.B.		
1.	COMPLETED REPORT FIGURES	05 OCT 2021	F.C.	A.D.B.	DATE	OCTOBER 2021	STUDY AREA	1
NO.	REVISION	DATE	BY	APP	SCALE	N.T.S.		OF 6

R1-A

R1-A

7.5m

3m

16 15 14 13 12 m

SWM AREA
317sm

3m

3m

NORFOLK STREET

6 R2

5

6m

4

3

2

1

6m

4.2m

10.7m 7.3m

6m

FIRE & GARBAGE ROUTE 7.3m R4(H)

317sm

3m

3m

11 8

AREA RESERVED STORM WATER MANAGEMENT

6m 7.5m 6m 7.3m 6m

10 7

7.5m 7.5m

9 6

6m 6m

5

4

3

2

1

7.5m

MECHANIC STREET WEST

				DESIGN A.D.B.	NORFOLK ST. DEVELOPMENT, WATERFORD — TIS	PROJECT NO. 21—1184
				CHECKED J.T.		
				DRAWN F.C.		FIGURE NO.
				CHECKED A.D.B.	SITE PLAN	2
1.	COMPLETED REPORT FIGURES	05 OCT 2021	F.C.	A.D.B.	DATE OCTOBER 2021		
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.		OF 6

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

Professional Engineers
Ontario

SITE GENERATED TRAFFIC (AM)

IN: 4
OUT: 12

SITE GENERATED TRAFFIC (PM)

IN: 14
OUT: 8

NORFOLK ST.
WESTERLY SITE ACCESS
EASTERLY SITE ACCESS
JOHN ST.
ST. JAMES ST. N.
COTTAGE ST.
MAIN ST. N. (OLD HWY. 24)
MAIN ST. S. (OLD HWY. 24)
SHADOW LAKE LN.
FACTORY ALLEY

MECHANIC ST. W. (CONCESSION 8 TOWNSEND)
DEER PARK RD. (CONCESSION 8 TOWNSEND)

DESIGN	A.D.B.		
CHECKED	J.T.		
DRAWN	F.C.		
CHECKED	A.D.B.		
DATE	OCTOBER 2021		
SCALE	N.T.S.		

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
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Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6
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NO.	REVISION	DATE	BY	APP
1.	COMPLETED REPORT FIGURES	05 OCT 2021	F.C.	A.D.B.

NORFOLK ST. DEVELOPMENT, WATERFORD – TIS

PROJECT NO.
21–1184

SITE GENERATED TRAFFIC
(AM/PM PEAK HOUR)

FIGURE NO.
3

OF
6

EXISTING TRAFFIC (AM)

EXISTING TRAFFIC (PM)

EXISTING TRAFFIC
(AM/PM PEAK HOUR)

DESIGN	A.D.B.
CHECKED	J.T.
DRAWN	F.C.
CHECKED	A.D.B.
DATE	OCTOBER 2021
SCALE	N.T.S.

NORFOLK ST. DEVELOPMENT, WATERFORD – TIS

PROJECT NO. 21-1184

FIGURE NO. 4

OF 6

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

Professional Engineers
Ontario

| NO. | REVISION | DATE | BY | APP |
| 1. | COMPLETED REPORT FIGURES | 05 OCT 2021 | F.C. | A.D.B. |

EXISTING + SITE GENERATED TRAFFIC (AM)

IN: 4
OUT: 12

NORFOLK ST.
WESTERLY SITE ACCESS
EASTERLY SITE ACCESS
JOHN ST.
ST. JAMES ST. N.
COTTAGE ST.
MAIN ST. N. (OLD HWY. 24)
FACTORY ALLEY
SHADOW LAKE LN.
MAIN ST. S. (OLD HWY. 24)

MECHANIC ST. W. (CONCESSION 8 TOWNSEND)
DEER PARK RD. (CONCESSION 8 TOWNSEND)

Norfolk St: 1 / 5, 6 / 39, 0 / 45
Westerly Site Access: 2 / 2, 0 / 43, 1 / 49
Easterly Site Access: 2 / 3, 1 / 41, 1 / 50
Main St N: 8 / 218 / 0, 13 / 0 / 58, 2 / 2 / 8, 35 / 217 / 6

EXISTING + SITE GENERATED TRAFFIC (PM)

IN: 14
OUT: 8

NORFOLK ST.
WESTERLY SITE ACCESS
EASTERLY SITE ACCESS
JOHN ST.
ST. JAMES ST. N.
COTTAGE ST.
MAIN ST. N. (OLD HWY. 24)
FACTORY ALLEY
SHADOW LAKE LN.
MAIN ST. S. (OLD HWY. 24)

MECHANIC ST. W. (CONCESSION 8 TOWNSEND)
DEER PARK RD. (CONCESSION 8 TOWNSEND)

Norfolk St: 2 / 4, 5 / 80, 4 / 70
Westerly Site Access: 2 / 1, 3 / 83, 2 / 72
Easterly Site Access: 1 / 2, 3 / 85, 2 / 71
Main St N: 20 / 288 / 2, 11 / 5 / 73, 5 / 2 / 9, 81 / 257 / 6

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

Professional Engineers
Ontario

DESIGN	A.D.B.
CHECKED	J.T.
DRAWN	F.C.
CHECKED	A.D.B.
DATE	OCTOBER 2021
SCALE	N.T.S.

| NO. | REVISION | DATE | BY | APP |
| 1. | COMPLETED REPORT FIGURES | 05 OCT 2021 | F.C. | A.D.B. |

NORFOLK ST. DEVELOPMENT, WATERFORD – TIS

PROJECT NO. 21-1184

EXISTING + SITE GENERATED TRAFFIC (AM/PM PEAK HOUR)

FIGURE NO. 5

OF 6

DESIGN INTERSECTION SIGHT DISTANCE CASE B1, LEFT TURN FROM STOP

Upper figure labels:
- NORFOLK ST.
- 3, 2, 1
- 10.7m, 4.2m, 7.3m, 6m
- 11, 10, 9
- 7.5m
- (WESTERLY SITE ACCESS)
- AREA RESERVED ST WATER MANAGEMEN
- 8, 7, 6
- 7.5m, 6m, 7.3m, 6m
- (EASTERLY SITE ACCESS)
- 3, 2, 1
- 7.5m, 6m
- 6m
- 125m (ASSUMING 60km/h DESIGN SPEED)
- 125m (ASSUMING 60km/h DESIGN SPEED)
- MECHANIC ST. W. (CONCESSION 8 TOWNSEND)

DESIGN INTERSECTION SIGHT DISTANCE CASE B2, RIGHT TURN FROM STOP

Lower figure labels:
- NORFOLK ST.
- 3, 2, 1
- 10.7m, 4.2m, 7.3m, 6m
- 11, 10, 9
- 7.5m
- (WESTERLY SITE ACCESS)
- AREA RESERVED ST WATER MANAGEMEN
- 8, 7, 6
- 7.5m, 6m, 7.3m, 6m
- (EASTERLY SITE ACCESS)
- 3, 2, 1
- 7.5m, 6m
- 6m
- 4.4m
- 108m (ASSUMING 60km/h DESIGN SPEED)
- MECHANIC ST. W. (CONCESSION 8 TOWNSEND)

		DESIGN	A.D.B.	NORFOLK ST. DEVELOPMENT, WATERFORD – TIS	PROJECT NO. 21–1184
		CHECKED	J.T.		
		DRAWN	F.C.	SIGHT LINE ANALYSIS: WESTERLY SITE ACCESS AT MECHANIC STREET WEST	FIGURE NO. 6A
		CHECKED	A.D.B.		
1. COMPLETED REPORT FIGURES	05 OCT 2021 F.C. A.D.B.	DATE	OCTOBER 2021		
NO. REVISION	DATE BY APP	SCALE	N.T.S.		OF 6

Top figure labels:
- NORFOLK ST.
- 10.7m · 7.3m · 6m
- (WESTERLY SITE ACCESS)
- 7.5m · 10 · 9
- 4.2m
- 6m
- AREA RESERVED WATER MANAGEMENT
- 7.5m · 7 · 6
- 6m · 7.3m · 6m
- (EASTERLY SITE ACCESS)
- 2 · 1
- 6m
- 125m (ASSUMING 60km/h DESIGN SPEED)
- 125m (ASSUMING 60km/h DESIGN SPEED)
- MECHANIC ST. W. (CONCESSION 8 TOWNSEND)
- FACTORY ALLEY

DESIGN INTERSECTION SIGHT DISTANCE
CASE B1, LEFT TURN FROM STOP

Bottom figure labels:
- NORFOLK ST.
- 10.7m · 7.3m · 6m
- (WESTERLY SITE ACCESS)
- 7.5m · 10 · 9
- 4.2m
- 6m
- AREA RESERVED WATER MANAGEMENT
- 7.5m · 7 · 6
- 6m · 7.3m · 6m
- (EASTERLY SITE ACCESS)
- 2 · 1
- 6m
- 4.4m
- 108m (ASSUMING 60km/h DESIGN SPEED)
- MECHANIC ST. W. (CONCESSION 8 TOWNSEND)
- FACTORY ALLEY

DESIGN INTERSECTION SIGHT DISTANCE
CASE B2, RIGHT TURN FROM STOP

		DESIGN	A.D.B.	NORFOLK ST. DEVELOPMENT, WATERFORD – TIS	PROJECT NO. 21–1184
		CHECKED	J.T.		
		DRAWN	F.C.	SIGHT LINE ANALYSIS: EASTERLY SITE ACCESS AT MECHANIC STREET WEST	FIGURE NO. 6B
		CHECKED	A.D.B.		
1.	COMPLETED REPORT FIGURES	05 OCT 2021	F.C.	A.D.B.	DATE OCTOBER 2021		
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.		OF 6

Appendix A

TRAFFIC DATA COLLECTION

Norfolk Street at Mechanic Street West
Mechanic Street West at Main Street North (Old
Highway 24)

Mechanic St W @ Norfolk St

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Waterford
Site #: 0000000001
Intersection: Mechanic St W & Norfolk St
TFR File #: 1
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry
Person(s) who counted:
Cam

** Non-Signalized Intersection **

Major Road: Mechanic St W runs W/E

North Leg Total: 8	Heavys 0	0	0
North Entering: 3	Trucks 0	0	0
North Peds: 4	Cars 0	3	3
Peds Cross: ⋈	Totals 0	3	

Heavys	1
Trucks	0
Cars	4
Totals	5

East Leg Total: 86
East Entering: 40
East Peds: 0
Peds Cross: ⧗

Norfolk St

Heavys	Trucks	Cars	Totals
2	0	33	35

Mechanic St W

	Cars	Trucks	Heavys	Totals
	4	0	1	5
	33	0	2	35
	37	0	3	

Heavys	Trucks	Cars	Totals
0	0	0	0
3	0	40	43
3	0	40	

N
W — E
S

Mechanic St W

Cars	Trucks	Heavys	Totals
43	0	3	46

Peds Cross: ⧗
West Peds: 0
West Entering: 43
West Leg Total: 78

Comments

Mechanic St W @ Norfolk St

Mid-day Peak Diagram	**Specified Period** **From:** 11:00:00 **To:** 14:00:00	**One Hour Peak** **From:** 13:00:00 **To:** 14:00:00

Municipality: Waterford
Site #: 0000000001
Intersection: Mechanic St W & Norfolk St
TFR File #: 1
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry
Person(s) who counted:
Cam

** Non-Signalized Intersection **

Major Road: Mechanic St W runs W/E

North Leg Total: 8	Heavys	0	0	0
North Entering: 1	Trucks	0	0	0
North Peds: 3	Cars	0	1	1
Peds Cross: ⋈	Totals	0	1	

Norfolk St

Heavys	Trucks	Cars	Totals
1	0	43	44

Mechanic St W

Heavys	Trucks	Cars	Totals
0	0	2	2
3	0	49	52
3	0	51	

	Heavys	Trucks	Cars	Totals
	Heavys	0		
	Trucks	0		
	Cars	7		
	Totals	7		

| East Leg Total: 102 |
| East Entering: 49 |
| East Peds: 0 |
| Peds Cross: ⧗ |

	Cars	Trucks	Heavys	Totals
	5	0	0	5
	43	0	1	44
	48	0	1	

Mechanic St W

Cars	Trucks	Heavys	Totals
50	0	3	53

N
W — E
S

Peds Cross: ⧗
West Peds: 0
West Entering: 54
West Leg Total: 98

Comments

Mechanic St W @ Norfolk St

Afternoon Peak Diagram	Specified Period	One Hour Peak
	From: 15:00:00	**From:** 15:00:00
	To: 18:00:00	**To:** 16:00:00

Municipality: Waterford
Site #: 0000000001
Intersection: Mechanic St W & Norfolk St
TFR File #: 1
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry
Person(s) who counted:
Cam

** Non-Signalized Intersection **

Major Road: Mechanic St W runs W/E

North Leg Total: 9
North Entering: 4
North Peds: 11
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	1	3	4
Totals	1	3	

Heavys	0
Trucks	1
Cars	4
Totals	5

East Leg Total: 149
East Entering: 80
East Peds: 0
Peds Cross: ⧗

Norfolk St

Heavys	Trucks	Cars	Totals
6	0	72	78

Mechanic St W

Cars	Trucks	Heavys	Totals
2	1	0	3
71	0	6	77
73	1	6	

N
W — E
S

Heavys	Trucks	Cars	Totals
0	0	2	2
2	1	63	66
2	1	65	

Mechanic St W

Cars	Trucks	Heavys	Totals
66	1	2	69

Peds Cross: ⧗
West Peds: 0
West Entering: 68
West Leg Total: 146

Comments

Mechanic St W @ Norfolk St

Total Count Diagram

Municipality: Waterford
Site #: 0000000001
Intersection: Mechanic St W & Norfolk St
TFR File #: 1
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry
Person(s) who counted:
Cam

** Non-Signalized Intersection **

Major Road: Mechanic St W runs W/E

North Leg Total: 68	Heavys 1	0	1
North Entering: 24	Trucks 0	0	0
North Peds: 36	Cars 4	19	23
Peds Cross: ⋈	Totals 5	19

Heavys 2		
Trucks 1		
Cars 41		
Totals 44		

East Leg Total: 800
East Entering: 386
East Peds: 0
Peds Cross: ⧖

Norfolk St

Heavys	Trucks	Cars	Totals
17	4	337	358

Mechanic St W

	Cars	Trucks	Heavys	Totals
	31	1	1	33
	333	4	16	353
	364	5	17	

N

W — E

S

Heavys	Trucks	Cars	Totals
1	0	10	11
22	5	368	395
23	5	378	

Mechanic St W

Cars	Trucks	Heavys	Totals
387	5	22	414

Peds Cross: ⧖
West Peds: 0
West Entering: 406
West Leg Total: 764

Comments

Mechanic St W @ Main St N

Morning Peak Diagram

	Specified Period	One Hour Peak
	From: 7:00:00	**From:** 8:00:00
	To: 9:00:00	**To:** 9:00:00

Municipality: Waterford
Site #: 0000000002
Intersection: Main St N & Mechanic St W
TFR File #: 2
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

** Non-Signalized Intersection **

Major Road: Main St N runs N/S

North Leg Total: 457
North Entering: 226
North Peds: 0
Peds Cross: ⋈

Heavys	1	12	0	13
Trucks	1	4	0	5
Cars	6	202	0	208
Totals	8	218	0	

Heavys	10
Trucks	2
Cars	219
Totals	231

East Leg Total: 18
East Entering: 12
East Peds: 6
Peds Cross: ⧗

Main St N

Heavys	Trucks	Cars	Totals
3	1	39	43

Mechanic St W

	Cars	Trucks	Heavys	Totals
	2	0	0	2
	2	0	0	2
	8	0	0	8
	12	0	0	

Concession 8 Townsend

Heavys	Trucks	Cars	Totals
1	0	11	12
0	0	0	0
2	0	50	52
3	0	61	

N
W — E
S

	Cars	Trucks	Heavys	Totals
	6	0	0	6

Main St N

Peds Cross: ⧗
West Peds: 3
West Entering: 64
West Leg Total: 107

Cars	260
Trucks	4
Heavys	14
Totals	278

Cars	31	206	6	243
Trucks	0	2	0	2
Heavys	2	9	0	11
Totals	33	217	6	

Peds Cross: ⋈
South Peds: 0
South Entering: 256
South Leg Total: 534

Comments

Mechanic St W @ Main St N

Mid-day Peak Diagram

	Specified Period	One Hour Peak
	From: 11:00:00	**From:** 12:00:00
	To: 14:00:00	**To:** 13:00:00

Municipality: Waterford
Site #: 0000000002
Intersection: Main St N & Mechanic St W
TFR File #: 2
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

** Non-Signalized Intersection **

Major Road: Main St N runs N/S

North Leg Total: 451
North Entering: 227
North Peds: 0
Peds Cross: ⋈

Heavys	0	6	0	6
Trucks	0	5	0	5
Cars	11	203	2	216
Totals	11	214	2	

Heavys	4
Trucks	1
Cars	219
Totals	224

East Leg Total: 22
East Entering: 9
East Peds: 3
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
0	0	56	56

Main St N

Mechanic St W

	Cars	Trucks	Heavys	Totals
	4	0	0	4
	0	0	0	0
	5	0	0	5
	9	0	0	

N
W — E
S

Concession 8 Townsend

Heavys	Trucks	Cars	Totals
0	0	12	12
1	0	2	3
1	1	39	41
2	1	53	

	Cars	Trucks	Heavys	Totals
	12	0	1	13

Main St N

Peds Cross: ⧗
West Peds: 2
West Entering: 56
West Leg Total: 112

Cars	247
Trucks	6
Heavys	7
Totals	260

Cars	45	203	8	256
Trucks	0	1	0	1
Heavys	0	4	0	4
Totals	45	208	8	

Peds Cross: ⋈
South Peds: 2
South Entering: 261
South Leg Total: 521

Comments

Mechanic St W @ Main St N

Afternoon Peak Diagram

	Specified Period	One Hour Peak
	From: 15:00:00	**From:** 15:45:00
	To: 18:00:00	**To:** 16:45:00

Municipality: Waterford
Site #: 0000000002
Intersection: Main St N & Mechanic St W
TFR File #: 2
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry
Person(s) who counted:
Cam

** Non-Signalized Intersection **

Major Road: Main St N runs N/S

North Leg Total: 580
North Entering: 308
North Peds: 0
Peds Cross: ⋈

Heavys	1	6	0	7
Trucks	0	2	0	2
Cars	17	280	2	299
Totals	18	288	2	

Heavys	9
Trucks	5
Cars	258
Totals	272

East Leg Total: 29
East Entering: 16
East Peds: 2
Peds Cross: ⌛

Main St N

Heavys	Trucks	Cars	Totals
2	1	92	95

Mechanic St W

Cars	Trucks	Heavys	Totals
2	0	3	5
2	0	0	2
9	0	0	9
13	0	3	

N
W — E
S

Heavys	Trucks	Cars	Totals
1	0	9	10
1	0	4	5
3	0	67	70
5	0	80	

Concession 8 Townsend

Cars	Trucks	Heavys	Totals
11	0	2	13

Main St N

Peds Cross: ⌛
West Peds: 1
West Entering: 85
West Leg Total: 180

Cars	356
Trucks	2
Heavys	9
Totals	367

Cars	73	247	5	325
Trucks	1	5	0	6
Heavys	1	5	1	7
Totals	75	257	6	

Peds Cross: ⋈
South Peds: 0
South Entering: 338
South Leg Total: 705

Comments

Mechanic St W @ Main St N

Total Count Diagram

Municipality: Waterford
Site #: 0000000002
Intersection: Main St N & Mechanic St W
TFR File #: 2
Count date: 28-Sep-2021

Weather conditions:
Clear/Dry
Person(s) who counted:
Cam

** Non-Signalized Intersection ** **Major Road:** Main St N runs N/S

North Leg Total: 3758										
North Entering: 1842	Heavys	5	46	2	53		Heavys	57	East Leg Total: 158	
North Peds: 1	Trucks	1	25	0	26		Trucks	26	East Entering: 73	
Peds Cross: ⋈	Cars	85	1665	13	1763		Cars	1833	East Peds: 32	
	Totals	91	1736	15			Totals	1916	Peds Cross: ⧖	

Main St N

Heavys	Trucks	Cars	Totals
17	5	469	491

Mechanic St W

	Cars	Trucks	Heavys	Totals
	19	1	3	23
	7	0	4	11
	38	0	1	39
	64	1	8	

Concession 8 Townsend

Heavys	Trucks	Cars	Totals
4	3	86	93
4	0	9	13
16	3	398	417
24	6	493	
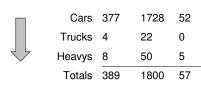
Main St N

	Cars	Trucks	Heavys	Totals
	74	0	11	85

Peds Cross: ⧖	Cars	2101	Cars	377	1728	52	2157	Peds Cross: ⋈
West Peds: 9	Trucks	28	Trucks	4	22	0	26	South Peds: 15
West Entering: 523	Heavys	63	Heavys	8	50	5	63	South Entering: 2246
West Leg Total: 1014	Totals	2192	Totals	389	1800	57		South Leg Total: 4438

Comments

Appendix B

ITE TRIP GENERATION MANUAL – 10TH EDITION REFERENCES

Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting
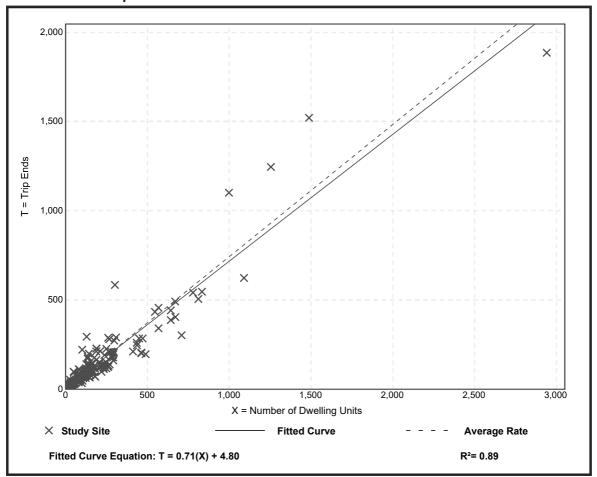
Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation

X **Study Site**   ——— **Fitted Curve**   - - - - **Average Rate**

Fitted Curve Equation: T = 0.71(X) + 4.80   **R²= 0.89**

Trip Generation Manual, 10th Edition ● Institute of Transportation Engineers

Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting
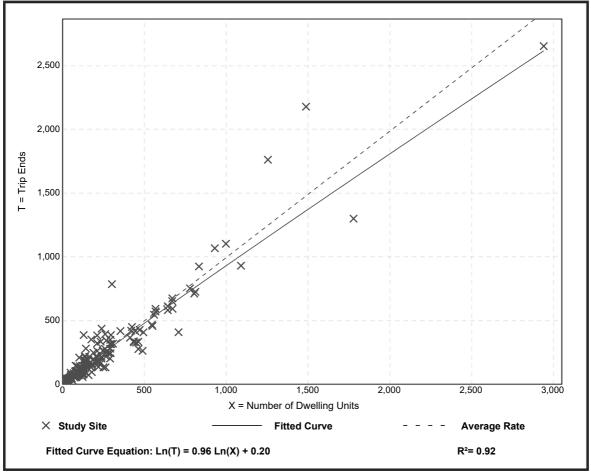
Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation

Study Site ✕　　　**Fitted Curve** ——　　　**Average Rate** – – – –

Fitted Curve Equation: Ln(T) = 0.96 Ln(X) + 0.20　　　　**R²= 0.92**

Trip Generation Manual, 10th Edition ● Institute of Transportation Engineers

Proposed Site Development Trip Generation and Distribution

Project: Norfolk Street Development Traffic Impact Study

Site: Waterford, County of Norfolk, Ontario

Assumed Land Use (1): Single-Family Detached Housing - ITE No. 210

Average Vehicle Trip Ends vs.:   Dwelling Units

ITE Trip Generation Data collected on a: Weekday

AM Peak Hour: | 0.74 | = Average Rate | 25 | % Entering
| | | 75 | % Exiting

PM Peak Hour: | 0.99 | = Average Rate | 63 | % Entering
| | | 37 | % Exiting

Assumed Land Use (1): Single-Family Detached Housing - ITE No. 210				
	Dwelling Units	**Trips Generated**	**Trips Entering**	**Trips Exiting**
AM Peak	22	16	4	12
PM Peak	22	22	14	8

Total Trips		
	Trips Entering	**Trips Exiting**
AM Peak	4	12
PM Peak	14	8
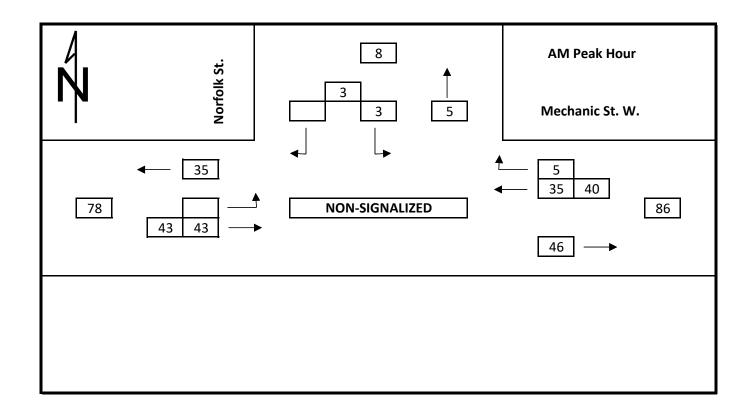
Appendix C
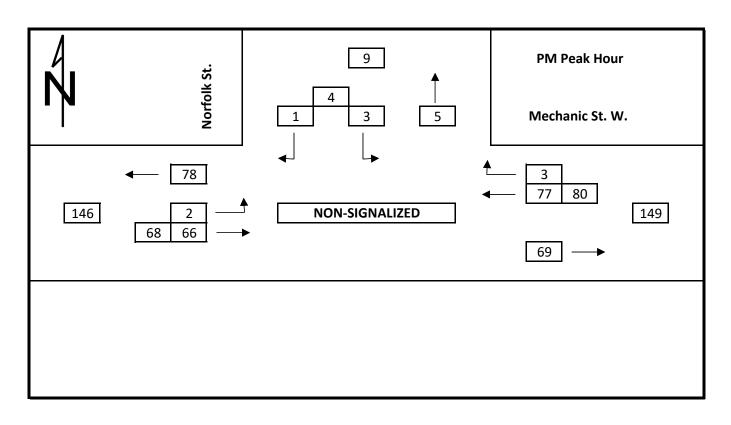
TRAFFIC PROJECTION FIGURES

Norfolk Street at Mechanic Street West
Westerly Site Access at Mechanic Street West
Easterly Site Access at Mechanic Street West
Mechanic Street West at Main Street North (Old Highway 24)
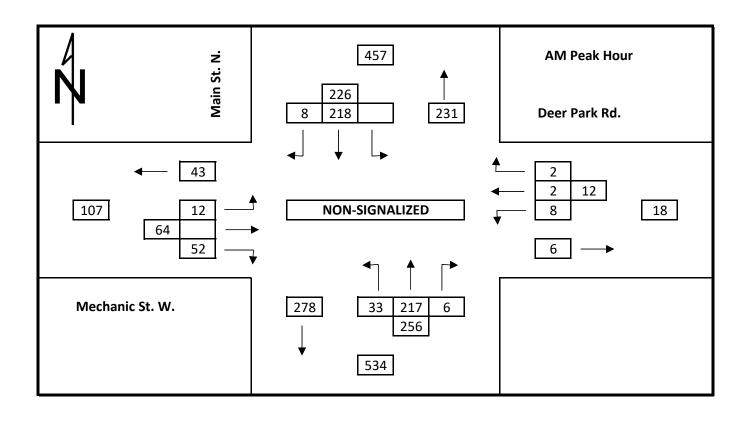
Existing Traffic Counts
Norfolk Street at Mechanic Street West

AM Peak Hour

Mechanic St. W.

Norfolk St.

N

8

3

3

5

35

78

43 43

NON-SIGNALIZED

5

35 40

86

46

PM Peak Hour

Mechanic St. W.

Norfolk St.

N

9

4

1 3

5

78

146

2

68 66

NON-SIGNALIZED

3

77 80

149

69
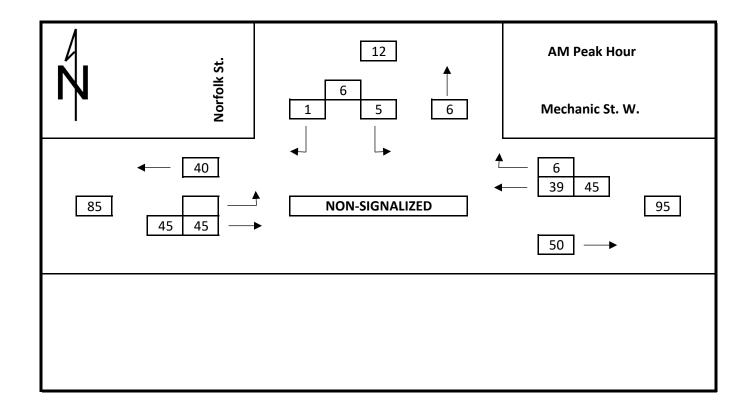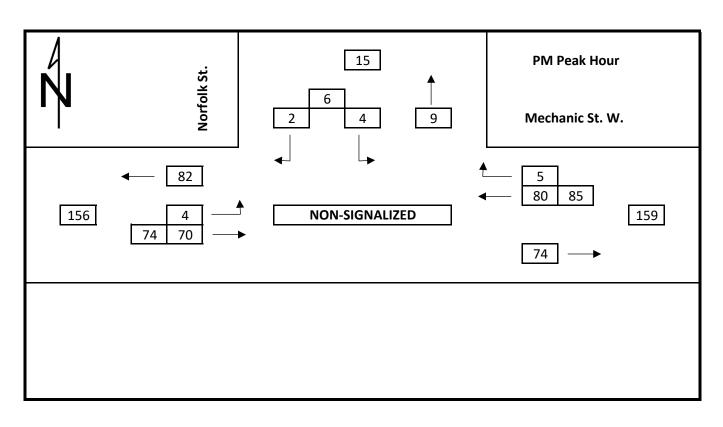
Existing + Site Generated Traffic
Norfolk Street at Mechanic Street West

AM Peak Hour

Norfolk St.

Mechanic St. W.

12

6

1   5

6

40

6

85

39   45

95

NON-SIGNALIZED

45   45

50

PM Peak Hour

Norfolk St.

Mechanic St. W.

15

6

2   4

9

82

5

156

80   85

159

NON-SIGNALIZED

4

74   70

74
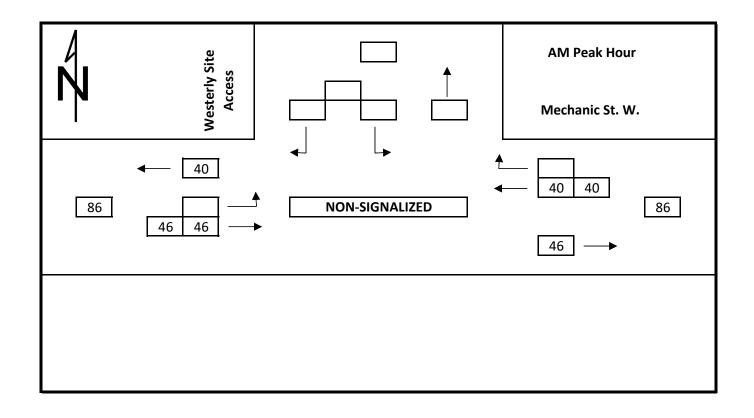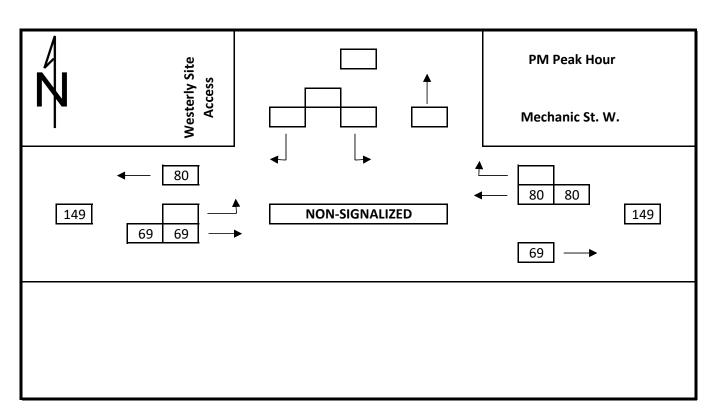
Existing Traffic Counts
Westerly Site Access at Mechanic Street West

AM Peak Hour

Westerly Site Access

Mechanic St. W.

← 40

86

→ 46 46

NON-SIGNALIZED

← 40 40

86

46 →

PM Peak Hour

Westerly Site Access

Mechanic St. W.

← 80

149

→ 69 69

NON-SIGNALIZED

← 80 80

149

69 →
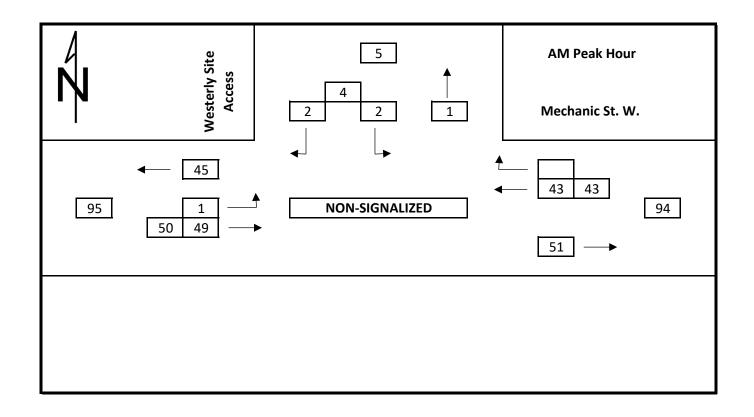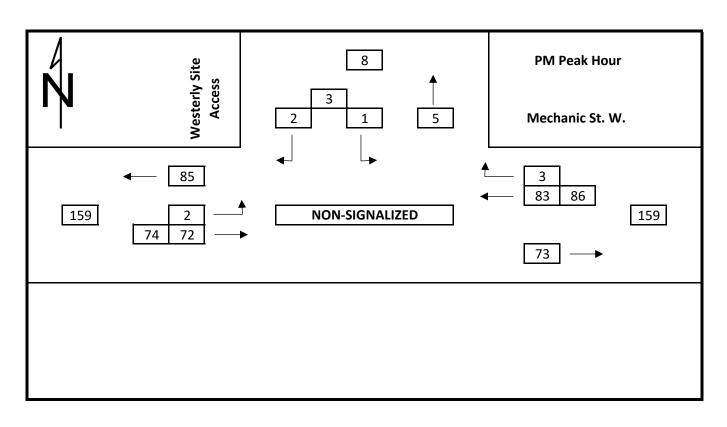
Existing + Site Generated Traffic
Westerly Site Access at Mechanic Street West

AM Peak Hour

Westerly Site Access

Mechanic St. W.

| | 5 | |
| 2 | 4 | 2 |

1

← 45

95 | 1
50 | 49

NON-SIGNALIZED

43 | 43

94

51 →

PM Peak Hour

Westerly Site Access

Mechanic St. W.

| | 8 | |
| 2 | 3 | 1 |

5

← 85

159 | 2
74 | 72

NON-SIGNALIZED

3
83 | 86

159

73 →
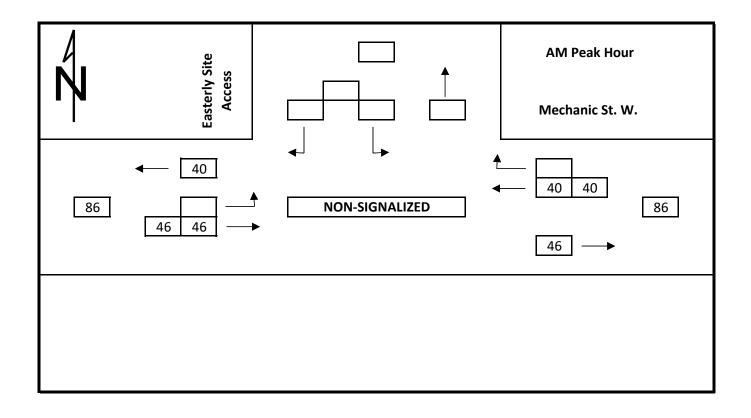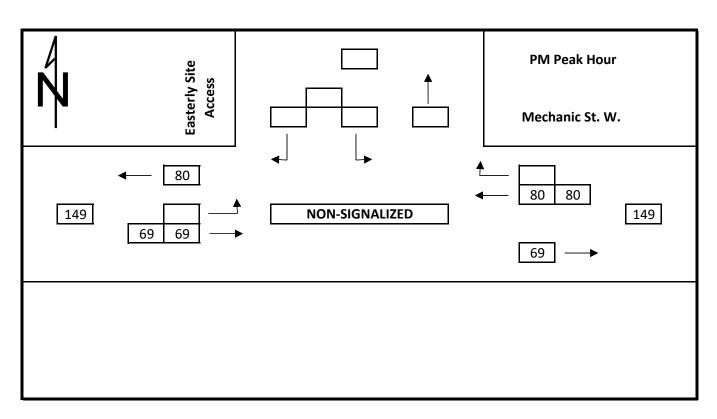
Existing Traffic Counts
Easterly Site Access at Mechanic Street West

Easterly Site Access

AM Peak Hour

Mechanic St. W.

← 40

86

NON-SIGNALIZED

46 | 46

40 | 40

86

46 →

Easterly Site Access

PM Peak Hour

Mechanic St. W.

← 80

149

NON-SIGNALIZED

69 | 69

80 | 80

149

69 →
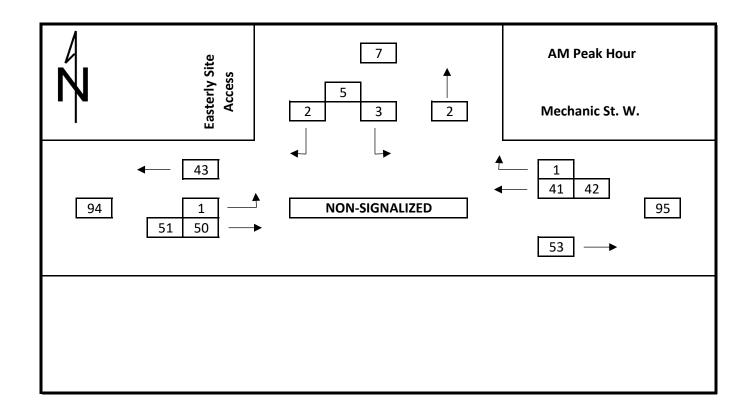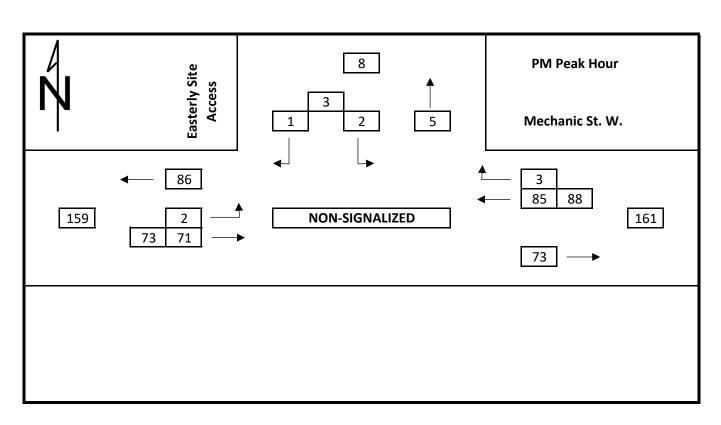
Existing + Site Generated Traffic
Easterly Site Access at Mechanic Street West

AM Peak Hour

Easterly Site Access

7

5

2   3

2

Mechanic St. W.

← 43

94

1

51 50

NON-SIGNALIZED

1

41 42

95

53 →

PM Peak Hour

Easterly Site Access

8

3

1   2

5

Mechanic St. W.

← 86

159

2

73 71

NON-SIGNALIZED

3

85 88

161

73 →
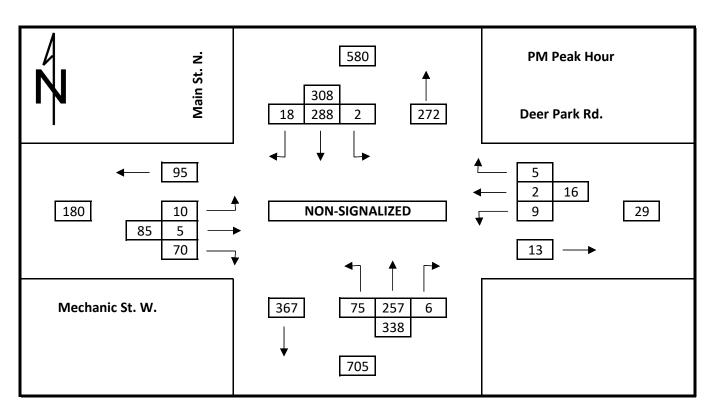
Existing Traffic Counts
Mechanic Street West at Main Street North

N

Main St. N.

AM Peak Hour

Deer Park Rd.

457

226
8 | 218

231

43

107

12
64
52

NON-SIGNALIZED

2
2 | 12
8

18

6

Mechanic St. W.

278

33 | 217 | 6
256

534

N

Main St. N.

PM Peak Hour

Deer Park Rd.

580

308
18 | 288 | 2

272

95

180

10
85 | 5
70

NON-SIGNALIZED

5
2 | 16
9

29

13

Mechanic St. W.

367

75 | 257 | 6
338

705
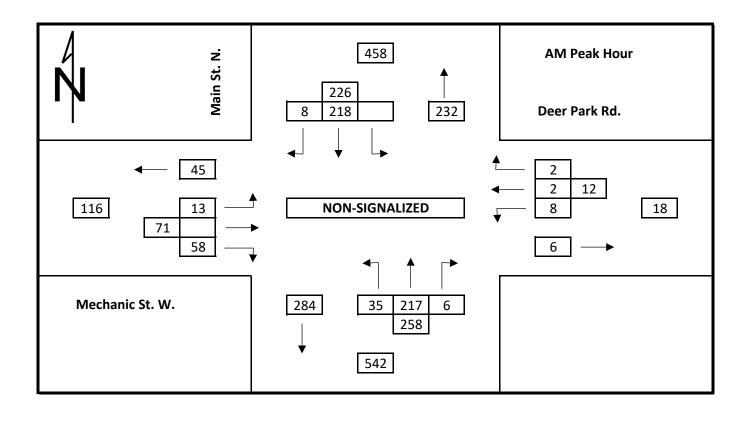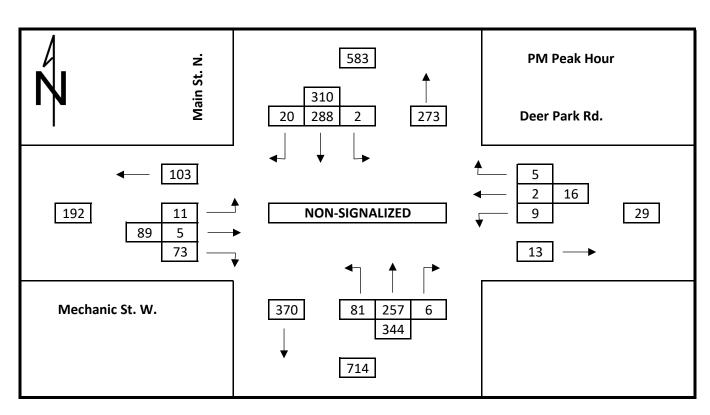
Existing + Site Generated Traffic
Mechanic Street West at Main Street North

N

Main St. N.

AM Peak Hour

Deer Park Rd.

458

226
8 | 218

232

45

116 | 13
71
58

NON-SIGNALIZED

2
2 | 12
8

18

6

Mechanic St. W.

284

35 | 217 | 6
258

542

N

Main St. N.

PM Peak Hour

Deer Park Rd.

583

310
20 | 288 | 2

273

103

192 | 11
89 | 5
73

NON-SIGNALIZED

5
2 | 16
9

29

13

Mechanic St. W.

370

81 | 257 | 6
344

714

Appendix D

DETAILED SYNCHRO RESULTS

Norfolk Street at Mechanic Street West
Westerly Site Access at Mechanic Street West
Easterly Site Access at Mechanic Street West
Mechanic Street West at Main Street North (Old Highway 24)

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Ｙ	
Traffic Vol, veh/h	0	43	35	5	3	0
Future Vol, veh/h	0	43	35	5	3	0
Conflicting Peds, #/hr	4	0	0	4	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	7	6	25	0	0
Mvmt Flow	0	47	38	5	3	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	47	0	-	0	92	45
Stage 1	-	-	-	-	45	-
Stage 2	-	-	-	-	47	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1573	-	-	-	913	1031
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	981	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1568	-	-	-	908	1028
Mov Cap-2 Maneuver	-	-	-	-	908	-
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	978	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1568	-	-	-	908
HCM Lane V/C Ratio	-	-	-	-	0.004
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↱		∀	
Traffic Vol, veh/h	2	66	77	3	3	1
Future Vol, veh/h	2	66	77	3	3	1
Conflicting Peds, #/hr	11	0	0	11	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	4	8	33	0	0
Mvmt Flow	2	72	84	3	3	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	98	0	-	0	173	97
Stage 1	-	-	-	-	97	-
Stage 2	-	-	-	-	76	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1508	-	-	-	822	965
Stage 1	-	-	-	-	932	-
Stage 2	-	-	-	-	952	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1494	-	-	-	806	956
Mov Cap-2 Maneuver	-	-	-	-	806	-
Stage 1	-	-	-	-	923	-
Stage 2	-	-	-	-	943	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1494	-	-	-	839
HCM Lane V/C Ratio	0.001	-	-	-	0.005
HCM Control Delay (s)	7.4	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.6					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		�546	�T6		�466	
Traffic Vol, veh/h	0	45	39	6	5	1
Future Vol, veh/h	0	45	39	6	5	1
Conflicting Peds, #/hr	4	0	0	4	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	7	6	25	0	0
Mvmt Flow	0	49	42	7	5	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	53	0	-	0	99	50
Stage 1	-	-	-	-	50	-
Stage 2	-	-	-	-	49	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1566	-	-	-	905	1024
Stage 1	-	-	-	-	978	-
Stage 2	-	-	-	-	979	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1561	-	-	-	900	1021
Mov Cap-2 Maneuver	-	-	-	-	900	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	976	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1561	-	-	-	918
HCM Lane V/C Ratio	-	-	-	-	0.007
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection

Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⇇	
Traffic Vol, veh/h	4	70	80	5	4	2
Future Vol, veh/h	4	70	80	5	4	2
Conflicting Peds, #/hr	11	0	0	11	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	4	8	33	0	0
Mvmt Flow	4	76	87	5	4	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	103	0	-	0	185	101
Stage 1	-	-	-	-	101	-
Stage 2	-	-	-	-	84	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1502	-	-	-	809	960
Stage 1	-	-	-	-	928	-
Stage 2	-	-	-	-	944	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1488	-	-	-	792	951
Mov Cap-2 Maneuver	-	-	-	-	792	-
Stage 1	-	-	-	-	917	-
Stage 2	-	-	-	-	936	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt		EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)		1488	-	-	-	839
HCM Lane V/C Ratio		0.003	-	-	-	0.008
HCM Control Delay (s)		7.4	0	-	-	9.3
HCM Lane LOS		A	A	-	-	A
HCM 95th %tile Q(veh)		0	-	-	-	0

Intersection						
Int Delay, s/veh	0.4					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		⬐	⬎		⬙	
Traffic Vol, veh/h	1	49	43	0	2	2
Future Vol, veh/h	1	49	43	0	2	2
Conflicting Peds, #/hr	4	0	0	4	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	6	8	0	0	0
Mvmt Flow	1	53	47	0	2	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	51	0	-	0	106	51
Stage 1	-	-	-	-	51	-
Stage 2	-	-	-	-	55	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1568	-	-	-	897	1023
Stage 1	-	-	-	-	977	-
Stage 2	-	-	-	-	973	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1563	-	-	-	891	1020
Mov Cap-2 Maneuver	-	-	-	-	891	-
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	970	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1563	-	-	-	951
HCM Lane V/C Ratio	0.001	-	-	-	0.005
HCM Control Delay (s)	7.3	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↵	↱		ᵛ	
Traffic Vol, veh/h	2	72	83	3	1	2
Future Vol, veh/h	2	72	83	3	1	2
Conflicting Peds, #/hr	11	0	0	11	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	4	8	0	0	0
Mvmt Flow	2	78	90	3	1	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	104	0	-	0	185	103
Stage 1	-	-	-	-	103	-
Stage 2	-	-	-	-	82	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1500	-	-	-	809	957
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	946	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1486	-	-	-	794	948
Mov Cap-2 Maneuver	-	-	-	-	794	-
Stage 1	-	-	-	-	917	-
Stage 2	-	-	-	-	937	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1486	-	-	-	890
HCM Lane V/C Ratio	0.001	-	-	-	0.004
HCM Control Delay (s)	7.4	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.5					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		⬱	⬱		⬲	
Traffic Vol, veh/h	1	50	41	1	3	2
Future Vol, veh/h	1	50	41	1	3	2
Conflicting Peds, #/hr	4	0	0	4	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	6	8	0	0	0
Mvmt Flow	1	54	45	1	3	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	50	0	-	0	106	50
Stage 1	-	-	-	-	50	-
Stage 2	-	-	-	-	56	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1570	-	-	-	897	1024
Stage 1	-	-	-	-	978	-
Stage 2	-	-	-	-	972	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1565	-	-	-	891	1021
Mov Cap-2 Maneuver	-	-	-	-	891	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	969	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt		EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)		1565	-	-	-	939
HCM Lane V/C Ratio		0.001	-	-	-	0.006
HCM Control Delay (s)		7.3	0	-	-	8.9
HCM Lane LOS		A	A	-	-	A
HCM 95th %tile Q(veh)		0	-	-	-	0

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		⬅	⬆		⬇	
Traffic Vol, veh/h	2	71	85	3	2	1
Future Vol, veh/h	2	71	85	3	2	1
Conflicting Peds, #/hr	11	0	0	11	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	4	8	0	0	0
Mvmt Flow	2	77	92	3	2	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	106	0	-	0	186	105
Stage 1	-	-	-	-	105	-
Stage 2	-	-	-	-	81	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1498	-	-	-	808	955
Stage 1	-	-	-	-	924	-
Stage 2	-	-	-	-	947	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1484	-	-	-	793	946
Mov Cap-2 Maneuver	-	-	-	-	793	-
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	938	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1484	-	-	-	838
HCM Lane V/C Ratio	0.001	-	-	-	0.004
HCM Control Delay (s)	7.4	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection

Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⬥			⬥			⬥			⬥	
Traffic Vol, veh/h	12	0	52	8	2	2	33	217	6	0	218	8
Future Vol, veh/h	12	0	52	8	2	2	33	217	6	0	218	8
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	6	6	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	9	0	4	0	0	0	6	5	0	0	8	25
Mvmt Flow	13	0	57	9	2	2	36	236	7	0	237	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	559	566	245	588	567	246	249	0	0	249	0	0
Stage 1	245	245	-	318	318	-	-	-	-	-	-	-
Stage 2	314	321	-	270	249	-	-	-	-	-	-	-
Critical Hdwy	7.19	6.5	6.24	7.1	6.5	6.2	4.16	-	-	4.1	-	-
Critical Hdwy Stg 1	6.19	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.19	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.581	4	3.336	3.5	4	3.3	2.254	-	-	2.2	-	-
Pot Cap-1 Maneuver	429	436	789	423	436	798	1294	-	-	1328	-	-
Stage 1	743	707	-	698	657	-	-	-	-	-	-	-
Stage 2	682	655	-	740	704	-	-	-	-	-	-	-
Platoon blocked, %							-		-		-	
Mov Cap-1 Maneuver	415	419	787	381	419	794	1291	-	-	1321	-	-
Mov Cap-2 Maneuver	415	419	-	381	419	-	-	-	-	-	-	-
Stage 1	718	705	-	672	633	-	-	-	-	-	-	-
Stage 2	656	631	-	687	702	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	13.8	1	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1291	-	-	674	424	1321	-	-
HCM Lane V/C Ratio	0.028	-	-	0.103	0.031	-	-	-
HCM Control Delay (s)	7.9	0	-	11	13.8	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.1	0	-	-

Intersection											
Int Delay, s/veh	2.7										

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⟁			⟁			⟁			⟁	
Traffic Vol, veh/h	10	5	70	9	2	5	75	257	6	2	288	18
Future Vol, veh/h	10	5	70	9	2	5	75	257	6	2	288	18
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	2	2	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	10	20	4	0	0	60	3	4	15	0	3	5
Mvmt Flow	11	5	76	10	2	5	82	279	7	2	313	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	778	780	324	817	787	285	334	0	0	288	0	0
Stage 1	328	328	-	449	449	-	-	-	-	-	-	-
Stage 2	450	452	-	368	338	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.7	6.24	7.1	6.5	6.8	4.13	-	-	4.1	-	-
Critical Hdwy Stg 1	6.2	5.7	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.7	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4.18	3.336	3.5	4	3.84	2.227	-	-	2.2	-	-
Pot Cap-1 Maneuver	304	307	712	298	326	635	1220	-	-	1286	-	-
Stage 1	668	616	-	593	576	-	-	-	-	-	-	-
Stage 2	573	541	-	656	644	-	-	-	-	-	-	-
Platoon blocked, %							-	-		-	-	
Mov Cap-1 Maneuver	281	281	711	245	298	634	1219	-	-	1284	-	-
Mov Cap-2 Maneuver	281	281	-	245	298	-	-	-	-	-	-	-
Stage 1	614	614	-	544	529	-	-	-	-	-	-	-
Stage 2	520	497	-	579	642	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	17.2	1.8	0.1
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1219	-	-	560	312	1284	-	-
HCM Lane V/C Ratio	0.067	-	-	0.165	0.056	0.002	-	-
HCM Control Delay (s)	8.2	0	-	12.7	17.2	7.8	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.6	0.2	0	-	-

Intersection												
Int Delay, s/veh	2.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⬧			⬧			⬧			⬧	
Traffic Vol, veh/h	13	0	58	8	2	2	35	217	6	0	218	8
Future Vol, veh/h	13	0	58	8	2	2	35	217	6	0	218	8
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	6	6	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	9	0	4	0	0	0	6	5	0	0	8	25
Mvmt Flow	14	0	63	9	2	2	38	236	7	0	237	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	563	570	245	595	571	246	249	0	0	249	0	0
Stage 1	245	245	-	322	322	-	-	-	-	-	-	-
Stage 2	318	325	-	273	249	-	-	-	-	-	-	-
Critical Hdwy	7.19	6.5	6.24	7.1	6.5	6.2	4.16	-	-	4.1	-	-
Critical Hdwy Stg 1	6.19	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.19	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.581	4	3.336	3.5	4	3.3	2.254	-	-	2.2	-	-
Pot Cap-1 Maneuver	426	434	789	419	434	798	1294	-	-	1328	-	-
Stage 1	743	707	-	694	655	-	-	-	-	-	-	-
Stage 2	679	653	-	737	704	-	-	-	-	-	-	-
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	411	416	787	373	416	794	1291	-	-	1321	-	-
Mov Cap-2 Maneuver	411	416	-	373	416	-	-	-	-	-	-	-
Stage 1	716	705	-	667	629	-	-	-	-	-	-	-
Stage 2	652	628	-	678	702	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	11			13.9			1.1			0		
HCM LOS	B			B								

Minor Lane/Major Mvmt		NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)		1291	-	-	674	417	1321	-	-
HCM Lane V/C Ratio		0.029	-	-	0.115	0.031	-	-	-
HCM Control Delay (s)		7.9	0	-	11	13.9	0	-	-
HCM Lane LOS		A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)		0.1	-	-	0.4	0.1	0	-	-

Intersection											
Int Delay, s/veh	2.8										

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⟐			⟐			⟐			⟐	
Traffic Vol, veh/h	11	5	73	9	2	5	81	257	6	2	288	20
Future Vol, veh/h	11	5	73	9	2	5	81	257	6	2	288	20
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	2	2	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	10	20	4	0	0	60	3	4	15	0	3	5
Mvmt Flow	12	5	79	10	2	5	88	279	7	2	313	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	791	793	325	831	801	285	336	0	0	288	0	0
Stage 1	329	329	-	461	461	-	-	-	-	-	-	-
Stage 2	462	464	-	370	340	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.7	6.24	7.1	6.5	6.8	4.13	-	-	4.1	-	-
Critical Hdwy Stg 1	6.2	5.7	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.7	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4.18	3.336	3.5	4	3.84	2.227	-	-	2.2	-	-
Pot Cap-1 Maneuver	298	301	712	291	320	635	1218	-	-	1286	-	-
Stage 1	667	615	-	584	569	-	-	-	-	-	-	-
Stage 2	565	534	-	654	643	-	-	-	-	-	-	-
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	274	274	711	237	291	634	1217	-	-	1284	-	-
Mov Cap-2 Maneuver	274	274	-	237	291	-	-	-	-	-	-	-
Stage 1	609	613	-	533	519	-	-	-	-	-	-	-
Stage 2	510	487	-	575	641	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	12.9		17.6		1.9		0.1	
HCM LOS	B		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1217	-	-	553	303	1284	-	-
HCM Lane V/C Ratio	0.072	-	-	0.175	0.057	0.002	-	-
HCM Control Delay (s)	8.2	0	-	12.9	17.6	7.8	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.6	0.2	0	-	-

Appendix E

SIGHT LINE CALCULATIONS

Westerly Site Access at Mechanic Street West
Easterly Site Access at Mechanic Street West

21-1184: Norfolk Street Development, Waterford TIS - Sight Line Analysis

Design Intersection Sight Distance (TAC Geometric Design Guide for Canadian Roads)

Design Speed: 60km/h (Posted Speed Limit = 50 km/h)

Table 9.9.3: Time Gap for Case B1, Left Turn from Stop

Design Vehicle	Time Gap $(t_g)(s)$ at Design Speed of Major Road
Passenger car	7.5
Single-unit truck	9.5
Combination truck (WB 19 and WB 20)	11.5
Longer truck	To be established by road authority

Intersection Stopping Distance **(ISD)** = 0.278 V_{major} t_g

Where:

ISD = intersection sight distance (m)
(length of the leg of sight triangle along the major road)
V_{major} = design speed of the major road (km/h)
t_g = time gap for minor road vehicle to enter the major road (s)

ISD $_{passenger\ car}$ (left turn from stop) = 0.278 x 60 x 7.5 = **125 m**

Table 9.9.5: Time Gap for Case B2—Right Turn from Stop and Case B3—Crossing Maneuver

Design Vehicle	Time Gap $(t_g)(s)$ at Design Speed of Major Road
Passenger car	6.5
Single-unit truck	8.5
Combination truck (WB 19 and WB 20)	10.5

ISD $_{passenger\ car}$ (right turn from stop) = 0.278 x 60 x 6.5 = **108 m**

① TYPICAL FRONT ELEVATION (6 UNIT)
P301 SCALE 1 : 75

② TYPICAL REAR ELEVATION (6 UNIT)
P301 SCALE 1 : 75

Project Title
SFO CAPITOL CONDOMINIUMS
MECHANIC STREET,
WATERFORD, ONTARIO,
N0E 1Y0

PRELIMINARY
NOT FOR
CONSTRUCTION

PROJECT No.
21-012

Drawing Title
**TYPICAL BUILDING
ELEVATIONS**

Drawing No.
P301