Lam Blvd. & Old Hwy 24 Mixed Use

Pramukh Developments Limited

Submission to Norfolk County for Site Plan Application

Project #21-059

October 27, 2023

vallee
Consulting Engineers,
Architects & Planners

vallee

Consulting Engineers,
Architects & Planners

October 27, 2023

Norfolk County
Community Development Division
185 Robinson Street
Simcoe, Ontario N3Y 5L6

Attention: **Mohammad Alam, Supervisor of Development Planning**

Reference: **Lam Blvd. Mixed Use – Pramukh Developments Limited**
Site Plan Application
Block 60 Plan 37M57
Our File 21-059

The intent of this letter is to request a pre-submission meeting to review all document required for a formal site plan application for the subject property:

In response to Norfolk County's minutes issued on August 18, 2022 relating to the pre-consultation meeting of August 15, 2022, we include the following documents as our complete application package:

1. This cover letter.
2. A draft outline for the pre-submission meeting to be held with Norfolk County Staff in preparation for acceptance of the submission. Following the pre-submission meeting, updated notes will be provided.
3. A copy of the Norfolk County minutes issued October 21, 2021 from the June 23, 2021 pre-consultation meeting, signed by Lesley Hutton-Rhora on behalf of G. Douglas Vallee Limited and the proponent.
4. Completed and executed Norfolk County Planning Department Development Application Form.
5. Conceptual site plan for the proposed development prepared by G. Douglas Vallee Limited.
6. Elevation & Floor Plans prepared by G. Douglas Vallee Limited.
7. Photometrics Plan(s) prepared by Seguin Engineering Inc.
8. Functional Servicing report prepared by G. Douglas Vallee Limited.
9. SWM Report containing the anticipated flows and demands associated with the project as prepared by G. Douglas Vallee Limited.
10. General Plan of Services prepared by G. Douglas Vallee Limited.
11. Grading Plan prepared by G. Douglas Vallee Limited.
12. SWM Plan prepared by G. Douglas Vallee Limited.
13. Siltation & Erosion Control Plan prepared by G. Douglas Vallee Limited.
14. Geotechnical report prepared by LVM on behalf of original developer Mr. Tony Yin (submitted with permission from developer).
15. Traffic Impact Study prepared by Paradigm Transportation Solutions.
16. Correspondence with County staff requesting water & sanitary modelling reports by the County's sub-consultant.
17. Securities estimate.

To streamline review of the submitted engineering plans, we kindly request to have the proposed engineering design reviewed by Norfolk County's third-party consultant – GM BluePlan Engineering.

All documents noted above were submitted electronically on October 27, 2023, to the Norfolk County Planning Department. Following the pre-submission meeting we kindly request Norfolk County to confirm any outstanding requirements and the associated site plan application fee as soon as possible so a formal application can be made.

Should you have any questions or comments, please contact me immediately so that we can address your items in a timely manner.

Thank you in advance for your support with this project.

Respectfully submitted,

Scott Puillandre, CD, RPP, MCIP, MSc.
Planner
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architect and Planners

c. Ronak Mehta, Pramukh Developments Limited
Darpan Patel, Pramukh Developments Limited
John Vallee, P.Eng, G. Douglas Vallee Limited
John Iezzi, P.Eng, G. Douglas Vallee Limited
Lesley Hutton-Rhora, G. Douglas Vallee Limited

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MEETING MINUTES

Project #: 21-059
Project: Pramukh Developments – Lam Blvd. Mixed Use

Date: TO BE SCHEDULED WITH NORFOLK COUNTY
Category: Pre-Submission Meeting with County Staff for Site Plan Application
Organizer: Lesley Hutton-Rhora
Attendees: ATTENDEES TBD

Agenda:

1. Confirm submission requirements for Site Plan application.

Notes:

Required:	Provided:	Comments:
Confirmation of Submission Requirements	A draft outline for the pre-submission meeting is included with the submission. Following the pre-submission meeting with Norfolk County staff, updated notes will be provided.	
Pre-Consultation Minutes	A copy of the final minutes forwarded by County staff on October 27, 2021 for the pre-consultation meeting held on June 23, 2021 is included with the submission.	
Development Application Form	A development application form has been completed, signed & commissioned by the applicant.	
Proposed Site Plan / Drawing	A proposed site plan drawing prepared by G. Douglas Vallee Limited is included with the submission.	
Elevation & Floor Plans	Elevation and conceptual floor plans for the proposed building(s) prepared by G. Douglas Vallee Limited are included with the submission.	
Landscaping Plan	**NOT REQUIRED** As per Bill 23 and as previously confirmed with Director of Planning Tricia Givens, a Landscape Plan is not required for a Site Plan Application.	
Photometrics Plan(s)	Photometrics plan(s) prepared by Seguin Engineering Inc. is included with the submission.	
Functional Servicing & Stormwater Management Report	A Functional Servicing and Stormwater Management Report (FSR) prepared by G. Douglas Vallee Limited is included with the submission.	

Confirmation of a Legal & Adequate Inlet	Provided in FSR.	
Detailed Design	The following detailed design plans prepared by G. Douglas Vallee Limited is included with the application: - General Plan of Services - Grading Plan - SWM Plan - Siltation/Erosion Control - Plan & Profile Drawings - Utility Plan	
Geotechnical Report	A geotechnical report prepared by LVM is included with the submission.	
Traffic Impact Study	A traffic impact study prepared by Paradigm Transportation Solutions is included with the submission.	
Water & Wastewater Modelling	Correspondence with Norfolk County Staff regarding the water & wastewater modelling is included with the submission.	
Securities Estimate	An estimate of securities required has been prepared by G. Douglas Vallee Ltd. and is included with the submission.	

Norfolk
COUNTY

Pre-Consultation Meeting Minutes

Date: June 23, 2021

Description of Proposal: The intent of the development is to create fifty-two (52) condominium stacked townhouse units on the 0.71 ha site for a development density of 73 units per hectare. These units are intended as reasonably priced, back-to-back, 3-storey units with a rooftop terrace, without a basement.

Property Location: LAM & Old Hwy 24.

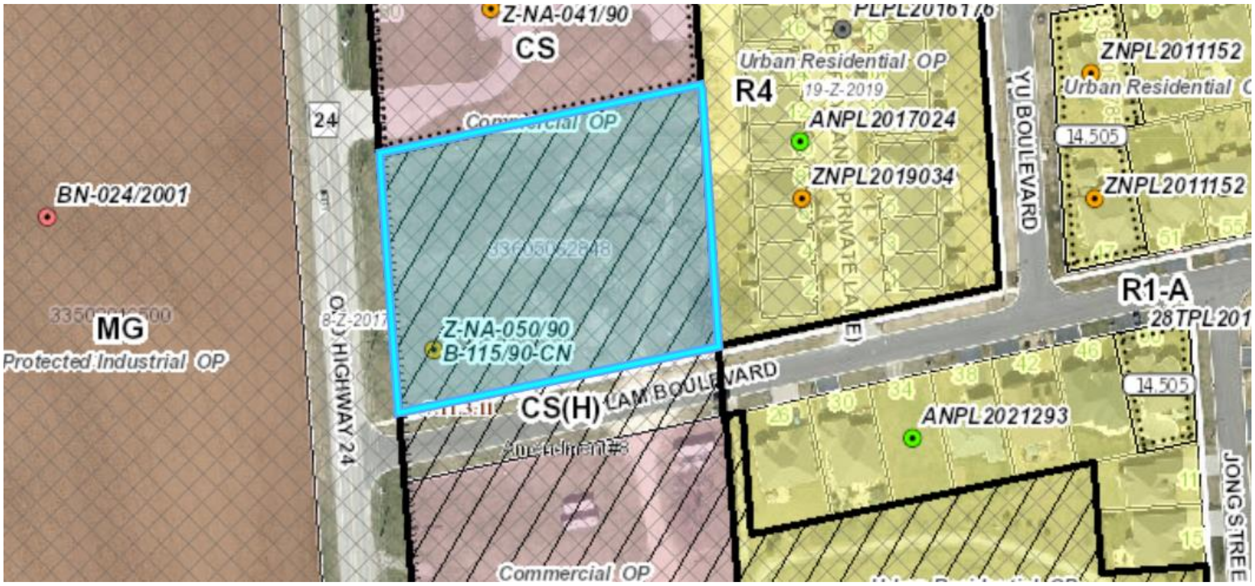
Roll Number: 331033605062848

As a result of the information shared at the pre-consultation meeting dated June 23, 2021, the following applications and qualified professional documents / reports are required as part of the development review process.

Please note that various fees are associated with each application and there are also costs for qualified professionals retained to complete various documents / reports. All requirements identified are minimum and determined as of the date of the pre-consultation meeting with the information available at that time. As the proposal proceeds and more information is made available, additional applications, studies, reports, etc. may be required. **Before you submit your application, please contact the assigned Planner to confirm submission requirements and the applicable fee.**

This summary including checklists, comments and requests are applicable for a period of one (1) year from the date of meeting. If an application is not received within that time frame, a subsequent pre-consultation meeting may be required due to changes in policies and technical requirements.

Site Map



Attendance List

Proponent	Ronak Mehta, Darpan Patel, John Vallee, Eldon Darbyson
Community Development – Planning	Mohammad Alam, Senior Planner Scott Wilson, Planner Nicole Goodbrand, Senior Planner (Chair) Annette Helmig, Agreement Coordinator
Community Development – Building and Zoning	Mark Van Hee, Building Supervisor Hayley Stobbe, Zoning Administrator
Public Works – Development Engineering	Stephen Gradish, Development Technologist
Community Services – Fire	Cory Armstrong-Smith, Fire Prevention Officer
Community Services – Paramedic Services	Stuart Burnett, Deputy Chief
Corporate Support Services – Realty Services	Lydia Harrison, Realty Services Coordinator

Lesley Hutton-Rhora

Signed on behalf of G. Douglas Vallee Limited &
Pramukh Developments

Table of Contents

Planning Department

Summary

The subject lands are designated as “Commercial” in the Official Plan. Section 7.11.1 states that residential uses shall be permitted, provided that the uses do not negatively impact the planned function of the Commercial areas subject to the following provisions:

> i) in a building of commercial character, residential uses shall only be permitted above the ground floor.

Planning Staff recommends exploring the possibility of a mixed use block along Old Highway 24.

An Official Plan Amendment will be required for the proposed development.

The Subject lands are zoned as Service Commercial. A zoning By-law amendment will be required for the proposed development. The Planning Justification report should include a parking assessment if a reduction of parking is proposed.

Reduction of driveway aisle will require technical justification and confirmation from the Development Engineering.

Vacant industrial land (4.4.5 of D6 Guidelines): Section 4.4.5 states that where there is no existing industrial facility within the area designated/zoned for industrial land use, determination of the potential influence area shall be based upon a hypothetical "worst case scenario" for which the zoned area is committed. Planning Staff recommends to provide a D6 guidelines analysis to identify any potential mitigation measures necessary along Old Highway 24.

Site Plan Control: As per Site Plan Control By-Law 2014-97, and County’s Official Plan, the proposed development will require a site plan approval.

Site Statistics: A basic site statistics should be included with the site plan with a zoning chart that will address the list of zoning relief required. Please review both General Provision (section 3.0), Off Street Parking (Section 4.0) and specific zoning provision of “Agricultural Zone” (Section 12.0) in detail to identify the zoning reliefs.

Drawing Requirements:

- All measurements must be in metric
- All drawings must be to a standard scale to suit project requirements:
- Surveyed property limits (including bearings and dimensions)
- Location and extent of road widening, daylight triangles, easements and road reserves (if any)
- location of existing tree cover (if any)
- Existing topography of the land
- Indicate existing land uses along property lines

Title Block Information

- Key plan (showing location of subject lands and surroundings)
- North arrow
- Consultant’s name and contact information (address, telephone, email)
- Professional stamp, signed and dated
- Date of plan preparation, Revision column (numbered and dated)
- Project name
- Municipal address and legal description and Site Plan File number (once assigned)
- Scale of drawing

Site Plan Details: The following features and elements to be included as appropriate on site plan:

Site Features:

- Label materials on the plan and/or provide legend (i.e. paving, curbing, sidewalks, depressed curbs, retaining walls, acoustic structures, fencing, signage signs, landscape areas, snow storage areas, etc.)
- Location and details of existing and proposed fencing,
- Location of garbage collection areas
- Location of on-site snow storage areas

Utilities:

- Location of fire hydrants and transformers (if any)
- Location of hydro & gas meters,
- Location of all proposed signs (if any)

Streetscape:

- Location of sidewalks (if any)
- Existing and proposed trees, SOD areas

Vehicular Network

- Location of proposed curbing. Provide Ontario Provincial Standard Drawing (OPSD) curb detail
- Location and dimension of designated fire routes (indicate centre-line, road width and centre- line turning radii)
- Location of garbage collection area
- Location of driveways and parking space with dimensions and materials
- “No parking/fire route” and “accessible parking signs”

Accessibility

- Location of accessible spaces complete with signage for each space
- Location of depressed curbs for each accessible space/ group of accessible spaces as appropriate and required
- Accessible routes to accommodate barrier-free paths of travel to main access of the building including tactile warning surface.

List of Application Requirements*

Planning application(s) required to proceed	**Required**
Official Plan Amendment Application (Regular)	X
Zoning By-law Amendment Application (Regular)	X
Site Plan Application (Regular)	X
Draft Plan of Subdivision Application	
Draft Plan of Condominium Application	X (TBD)
Part Lot Control Application	
Consent / Severance Application	
Minor Variance Application	
Removal of Holding Application	
Temporary Use By-Law Application	
Other - Click here to enter text.	

Planning requirements for a complete application The items below are to be submitted as part of the identified Planning Application(s). ** electronic/PDF copies of all plans, studies and reports are required**	**Required at OPA/ Zoning Stage**	**Required at Site Plan Stage**
Proposed Site Plan / Drawing	X	X
Planning Impact Analysis Report / Justification Report	X	
Environmental Impact Study Choose an item.		
Neighbourhood Plan (TOR must be approved by the County)		
Agricultural Impact Assessment Report		
Archaeological Assessment		
Heritage Impact Assessment		
Dust, Noise and/or Vibration Study		
MOE D-Series Guidelines Analysis	X	
Landscaping Plan		X
Elevation Plan & Floor Plans	X	X

Photometrics (Lighting) Plan		X
Shadow Analysis Report		
Record of Site Condition		
Contaminated Site Study		
Minimum Distance Separation Schedule		
Parking Assessment	X (With PJR)	
Hydrogeological Study		
Topographical Survey Drawing	X	
Additional Planning requirements		**Required**
Development Agreement		X
Parkland Dedication/Cash-in-lieu of Parkland		X

*the list of requirements is based on the information submitted and as presented for this specific pre-consultation meeting. Any changes to a proposal may necessitate changes to Planning Department submission requirements.

*Community Development fees, applications, and helpful resources can be found can be found by visiting https://www.norfolkcounty.ca/government/planning/

Assigned Planner:
Mohammad Alam
Senior Planner
Extension 1828
Mohammad.Alam@norfolkcounty.ca

Agreements

The requirements for a development agreement include the following:

- Additional user fees and performance securities
- Current Property Identification Number (PIN) (can be obtained at local registry office or your legal representative)
- Owner’s Commercial General Liability Insurance to be obtained and kept in force during the term of the agreement:
- Certificate of Insurance for Professional Liability and/or Errors and Omissions coverage for surveyor and engineer
- Postponement of Interest (if there are mortgagees / charges on your property identifier – your legal representative will be required to obtain a postponement from your bank or financial institution)
- Transfers/Easements and final reference plan for any easements or lands to be conveyed

Annette Helmig, will lead you throughout the Agreement and Performance Securities processes.

Annette Helmig
Agreement and Development Coordinator
Extension 1849
Annette.Helmig@norfolkcounty.ca

Development Engineering

Comments pending.

Stephen Gradish
Development Technologist
Extension 1702
Stephen.Gradish@norfolkcounty.ca

COMMENTS FROM STEPHEN GRADISH (PROVIDED 28OCT21) subsequently inserted - see page 13

County Departmental Comments & Requirements

Building

Zoning Administrator:

Comments:

1. Proposal to rezone property to R4, stacked townhouses permitted
2. Property viewed as one large lot (ownership of unit only)
3. Front lot line runs along Old Highway 24
4. Zoning table to be provided
5. Relief required for front yard setback, exterior side yard setback and rear yard setback
6. Relief required to permit 12 visitor parking spaces (ensure accessible parking space and aisle are dimensioned on site plan)
7. Maximum permitted building height is 11 meters, no information provided so relief may be required
8. Relief required to permit more than 8 units within townhouse dwelling
9. Two parking spaces to be provided for each unit, ensure 3.3m x 5.8m uninterrupted parking space provided in each garage
10. Relief required to permit 6.0 meter wide aisle width
11. 50% of the front yard and exterior side yard to be maintained as landscaped area for the entire lot
12. Ensure all decks with dimensions are shown on site plan

Hayley Stobbe
Zoning Administrator
Extension 1853
hayley.stobbe@norfolkcounty.ca

Building Inspector:

Please refer to our website for current forms, and fees.
https://www.norfolkcounty.ca/business/building/

Proposed development is considered a house as defined by the Ontario Building Code (OBC)

Site Plan requirements

- ☐ Fire department access to buildings to conform to Ontario Building Code 9.10.20.3. Consultation with Norfolk Fire Department for site development is required.
- ☐ Plot Plan

  - Property lines and lot dimension,
  - Location of dwelling and all other structures on the lot,
  - Location of all steps and landing,
  - Distance from dwelling to property lines
  - Parking spots with dimensions
  -

Building Permits

What do I need to apply?

Completed Forms

- ☐ Building Permit Application Form
- ☐ Schedule 1: Designer Information
- ☐ Property Owner Consent Form, if application is not completed by the property owner.
- ☐ Applicable Law Checklist and supporting documents.
- ☐ Lot grading form.
- ☐ Water, storm sewer, sanitary sewer connection permit (where required)
- ☐ Energy Efficiency Design Summary (EEDS form)
- ☐ Residential Mechanical Ventilation Design Summary form

Required Documents

- ☐ Approved site plan and site plan agreement.
- ☐ Lot grading plan.
- ☐ Drawings of the dwelling.
  - Floor plans,
  - Elevations,
  - Cross sections of exterior wall from footing to roof.
  - Fire separations, complete with STC and ASTC ratings
- ☐ Roof truss layout (where required)
- ☐ Engineered floor system layout (where required)
- ☐ Engineered beam details (i.e. Parallam, Micro-lam) (where required)
- ☐ Engineered fire wall designs (where applicable)
- ☐ Heat loss calculations
- ☐ Ventilation duct design
  - Heat Recovery Ventilator (HRV) duct sizing and layout,
  - Exhaust fan duct sizing and layout.

Fees

- ☐ Building Permit fee
- ☐ Plumbing fee
- ☐ Occupancy fee
- ☐ Water/storm/sanitary connection fees (where applicable)
- ☐ Development changes

If you have any question on the building permit process or plans required, please contact Scott Northcott, Building Inspector.

Currently, all permit can be applied for by email to permits@norfolkcounty.ca. Our Permit Coordinators will review your application and provide in writing any item which may be missing from the application and a cost break down for the permit fees and payment options.

Scott Northcott
Senior Building Inspector
Extension 1848
Scott.Northcott@norfolkcounty.ca

Fire Department

Applicant will be required to submit a drawing confirming the fire access route conforms to the Ontario Building Code, including a measurement less than or equal to 45m from the farthest unit door of Block C to the anticipated truck location at the end of the fire route, and the fire route itself not exceeding the 90m threshold that would require a turnaround facility. Further, a private fire hydrant may be required unless it can be shown that a firetruck located within the Block C portion of the fire access route can also be within 90m of the nearest municipal hydrant with a clear path of travel.

Cory Armstrong-Smith
Fire Prevention Officer
Extension 2402
Cory.Armstrong-Smith@norfolkcounty.ca

Paramedic Services

No comments from Paramedic Services

Stuart Burnett
Deputy Chief
Extension 2429
Stuart.Burnett@norfolkcounty.ca

Development Engineering – Corner of Lam Blvd and Old HWY 24 – 52 Condo Stacked

Development Engineering requirements to proceed The below requirements are to be submitted as part of the Formal Development Planning application.	**Required at OPA/ Zoning Stage**	**Required at Site Plan Stage**	**Potentially Required (See Notes Section)**
General Requirements			
Concept Plan	X	X	
Area Rough Grading Plan			X
Lot Grading Plan		X	
Siltation and Erosion Control Plan		X	
General Plan of Services	X[2]	X	
Plan and Profile Drawings			X[8]
Utility Plan			X
Geotechnical Report			X[9]
Functional Servicing Report	X[2]	X	
Ministry of Environment, Conservation and Parks Permit			
Water Servicing Requirements– Section 10.0 Norfolk County Design Criteria and ISMP Section 4.0			
Extension of Watermain			
Water main Looping			X
Easement and/or Block Registration			
Disconnection of Water Service(s) to Property Line			
Disconnection of Water Service(s) to Main			X
Water Modelling (County Consultant)	X[2]	X	
Backflow Preventer		X	
Sanitary Servicing Requirements – Section 9.0 Norfolk County Design Criteria and ISMP Section 4.0			
Sanitary Drainage Plan		X	
Sanitary Design Sheet		X	
Pumping Station Design			

Extension of Sanitary Mainline			
Disconnection of Sanitary Service(s) to Property Line			
Disconnection of Sanitary Service(s) to Main			
Sanitary Modelling (County Consultant)	X[2]	X	
Property Line Inspection Maintenance Hole		X	
Storm Water Servicing Requirements – Section 7.0 and Section 8 Norfolk County Design Criteria and ISMP Section 4.0			
Storm Water Management Design Report (including calculations)	X[3]	X	
Storm Water Drainage Plan		X	
Storm Sewer Design Sheet		X	
Establish/Confirm Legal and Adequate Outlet	X	X	
Anticipated Flow/Analysis to Receiving Collection System		X	
Extension of Storm Water Mainline			
Easement and/or Block Registration			
Municipal Drainage	X		
Transportation Requirements – Section 6.0 Norfolk County Design Criteria, ISMP Section 5.0, Section 6.0 and Appendix J			
Traffic Impact Study	X	X	
Street Signage/Traffic Control Plan			
Improvements to Existing Roads & Sidewalk (urbanization, pavement structure, widening sidewalk replacement, upgrades, extension and accessibility)		X	

The Entrance from Old Highway 24 will need to conform to the Norfolk County Design Criteria, and the TAC Manual. The sidewalk, curb gutter will need to be continuous across driveway entrance.

Urbanization of Old Highway 24 required, sidewalk to be connected to existing sidewalks.

The interior road ways will need to conform to the design criteria and the zoning requirements, of 7.3 meters.

The garbage collection pads will be for a private collections only. The county waste collection manual requires no reversing.

Further clarification if By-Law 60-74 still applies, it requires a larger setback from the Old Highway 24 to the buildings.

From the GIS system this parcel of land is not serviced by the Yin Storm Pond, quantity and quality controls will be required.

General Notes:

1. Any required infrastructure to facilitate the development will be at the developer's expense;
2. Securities in the form of a schedule will be required. 100% securities for any works completed within the municipal R.O.W. and 10% securities for any works completed within private property.
3. All reports are to adhere to Norfolk County's Design Criteria. All engineering drawings are to adhere to Norfolk County's Design Criteria. A copy of this criteria is available upon request.
4. Recommendations from all reports must be incorporated into the design. All reports and drawings are to be signed and sealed by a Professional Engineer (P.Eng.);
5. If Municipal Waste Collection Services are required, the development must adhere to Norfolk County's Technical Guidelines for Waste Collection Services for Condominium Corporations. These guidelines have been included as part of this information package. Application for waste collection can be made after the development is completed.

Required at Zoning Notes:

6. The following reports/studies will be required at time of Zoning Amendment Submission:
    - Concept Plan;
    - Functional Servicing Report (as per Norfolk County Design Criteria);
    - Water / Sanitary Modelling;
    - Storm Water Management Report;
    - Traffic Impact Study (as per ISMP Appendix J – TIS Guidelines);
7. Sanitary and Water modelling will be required. This is to be completed by Norfolk County's third-party consultant. The cost to complete the modelling and any recommendations from reports are to be implemented into the design at the

applicant's expense. The following information will be required to receive a quote and complete the modelling;

   a. General Plan of Services
   b. Functional Servicing Report;

The Functional Servicing Report must include water /sanitary servicing and fire flow calculations.

Once the quote has been received, approval from the applicant will be required before proceeding.

8. Stormwater Management Report is to be completed as per Norfolk County Design Criteria Section 7.0.

9. The property identified in this proposal is currently part of the Waterford South Main Street Drain. Therefore early consultation with Norfolk County's Drainage Department will be required. This will be necessary prior to completing the determination of the legal and adequate outlet. Furthermore for those sections of the proposal where a severance application is proposed the following would be required at the time of Severance application.

   - Developer to prove capacity in existing storm sewer and drain to outlet.
   - A Drain Apportionment under Drainage Act Section 65 is required at the Cost of the Developer. This is to apportion the future maintenance assessment of Waterford South Main Street Drain.

10. As per Norfolk County's Integrated Sustainable Master Plan (ISMP) – Appendix J: Traffic Impact Study (TIS) Guidelines, a traffic impact study will be required. These guidelines are available upon request.
    - The TIS is going to have to verify that a high volume residential entrance is permitted that close to an intersection

<u>Required at Site Plan Stage Notes and/ or Severances Stage:</u>

11. Recommendations from all reports must be incorporated into the design. All reports and drawings are to be signed and sealed by a Professional Engineer (P.Eng.);
12. The design and engineering drawings are to adhere to Section 16 of Norfolk County's Design Criteria. A copy of this criteria has been included as part of this information package;
13. Any recommendations/upgrades from the modelling reports must be implemented at the time of Site Plan submission and/or Severance Application. Upgrades, if any, are to be completed at the Developer's expense.

14. Lot Grading Plan, Siltation and Erosion Control Plan, and General Plan of Services drawing can be shown on one engineering plan as long as it’s legible for review.
15. As per Norfolk County By-Law 2013-65, only one domestic water service pipe shall be installed per lot. A copy of this By-law is available upon request.
16. For Condo developments a Backflow Preventer (RPZ) may be required. Approval from the Manager of Environmental Services must be obtained as per Norfolk County Design criteria.
17. Property Line Manhole on Sanitary
18. As per Norfolk County By-Law 2016-32, only one entrance is permitted per residential lot.

Potentially Required Notes:

19. As per Norfolk County Design Criteria, an area rough grading plan will be required if earth cuts and fills in excess of 0.5m.
20. Plan and Profile drawings will be required if any infrastructure is to be installed within the municipal R.O.W.
21. A Geotechnical Report will be required if infiltration galleries are proposed within the design.

access NORFOLK Accessible formats available

Planning Department Development Application Form

Complete Application

A complete development application consists of the following:

1. A completed, signed, and notarized application form
2. Supporting information adequate to illustrate your proposal as indicated in **Section H** of this application form
3. Written authorization from the registered owner of the subject lands where the applicant is not the owner as per Section N
4. Cash, debit, credit or cheque payable to Norfolk County in the amount set out in the user fees By-Law that will be accepted and deposited once the application has been deemed complete.

Pre-Submission Consultation:

Norfolk County requires a Pre-Consultation Meeting for all applications; however, minor applications may be exempted depending on the nature of the proposal. 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 Norfolk County and Agency staff to identify the application requirements. Application requirements, as detailed in the Pre-Consultation Meeting Comments, are valid for one year after the meeting date.

Development Application Process

Once an application has been deemed complete by a Planner, Norfolk County staff will circulate the application to adjacent landowners, public agencies, and internal departments for comment. The time involved in application processing varies depending on its complexity, acceptability to the other agencies, and statutory Planning Act decision time-frames.

Payment is required once your application is deemed complete. Pre-payments will not be accepted.

Norfolk County collects personal information submitted through this form under the Municipal Freedom of Information and Protection Act's authority. Norfolk County will use this information for the purposes indicated or implied by this form. You can direct questions about collecting personal information to Norfolk GIS Services at NorfolkGIS@norfolkcounty.ca.

Additional studies required for the complete application shall be at the applicant's sole expense. Sometimes, peer reviews may be necessary to review particular studies at the applicant's expense. In these caseds, Norfolk County staff will select the company to complete the peer review.

Norfolk County will refund the original fee if applicants withdraw their applications before circulation. If Norfolk County must recirculate your drawings, there will be an additional fee. If Norfolk County must do more than three reviews of engineering drawings due to revisions by the owner or failure to revise engineering drawings as requested, Norfolk County will charge an additional fee. Full refunds are only available before Norfolk County has circulated the application.

Notification Sign Requirements

For public notification, Norfolk County will provide you with 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 and not on a tree.
3. Notify the Planner when the sign is in place.
4. Maintain the sign until the development application is finalized and, after that, remove it.

Contact Us

For additional information or assistance 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 result of this application (for example, a special zoning provision on the subject lands to include additional use(s), changing the zone or official plan designation of the subject lands, creating a certain number of lots, or similar)

Site Plan approval for the proposed development

Property Assessment Roll Number: 33605062848

A. Applicant Information

Name of Owner Pramukh Development Ltd. - C/O Ronak Mehta

Address 2324 West Ham Rd
Town and Postal Code Oakville L6M 4N6
Phone Number 416-871-0086
Cell Number
Email Ronmehta@gmail.com

Name of Applicant Same as above
Address
Town and Postal Code
Phone Number
Cell Number
Email

Name of Agent G. Douglas Vallee Limited C/O Scott Puillandre
Address 2 Talbot St. North
Town and Postal Code Simcoe, ON N3Y 3W4
Phone Number 519-426-6270
Cell Number
Email scottpuillandre@gdvallee.ca

Unless otherwise directed, Norfolk County will forward all correspondence and notices regarding this application 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:

Hong Wang - 29 Carter Place, Markham ON
L9C 2K4

B. Location, Legal Description and Property Information

1. Legal Description (include Geographic Township, Concession Number, Lot Number, Block Number and Urban Area or Hamlet):
   Block 60, Plan 37M57

   Municipal Civic Address: No civic address

   Present Official Plan Designation(s): Commercial and Urban Residential

   Present Zoning: Service Commercial (CS-H) and Urban Residential (R4-H)

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

   ■ Yes ☐ No If yes, please specify corresponding number:
   Special Provision - 14.1021 and Section 7.11.3.11

3. Present use of the subject lands:
   Vacant

4. Please describe **all existing** buildings or structures on the subject lands and whether they will 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 the 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:
   Vacant

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.
   NA

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:
   24 Back-to-Back townhouse dwelling units
   Two storey commercial building 1,350m2

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:

   Not known

9. Existing use of abutting properties:

   North - Commercial, East - Residential, South - Commercial, West - Industrial

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:

   Property is under site plan control

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

   NA

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, m^2 or %		
Lot frontage	16.5m/30.0m	74.79m/74.79m
Lot depth		
Lot width		
Lot area	495m2/195m2	2167m2/4843m2
Lot coverage	60%	42.8%
Front yard	1.5m/35.6m	1.5m/35.63m
Rear yard	7.5m/7.5	74.38m/7.51m
Left Interior side yard	3m/3m	16.2m/23.41m
Right Interior side yard		
Exterior side yard (corner lot)	1.5m/1.5m	1.5m/1.5m
Landscaped open space	NA	12.4%
Entrance access width	7.3m	7.3m
Exit access width	7.3m	7.3m
Size of fencing or screening		
Type of fencing		
10. Building Size		
Number of storeys	2 / 3	2 / 3
Building height	11m / 13.5m	11m / 13.5m
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	93	93
Number of visitor parking spaces	8	8
Number of accessible parking spaces	3	3
Number of off street loading facilities		

12. Residential (if applicable)

Number of buildings existing: 0

Number of buildings proposed: 2 dwellings / 24 dwelling units

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: 0

Number of buildings proposed: 1

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):

1350m2 usable floor area total

Seating Capacity (for assembly halls or similar): ______________________

Total number of fixed seats: ______________________

Describe the type of business(es) proposed: CS Zone and SP 14.1021

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:
   Not in WHPA

   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 70m

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 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 site plan approval, 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, to disclose the registration of all transfer(s) of land and/or 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.

	October 26, 2023
[✓ Owner/Applicant Signature]	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 Ronak Mehta 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.

	October 26, 2023
[✓ Owner]	Date
Owner	Date

N. Declaration

I, Ronak Mehta of Oakville

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:

Town of Simoce

Owner/Applicant Signature

In County of Norfolk

This 26 day of October

A.D., 2023

A Commissioner, etc.

SCOTT CONNELL PUILLANDRE,
a Commissioner, etc., Province of Ontario,
for G. Douglas Vallee Limited.
Expires August 19, 2025.

DATE PLOTTED 10/3/2023 10:33:13 AM PROJECT NUMBER & NAME: 21-059 LAM BLVD. FILE PATH: H:\Projects\2021\21-059 Lam Blvd Townhomes\Drawings\Architectural\21-059 Lam Blvd - Site.rvt

SITE STATISTIC & ZONING REQ.'S

PROPERTY LEGAL DESCRIPTION:

PLAN 37M57 BLK 60, PART 1
IN THE TOWN OF WATERFORD, IN THE DISTRICT OF NORFOLK COUNTY

ZONING:

IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014 NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021

PROVISION	LAND USE: EXISTING
14.1021	SERVICE COMMERCIAL ZONE (CS) - PART 1 PERMITTED USES *Permitted* Uses [30-Z-2022] In addition to the permitted uses in the Service Commercial (CS) *Zone*, the following uses shall be permitted: i) Grocery store, ii) Office, all types as identified in Z-1-2014 iii) Pharmacy, iv) Photographic studio or shop, v) Retail store

PROVISION	SETBACKS (m - METERS):	REQUIRED (m)	PROVIDED (m)
6.3.2a)	MIN. LOT AREA: ii) CORNER LOT	495m²	2,167m² (PART 1)
6.3.2b)	MIN. LOT FRONTAGE: ii) CORNER LOT	16.5	74.79
14.1021	MIN. FRONT YARD:	1.5 [30-Z-2022]	1.5
6.3.2d)	MIN. EXTERIOR SIDE YARD:	1.5 [30-Z-2022]	1.5
6.3.2e)	MIN. INTERIOR SIDE YARD	3	16.2
14.1021	MIN. REAR YARD:	7.5 [30-Z-2022]	74.38
6.3.2g)	MIN. USABLE FLOOR AREA: FOR A DWELLING UNIT IN A NON-RESIDENTIAL BLDG.	40m²	N/A
6.3.2h)	MAX. BLDG. HEIGHT	11	11 MAX.
14.1021	MAX. LOT COVERAGE	60% [30-Z-2022]	42.8% (SEE BELOW)
6.3.2j)	MAX. USABLE FLOOR AREA: OF A FRUIT AND VEGETABLE OUTLET	200m²	N/A
6.3.2.k)	OUTDOOR STORAGE	PROHIBITED IN A FRONT YARD & WITHIN 3m OF ANY LOT LINE ADJOINING A RESIDENTIAL ZONE	
6.3.3	Outdoor Display of Goods Outdoor display of *vehicles* on paved areas shall be *permitted* in the *front yard* subject to Subsection 6.3.5. Outdoor display of other non-vehicular items shall be *permitted* within a *front yard* provided such display is located on a grassed or landscaped area without surrounding fences and subject to Subsection 6.3.5.		
14.1021	Section 6.3.4 of Zoning BY-Law Z-1-2014 shall not apply		
14.1021	Sections 4.2.1 and 4.2.4 (d) of Zoning By-Law Z-1-2014 shall not apply		

AREAS	PROVIDED (m²)	PROVIDED (%)
AREA OF CS ZONE *** MEASURED TO CENTRE OF AISLE SEPARATING CS FROM R4*	2,167m²	-
BLDG. (GROSS / FOOTPRINT)	927m²	42.8%
ASPHALT PARKING & DRIVEWAY	772m²	35.6%
SIDEWALKS & HARD SURFACE AREAS	199m²	9.2%
LANDSCAPED OPEN SPACE	269m²	12.4%

COORD. W/ ZONING BY-LAW FOR ALL OTHER ZONING REQ.'S

PROPERTY LEGAL DESCRIPTION:

PLAN 37M57 BLK 60, PART 2
IN THE TOWN OF WATERFORD, IN THE DISTRICT OF NORFOLK COUNTY

ZONING:

IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014 NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021

PROVISION	LAND USE: EXISTING
5.0 5.4 14.1021	RESIDENTIAL ZONES URBAN RESIDENTIAL TYPE 4 ZONE (R4) PERMITTED USES In an R4 *Zone*, the following shall apply: i) Back-to-back townhouse

PROVISION	SETBACKS (m - METERS):	REQUIRED (m) Back-to-Back Townhouse [30-Z-2022]	PROVIDED (m)
5.4.2a)	MIN. LOT AREA: ii) CORNER LOT	195m²	4,843m² (PART 2)
5.4.2b)	MIN. LOT FRONTAGE: ii) CORNER LOT	30	74.79
14.1021	MIN. FRONT YARD:	35.6 [30-Z-2022]	35.63
14.1021	MIN. EXTERIOR SIDE YARD:	1.5 [30-Z-2022]	1.5
5.4.2e)	MIN. INTERIOR SIDE YARD:	3	23.41
14.1021	MIN. REAR YARD :	7.5 [30-Z-2022]	7.51
5.4.2g)	MIN. SEPARATION BETWEEN TOWNHOUSE DWELLINGS	2	10.18
14.1021	MAX. BLDG. HEIGHT	13.5 [30-Z-2022]	13.5 MAX.
5.4.3	*Setback* from Mutual *Side Lot Line* Notwithstanding the *required side yard*, on a mutual *side lot line* separating two (2) attached *townhouse* units, no *interior side yard* is *required* where the walls are joined, where the walls are not joined, a 1.2 metre *side yard* shall be *required*.	1.2	N/A
14.1021	Sections 4.2.1 and 4.2.4 (d) of Zoning By-Law Z-1-2014 shall not apply		
14.1021	Section 5.4.4 of Zoning By-Law Z-1-2014 shall not apply		

COORD. W/ ZONING BY-LAW FOR ALL OTHER ZONING REQ.'S

PARKING REQUIREMENTS:

PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	SINGLE DETACHED, SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-PLEX, TOWNHOUSE DWELLINGS & VACATION HOME [8-Z-2017]: 2 SPACES / DWELLING UNIT 2 SPACES x 24 DWELLING UNITS = 48	48 SPACE(S)	48 SPACE(S)
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (24 / 3) = 8	8 SPACE(S)	8 SPACE(S)
14.1021	NON-RESIDENTIAL USES: 1 SPACE / 30m² USEABLE FLOOR AREA [30-Z-2022] 1 SPACE x (1,350 / 30m²) = 45	45 SPACE(S)	45 SPACE(S)
	TOTAL	101 SPACE(S)	101 SPACE(S)

PARKING REQ.'D - BARRIER FREE: (PART OF REQ.'D PARKING)

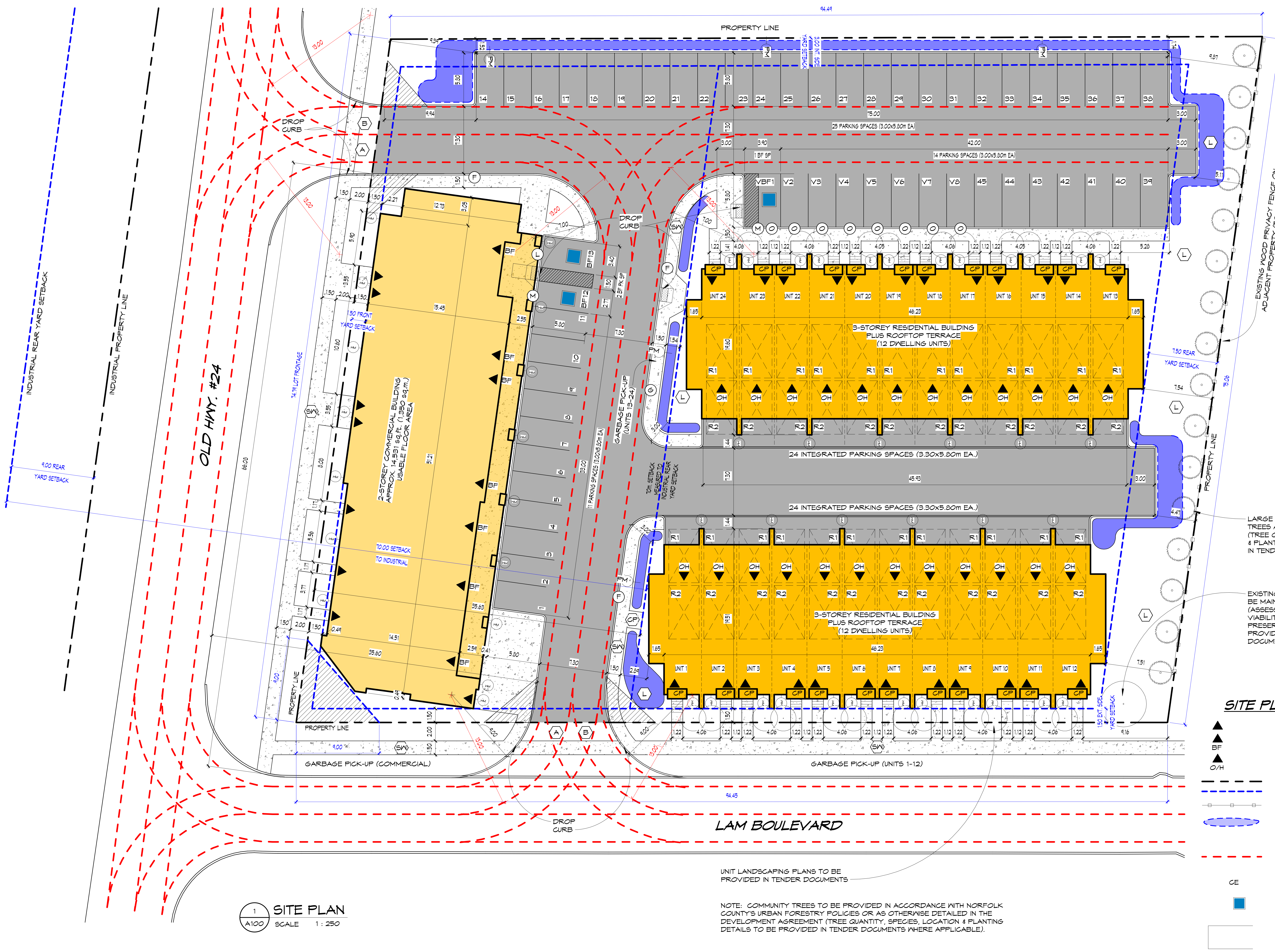
4.3.3	BARRIER FREE PARKING REQ.'D: *26-50 COMMERCIAL/VISITOR SPACES*		
	TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S)	1 SPACE(S)
	TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	2 SPACE(S)	2 SPACE(S)

PARKING SPACE DIMENSIONS

4.1 4.1.3a)	PARKING SPACE DIMENSIONS 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 4.1.4b)	PARKING AISLE REQ.'S TWO-WAY TRAFFIC	7.3 MIN.	7.3 MIN.

LIGHTING NOTE:

LIGHTING MUST BE DIRECTED ON SITE AND MUST NOT SPILL OVER TO / ONTO ADJACENT PROPERTIES OR STREETS. PROVIDE "HOUSE SHIELDS" WHERE NEEDED, TO COMPLETELY ELIMINATE SPILL / GLARE TO ADJACENT PROPERTIES, DARK SKY COMPLIANT (COORD. W/ ELEC. PHOTOMETRIC SITE PLAN)



LARGE CALIPER CONIFEROUS TREES ALONG EXISTING FENCE LINE (TREE QUANTITY, SPECIES, LOCATION & PLANTING DETAILS TO BE PROVIDED IN TENDER DOCUMENTS)

EXISTING DECIDUOUS TREE TO BE MAINTAINED IF POSSIBLE (ASSESSMENT OF TREE VIABILITY AND APPLICABLE PRESERVATION PLAN TO BE PROVIDED IN TENDER DOCUMENTS)

UNIT LANDSCAPING PLANS TO BE PROVIDED IN TENDER DOCUMENTS

NOTE: COMMUNITY TREES TO BE PROVIDED IN ACCORDANCE WITH NORFOLK COUNTY'S URBAN FORESTRY POLICIES OR AS OTHERWISE DETAILED IN THE DEVELOPMENT AGREEMENT (TREE QUANTITY, SPECIES, LOCATION & PLANTING DETAILS TO BE PROVIDED IN TENDER DOCUMENTS WHERE APPLICABLE.)

1 / A100 SITE PLAN
SCALE 1 : 250

BEFORE STARTING WORK

- THE *AUTHORITY HAVING JURISDICTION* IS *NORFOLK COUTY*
- THE CONTRACTOR SHALL NOTIFY THE *AUTHORITY HAVING JURISDICTION*, ARCHITECT & CONSULTANTS AT LEAST 48 HOURS PRIOR TO COMMENCING ANY CONST. OR DEMOLITION.

SITE PLAN NOTES

- 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

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. PLANS FOR ALL EX. & NEW LOCATIONS OF SERVICES & ENTRY OF SERVICES INTO THE BLDG. ENVELOPE.
- COORD. W/ SITE GRADING PLAN FOR PROPOSED FINAL FINISH GRADE ELEV.'S & DRAINAGE SLOPES

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 (COORD. WITH DETAIL(S) ON A101) (SUGGESTED LOCATION SHOWN - TO BE CONFIRMED BY CANADA POST)

SIGN LEGEND

Ⓐ	STOP SIGN
Ⓕ	NO PARKING - FIRE ROUTE
Ⓖ	NO PARKING - FIRE HYDRANT
Ⓛ	NO PARKING, BY PERMIT ONLY, BARRIER-FREE PARKING, VAN ACCESSIBLE - TYPE 'A'
Ⓜ	NO PARKING, BY PERMIT ONLY, BARRIER-FREE PARKING - TYPE 'B'
Ⓞ	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.

HATCH IDENTIFICATION LEGEND

▨	CONC. SIDEWALK / PAD / CROSSWALK / SIDEWALK / LANEWAY / STAIRS / ETC.
▨	EX. CONC. SIDEWALK / PAD / CROSSWALK / SIDEWALK / LANEWAY / STAIRS / ETC.
▨	AREA OF NEW SOD ON 150mm TOPSOIL (COORD. W/ CONST. FOR EXTENTS)
🟨	NEW BLDG.

- SHOP DWG.'S ARE TO BE DIMENSIONED IN METRIC UNITS (IMPERIAL & METRIC BOTH SHOWN IS ACCEPTABLE)
- ALL EX. ITEMS WILL BE LABELLED W/ 'EX' (OR GRAY SCALE ON EX. SURVEY DWG.) & ARE 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 GRASSED AREAS)
- COORD. W/ CIVIL DWG.'S & GEOTECHNICAL REPORT FOR CLASSIFICATION & REQUIREMENTS FOR ASPHALT SURFACES, CATCH BASINS AND STORMWATER MANAGEMENT FACILITIES, GRADING, SERVICING, EROSION, SILTATION & SEDIMENT CONTROL MEASURES; FIRE HYDRANT(S)

SITE PLAN LEGEND

▲	ENTRANCE / EXIT DOOR
▲ BF	ENTRANCE / EXIT DOOR (BARRIER FREE OPERATOR)
▲ O/H	ENTRANCE / EXIT DOOR (OVERHEAD DOOR W/ OPERATOR)
— — —	PROPERTY BOUNDARY LINE(S)
- - - -	SETBACKS
—□—□—	WD. FENCE (EXISTING - TO BE MAINTAINED)
⬭	SNOW STORAGE (ALL ADDITIONAL SNOW TO BE PILED IN AREAS SHOWN ON SITE PLAN)
- - -	FIRE & GARBAGE ROUTE (6m WIDE / 13m CENTER RADIUS)
CE	COVERED ENTRANCE
🟦	ACCESSIBLE SIGN ON ASPHALT / CONC. (WHITE & BLUE COLOUR)
□	VEHICULAR STALL MARKINGS (YELLOW COLOUR)
▨	DIAGONAL MARKINGS (YELLOW COLOUR)
○	NEW DECIDUOUS/CONFIFEROUS TREE (TREE QUANTITY, SPECIES, LOCATION & PLANTING DETAILS TO BE PROVIDED IN TENDER DOCUMENTS)
5000 16'-4 7/8" 9000 29'-6 3/8"	**LOCATED ON THE PROPERTY LINES TYP.** VISIBILITY TRIANGLES / SIGHT / DAYLIGHT TO BE MAINTAINED (REMAIN CLEAR) @ BOTH SIDES OF ALL LANEWAY / DRIVEWAYS & INTERSECTIONS. THE MAX. HEIGHT OF ANY OBJECT OR MATURE VEGETATION WITHIN THE VISIBILITY TRIANGLE IS NOT TO EXCEED REQ.'D HEIGHT ABOVE THE CENTRELINE OF THE CORRESPONDING ADJACENT STREET **NORFOLK COUNTY** 5m X 5m LANEWAY 9m X 9m INTERSECTION / STREET LINES 1m HEIGHT NO PARKING ALLOWED
WM	WALL MTD. LIGHT FIXTURE
PM	POLE MTD. LIGHT FIXTURE
610 2'-0" VARIES	TACTILE WARNING SURFACE INDICATORS (600mmxLENGTH - TILE) (FOR SITE CONDITIONS ONLY) (COORD. W/ OPSD 310.39) **ON SITE** • KINESIK ARMOR-TILE CAST IN PLACE IN NEW SURFACES (COLOUR TO BE VERIFIED BY ARCHITECT) **MUNICIPAL SIDEWALK LOCATIONS** • KINESIK ADVANTAGE CAST IRON CAST IN PLACE IN NEW SURFACES (UNCOATED NATURAL PATINA) (COLOUR TO BE VERIFIED BY ARCHITECT)
☒	ZONING BY-LAW PARKING SPACE (3300mm W. x 5800mm D.)

NO.	DATE	ISSUANCE

NO.	DATE	ISSUANCE

PROPERTY LEGAL DESCRIPTION:
PART 1 & 2, BLOCK 60, PLAN 37M-57
IN THE TOWN OF WATERFORD, IN THE DISTRICT OF NORFOLK COUNTY

APPLICANT:
PRAMUKH DEVELOPMENTS LTD.
RONAK MEHTA & DARPAN PATEL
2324 WEST HAM RD.,
OAKVILLE, ONTARIO
L6M 4N6
1-416-871-0086 & 1-416 829-6620

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ALL DWG.'S ARE TO BE READ IN COLOUR

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

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STAMP

PROJECT TITLE:
LAM BLVD.
OLD HWY. 24 & LAM BLVD.,
WATERFORD ON, N0E 1Y0

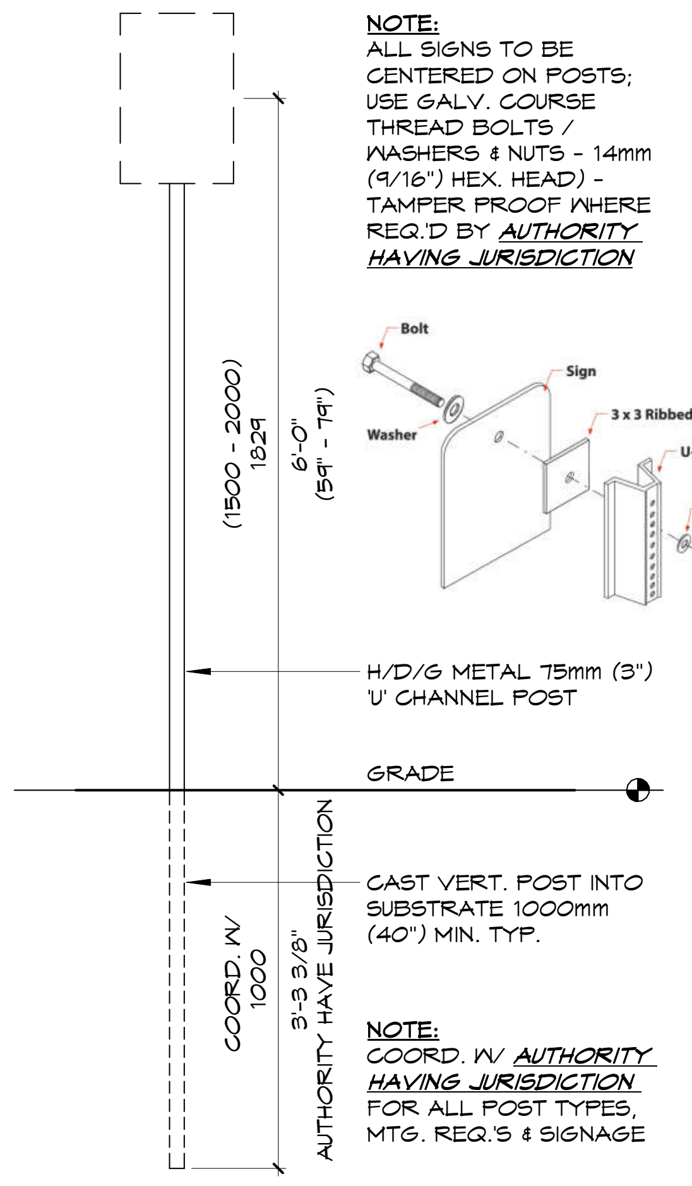
DRAWING TITLE:
SITE PLAN

CHECKED BY:	DRAWN BY:
LHR	BM
DRAWING SCALE: As indicated	DRAWING NO.: A100
PROJECT NO.: 21-059	

FILE PATH: H:\Projects\2021\21-059 Lam Blvd Townhomes\Drawings\Architectural\21-059 Lam Blvd - Site.rvt

PROJECT NUMBER & NAME: 21-059 LAM BLVD.

DATE PLOTTED 10/3/2023 10:33:17 AM



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***

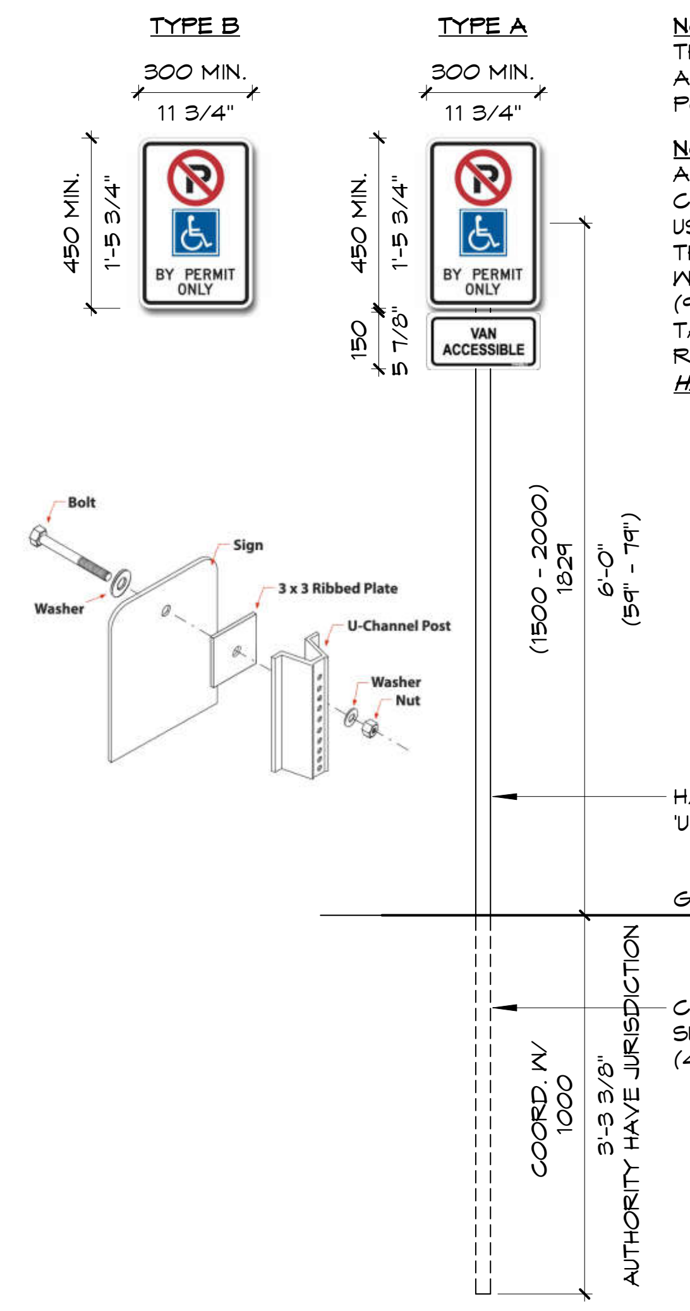
H/D/G METAL 75mm (3") 'U' CHANNEL POST

CAST VERT. POST INTO SUBSTRATE 1000mm (40") MIN. TYP.

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

1 A101 VERT. SIGNAGE (TYPICAL)

SCALE 1 : 20



NOTE:
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NOTE:
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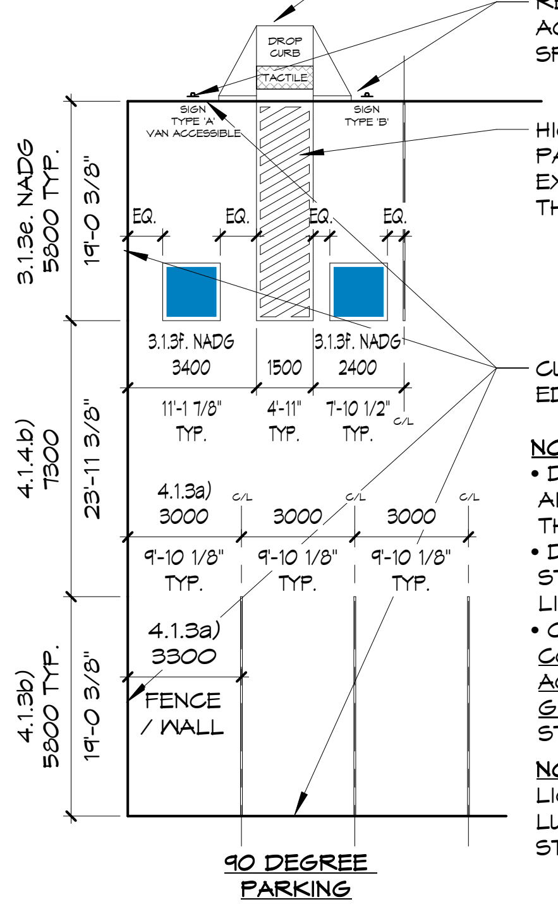
H/D/G METAL 75mm (3") 'U' CHANNEL POST

CAST VERT. POST INTO SUBSTRATE 1000mm (40") MIN. TYP.

2 A101 ACCESSIBLE PARKING VERT. SIGNAGE - NORFOLK (TYPICAL)

SCALE 1 : 20



DROP CURB @ CURB & ADJ. RAISED SURFACE MATERIALS (COORD. W/ SITE PLAN LEGEND & HALDIMAND COUNTY BY-LAW)

RB-93 SIGN @ ALL ACCESSIBLE PARKING SPACES TYP.

HIGH CONTRAST DIAGONAL PAVEMENT MARKINGS EXTEND THE FULL LENGTH OF THE SPACE

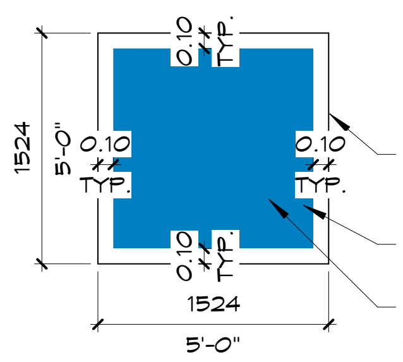
CURB OR SURFACE MATERIAL EDGE

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-LAW & ACCESSIBILITY DESIGN GUIDELINES (NADG) FOR STD.'S

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

3 A101 PARKING STALL GUIDELINES - NORFOLK COUNTY (TYPICAL)

SCALE 1 : 200



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)

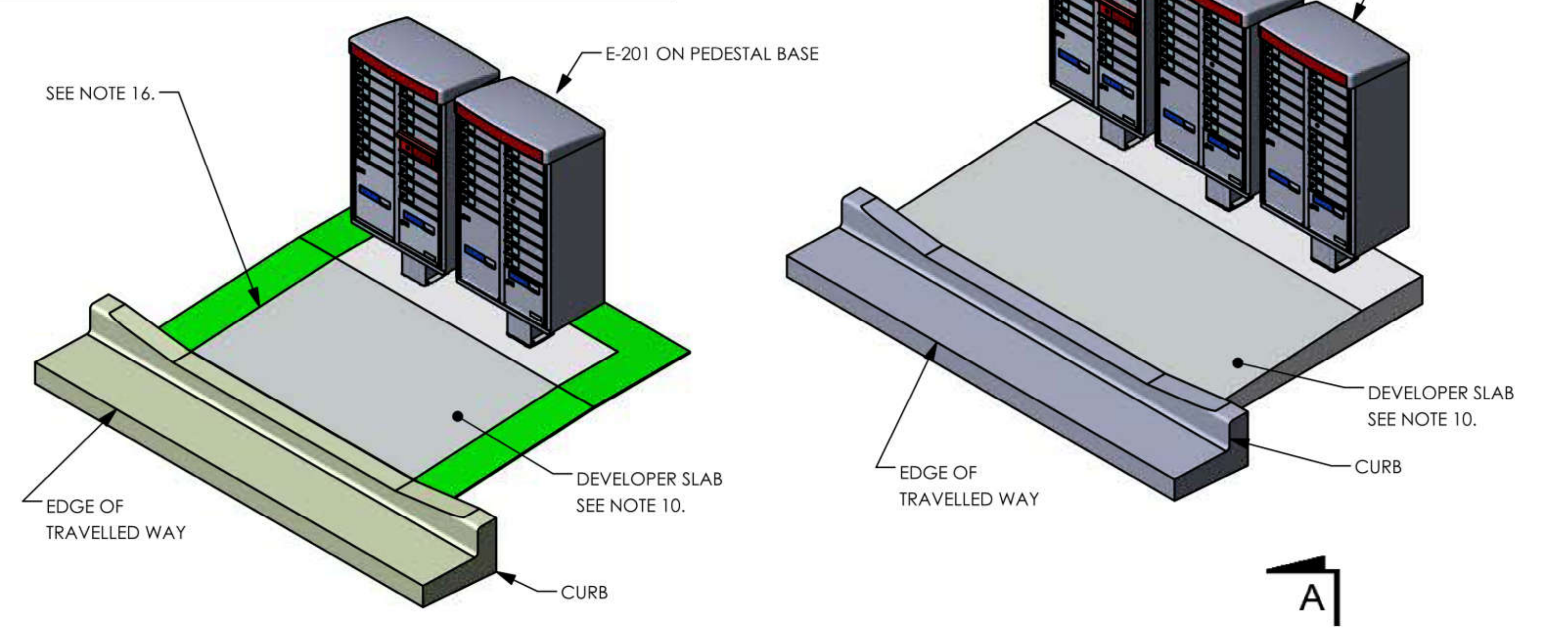
INTERNATIONAL SYMBOL OF ACCESSIBILITY (WHITE COLOUR)

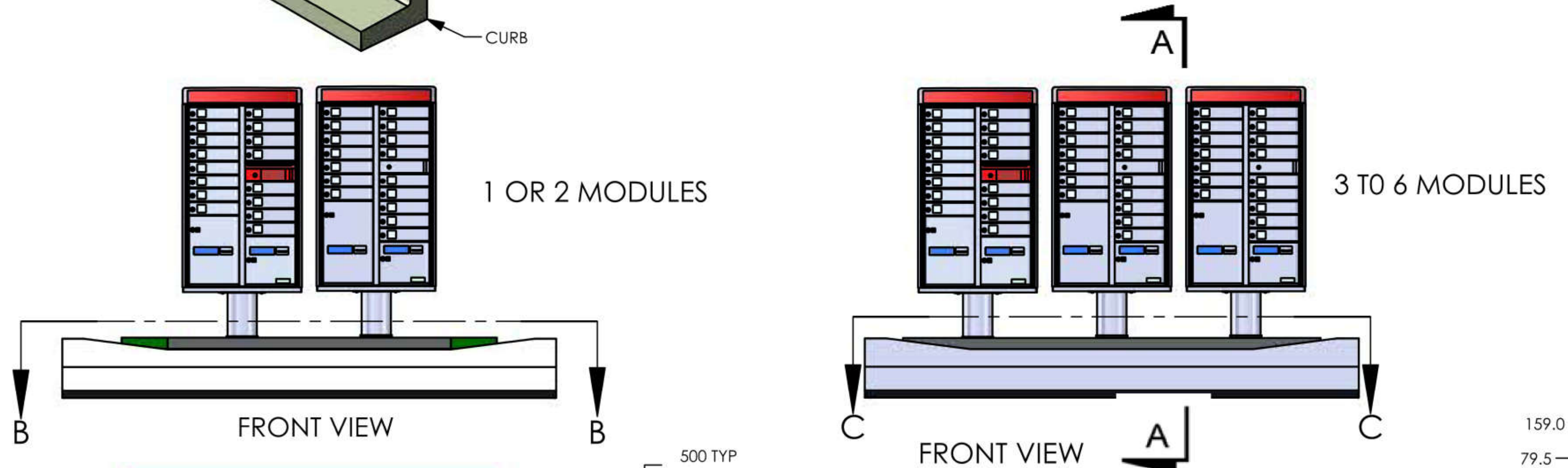
4 A101 ACCESSIBLE PARKING PAVEMENT MARKING (TYPICAL)

SCALE 1 : 50

5 A101 SIGNS (TYPICAL)

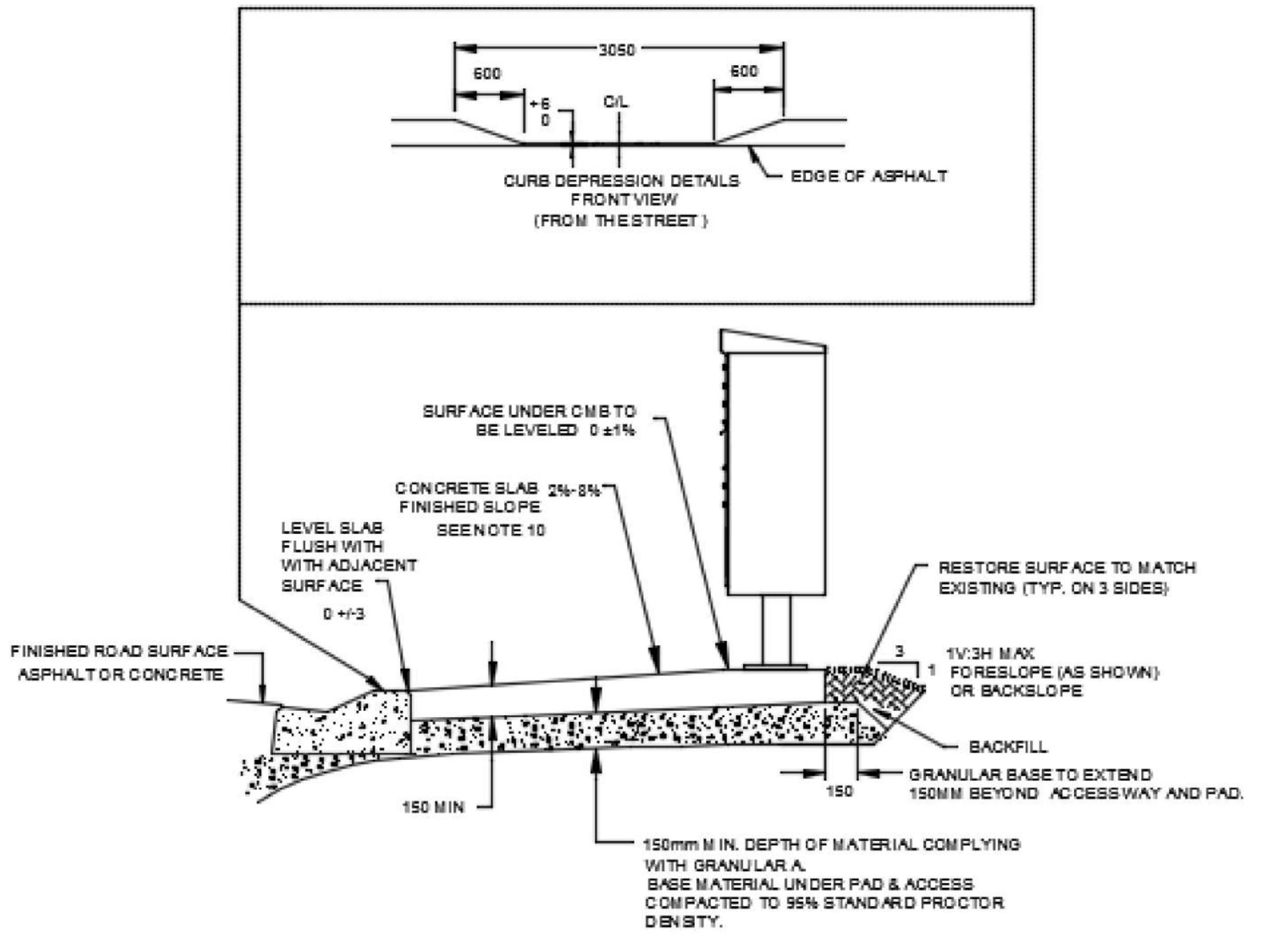
SCALE 1 : 50



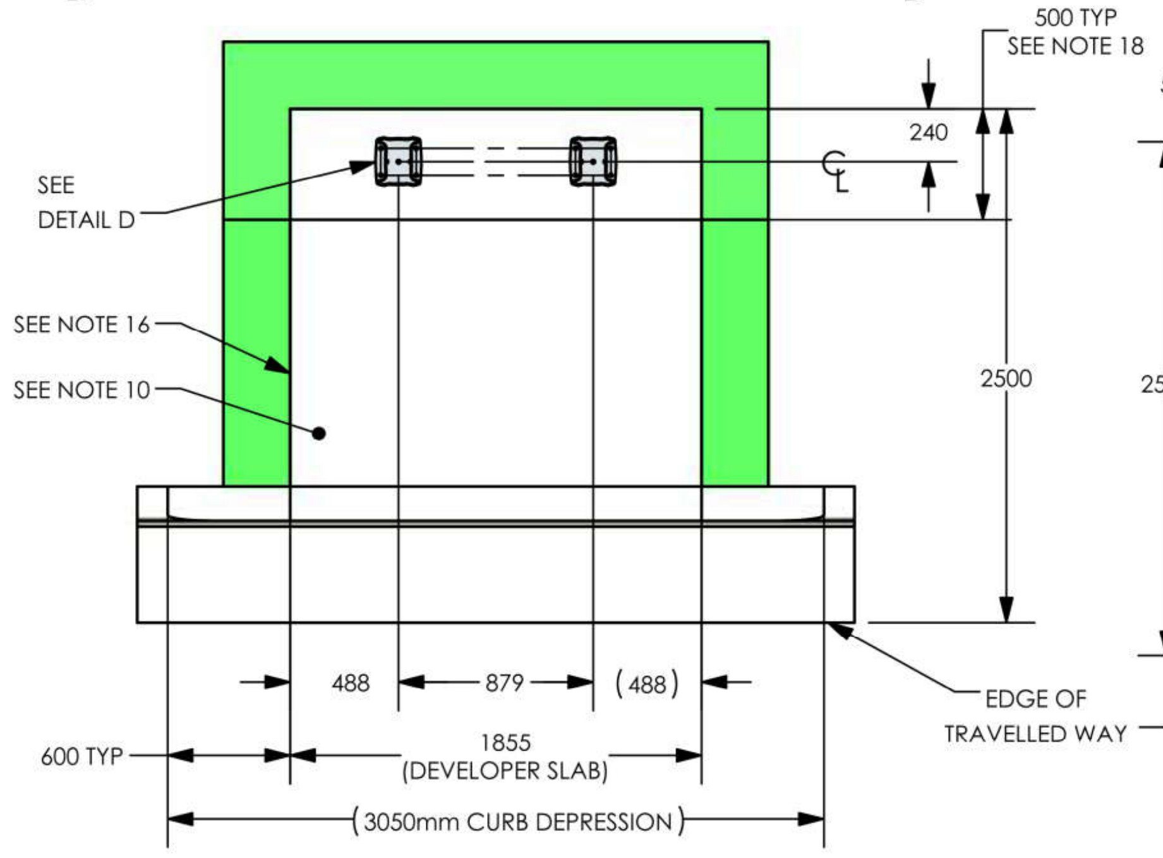


FRONT VIEW

FRONT VIEW



SECTION A-A



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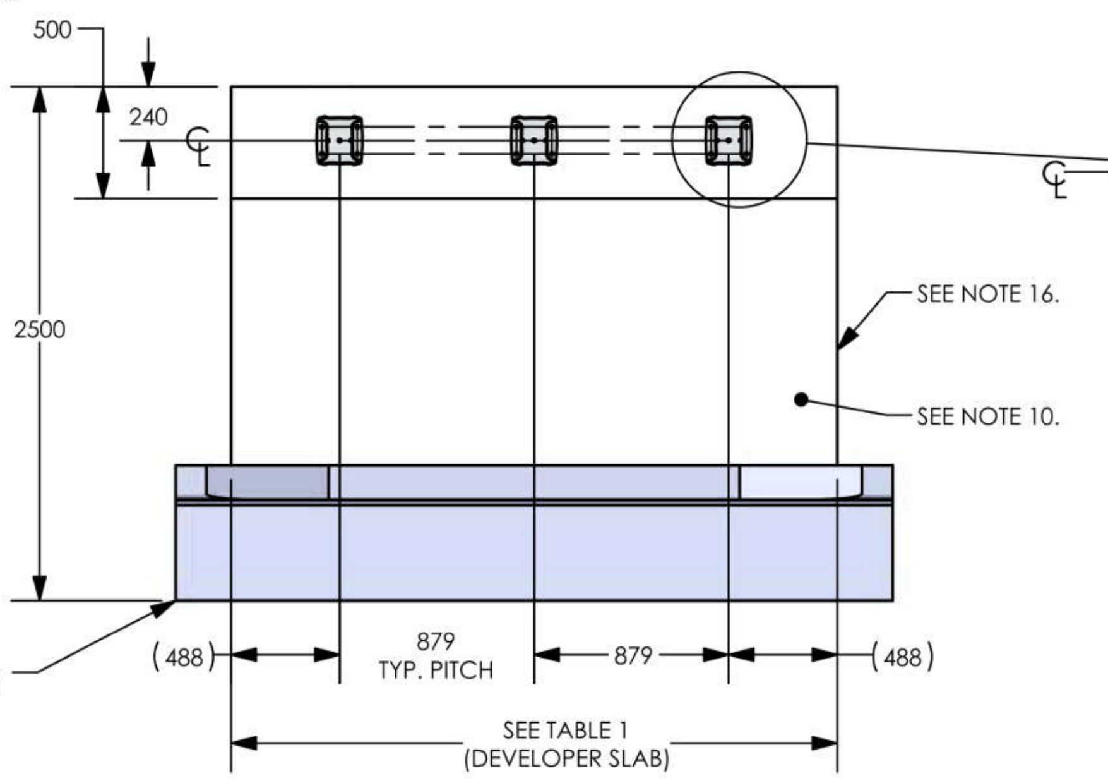
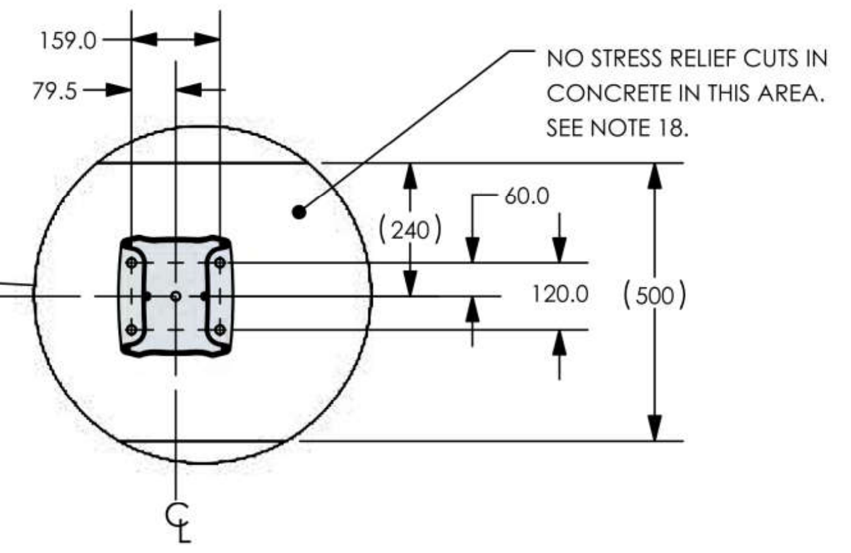


SECTION C-C



DETAIL D
5 HOLE BOLT PATTERN
TYPICAL

TABLE 1	
NUMBER OF MODULES	WIDTH OF SLAB
3	2734 MM
4	3613 MM
5	4492 MM
6	5371MM

NOTES:

1. 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.
2. THE CONTRACTOR SHALL REVIEW THE SITE CONDITIONS AND ASSUME RESPONSIBILITY FOR EXISTING SERVICES (WATER; POWER; SEWAGE; GAS ETC.) THAT EXIST AT THE SITE.
3. CONCRETE SLAB TO HAVE A MINIMUM THICKNESS OF 150 mm.
4. 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.
5. GRANULAR BASE SHALL BE PLACED ON SOIL CAPABLE OF SAFELY SUSTAINING A BEARING PRESSURE OF NOT LESS THAN 30 kPa.
6. CONCRETE CONSTRUCTION SHALL CONFORM TO CSA A23.1.
7. CONCRETE TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH CSA A23.1 AND CSA A23.2.
8. 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%
9. SURFACE OF SLAB TO BE SLOPED 2% to 8% MAX TO THE NEAREST PLUVIAL DRAIN.
10. TOP OF SLAB TO HAVE A TEXTURED BROOM FINISH TO CSA A23.1. EDGES OF SLAB TO HAVE A SMOOTH TOOLED FINISH.
11. 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.
12. APPLY PIGMENTED CURING COMPOUND TO SURFACE OR REBAR OF SLAB IN ACCORDANCE WITH ASTM C309 TYPE 2 (WHITE COLOUR), CLASS B (RESIN).
13. ALL SITE LOCATIONS REQUIRE CPC AND MUNICIPAL APPROVAL.
14. IF SITE CONDITIONS LIMIT PLACEMENT, CONTACT CPC FOR ASSISTANCE.
15. DIFFERENT LAYOUT, CONFIGURATIONS, AND QUANTITY OF BOXES PERMITTED WITH CPC ENGINEERING INPUT TO ENSURE ACCESSIBILITY AND EASE OF USE REQUIREMENTS HAVE BEEN CONSIDERED.
16. RESTORE SURFACES ADJACENT TO ALL 3 SIDES OF SLAB PERIMETER WITHIN 6mm AS TO AVOID TRIPPING HAZARDS.
17. PROVIDE A MINIMUM SETBACK DISTANCE OF 2000mm FROM ANY EDGE OF MAILBOX TO NEAREST EDGE OF TRAVELLED ROADWAY. THIS DISTANCE MAY NEED TO BE INCREASED IN THE EVENT OF HIGH VOLUME OR ARTERIAL ROADS TO ENSURE THE BOXES ARE OUTIDE OF THE CLEAR ZONE.
18. THERE ARE TO BE NO STRESS RELIEF CUTS IN CONCRETE IN AREA WHERE BOXES ARE TO BE BOLTED DOWN.

TOLERANCES

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MILLIMITERS.
SAUF SI SPÉCIFICATIONS CONTRAIRE DIMENSIONS SONT EN MILLIMÈTRES

DEC.		ANGLES
X	± 4	± 1°
X.X	± .5	
X.XX	± .30	

CONFORMS TO/
CONFORME À
CSA B78.2

REV RÉV	DATE	BY/PAR	CHKD/VÉR	
2	17-10-2022	KC	AH	
	UPDATED SLAB TABLE AND MODULE SPACING			
	DESCRIPTION			

CANADA POST
POSTES CANADA

ENGINEERING SERVICES / SERVICES D'INGÉNERIE		DATE DD-MM-YYYY JJ-MM-AAAA
CREATED BY CRÉÉ PAR	A. HORNER	07-10-2020
CHECKED BY VÉRIFIÉ PAR	T. POLICARPIO	17-12-2020
ENGINEERING AUTH. RESP. DU GÉNIE	T. MACGILLIVRAY	17-12-2020

PROJECT / PROJET: DEVELOPER PROVIDED CONCRETE PAD

CPC ID: **E20X-ENG-06**   REV / RÉV **2**

TITLE / TITRE:
DEVELOPER PROVIDED
CONCRETE PAD SPECIFICATION
ROAD FACING INSTALLATION

SCALE / ÉCHELLE: NTS   SHEET / FEUILLE 1 OF / DE 1

A3

NO.	DATE	ISSUANCE
NO.	DATE	ISSUANCE

PROPERTY LEGAL DESCRIPTION:
PART 1 & 2, BLOCK 60, PLAN 37M-57
IN THE TOWN OF WATERFORD, IN THE DISTRICT OF NORFOLK COUNTY

APPLICANT:
PRAMUKH DEVELOPMENTS LTD.
RONAK MEHTA & DARPAN PATEL
2324 WEST HAM RD.,
OAKVILLE, ONTARIO
L6M 4N6
1-416-871-0086 & 1-416 829-6620

CN
TN

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STAMP

STAMP

PROJECT TITLE:
LAM BLVD.
OLD HWY. 24 & LAM BLVD.,
WATERFORD ON, N0E 1Y0

DRAWING TITLE:
SITE PLAN DETAILS

CHECKED BY:	DRAWN BY:
LHR	BM
DRAWING SCALE: As indicated	DRAWING NO.: A101
PROJECT NO.: 21-059	

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1
P000
SOUTHWEST ISOMETRIC
SCALE

2
P000
SOUTHEAST ISOMETRIC
SCALE

3
P000
NORTHWEST ISOMETRIC
SCALE

4
P000
NORTHEAST ISOMETRIC
SCALE

PROJECT TITLE:
LAM BLVD. COMMERCIAL
LAM BLVD. & OLD HWY 24
WATERFORD, ONTARIO

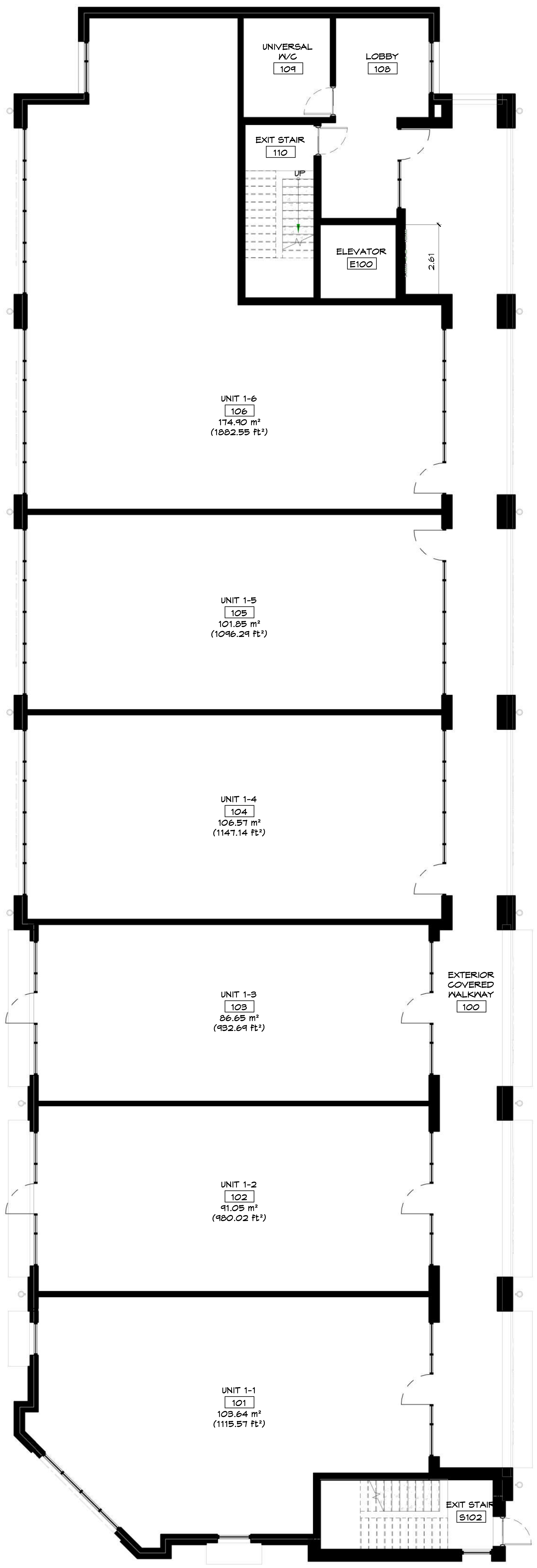
DRAWING TITLE:
PRESENTATION COVER PAGE

DRAWING SCALE:

DATE ISSUED:
2023.10.02

DRAWING NO.:
P000

PROJECT NO.:
21-059



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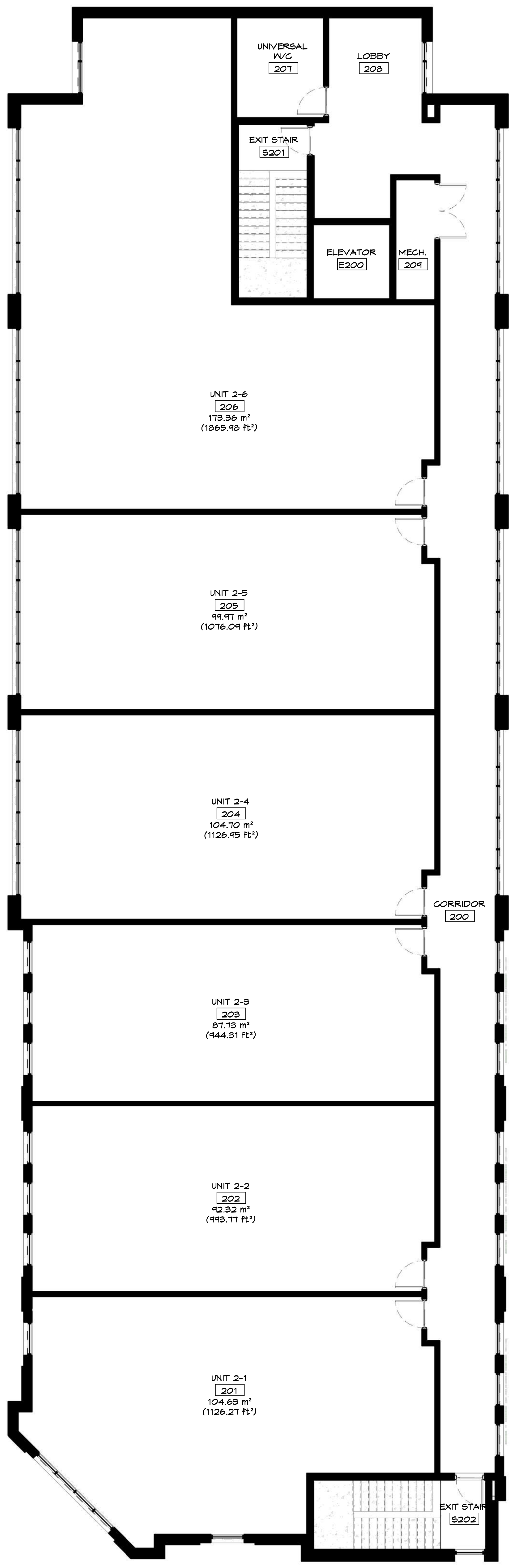
SCALE 1 : 100



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SCALE 1 : 100

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PROJECT TITLE:
LAM BLVD. COMMERCIAL
LAM BLVD. & OLD HWY 24
WATERFORD, ONTARIO

DRAWING TITLE:
PRESENTATION PLANS

DRAWING SCALE:
1 : 100

DATE ISSUED:
2023.10.02

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P201

PROJECT NO.:
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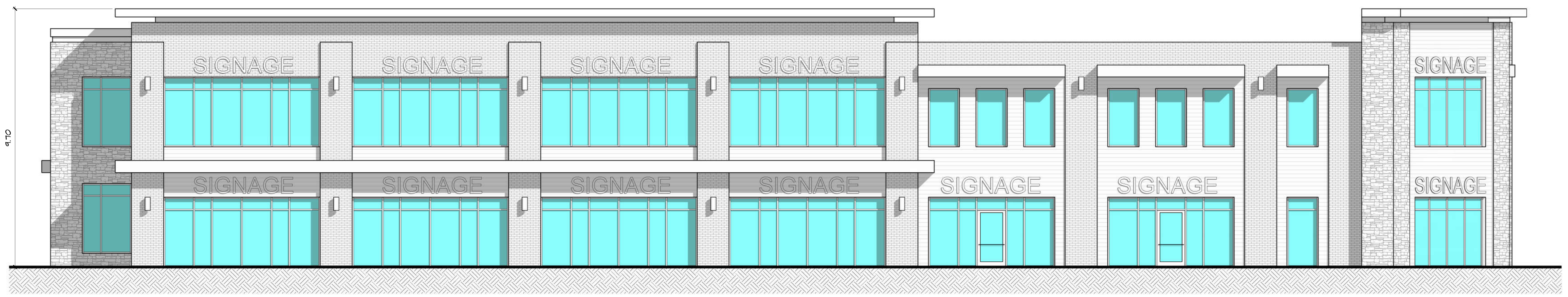

1 P301 WEST ELEVATION
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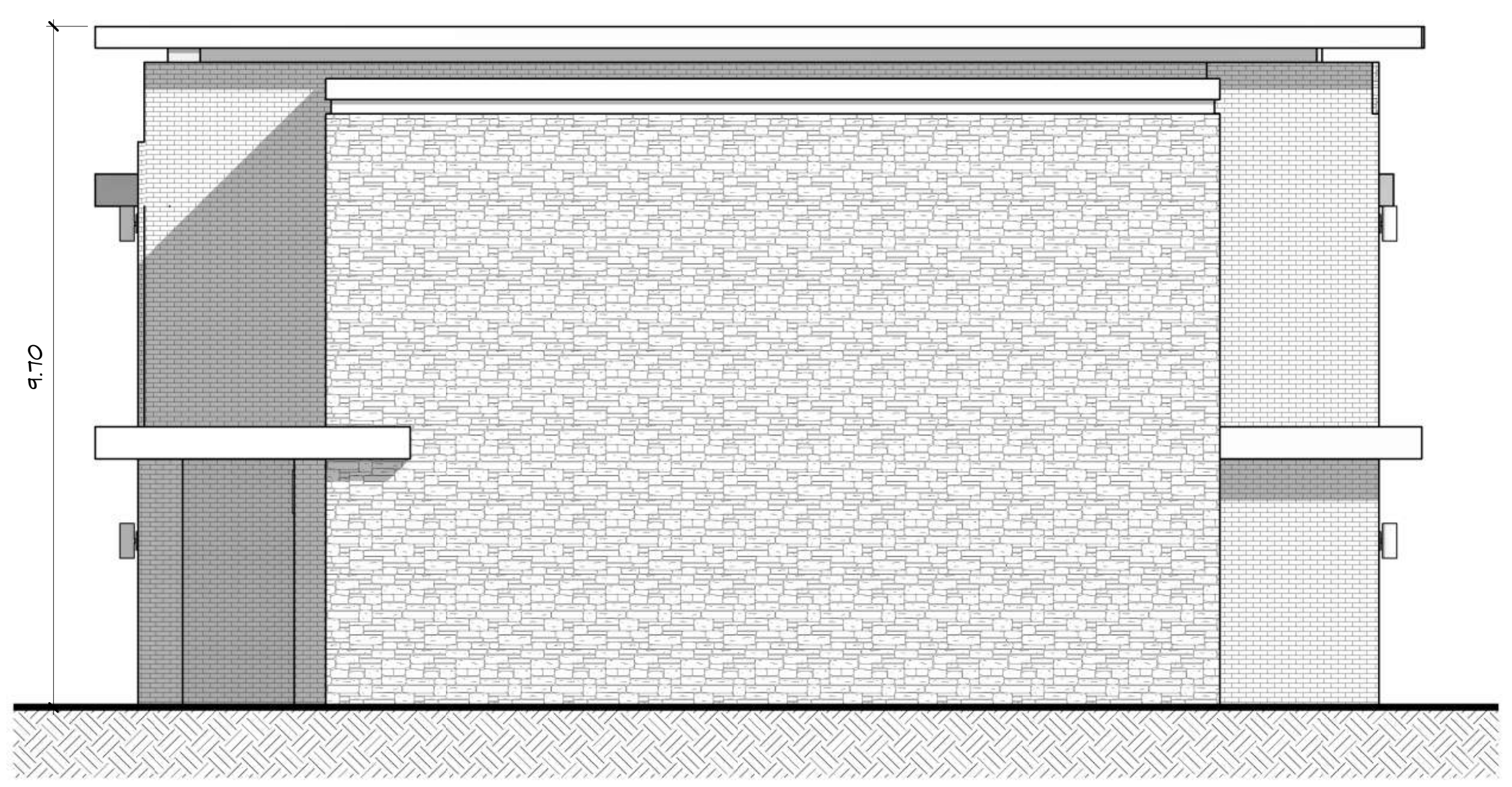

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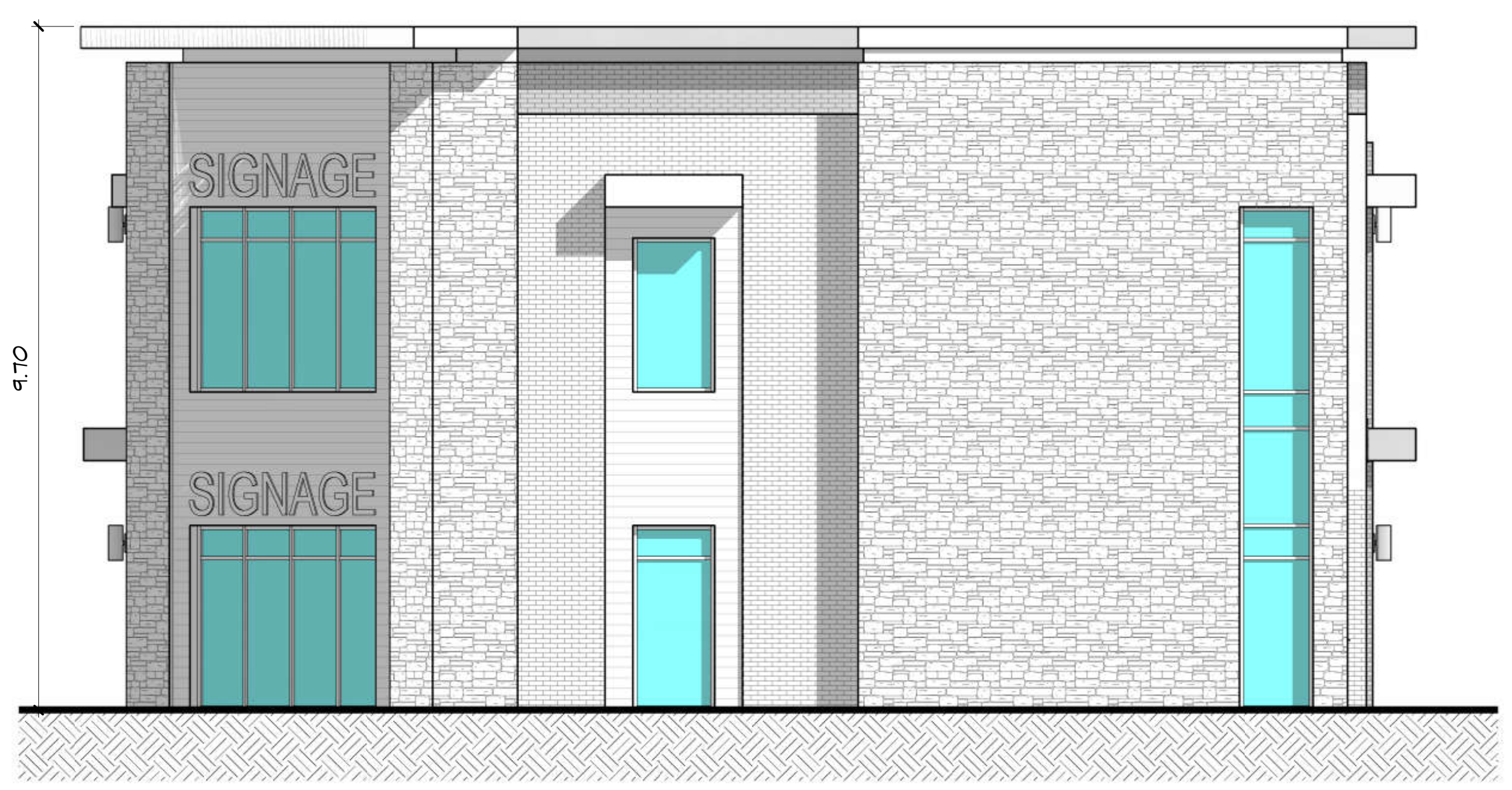
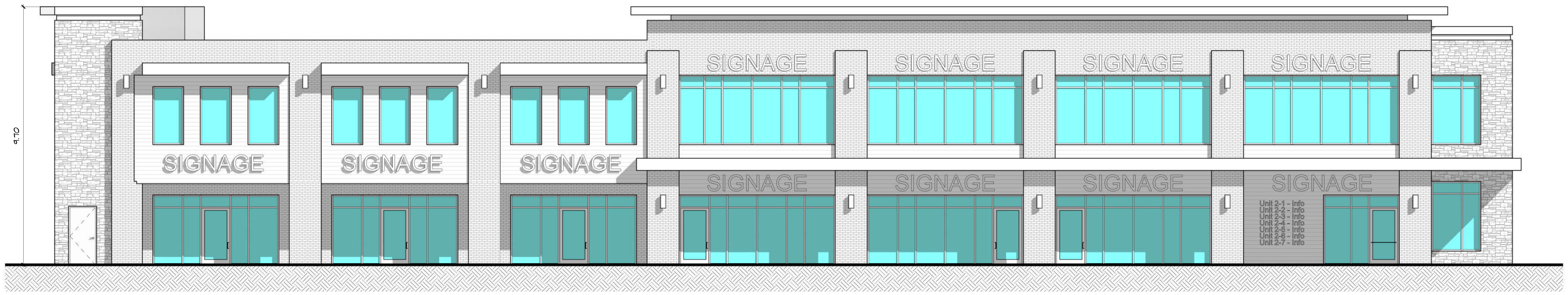


3 P301 SOUTH ELEVATION
SCALE 1 : 100



4 P301 EAST ELEVATION
SCALE 1 : 100

PROJECT TITLE:
LAM BLVD. COMMERCIAL
LAM BLVD. & OLD HWY 24
WATERFORD, ONTARIO

DRAWING TITLE:
PRESENTATION ELEVATIONS

DRAWING SCALE:
1 : 100

DATE ISSUED:
2023.10.02

DRAWING NO.:
P301

PROJECT NO.:
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1
P000
NORTHEAST ISOMETRIC
SCALE

2
P000
NORTHWEST ISOMETRIC
SCALE

3
P000
SOUTHEAST ISOMETRIC
SCALE

4
P000
SOUTHWEST ISOMETRIC
SCALE

PROJECT TITLE:
LAM BLVD.
TOWNHOUSES
WATERFORD, ONTARIO
N0E 1Y0

DRAWING TITLE:
PRESENTATION COVER PAGE

DRAWING SCALE:

DATE ISSUED:
2023.10.03

DRAWING NO.:
P000

PROJECT NO.:
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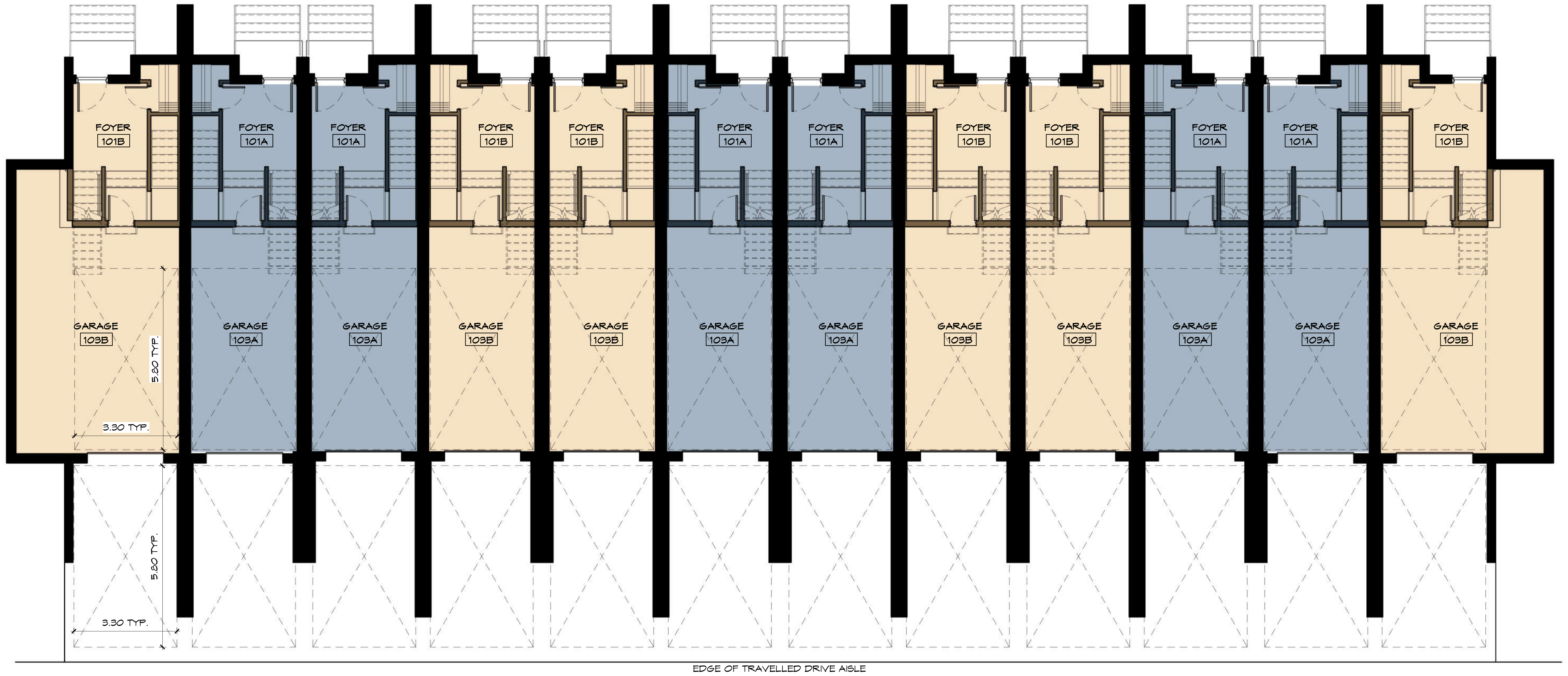
9 / P200 LEVEL 0 PRESENTATION
SCALE 1 : 100



1 / P200 LEVEL 1 PLAN PRESENTATION
SCALE 1 : 100

8 / P200 LEVEL 2 PLAN PRESENTATION
SCALE 1 : 100

PROJECT TITLE:
LAM BLVD.
TOWNHOUSES
WATERFORD, ONTARIO
N0E 1Y0

DRAWING TITLE:
PRESENTATION PLANS

DRAWING SCALE:
1 : 100

DATE ISSUED:
2023.10.03

DRAWING NO.:
P200

PROJECT NO.:
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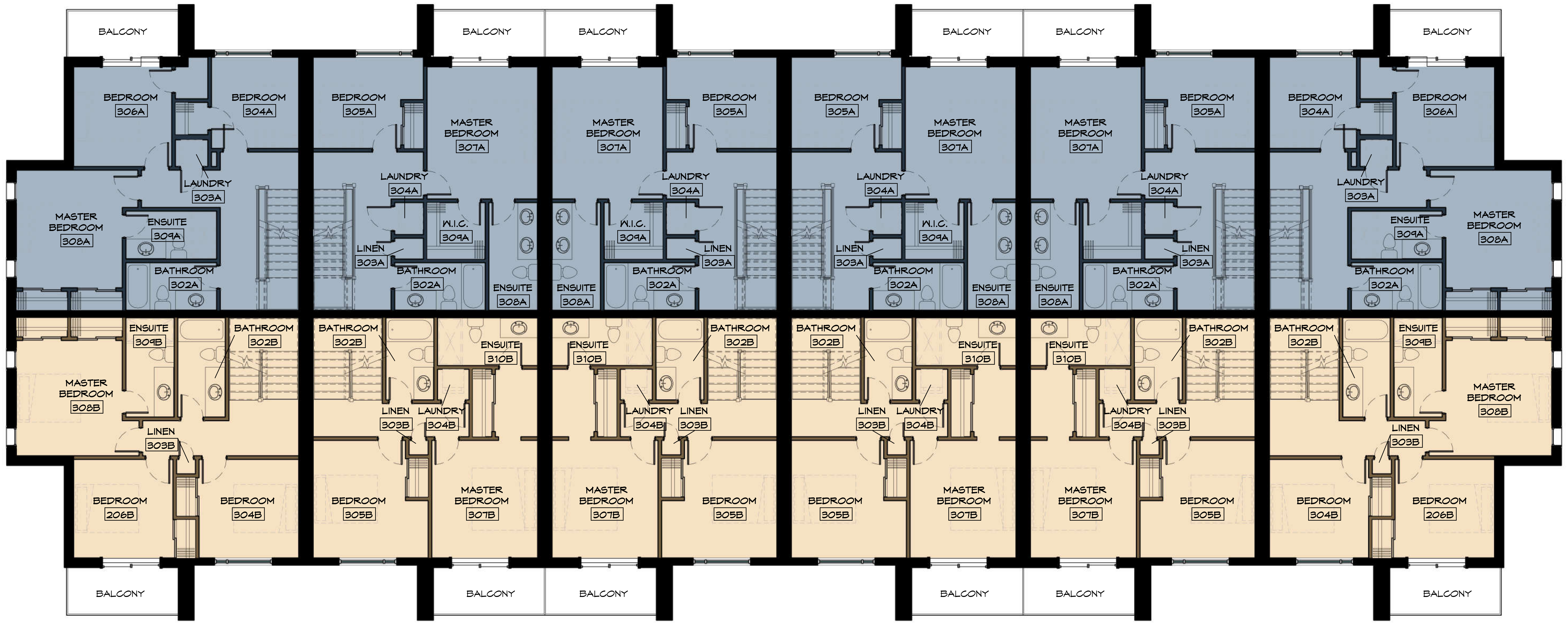
(519) 426-6270



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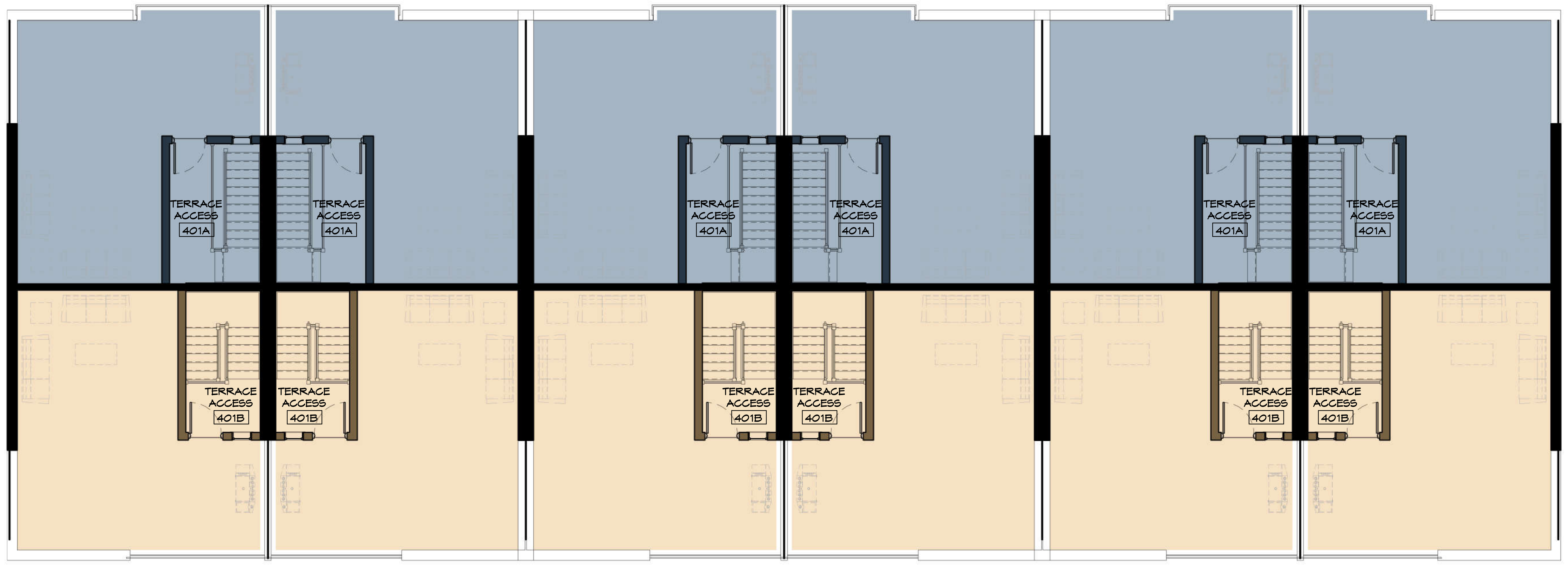

2 P201 ROOF TOP PLAN PRESENTATION
SCALE 1 : 100

PROJECT TITLE:
LAM BLVD.
TOWNHOUSES
WATERFORD, ONTARIO
N0E 1Y0

DRAWING TITLE:
PRESENTATION PLANS

DRAWING SCALE:
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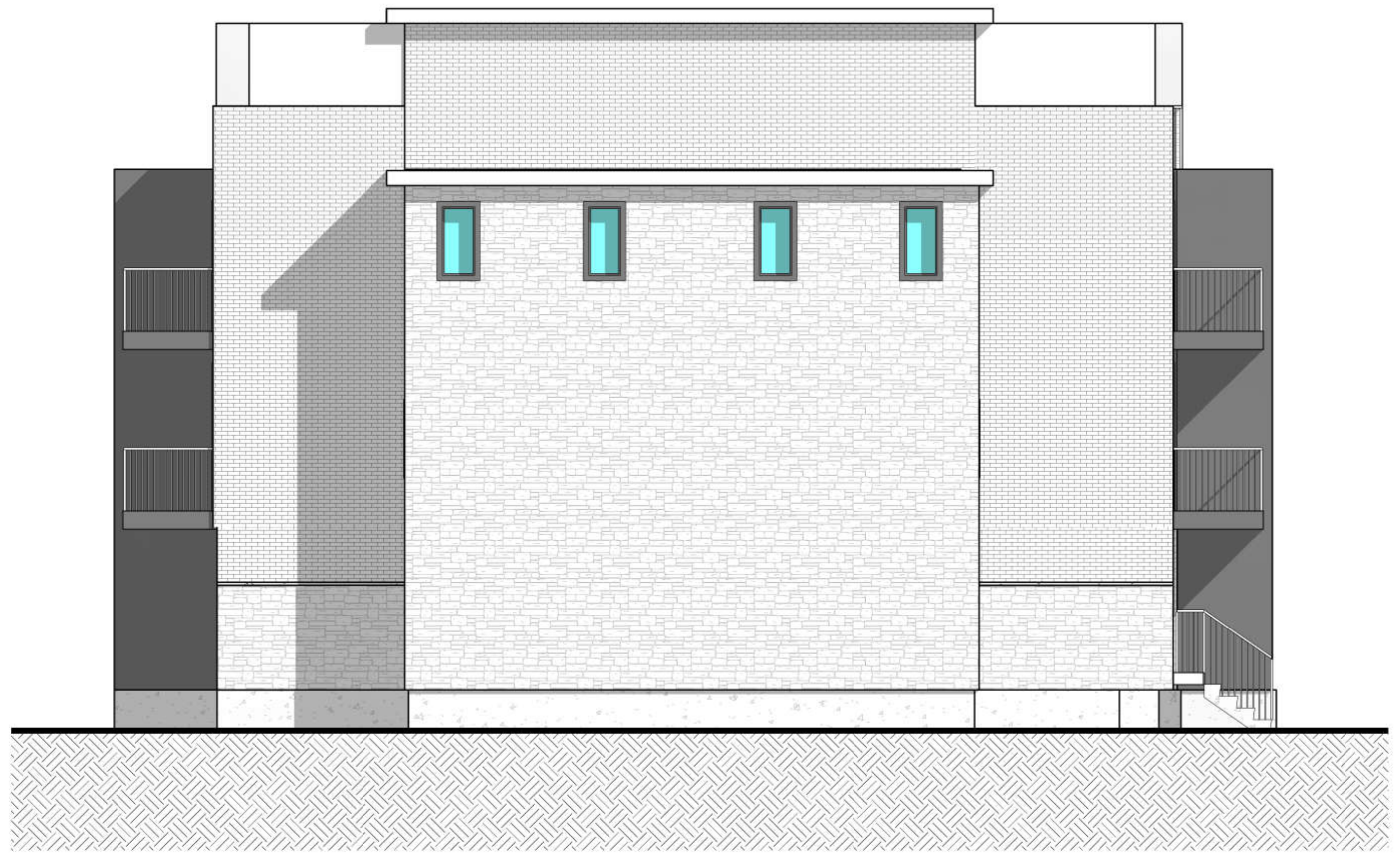
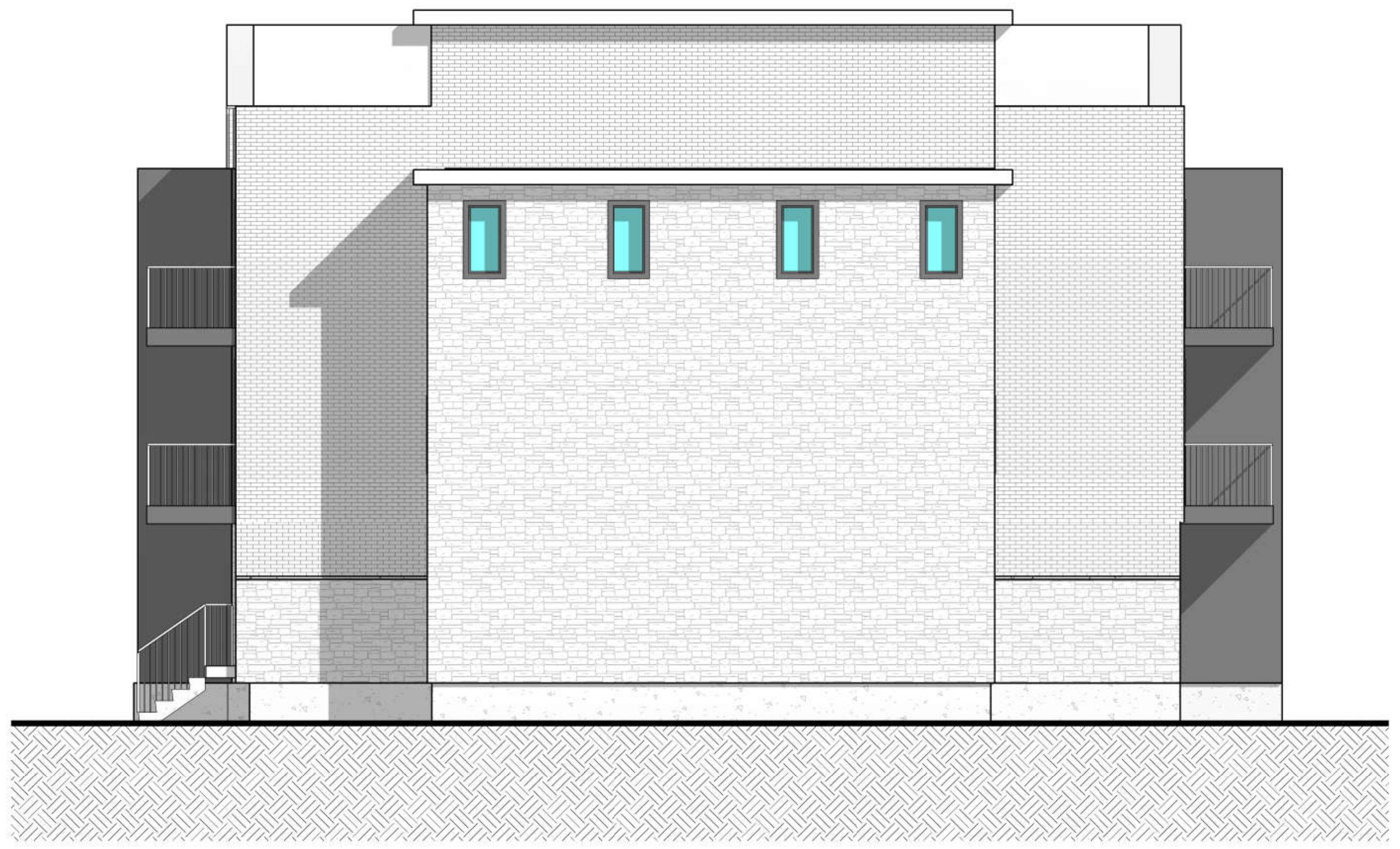
1 NORTH PRESENTATION ELEVATION
P301 SCALE 1 : 100



2 EAST PRESENTATION ELEVATION
P301 SCALE 1 : 100

3 SOUTH PRESENTATION ELEVATION
P301 SCALE 1 : 100



4 WEST PRESENTATION ELEVATION
P301 SCALE 1 : 100

PROJECT TITLE:
LAM BLVD.
TOWNHOUSES
WATERFORD, ONTARIO
N0E 1Y0

DRAWING TITLE:
PRESENTATION ELEVATIONS

DRAWING SCALE:
1 : 100

DATE ISSUED:
2023.10.03

DRAWING NO.:
P301

PROJECT NO.:
21-059

TYPICAL POLE MOUNTED LIGHT FIXTURE TYPE 'Px'

TYPICAL COMMERCIAL BUILDING WALL MOUNTED LIGHT FIXTURE TYPE 'X'

TYPICAL BUILDING DECORATIVE WALL MOUNTED LIGHT FIXTURE TYPE 'Wx'

LEGEND

THIS LEGEND REPRESENTS THE SYMBOLS COMMONLY USED. NOT ALL SYMBOLS MAY APPEAR ON THE DRAWINGS. SHOULD A SYMBOL BE FOUND ON THE DRAWING AND NOT APPEARING ON THE LEGEND, THE CONTRACTOR SHALL SUBMIT A QUESTION TO HAVE THE SYMBOL CLARIFIED IN AN ADDENDUM PRIOR TO SUBMITTING A BID.

ABBREVIATIONS

AE	APPROVED EQUAL
AFF	ABOVE FINISHED FLOOR
CB	CIRCUIT BREAKER
ER	EXISTING TO BE RELOCATED
EX	EXISTING TO REMAIN
JB	JUNCTION BOX
REL	RELOCATED ITEM IN NEW LOCATION
REM	EXISTING TO BE REMOVED IN IT'S ENTIRETY
UNO	UNLESS NOTED OTHERWISE

LIGHTING FIXTURES

●–☼	SINGLE POLE MOUNTED LIGHT FIXTURE
☼–●–☼	TWIN POLE MOUNTED LIGHT FIXTURES TYPES AS PER DRAWINGS
☼–●–☼ ☼	TRIPLE POLE MOUNTED LIGHT FIXTURE TYPES AND ORIENTATION AS PER DRAWINGS
☼ ☼–●–☼ ☼	QUAD POLE MOUNTED LIGHT FIXTURES REFER TO DRAWINGS FOR TYPES
☼ ☐	POST TOP MOUNTED AREA LIGHT FIXTURES. LETTER DENOTES TYPE.
⊢☼ ▯ ◗	WALL OR COLUMN MOUNTED LIGHTING FIXTURES. LETTER DENOTES TYPE.
B-1-2	LIGHTING CIRCUITING NOTE. B-PANELBOARD I.D., 1-BRANCH CIRCUIT, 2-LOCAL (SWITCH) CIRCUIT.

SITE STATISTICS - DRIVELANE AND PARKING SURFACE

AVERAGE	MINIMUM	MAXIMUM	MAX/AVG	AVG/MIN	MAX/MIN
1.15fc	0.1c	2.9fc	2.52	11.50	29.00

THE PHOTOMETRIC DATA USED AS INPUT FOR THESE CALCULATIONS IS BASED ON ESTABLISHED IES PROCEDURES AND PUBLISHED FIXTURE RATINGS. FIELD PERFORMANCE WILL DEPEND ON ACTUAL LAMP, BALLAST, ELECTRICAL AND SITE CHARACTERISTICS.

DRAWING LIST

EP001	GENERAL NOTES, DRAWING LIST, LEGEND AND FIXTURE SCHEDULE
EP100	ELECTRICAL SITE PLAN LAYOUT - PHOTOMETRIC CALCULATIONS

SITE LIGHTING FIXTURE SCHEDULE

1. THE LIGHTING FIXTURES, BALLASTS AND LAMPS FOR THIS PROJECT HAVE BEEN SPECIFIED TO ENSURE THAT SPECIFIC AESTHETIC AND PERFORMANCE REQUIREMENTS WILL BE SATISFIED.
2. THE SPECIFIED LIGHTING FIXTURES ARE IDA APPROVED DARK-SKY FRIENDLY FIXTURES AND CONSISTENT WITH LEED GOALS & GREEN GLOBES CRITERIA FOR LIGHT POLLUTION REDUCTION. DIRECT GLARE WILL NOT BE OBSERVABLE (OUTSIDE THE ORIGINATING PROPERTY LIMITS) AT AN ANGLE GREATER THAN 85° FROM NADIR OF THE VERTICAL AXIS OF THE LIGHT SOURCE.
3. ALL ALTERNATE FIXTURES TO THE PROPOSED FIXTURES SHALL HAVE IES FILES FOR FIXTURES FROM A REPUTABLE LAB WITH IES LAB CERTIFICATION. SHOULD A PROPOSED FIXTURE PERFORMANCE FAIL TO MEET THE MINIMUM REQUIREMENTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ANY ADDITIONAL EQUIPMENT TO BRING THE LIGHTING LEVELS UP TO THE REQUIRED VALUES.
4. INSTALLATION OF LIGHT FIXTURES SHALL BE ACCORDING TO MANUFACTURER'S RECOMMENDATION AND ACCORDING TO CODE REQUIREMENTS.
5. POLES LISTED BELOW ARE BASED ON STRESSCRETE DECORATIVE DIRECT BURIED POLES (THE TRADITIONAL - NON-FLUTED) FOR EXAMPLE PURPOSES. POLES SHALL BE SUBMITTED FOR ENGINEERS REVIEW C/W ENGINEERS STAMP. ALL POLES SHALL BE MOUNTED ON CONCRETE BASES AS NOTED IN SCHEDULE BELOW.

TYPE	DESCRIPTION	LAMP/ WATTAGE	VOLTAGE
P3	SINGLE, POLE MOUNTED, FULL CUT-OFF, LED AREA LIGHT, TYPE III SPILL LIGHT CONTROL OPTICS C/W INTERNAL HOUSE SIDE SHIELD. 0-10V ELECTRONIC DIMMING DRIVER, WIRED FOR 120V AND SUITABLE FOR -40°C TO 40°C ENVIRONMENTS. FIXTURE TO BE MOUNTED ON 20'-0", 4" SQUARE STEEL POLE C/W 3'-0" HIGH (24"Ø) CONCRETE BASE (ARTFORM) FOR A TOTAL MOUNTING HEIGHT OF 23'-0" (7.0m) A.F.G. MINIMUM POLE EPA TO BE 5.0. FINISH SELECTED BY ARCHITECT. FIXTURE B.U.G. RATING TO BE B1-U0-G2 OR BETTER. FIXTURE TO BE SUPPLIED C/W FIXTURE MOUNTED PHOTOCELL. BASE OF DESIGN; COOPER LIGHTING McGRAW-EDISON CAT. No.: GALN-SA1C-730-U-SL3-xx-HSS-AHD145-PR7-OA-RA1016-LS/GRSxx OR APPROVED EQUAL	6,000 NOMINAL LUMEN OUTPUT 57W INPUT 3000K	TBC (120V)
P4	SINGLE, POLE MOUNTED, FULL CUT-OFF, LED AREA LIGHT, TYPE IV SPILL LIGHT CONTROL OPTICS C/W INTERNAL HOUSE SIDE SHIELD. 0-10V ELECTRONIC DIMMING DRIVER, WIRED FOR 120V AND SUITABLE FOR -40°C TO 40°C ENVIRONMENTS. FIXTURE TO BE MOUNTED ON 20'-0", 4" SQUARE STEEL POLE C/W 3'-0" HIGH (24"Ø) CONCRETE BASE (ARTFORM) FOR A TOTAL MOUNTING HEIGHT OF 23'-0" (7.0m) A.F.G. MINIMUM POLE EPA TO BE 5.0. FINISH SELECTED BY ARCHITECT. FIXTURE B.U.G. RATING TO BE B1-U0-G2 OR BETTER. FIXTURE TO BE SUPPLIED C/W FIXTURE MOUNTED PHOTOCELL. BASE OF DESIGN; COOPER LIGHTING McGRAW-EDISON CAT. No.: GALN-SA1C-730-U-SL4-xx-HSS-AHD145-PR7-OA-RA1016-LS/GRSxx OR APPROVED EQUAL	6,000 NOMINAL LUMEN OUTPUT 57W INPUT 3000K	TBC (120V)
W3A	EXTERIOR WALL MOUNTED DECORATIVE LED FIXTURE WITH TYPE III DISTRIBUTION. EXTRUDED ALUMINIUM ALLOY HOUSING. ELECTRONIC DRIVER, B1-U0-G1 (B.U.G. RATING). SUITABLE FOR -30°C TO 40°C ENVIRONMENTS. FINISH OF FIXTURE TO BE SELECTED BY ARCHITECT. MOUNTING HEIGHT AS INDICATED ON PLANS LUMENPULSE NANO CAT. NO.: BLDN-WM-120-FSL-XS25-30K-CRI80-3 OR APPROVED EQUAL	2,000 NOMINAL LUMEN OUTPUT 30W INPUT 3000K	TBC (120V)
W3B	EXTERIOR WALL MOUNTED DECORATIVE LED FIXTURE WITH TYPE III DISTRIBUTION. EXTRUDED ALUMINIUM ALLOY HOUSING. ELECTRONIC DRIVER, B1-U0-G1 (B.U.G. RATING). SUITABLE FOR -30°C TO 40°C ENVIRONMENTS. FINISH OF FIXTURE TO BE SELECTED BY ARCHITECT. MOUNTING HEIGHT AS INDICATED ON PLANS LUMENPULSE NANO CAT. NO.: BLDN -WM-120-FSL-XS15-30K-CRI80-3 OR APPROVED EQUAL	1,000 NOMINAL LUMEN OUTPUT 17W INPUT 3000K	TBC (120V)
W3D	EXTERIOR WALL MOUNTED DECORATIVE LED FIXTURE WITH TYPE III DISTRIBUTION. EXTRUDED ALUMINIUM ALLOY HOUSING. ELECTRONIC DRIVER, B1-U0-G1 (B.U.G. RATING). SUITABLE FOR -30°C TO 40°C ENVIRONMENTS. FINISH OF FIXTURE TO BE SELECTED BY ARCHITECT. MOUNTING HEIGHT AS INDICATED ON PLANS LUMENPULSE NANO CAT. NO.: BLDN -WM-120-FSL-XS15-30K-CRI80-3 OR APPROVED EQUAL	700 NOMINAL LUMEN OUTPUT 11W INPUT 3000K	TBC (120V)
X	EXTERIOR WALL MOUNTED, FULL CUT-OFF FIXTURE, DIE-CAST ALUMINIUM CONSTRUCTION, MOUNTED AT HEIGHT AS INDICATED ON PLANS, 3000K. FINISH OF FIXTURE TO BE SELECTED BY ARCHITECT. COOPER LUMARK CAT. NO.: XTOR1B-Y-xx-PC1 OR APPROVED EQUAL	12W INPUT 1200 NOMINAL LUMEN OUTPUT	120V

FULL CUTOFF PERFORMANCE - FULL CUTOFF PERFORMANCE MEANS A LUMINAIRE DISTRIBUTION WHERE ZERO CANDELA INTENSITY OCCURS AT AN ANGLE AT OR ABOVE 90° ABOVE NADIR. ADDITIONALLY, THE CANDELA PER 1000 LAMP LUMENS DOES NOT NUMERICALLY EXCEED 10% (100 LUMENS) AT A VERTICAL ANGLE OF 80° ABOVE NADIR. THIS APPLIES TO ALL LATERAL ANGLES AROUND THE LUMINAIRE.

CUTOFF PERFORMANCE - CUTOFF PERFORMANCE MEANS A LUMINAIRE DISTRIBUTION WHERE THE CANDELA PER 1000 LAMP LUMENS DOES NOT NUMERICALLY EXCEED 2.5% (25 LUMENS) AT AN ANGLE ABOVE 90° ABOVE NADIR, AND 10% (100 LUMENS) AT A VERTICAL ANGLE 80° ABOVE NADIR. THIS APPLIES TO ALL LATERAL ANGLES AROUND THE LUMINAIRE.

Notes:

No.	Revision	Date	By
1	ISSUED FOR SPA	2023.09.11	K.S.

Electrical Engineering
12 Argyle Street N., Caledonia, ON, N3W 1B6
www.sei-ee.com

Seal

K. SEGUIN
Sept 11/23

Project
G. DOUGLAS VALLEE LTD.

LAM BLVD.
OLD HWY. 24 & LAM BLVD.

WATERFORD, ON N0E 1Y0

Title
ELECTRICAL GENERAL NOTES
LEGENDS AND SCHEDULES

Drawn By:	Designed By:	Approved By:	Date:
J.R.	J.R.	K.S.	AUGUST 2023

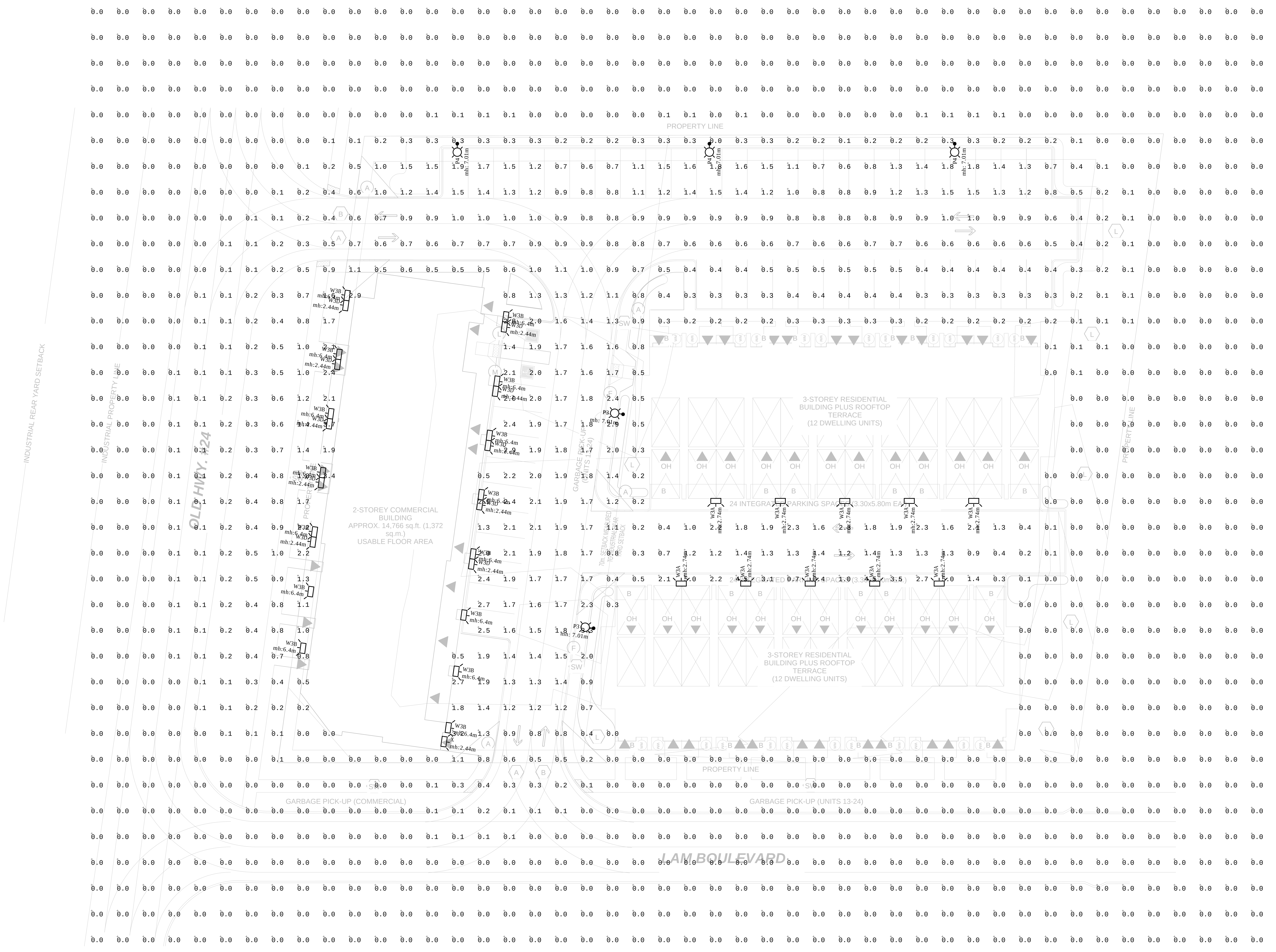
Project No.	Scale
23-130	AS NOTED

Drawing No.	Sheet	Revision
EP001		1

ORIGINAL SHEET - ARCH D

File: P:\2023\23-130 Lam Blvd Photometrics Pramukh Developments\E\23-130 Lam Blvd - elec SPA.dwg
September 11, 2023 - 01:08pm Plotted by: jrudy

Notes:



1 EP100 **ELECTRICAL SITE PLAN - PHOTOMETRIC DRAWING**

SCALE: 1:250

No.	Revision	Date	By
1	ISSUED FOR SPA	2023.09.11	K.S.

Electrical Engineering
12 Argyle Street N., Caledonia, ON, N3W 1B6
www.sei-ee.com

Seal

K. SEGUIN

Project

G. DOUGLAS VALLEE LTD.

LAM BLVD.
OLD HWY. 24 & LAM BLVD.

WATERFORD, ON N0E 1Y0

Title

ELECTRICAL SITE PLAN
PHOTOMETRIC CALCULATIONS

Drawn By:	Designed By:	Approved By:	Date:
J.R.	J.R.	K.S.	AUGUST 2023

Project No.: 23-130

Scale: AS NOTED

Drawing No.: EP100

Sheet:

Revision: 1

ORIGINAL SHEET - ARCH D

File: P:\2023\23-130 Lam Blvd Photometrics Pramukh Developments\E\23-130 Lam Blvd - elec SPA.dwg
September 11, 2023 - 01:08pm Plotted by: jrudy

vallee
Consulting Engineers,
Architects & Planners

September 22, 2023

Ronak Mehta & Darpan Patel
Pramukh Developments Ltd.
2324 West Ham Rd
Oakville, ON, L6M 4N6

Attention: **Ronak Mehta & Darpan Patel**

Reference: **Conceptual Functional Servicing Report**
Lam Boulevard Development (OPNPL2022043 / ZNPL2022053)
Waterford, Norfolk County
Project No. 21-059

Introduction

G. Douglas Vallee Ltd (Vallee) has been retained by Pramukh Development Ltd. to prepare a Functional Servicing report for submission to Norfolk County. This report has been prepared in support of the site plan approval application required for the construction of a 24-unit townhouse development and a 6-unit, 2-storey commercial building. This report presents the functional servicing for the proposed development, including sanitary servicing, storm servicing and domestic and fire water servicing.

Background

The proposed 0.70 ha development site is situated northeast corner of Old Highway 24 and Lam Boulevard in Waterford, Norfolk County. The subject lands are bound by an existing subdivision to the east and commercial land to the north, as shown in Figure 1.

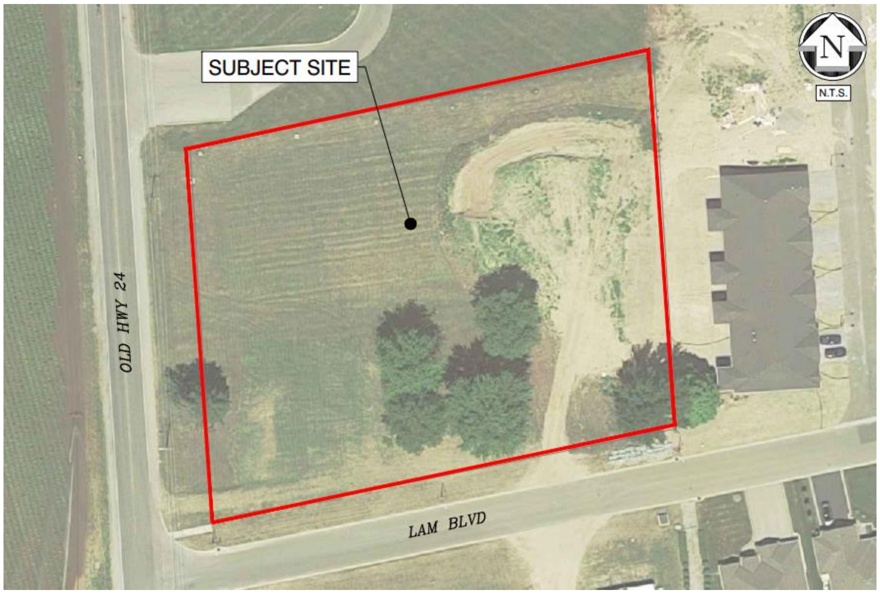


Figure 1 - Site Location

The development site currently features open grassed area and is zoned as “Hamlet Service Commercial CS(H)”. The proposed residential development shall consist of the following construction:

- Block 1: 6 – 2-storey commercial units;
- Block 2 and Block 3: 24 – 3-storey stacked residential dwelling units;
- Storm and sanitary infrastructure to support proposed construction;
- Underground stormwater management facility;
- Curbs, sidewalks, swales and other miscellaneous items to support proposed construction.

Sanitary Servicing

Record drawings from Vallee Project No. 10-034 – Yin Subdivision Phase 5 indicate a 200mm diameter PVC gravity sanitary sewer along Lam Boulevard and Old Highway 24. It is proposed that sanitary flows from the proposed development will discharge to this existing sanitary sewer along Lam Boulevard via an internal sanitary sewer system.

Sanitary design flows were calculated using the Norfolk County Design Criteria. Table 1 presents the total sanitary design flow from the proposed development. In summary, the proposed development is anticipated to generate a total additional sanitary flow of approximately 1.95 L/s to the existing sanitary sewer along Lam Boulevard. Refer to the sanitary design sheet on Drawing SAN – Sanitary Drainage Areas.

Table 1
Sanitary Design Flow Information

	Block 1 Commercial	**Block 2 & 3 Residential**
Total Number of Units	N/A	24
Population Density	90 persons/ha	2.75 persons/unit
Population	18	66
Per Capita Flow	40000 L/ha/day	450 L/persons/day
Peak Extraneous Flow	0.28 L/s/ha	
Development Area	0.20 ha	
Infiltration Flow	0.20 L/s	
Sewage Flow	1.76 L/s	
Peak Flow Factor	4.02	
Peak Design Flow	1.95 L/s	

As part of the Yin Subdivision Phase 5 project (Vallee Project No. 10-034), a sanitary drainage area plan and sanitary design sheet were created for the sanitary sewer system which discharges to the sanitary main along Lam Boulevard and Old Highway 24, as shown in Appendix A. The sanitary design sheet has been updated to reflect the proposed 24-unit townhouses and the 6-unit commercial building, as shown on the revised sanitary design sheet in Appendix A. Based on the calculations completed, it can be concluded that the existing sanitary sewer along Lam Boulevard and Old Highway 24 has adequate capacity to support the proposed development.

Vallee has reviewed the invert elevations of the existing sanitary sewer and has confirmed that it has sufficient depth to service the proposed development. To confirm the calculations presented, Vallee has requested 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.

Stormwater Management

Under pre-development conditions, the subject property is vacant land which features an open grassed area. Stormwater runoff from the subject property drains uncontrolled, overland in a northwesterly direction towards Old Hwy 24. As part of the Yin's Subdivision - Phase 5 project (Vallee Project No. 10-034), a peak flow allowance of 0.015 m^3/s was allocated for the subject site as part of the storm sewer design along Old Highway 24. The overall stormwater management strategy is to utilize site grading and a storm sewer system to convey flows to the underground storage facility, which will ultimately release runoff to the existing municipal 600mm diameter storm sewer along Old Highway 24.

The proposed SWM facility will be located at the northwest corner of the development and will have two primary functions:

1. Reduce or control the post-development peak flow rates from the site to less than or equal to the allowable release rate of 0.015 m^3/s, for all storm events up to and including the 100-year storm event.
2. Treat stormwater to a Normal Protection Level as defined in the Ministry of the Environment's *Stormwater Management Practices Planning and Design Manual* (March 2003).

The following summarizes the proposed SWM Facility:

- The underground storage chamber facility uses 60 StormTech MC-3500 chambers and has a total storage volume of 336 m^3.
- Discharge from the chamber facility is controlled by an 85mm orifice at an elevation of 241.80m.
- During events greater than the 100-year storm, runoff from the site will surcharge the SWM facility, and flow overland towards Old Highway 24 as it does under pre-development conditions.
- The proposed StormTech Isolator PLUS Row shall be utilized to achieve an enhanced level of water quality protection, corresponding to 80% TSS removal.

Complete details of the stormwater management design are provided in the Lam Boulevard Development Stormwater Management Report dated September 22, 2023.

Water Servicing

As-constructed drawings and the Norfolk County ISMP indicate there is an existing 200mm diameter watermain along Lam Boulevard. It is proposed to use the existing 200mm watermain along Lam Boulevard to service the proposed development. 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:

Block 1: Commercial:

- Floor Area 0.22 ha
- Population: 90 people/ha (20 people)
- Average Daily Water Demand (per person) 0.450 m^3/person/day
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand (Commercial): 18.23 m^3/day (0.21 L/s)
- Peak Hourly Demand Factor (Commercial): 2.0
- Peak Hourly Demand (Commercial): 0.68 m^3/hour (0.19 L/s)

Block 2 & 3: Residential

- Total Number of Units: 24
- Population Density: 2.75 persons per unit
- Population: 66 people
- Average Daily Water Demand (per person) 0.450 m^3/person/day
- Average Daily Water Demand: 49.5 m^3/day (0.57 L/s)
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand: 66.83 m^3/day (0.77 L/s)
- Peak Hourly Demand Factor (Residential) 4.00
- Peak Hourly Demand 4.95 m^3/hour (1.38 L/s)

In summary, the proposed development is anticipated to have a total maximum daily demand of 0.98 L/s and a maximum hourly demand of 1.56 L/s. Refer to Appendix B for detailed calculations.

Fire Water Service

According to the County GIS online mapping, there are three existing fire hydrants located in proximity to the subject development site. The first hydrant is located on the west side of Old Highway 24, at the northwest corner of the property, the second is located on the west side of Old Highway 24 at the intersection of Old Highway 24 and Lam Boulevard, and the third is located on the north side of Lam Boulevard at the southeast corner of the property. An additional hydrant has been added to the proposed development.

Typically, available fire flow during the maximum day demand is the critical criterion 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 – 2020 (FUS) method. Using the FUS recommendations, the minimum required fire flow was determined to be 133 L/s, respectively. Supporting calculations are detailed in Appendix B.

The Norfolk County ISMP estimates that the available fire flow in the existing watermain on Lam Boulevard ranges from 83 L/s to 159 L/s, as displayed in Appendix B. The required flow calculated using the FUS method falls within this range. It should be noted that the ISMP modelling was from 2015, consequently, Vallee has requested that Norfolk County review their current model and provide more current available demands to confirm that the supply is adequate and provide fire flow estimations at all three of the fire hydrants surrounding the subject site.

Conclusions and Recommendations

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

- The proposed development will be serviced by an internal sanitary sewer system that connects to the existing 200mm sanitary sewer along Lam Boulevard.
- A peak sanitary design flow of approximately 1.95 L/s is anticipated from the proposed development.
- An analysis of the existing sanitary sewer network on Lam Boulevard and Old Highway 24 indicates that there is sufficient capacity to support the sanitary flows from the proposed development. However, modelling from Norfolk County’s consultant has been requested to determine the impact of the proposed additional sanitary flows further downstream.
- The proposed underground stormwater storage chamber facility uses 60 StormTech MC-3500 chambers and has a total storage volume of 336 m^3.
- Discharge from the chamber facility is controlled by an 85mm orifice at an elevation of 241.80m.
- During events greater than the 100-year storm, runoff from the site will surcharge the SWM facility, and flow overland towards Old Highway 24 as it does under pre-development conditions.
- Under all storm events, peak flows associated with the post-development site are controlled to less than or equal to the allowable peak flow rate determined as part of the Yin Subdivision Phase 5 - Vallee Project 10-034.
- The proposed StormTech Isolator PLUS Row shall be utilized to achieve an enhanced level of water quality protection, corresponding to 80% TSS removal.
- The existing 200mm watermain on Lam Boulevard shall serve as the water supply for the proposed development.
- The domestic maximum day demand and peak hourly demand were found to be 0.98 L/s and 1.56 L/s, respectively.
- The required fire flow demand for the proposed development was found to be 133 L/s in accordance with the FUS 2020, which is within the estimated range of available fire flow (83 L/s to 159 L/s). Actual flows at each of the hydrants noted is to be provided through modelling by the county’s consultants.
- Vallee requests that an analysis of the hydraulic modelling 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.

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

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

2023-09-22
J. T. IEZZI
100189485

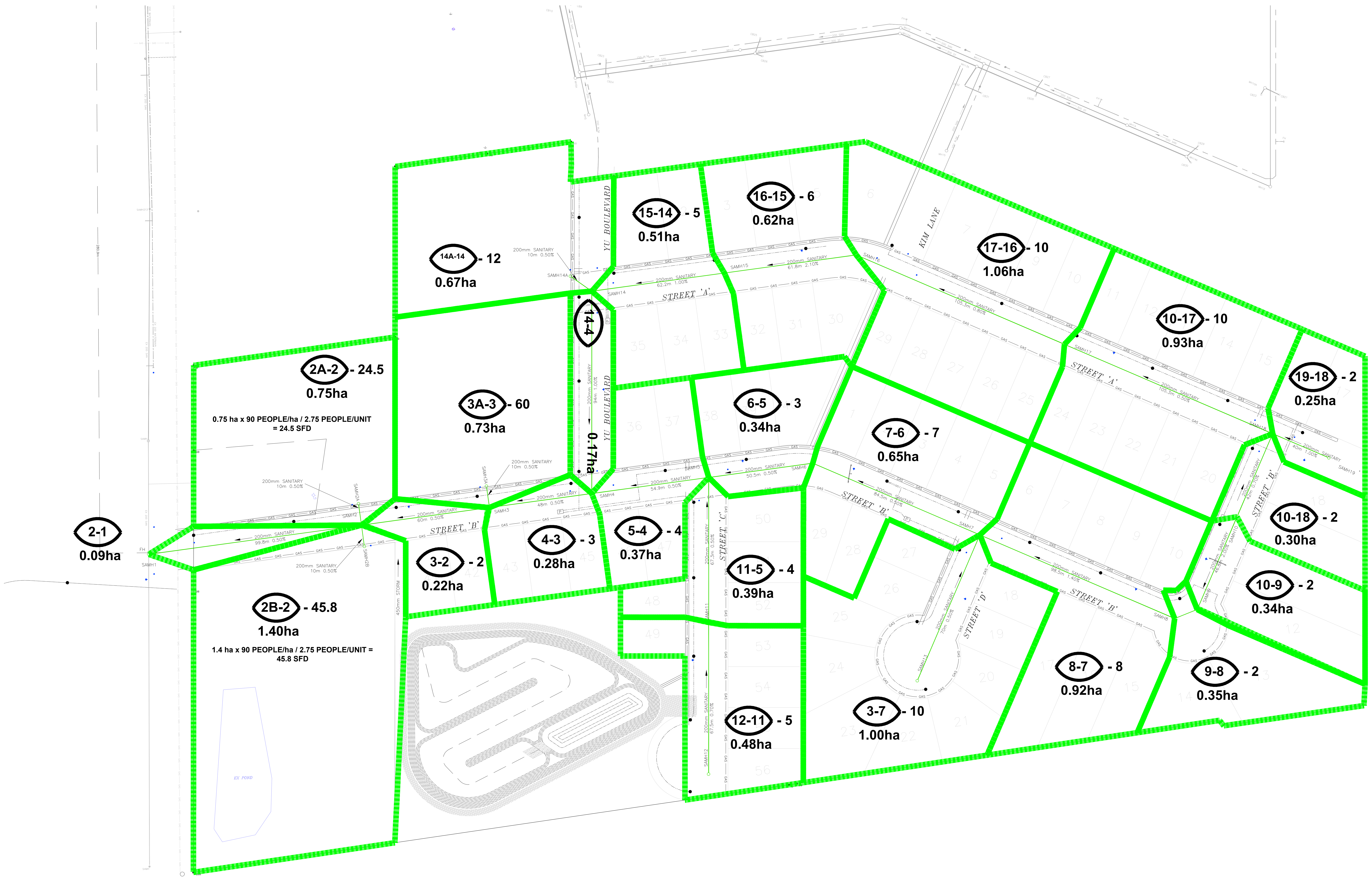
John Iezzi, P.Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

Appendix A
– 10-034 SA1 – Sanitary Sewer Drainage Areas
– 10-034 Sanitary Sewer Design Sheet
– 21-059 External Sanitary Sewer Design Sheet

Appendix B
– Domestic Water Demand Calculations
– Fire Flow Calculation Distances
– FUS Calculations
– Norfolk ISMP Map

APPENDIX A

10-034 SA1 – Sanitary Sewer Drainage Areas
10-034 Sanitary Sewer Design Sheet
21-059 External Sanitary Sewer Design Sheet



REV. No.	DATE	REVISION
0		

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

YIN PHASE 5

WATERFORD - NORFOLK COUNTY

Drawing Title

SANITARY SEWER DRAINAGE AREAS

Designed by : DJB	Drawn By : TJC
Checked by : TGS	Date Started : SEPTEMBER 2010
Drawing Scale : 1:1000	Drawing No. SA1
Project No. 10-034	

DATE LAST PLOTTED :-

SANITARY SEWER DESIGN SHEET

Pipe Material PVC
N 0.013

Project: Yin's Subdivision Phase 6
Job No. 14123

Date 1-Feb-15
Designed by TGS
Checked by JDV
Sheet of : 1 of 1

Location				Area						Flow			Sewer Design						
Area	Street	From	To	Section	Cumul.	Section	Cumul	Total	M=Peak	Q(i)	Q(s)	Q(d)	Material	Size	Length	N	Slope	Cap	Full V
		MH	MH	Ha	Ha	Units	Units	Pop.	Factor	L/s	L/s	L/s		mm	m		%	L/s	m/s
10-18	Lam Blvd	10	18	0.3	0.30	2	2	6	4.4363	0.084	0.1271	0.2111	PVC	200	42	0.013	0.70%	27.4	0.87
19-18	Tan Ave	19	18	0.25	0.55	2	4	11	4.4106	0.154	0.2527	0.4067	PVC	200	40	0.013	1.00%	32.8	1.04
18-17	Tan Ave	18	17	0.93	1.48	10	14	39	4.3363	0.4144	0.8695	1.2839	PVC	200	105.3	0.013	0.50%	23.2	0.74
17-16	Tan Ave	17	16	1.06	2.54	10	24	66	4.2888	0.7112	1.4743	2.1855	PVC	200	105.3	0.013	0.80%	29.3	0.93
16-15	Tan Ave	16	15	0.62	3.16	6	30	83	4.2655	0.8848	1.8328	2.7176	PVC	200	61.8	0.013	2.10%	47.5	1.51
15-14	Tan Ave	15	14	0.51	3.67	5	35	96	4.2481	1.0276	2.1296	3.1572	PVC	200	62.2	0.013	1.00%	32.8	1.04
14A-14	Block 1 - TWNHSE	14A	14	0.67	0.67	12	12	33	4.348	0.1876	0.7473	0.9349	PVC	200	10	0.013	0.50%	23.2	0.74
14-4	Yu Blvd	14	4	0.17	4.51	0	47	129	4.2114	1.2628	2.835	4.0978	PVC	200	94	0.013	1.00%	32.8	1.04
10-9	Lam Blvd	10	9	0.34	0.34	2	2	6	4.4363	0.0952	0.1271	0.2223	PVC	200	46.8	0.013	2.00%	46.4	1.48
9-8	Lam Blvd	9	8	0.35	0.69	2	4	11	4.4106	0.1932	0.2527	0.4459	PVC	200	11.3	0.013	1.70%	42.8	1.36
8-7	Lam Blvd	8	7	0.92	1.61	8	12	33	4.348	0.4508	0.7473	1.1981	PVC	200	98.5	0.013	1.40%	38.8	1.24
13-7	Tai Shan Place	13	7	1.00	1.00	10	10	28	4.3607	0.28	0.6246	0.9046	PVC	200	70	0.013	0.50%	23.2	0.74
7-6	Lam Blvd	7	6	0.65	3.26	7	29	80	4.2692	0.9128	1.7733	2.6861	PVC	200	84.5	0.013	0.50%	23.2	0.74
6-5	Lam Blvd	6	5	0.34	3.60	3	32	88	4.2584	1.008	1.9517	2.9597	PVC	200	50.5	0.013	0.50%	23.2	0.74
12-11	Jong St	12	11	0.48	0.48	5	5	14	4.4003	0.1344	0.3151	0.4495	PVC	200	67.5	0.013	0.70%	27.4	0.87
11-5	Jong St	11	5	0.39	0.87	4	9	25	4.3676	0.2436	0.563	0.8066	PVC	200	67.3	0.013	0.50%	23.2	0.74
5-4	Lam Blvd	5	4	0.37	4.84	4	45	124	4.2171	1.3552	2.718	4.0732	PVC	200	54.9	0.013	0.50%	23.2	0.74
4-3	Lam Blvd	4	3	0.28	9.63	3	95	261	4.1034	2.6964	5.5835	8.2799	PVC	200	48	0.013	0.50%	23.2	0.74
3A-3	Block 2 Aptmnts.	3A	3	0.73	0.73	60	60	165	4.1773	0.2044	3.5899	3.7943	PVC	200	10	0.013	0.50%	23.2	0.74
3-2	Lam Blvd	3	2	0.22	10.58	2	157	432	4.0062	2.9624	9.0087	11.971	PVC	200	60	0.013	0.50%	23.2	0.74
2A-2	Block 3 Commercial	2A	2	0.75	0.75	25	25	67	4.2867	0.21	1.5043	1.7143	PVC	200	10	0.013	0.50%	23.2	0.74
2B-2	Block 2 Aptmnts.	2B	2	1.4	1.40	46	46	127	4.2142	0.392	2.7765	3.1685	PVC	200	10	0.013	0.50%	23.2	0.74
2-1	Lam Blvd	2	1	0.09	12.07	0	228	626	3.9222	3.3796	12.78	16.16	PVC	200	99.8	0.013	0.50%	23.2	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 2.75 persons /unit

▒ Existing Sewer

SANITARY SEWER DESIGN SHEET

Pipe Material PVC
N 0.01

Project: Yin's Subdivision Phase 6
Updated to Include Lam Boulevard Townhouses
Job No. 21-059

Date 2-Feb-23
Designed by TGS/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	Length m	N	Slope %	Cap L/s	Full V m/s	% Full
10-18	Lam Blvd	10	18	0.3	0.30	2	2	6	4.43629	0.084	0.12708	0.21108	PVC	200	42	0.013	0.70%	27.4	0.87	✓ 1%
19-18	Tan Ave	19	18	0.25	0.55	2	4	11	4.41057	0.154	0.25269	0.40669	PVC	200	40	0.013	1.00%	32.8	1.04	✓ 1%
18-17	Tan Ave	18	17	0.93	1.48	10	14	39	4.33634	0.4144	0.86953	1.28393	PVC	200	105.3	0.013	0.50%	23.2	0.74	✓ 6%
17-16	Tan Ave	17	16	1.06	2.54	10	24	66	4.28877	0.7112	1.47427	2.18547	PVC	200	105.3	0.013	0.80%	29.3	0.93	✓ 7%
16-15	Tan Ave	16	15	0.62	3.16	6	30	83	4.26551	0.8848	1.83284	2.71764	PVC	200	61.8	0.013	2.10%	47.5	1.51	✓ 6%
15-14	Tan Ave	15	14	0.51	3.67	5	35	96	4.24808	1.0276	2.12957	3.15717	PVC	200	62.2	0.013	1.00%	32.8	1.04	✓ 10%
14A-14	Block 1 - TWNHSE	14A	14	0.67	0.67	12	12	33	4.34795	0.1876	0.7473	0.9349	PVC	200	10	0.013	0.50%	23.2	0.74	✓ 4%
14-4	Yu Blvd	14	4	0.17	4.51	0	47	129	4.21137	1.2628	2.835	4.0978	PVC	200	94	0.013	1.00%	32.8	1.04	✓ 12%
10-9	Lam Blvd	10	9	0.34	0.34	2	2	6	4.43629	0.0952	0.12708	0.22228	PVC	200	46.8	0.013	2.00%	46.4	1.48	✓ 0%
9-8	Lam Blvd	9	8	0.35	0.69	2	4	11	4.41057	0.1932	0.25269	0.44589	PVC	200	11.3	0.013	1.70%	42.8	1.36	✓ 1%
8-7	Lam Blvd	8	7	0.92	1.61	8	12	33	4.34795	0.4508	0.7473	1.1981	PVC	200	98.5	0.013	1.40%	38.8	1.24	✓ 3%
13-7	Tai Shan Place	13	7	1.00	1.00	10	10	28	4.36067	0.28	0.62458	0.90458	PVC	200	70	0.013	0.50%	23.2	0.74	✓ 4%
7-6	Lam Blvd	7	6	0.65	3.26	7	29	80	4.26919	0.9128	1.77327	2.68607	PVC	200	84.5	0.013	0.50%	23.2	0.74	✓ 12%
6-5	Lam Blvd	6	5	0.34	3.60	3	32	88	4.25835	1.008	1.95175	2.95975	PVC	200	50.5	0.013	0.50%	23.2	0.74	✓ 13%
12-11	Jong St	12	11	0.48	0.48	5	5	14	4.40032	0.1344	0.31513	0.44953	PVC	200	67.5	0.013	0.70%	27.4	0.87	✓ 2%
11-5	Jong St	11	5	0.39	0.87	4	9	25	4.36755	0.2436	0.563	0.8066	PVC	200	67.3	0.013	0.50%	23.2	0.74	✓ 3%
5-4	Lam Blvd	5	4	0.37	4.84	4	45	124	4.21707	1.3552	2.71804	4.07324	PVC	200	54.9	0.013	0.50%	23.2	0.74	✓ 18%
4-3	Lam Blvd	4	3	0.28	9.63	3	95	261	4.10344	2.6964	5.58345	8.27985	PVC	200	48	0.013	0.50%	23.2	0.74	✓ 36%
3A-3	Block 2 Aptmnts.	3A	3	0.73	0.73	60	60	165	4.17734	0.2044	3.5899	3.7943	PVC	200	10	0.013	0.50%	23.2	0.74	✓ 16%
3-2	Lam Blvd	3	2	0.22	10.58	2	157	432	4.00618	2.9624	9.00868	11.9711	PVC	200	60	0.013	0.50%	23.2	0.74	✓ 52%
2A-2	Block 3 Commercial (21-059 Lam Blvd)	2A	2									1.95								
2B-2	Block 2 Aptmnts.	2B	2	1.4	1.40	46	46	127	4.2142	0.392	2.77654	3.16854	PVC	200	10	0.013	0.50%	23.2	0.74	✓ 14%
2-1	Lam Blvd	2	1	0.09	12.07	0	203	558	3.94913	3.3796	11.4823	16.8119	PVC	200	99.8	0.013	0.50%	23.2	0.74	✓ 72%

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	2.75	persons /unit

▨ Existing Sewer

Notes:
1) Sanitary flow from the proposed Lam Blvd Development is estimated to be 1.95 L/s

APPENDIX B

Domestic Water Demand Calculations
Fire Flow Calculation Distances
FUS Calculations
Norfolk ISMP Map

Subject:	Lam Boulevard Townhouses		
Date:	2/1/2023	By:	N.B.N
Project #:	21-059	Page	1

Proposed Residential Condos

Maximum Daily Demand

Total Number of Units	24	units
Zoning of Land	Residential	
Equiv. Population Density	2.75	ppl/unit
Equiv. Population	66	
Av. Daily Demand Per Capita	0.45	m³/capita/day
Maximum Daily Demand Peaking Factor	2.25	
Maximum Daily Demand	66.83	m³/day
	0.77	l/s

Maximum Hourly Demand

Total Number of Units	24	units
Zoning of Land	Residential	
Equiv. Population Density	2.75	ppl/ha
Equiv. Population	66	
Av. Daily Demand Per Capita	0.45	m³/capita/day
Maximum Hourly Demand Peaking Factor	4	
Maximum Hourly Demand	4.95	m³/hour
	1.38	l/s

Proposed Commercial

Maximum Daily Demand

Area	0.2	ha
Zoning of Land	Commercial	
Equiv. Population Density	90	ppl/ha
Equiv. Population	18	
Av. Daily Demand Per Capita	0.45	m³/capita/day
Maximum Daily Demand Peaking Factor	2.25	
Maximum Daily Demand	18.23	m³/day
	0.21	l/s

Maximum Hourly Demand

Area	0.2	ha
Zoning of Land	Commercial	
Equiv. Population Density	90	ppl/ha
Equiv. Population	18	
Av. Daily Demand Per Capita	0.45	m³/capita/day
Maximum Hourly Demand Peaking Factor	2	
Maximum Hourly Demand	0.68	m³/hour
	0.19	l/s

Summary of Maximum Daily Demand

Proposed Residential Condos	0.77 L/s
Proposed Commercial	0.21 L/s
Total Maximum Daily Demand:	**0.98 L/s**

Summary of Maximum Hourly Demand

Proposed Residential Condos	1.38 L/s
Proposed Commercial	0.19 L/s
Total Maximum Hourly Demand:	**1.56 L/s**

REV. No.	DATE	REVISION

LEGEND

🟥 PROPOSED FIREWALL

-- -- 50m FIRE HYDRANT RADIUS

SCALE:

5 10 15

HORIZONTAL : 1:250

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

LAM BOULEVARD

WATERFORD, NORFOLK COUNTY

Drawing Title
FIRE FLOW CALCULATION DISTANCES

Designed by : NLB

Drawn By : NLB

Checked by : JI

Date Started : 5/29/2023

Drawing Scale : 1:250

Drawing No. FIRE

Project No. 21-059

DATE LAST PLOTTED : September 22, 2023

Subject: Lam Blvd Townhouses
Date: Feb-23 By: NLB
Project #: 21-059 Page: 1

BLOCK 1 - 2 STOREY COMMERCIAL

1) Fire Flow Requirement

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

C= 0.8 Non Combustible Construction

A= 710 Floor Area m^2 = main floor area
A= 1420 Fire Area m^2 = main floor area + second floor area

$F_1=$ 6632 L/min
$F_1=$ 7000 L/min (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Limited Combustible Contents
Reduction: 15%
Surcharge: 0%

$F_2=F_1+(F_1*\text{Reduction/Surcharge})$ (L/min)
$F_2=$ 5950 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
Front	East	19.1	15%
Side	North	> 30m	0%
Side	South	> 30m	0%
Rear	West	> 30m	0%
		Total:	15%

Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

F4=(TOTAL)*F2 (L/min)
$F_4=$ 893 L/min

Total Fire Flow

$F=F_2\text{-}F_3+F_4$ = 6843 L/min
= 7000 L/min (Round to the nearest 1,000 l/min)
= **116.7 L/s**

Notes: *1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020*

BLOCK 3 - Units 18 & 24

1) Fire Flow Requirement

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

C= 1.5 Construction coefficient for wood frame construction

A= 145.0 Floor Area m^2 = main floor area

= 435.0 Fire Area m^2 = main floor + second floor + third floor

$F_1=$ 6883 L/min

$F_1=$ 7000 L/min (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Occupancy

Reduction: 15%

Surcharge: 0%

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

$F_2=$ 5950 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
Front	South	10.3	15%
Side	East	16.6	15%
Side	West	Firewall	0%
Rear	North	> 30m	0%
		Total:	30%

Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

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

$F_4=$ 1785 L/min

Total Fire Flow

$F=F_2-F_3+F_4$ = 7735 L/min

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

= **133.3 L/s**

Notes: *1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020*

Water Supply for Public Fire Protection - Fire Underwriters Survey 2020

Tables & Figures

Method for Determining Required Fire Flows

Fire Underwriters Survey defines **Required Fire Flow** as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a city block.

To determine the estimated amount of water required to confine and control a fire in a building or group of buildings, Fire Underwriters Survey uses the following base formula:

$$RFF = 220C\sqrt{A}$$

Where:

RFF = the Required Fire Flow in litres per minutes (LPM)
C = the Construction Coefficient is related to the type of construction of the building
A = the Total Effective Floor Area (effective building area) in square metres of the building

Construction Coefficient (C)

Note that the construction typology used by the insurance industry and public fire protection differs from the terms of reference in the National Building Code of Canada (NBC).

The following Construction Types and Coefficients are used in the required fire flow formula:

C = 1.5 for **Type V** Wood Frame Construction
= 0.8 for **Type IV-A** Mass Timber Construction
= 0.9 for **Type IV-B** Mass Timber Construction
= 1.0 for **Type IV-C** Mass Timber Construction
= 1.5 for **Type IV-D** Mass Timber Construction
= 1.0 for **Type III** Ordinary Construction
= 0.8 for **Type II** Noncombustible Construction
= 0.6 for **Type I** Fire Resistive Construction

Table 3 Recommended Occupancy/Contents Charges by Major Occupancy Examples[1]

Group	Division	Description of Major Occupancies	Occupancy and Contents	Adjustment Factor
A	1	***Assembly*** *occupancies* intended for the production and viewing of the performing arts	Combustible	0%
A	2	***Assembly*** *occupancies* not elsewhere classified in Group A	Limited to Combustible	-15% to 0%
A	3	***Assembly*** *occupancies* of the arena type	Limited to Combustible	-15% to 0%
A	4	***Assembly*** *occupancies* in which occupants are gathered in the open air	Limited to Combustible	-15% to 0%
B	1	**Detention** occupancies	Noncombustible to Limited	-25% to -15%
B	2	**Care and treatment** occupancies	Noncombustible to Limited	-25% to -15%
B	3	**Care** occupancies	Limited	-15%
C	---	**Residential** occupancies	Limited	-15%
D	---	**Business and personal services** occupancies		
D	---	• *Police stations without detention quarters*	Non-combustible	-20%
D	---	• *Banks, Barber and hairdressing shops, Beauty parlours, Dental offices, Laundries (self-service), Medical offices, Offices, Radio stations*	Limited	-15%
D	---	• *Dry cleaning establishments (self-service, not using flammable or explosive solvents or cleaners), Small tool and appliance rental and service establishments*	Combustible	0%
E	---	**Mercantile** occupancies		
E	---	• *Exhibition halls*	Limited	-15%
E	---	• *Supermarkets*	Limited	-15%
E	---	• *Shops/Stores*	Limited to Combustible	-15% to 0%
E	---	• *Markets*	Combustible	0
E	---	• *Department stores*	Free Burning	15%
F	1	**High hazard industrial** occupancies	Rapid Burning	+25%
F	2	**Medium hazard industrial** occupancies		
F	2	• *Television studios not admitting a viewing audience*	Limited	-15%
F	2	• *Cold storage plants*	Combustible	0%
F	2	• *Electrical substations*	Combustible	0%
F	2	• *Helicopter landing areas on roofs*	Limited	-15%

---

[1] *The values presented in this table are intended as a guideline and the occupancy/contents adjustment should be based on the actual severity of conditions within the risk structure.*

Exposure Adjustment Charge

A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks (ex. structures, stored materials, forest, etc.). The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

The maximum Exposure Adjustment Charge to be applied to a subject building is 75% when summing the percentages for all sides of the building. Table 5 outlines the maximum Exposure Adjustment Charge to apply for any one side of the subject building based on the following separation distances between the subject building and the exposed risk (aka. exposure):

Table 5 Exposure Charges

Separation Distance	Maximum Exposure Adjustment Charge
0 m to 3 m	25%
3.1 m to 10 m	20%
10.1 m to 20 m	15%
20.1 m to 30 m	10%
Greater than 30	0%

Occupancy and Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with a very low fire hazard or may be increased by up to 25% for occupancies having contents with a high fire hazard. The Occupancy and Contents Adjustment Factor should not be made at greater than 25% or less than -25%.

- *Noncombustible Contents* -25%
  - Includes merchandise or materials, including stock, or equipment, which in permissible quantities does not in themselves constitute an active fuel for the spread of fire.
  - May include limited or controlled amounts of combustible material, not exceeding 5% of the Total Effective Area of the occupancy. Combustible components of construction (ex. interior walls, finishes, etc.) should be included in the limit on combustible materials.
- *Limited Combustible Contents* -15%
  - Includes merchandise or materials, including furniture, stock, or equipment, of low combustibility, with limited concentrations of combustible materials.
- Combustible Contents 0% no adjustment
  - Includes merchandise or materials, including furniture, stock, or equipment, of moderate combustibility.
- *Free Burning Contents* +15%
  - Includes merchandise or materials, including furniture, stock, or equipment, which burn freely, constituting an active fuel.
- *Rapid Burning Contents* +25%
  - Includes merchandise or materials, including furniture, stock, or equipment, which either
    - Burn with great intensity
    - spontaneously ignite and are difficult to extinguish
    - give off flammable or explosive vapors at ordinary temperatures
    - as a result of an industrial processing, produce large quantities of dust or other finely divided debris subject to flash fire or explosion

Total Effective Area (A)

To determine a required fire flow for an individual building, the Total Effective Area that would be affected during the design fire must be determined. The Total Effective Area is the largest Floor Area (in square metres) plus the following percentages of the total area of the other floors:

1) For a building classified with a Construction Coefficient from 1.0 to 1.5:
   a) 100% of all Floor Areas are considered in determining the Total Effective Area to be used in the formula.
2) For a building classified with a Construction Coefficient below 1.0:
   a) if any vertical openings in the building (ex. interconnected floor spaces, atria, elevators, escalators, etc.) are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to a maximum of eight; or
   b) if all vertical openings and exterior vertical communications are properly protected in accordance with the National Building Code, consider only the single largest Floor Area plus 25% of each of the two immediately adjoining floors.

Automatic Sprinkler Protection

The required fire flow may be reduced by up to 50 percent for complete Automatic Sprinkler Protection depending upon adequacy of the system. Where only part of a building is protected by Automatic Sprinkler Protection, credit should be interpolated by determining the percentage of the Total Floor Area being protected by the automatic sprinkler system.

To be able to apply the full 50 percent reduction, the following areas should be reviewed to determine the appropriate level of credit for having Automatic Sprinkler Protection as per the table below:

Table 4 Sprinkler Credits

Automatic Sprinkler System Design	Credit	
	With complete building coverage	With partial building coverage of X%
Automatic sprinkler protection designed and installed in accordance with NFPA 13	30%	30% × Percentage of Total Floor Area Serviced by Sprinkler System
Water supply is standard for both the system and Fire Department hose lines	10%	10% × Percentage of Total Floor Area Serviced by Sprinkler System
Fully supervised system	10%	10% × Percentage of Total Floor Area Serviced by Sprinkler System

Table 6 Exposure Adjustment Charges for Subject Building considering Construction type of Exposed Building Face

Distance (m) to the Exposure	Length-height factor of exposing building face	Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 to 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30 m	all sizes	0%	0%	0%	0%	0%

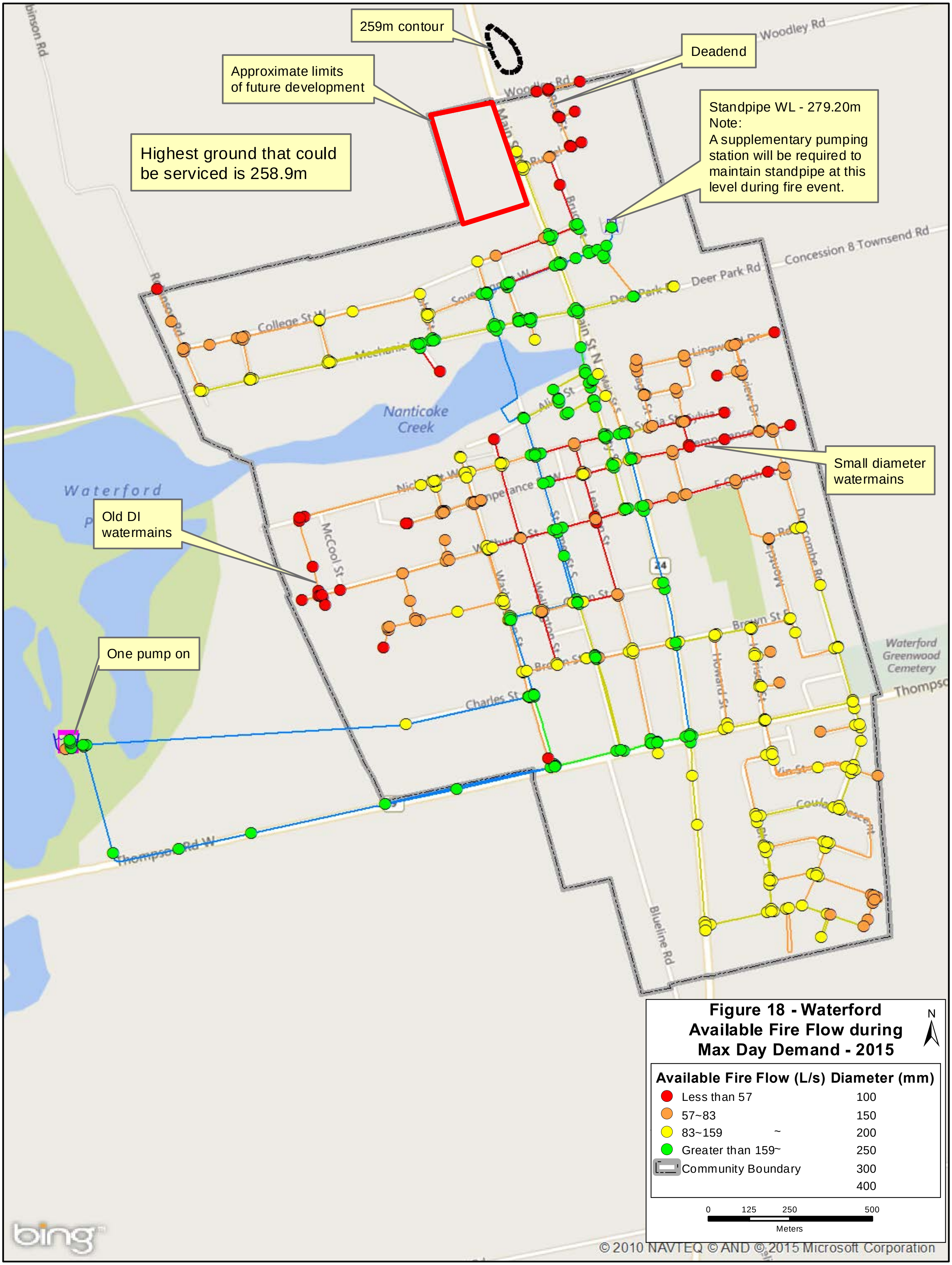


Figure 18 - Waterford Available Fire Flow during Max Day Demand - 2015

259m contour

Deadend

Approximate limits of future development

Highest ground that could be serviced is 258.9m

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

Small diameter watermains

Old DI watermains

One pump on

Consulting Engineers,
Architects & Planners

September 22, 2023

Ronak Mehta & Darpan Patel
Pramukh Developments Ltd.
2324 West Ham Rd
Oakville, ON, L6M 4N6

Attention: **Ronak Mehta & Darpan Patel**

Reference: **Stormwater Management Report**
Lam Boulevard Development (OPNPL2022043 / ZNPL2022053)
Waterford – Norfolk County
Project No. 21-059

Introduction

This Stormwater Management (SWM) Report has been prepared in support of the site plan approval application for the construction of a 24-unit townhouse development and a 6-unit, 2-storey commercial buildingin Waterford – Norfolk County. It is the intention to submit this report to Norfolk County and the Long PointRegion Conservation Authority (LPRCA) for review and approval of the proposed site plan.

The subject property is situated at the northeast corner of Old Highway 24 and Lam Boulevard in Waterford – Norfolk County. The subject lands are bound by a commercial property to the north, existing townhouses to the east, Lam Boulevard to the south, and Old Highway 24 to the west, as shown in Figure 1.

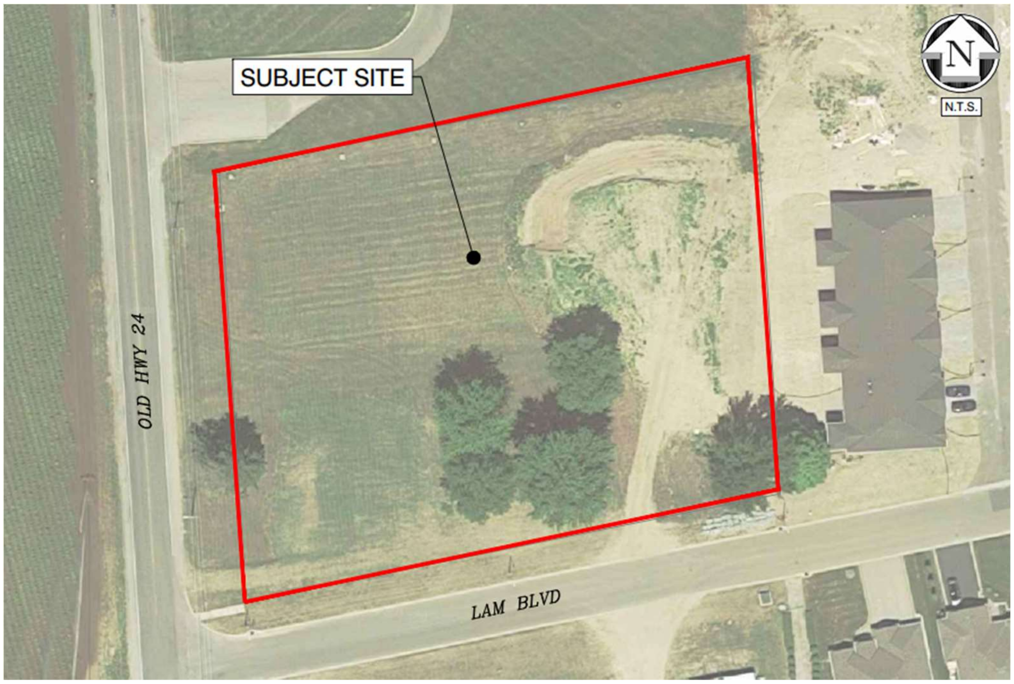


Figure 1 - Site Location

Original Design Condition and Stormwater Management Design Criteria

Under pre-development conditions, the subject property is vacant land which features an open grassed area. Stormwater runoff from the subject property drains uncontrolled, overland in a northwesterly direction towards Old Hwy 24. As part of the Yin's Subdivision - Phase 5 project (Vallee Project No. 10-034), a peak flow allowance of 0.015 m^3/s was allocated for the subject site as part of the storm sewer design along Old Highway 24. Refer to the 10-034 Yin's Subdivision - Phase 5 Stormwater Management Report in Appendix D for details.

Consequently, the design criteria for the proposed development are as follows:

- Quantity Control: Reduce or control the total post-development peak flow rates from the site to levels that do not exceed the 0.015 m^3/s flow allowance, for all storm events up to and including the 100-year storm event.
- Quality Control: Stormwater is to be treated to a Normal Protection Level as defined in the MOECC Ministry of Environment and Climate Change Design Manual - March 2003.

Post Development Condition

The overall stormwater management strategy is to reduce the total post-development peak flow rates from the site to less than or equal to the allowable release rate of 0.015 m^3/s. To meet this objective, runoff from the proposed development will be detained in an underground storage facility, and released at a rate such that the peak flow allowance is not exceeded. Infiltration beneath the chamber facility will be utilized to decrease the required storage volume. Minor and major storm events (2-year to 100-year storm) will be conveyed to the proposed SWM storage facility through a storm sewer network. Runoff released from the storage facility will be directed to the existing municipal 600mm diameter storm sewer along Old Highway 24. In addition, soakaway pits will be utilized to capture and infiltrate runoff from a small portion of the development on the east side of the property that can't be conveyed to the SWM facility.

Visual OTTHYMO was used to simulate the post-development system for the subject site. Table 1 presents the Norfolk County rainfall IDF curve data.

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

Table 2 and 3 present the post-development OTTHYMO soil input parameters, and the catchment parameters, respectively. At this stage, the geotechnical investigation is still ongoing, but soil information from the neighbouring property can be used to determine an appropriate design infiltration rate for the development site. Based on a unfactored infiltration rate of 30 mm/hr and a safety factor of 2.5, the design infiltration rate for the proposed development was taken as 0.012 mm/hr. Land area that is directly connected to the storm sewer system includes the proposed rooftops, driveways, parking spaces and roads. Refer to Drawing SWM – SWM Drainage Areas provided in Appendix F.

Table 2
Post-Development OTTHYMO Input Parameters

Soil Type	Gravelly Sandy Till
Hydrologic Soil Group	A
SCS Curve Number	58
Initial Abstraction	16.5 mm
Design Infiltration Rate	0.012 mm/hr

Table 3
Post-Development Catchments

Catchment	Runoff Control System	Area	Imperv. Percent	Directly Connected Imperv. Percent
POST1	Chamber Facility	0.60	90%	90%
POST2	Uncontrolled	0.05	25%	0%
POST3	Infiltration	0.05	0%	0%

Catchment area POST2 encompasses a small portion of the site along the south, west and north property limit that flows uncontrolled overland towards Lam Blvd and Old Highway 24. Runoff from catchment area POST3, located on the east side of the development, will be captured and infiltrated by two soakaway pits. Infiltration basins provide not only water quantity benefits such as a reduced runoff volume, but also provide water quality benefits by promoting natural groundwater recharge. The depth of an infiltration basin is governed by the native soil infiltration rate, the porosity of the aggregate material used in the stone reservoir and the targeted time period to achieve complete drainage between storm events.

For the subject site, the maximum allowable stone depth was determined to be 2.9 m based on the design infiltration rate of 12 mm/hr, a void ratio of 0.4 and a maximum drainage time of 96 hours. Corresponding calculations are detailed in Appendix A. Using Visual OTTHYMO, the soakaway pits in catchment area POST3 were sized to infiltrate 100% of the runoff captured under all storm events up to and including the 100-year event. Table 4 outlines the storage capacity and drawdown time during the 100-year storm event for each proposed soakaway pit.

Table 4
Soakaway Pit Sizing & Drawdown

Soakaway Pit	Length (m)	Width (m)	Depth (m)	Storage Volume (m^3)	Drawdown Time (hr)
Soakaway #1	3.0	3.0	1.5	5.4	15.6
Soakaway #2	3.0	3.0	1.5	5.4	15.6

The remaining area of the subject site is encompassed within catchment area POST1. Area POST1 is conveyed to the underground chamber facility via the proposed storm sewers, which have been sized to convey flows from a 100-year storm event. The proposed underground chamber system utilizes 60 StormTech MC-3500 chambers, with 12 end caps, a 300mm stone reservoir above and below the chambers, resulting in a total storage volume of 336 m^3. Drawings and specifications for the proposed StormTech chamber facility can be found in Appendix C. To control the release rate from the proposed facility, an 85mm orifice, at an elevation of 241.80m, will be installed in the outlet control structure (EX STMH1). 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 total peak post-development runoff rates from the entire subject site 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 and drawdown times for each storm event are also presented in Table 5.

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

Event	Allowable Release Rate (cms)	Post-Development (cms)	Net Change (cms)	Utilized Storage Volume (cm)	Ponding Elevation (m)	Drawdown Time (hr)
2-year	0.015	0.000	-0.015	172	241.62	45.3
5-year		0.005	-0.010	225	241.84	57.5
10-year		0.007	-0.008	267	242.04	58.3
25-year		0.010	-0.005	281	242.16	59.3
50-year		0.013	-0.002	309	242.34	59.9
100-year		0.015	0.000	332	242.52	60.4

As presented above in Table 5, the total peak post development flow rates from the entire site have been attenuated to less than or equal to the allowable release rate of 0.015 m^3/s, for all storm events up to and including the 100-year storm event. In addition, the drawdown time for each storm event is less than the maximum drawdown time of 96 hours specified in the Norfolk County Design Criteria. 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 E.

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 Old Highway 24 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 an ETV verified treated flow rate of 11.19 L/s corresponding to greater than 81% TSS removal. The proposed chamber facility features 9 isolator row chambers, which allows for a total treated inlet flow rate of approximately 100.71 L/s. Using Visual OTTHYMO, the maximum flow rate entering the chambers during the 25mm storm event (quality control event) was determined to be 76 L/s. 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 A.

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.

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:

- Storm sewers will convey stormwater from the subject site to the proposed underground SWM chamber facility located at the northwest corner of the development.
- Runoff released from the SWM facility will be conveyed to the existing municipal 600mm diameter storm sewer along Old Highway 24.
- The underground storage chamber facility uses 60 StormTech MC-3500 chambers and has a total storage volume of 336 m^3.
- The required storage volume in the chamber facility ranges between 172 m^3 to 332 m^3 for the 2-year and 100-year storm event, respectively.
- Discharge from the chamber facility is controlled by an 85mm orifice at an elevation of 241.80m.
- The proposed stormwater management facility has sufficient volume to detain runoff such that discharge from the total post-development site is controlled to less than or equal to the allowable release rate of 0.015 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 Old Highway 24 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 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,

2023-09-22
J. T. IEZZI
100189485

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
– Chamber Stage-Storage-Discharge
– Allowable to Post Flows and Ponding Depths
– Quality Control
– Soakaway Sizing

Appendix B
– Soil Parameters

Appendix C
– ADS StormTech Chamber Drawings & Specifications

Appendix D
– 10-034 Yin’s Subdivision - Phase 5 Stormwater Management Report

Appendix E
– Visual OTTHYMO Summary Outputs

Appendix F
– 21-059 DWG SWM – Stormwater Management Drainage Areas

APPENDIX A

Catchment Parameters
Chamber Stage-Storage-Discharge
Allowable to Post Flows and Ponding Depths
Quality Control
Soakaway Sizing

Post-Development Catchment Parameters

Drainage Area	Area Description	Area (ha)	Imperv. Area (ha)	Directly Connected Imperv. (ha)	TIMP (%)	XIMP (%)
		(1)	(2)	(3)	(2)/(1)	(3)/(1)
POST1	Chambers	0.600	0.539	0.539	90%	90%
POST2	Uncontrolled	0.051	0.013	0.000	25%	0%
POST3	Infilltration	0.050	0.000	0.000	0%	0%

Allowable Release Rate (m^3/s)	0.015	**obtained from 10-034 Yin Phase5 Subdivision SWM Report*

Soil Parameters

Soil Type	A - gravelly sandy till, sandy textures over gravelly sandy till		
CN	58		
Initial Abstraction	16.5	mm	
Unfactored Infiltration Rate	0.030	mm/hr	**Based on geotech report from neighbouring site*
Safety Factor	2.5		
Desgin Infiltration Rate	0.012	mm/hr	
Void Ratio (Vr)	0.4		
Drainage Time (ts)	96	hr	
Max allowable stone depth (drmax)	2.9	m	

Chamber Parameters

Model	MC-3500	
Number of Chambers	60	
Number of Cend Caps	12	
Depth of Stone Above Chamber	305	mm
Depth of Stone Below Chambers	300	mm
Base of Stone Elev.	240.80	m
Base of Chamber Elev.	241.10	m
Height of Chambers	1143	mm
Top of Chamber Elv.	242.24	m
Top of Stone Elev.	242.55	m
Min. Cover (For Vehicles)	0.54	m
Min Surface Elev.	243.09	m
System Footprint	315.2	m2

Orifice Parameters

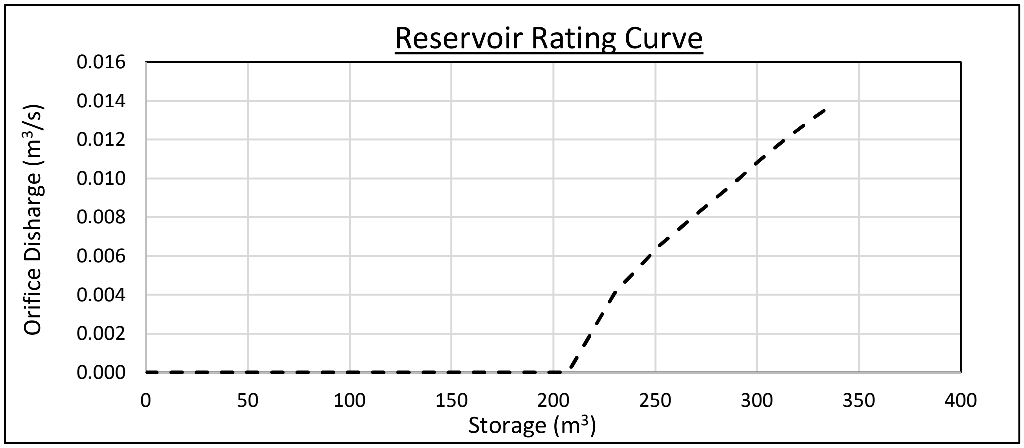
	Diameter	0.085	m
Orifice #1	Area	0.0057	m2
	Elevation	241.80	m
	CL Elevation	241.84	m
	Depth	1.00	m

**300mm Gran B, 150mm Gran A, 50mm base, 40mm surface*

Stage-Storage-Discharge

Description	Elevation (m)	Stage (mm)	Stage (m)	Volume (m3)	Height Above Invert (m)	Q (m3/s) Orifice 1
Base of Stone Storage	240.80	0	0.000	0.00	0.000	0.0000
	240.90	102	0.102	12.81	0.000	0.0000
	241.00	203	0.203	25.61	0.000	0.0000
Base of Chambers	241.11	305	0.305	38.42	0.000	0.0000
	241.21	406	0.406	65.83	0.000	0.0000
	241.36	559	0.559	106.20	0.000	0.0000
	241.46	660	0.660	132.50	0.000	0.0000
	241.56	762	0.762	158.19	0.000	0.0000
	241.66	864	0.864	183.14	0.000	0.0000
Outlet Orifice #1	241.77	965	0.965	207.17	0.000	0.0000
	241.87	1067	1.067	230.08	0.025	0.0041
	241.97	1168	1.168	251.57	0.126	0.0065
	242.07	1270	1.270	271.16	0.228	0.0082
	242.17	1372	1.372	287.47	0.330	0.0097
Top of Chambers	242.27	1473	1.473	300.84	0.431	0.0109
	242.38	1575	1.575	313.65	0.532	0.0120
	242.48	1676	1.676	326.46	0.633	0.0130
Top of Stone Storage	242.55	1753	1.753	336.06	0.710	0.0137

**Storage volumes obtained from OTTHYMO*



Allowable to Post-Development Flow Rates

Return Period	Q (m3/s)			Check
	Allowable	Post	Net	
2	0.015	0.000	-0.015	✓
5		0.005	-0.010	✓
10		0.007	-0.008	✓
25		0.010	-0.005	✓
50		0.013	-0.002	✓
100		0.015	0.000	!

Stage-Storage

Description	Elevation (m)	Stage Depth (m)	Total Volume (m^3)	Q (m^3/s) Total
Base of Stone Storage	240.80	0.00	0	0.000
	240.90	0.10	13	0.000
	241.00	0.20	26	0.000
Base of Chambers	241.11	0.31	38	0.000
	241.21	0.41	66	0.000
	241.36	0.56	106	0.000
	241.46	0.66	133	0.000
	241.56	0.76	158	0.000
	241.66	0.86	183	0.000
Outlet Orifice #1	241.77	0.97	207	0.000
	241.87	1.07	230	0.004
	241.97	1.17	252	0.006
	242.07	1.27	271	0.008
	242.17	1.37	287	0.010
Top of Chambers	242.27	1.47	301	0.011
	242.38	1.58	314	0.012
	242.48	1.68	326	0.013
Top of Stone Storage	242.55	1.75	336	0.014

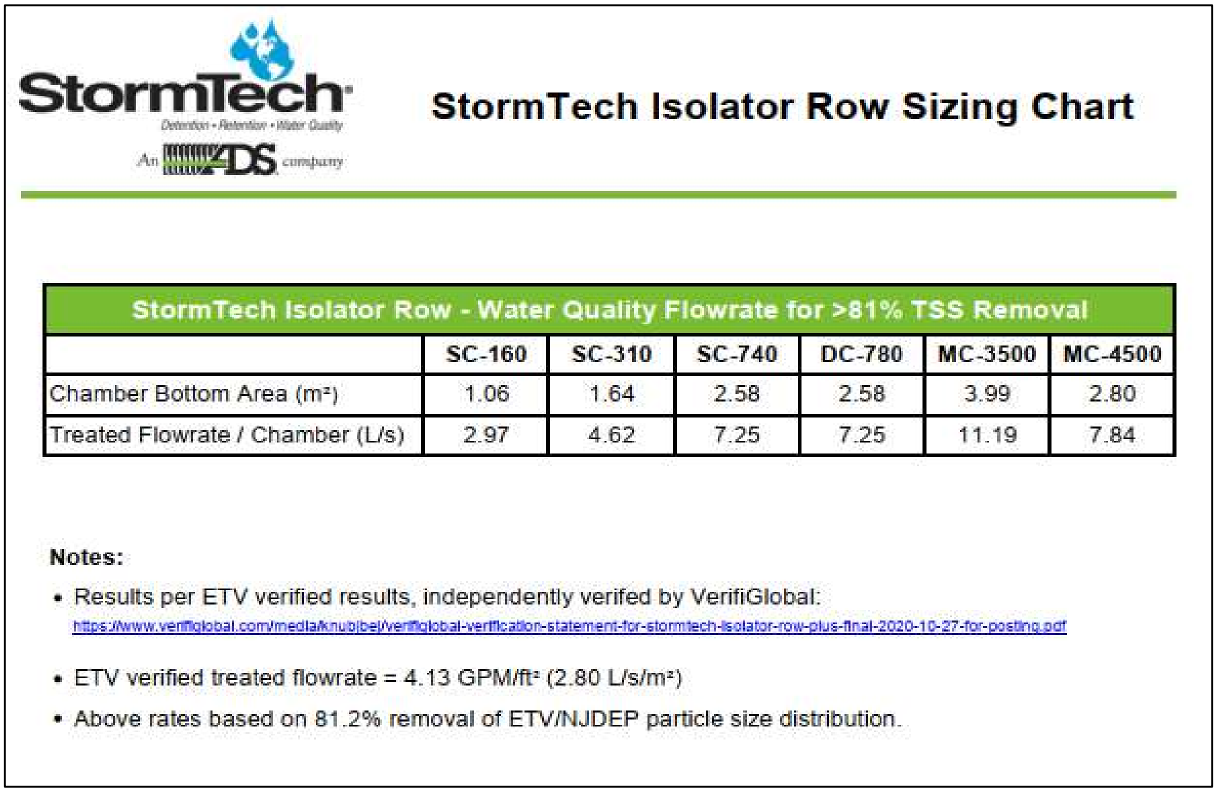
**Storage volumes obtained from OTTHYMO*

Approximate Storage and Ponding Depths

Return Period	Storage (m)	Ponding Depth (m)	Elev. (m)
2	172	0.82	241.62
5	225	1.04	241.84
10	267	1.24	242.04
25	281	1.33	242.13
50	309	1.54	242.34
100	332	1.72	242.52

Water Quality Control Provided by Stormtech Isolator Row

Inflow to Chambers During 25mm Quality Storm Event	0.076	m^3/s
	76	L/s
Chamber Type	MC-3500	
Treated Flowrate / Isolator Row Chamber	11.19	L/s
Required Number of Isolator Row Chambers	7	
Provided Number of Isolator Row Chambers	9	
Provided Treated Flowrate	100.71	L/s ✓



StormTech
Detention • Retention • Water Quality
An ADS company

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.

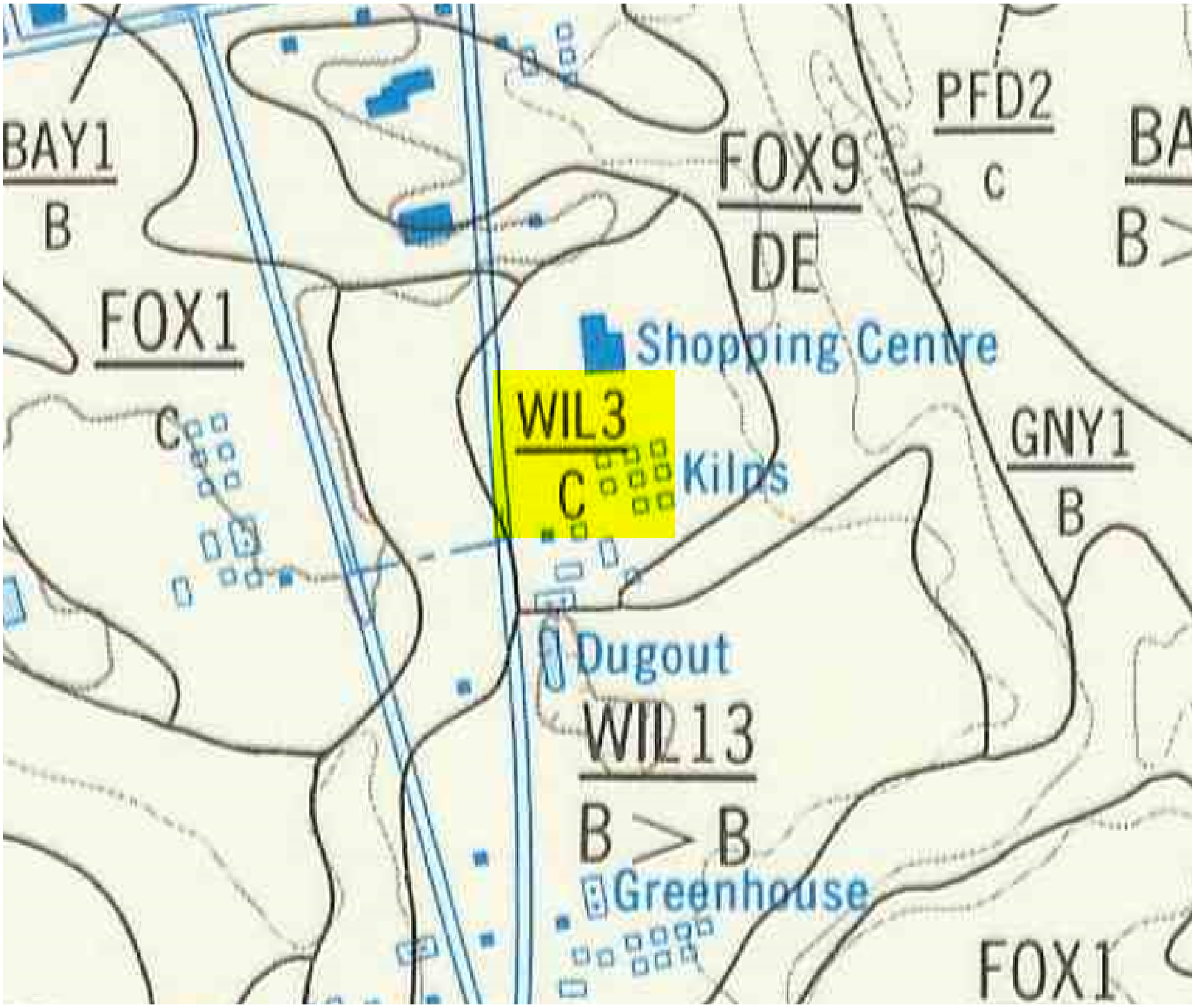
Soakaway Sizing for Area POST3

Contributing Area	0.05	ha	
Runoff from VO (100-YR)	14.934	mm	
Volume Required	**7.47**	**m^3**	
Soakaway Pit #1			
Void Ratio	0.4	m	
Soakaway Depth	1.5	m	
Soakaway Width	3	m	
Soakaway Length	3	m	
Volume	5.4	m^3	
Soakaway Pit #2			
Void Ratio	0.4	m	
Soakaway Depth	1.5	m	
Soakaway Width	3	m	
Soakaway Length	3	m	
Volume	5.4	m^3	
Total Provided Volume	**10.8**	**m^3**	✓
Drawdown Time	**15.6**	**hr**	< 96 hr OK.

APPENDIX B

Soil Parameters

21-059 Lam Blvd Soil Properties



WIL 3	WIL.C	None	15-40 cm sandy textures over gravelly sandy till	Rapid to well

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-[illegible]l exceeds infiltration into soil. Classifications [illegible]wn are subject to modification as experience dictates.

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

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)

APPENDIX C

ADS StormTech Chamber Drawings & Specifications

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

ADS SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

2023-06-19 21059 LAM BLVD COPY

WATERFORD, ON, 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 ARE 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

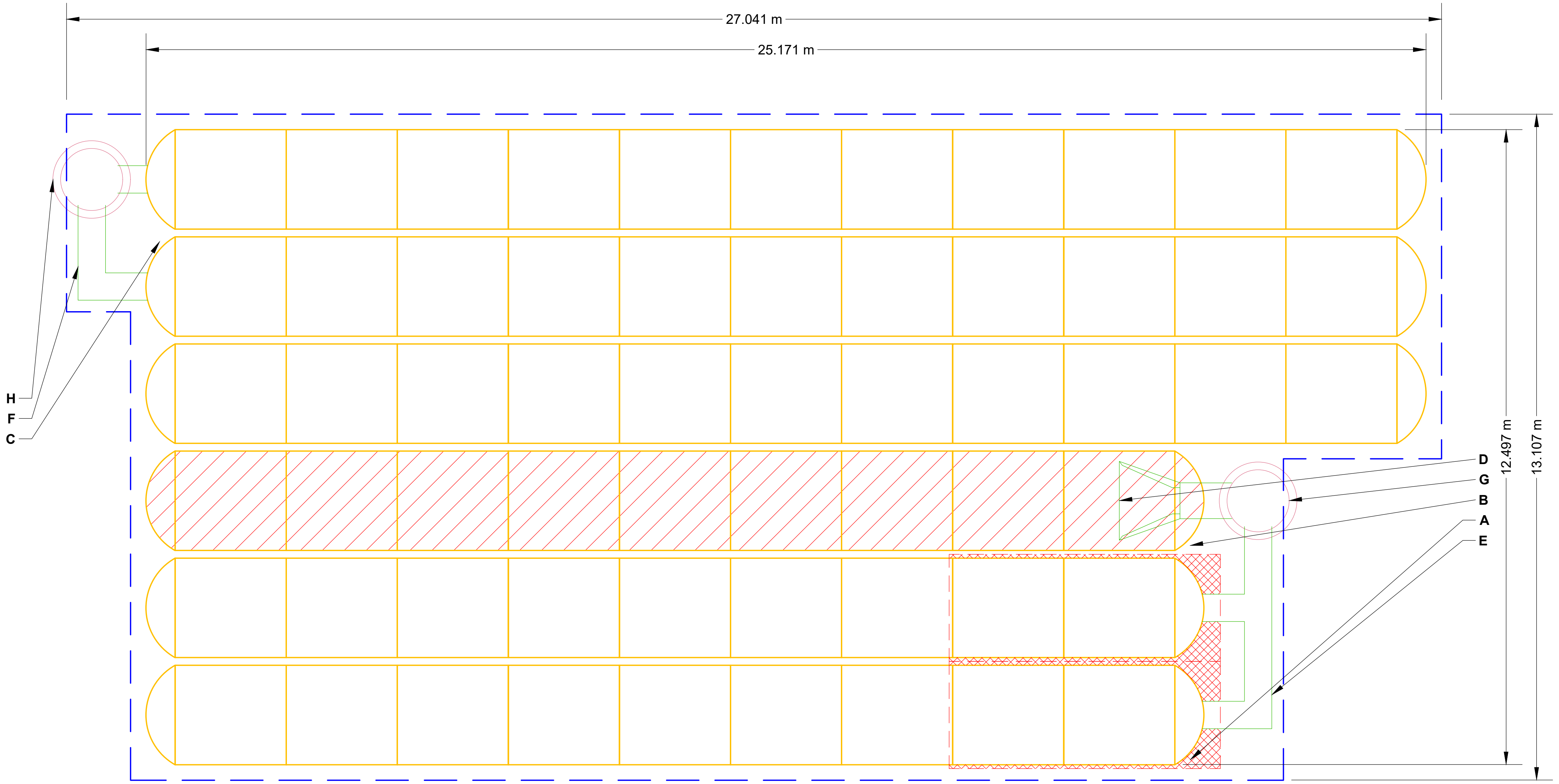
60	STORMTECH MC-3500 CHAMBERS
12	STORMTECH MC-3500 END CAPS
305	STONE ABOVE (mm)
300	STONE BELOW (mm)
40	STONE VOID
341.7	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
323.1	SYSTEM AREA (m^2)
80.3	SYSTEM PERIMETER (m)

PROPOSED ELEVATIONS:

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	244.681
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	242.852
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	242.700
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	242.700
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	242.700
TOP OF STONE:	242.548
TOP OF MC-3500 CHAMBER:	242.243
450 mm x 450 mm TOP MANIFOLD INVERT:	241.609
600 mm ISOLATOR ROW PLUS INVERT:	241.152
450 mm x 450 mm BOTTOM MANIFOLD INVERT:	241.145
450 mm BOTTOM CONNECTION INVERT:	241.145
BOTTOM OF MC-3500 CHAMBER:	241.100
BOTTOM OF STONE:	240.800

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	450 mm TOP CORED END CAP, PART#: MC3500IEPP18TC / TYP OF ALL 450 mm TOP CONNECTIONS	509 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#: MCFLAMP		
MANIFOLD	E	450 mm x 450 mm TOP MANIFOLD, ADS N-12	509 mm	
MANIFOLD	F	450 mm x 450 mm BOTTOM MANIFOLD, ADS N-12	45 mm	
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		311 L/s IN
CONCRETE STRUCTURE	H	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		227 L/s OUT



▧	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.

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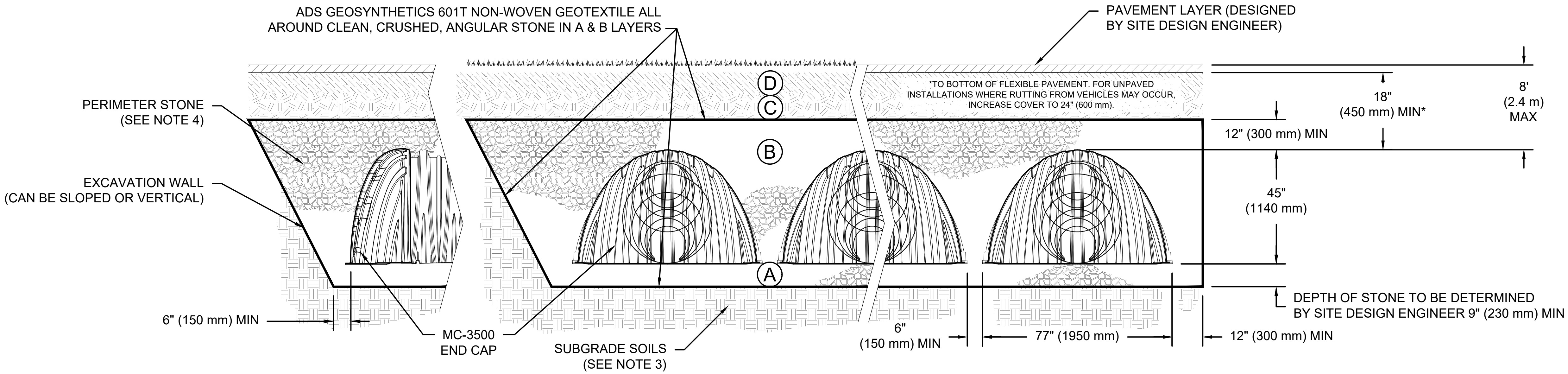
SHEET
2 OF 5

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.



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.

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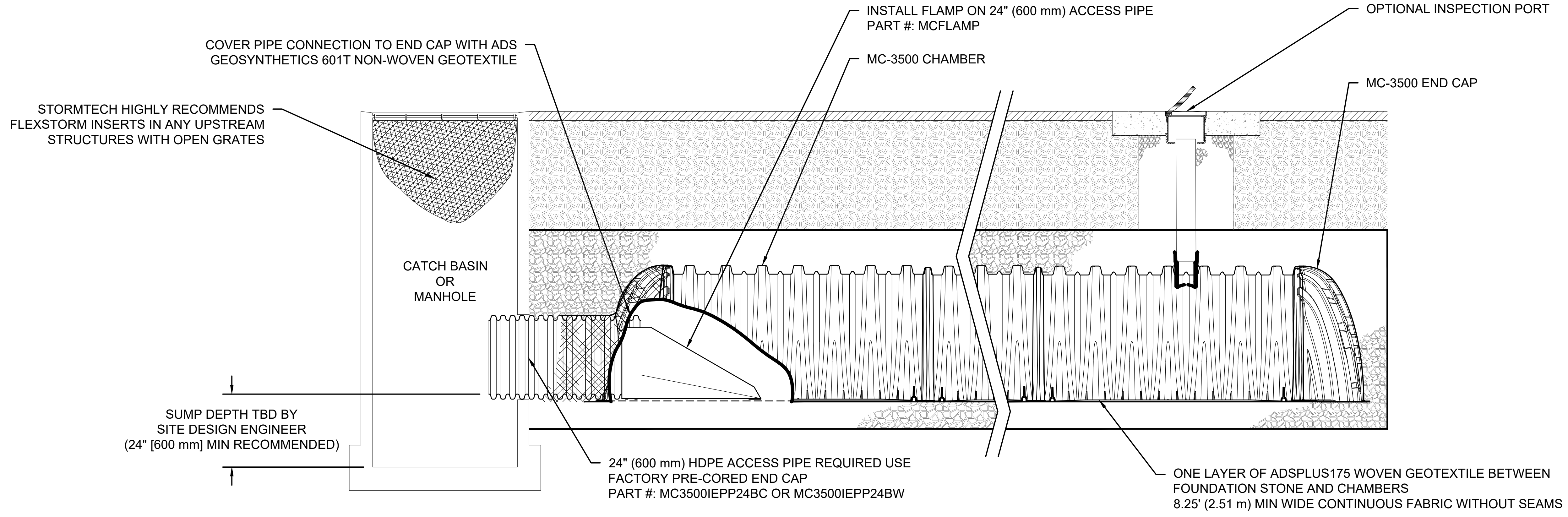
3 OF 5



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.

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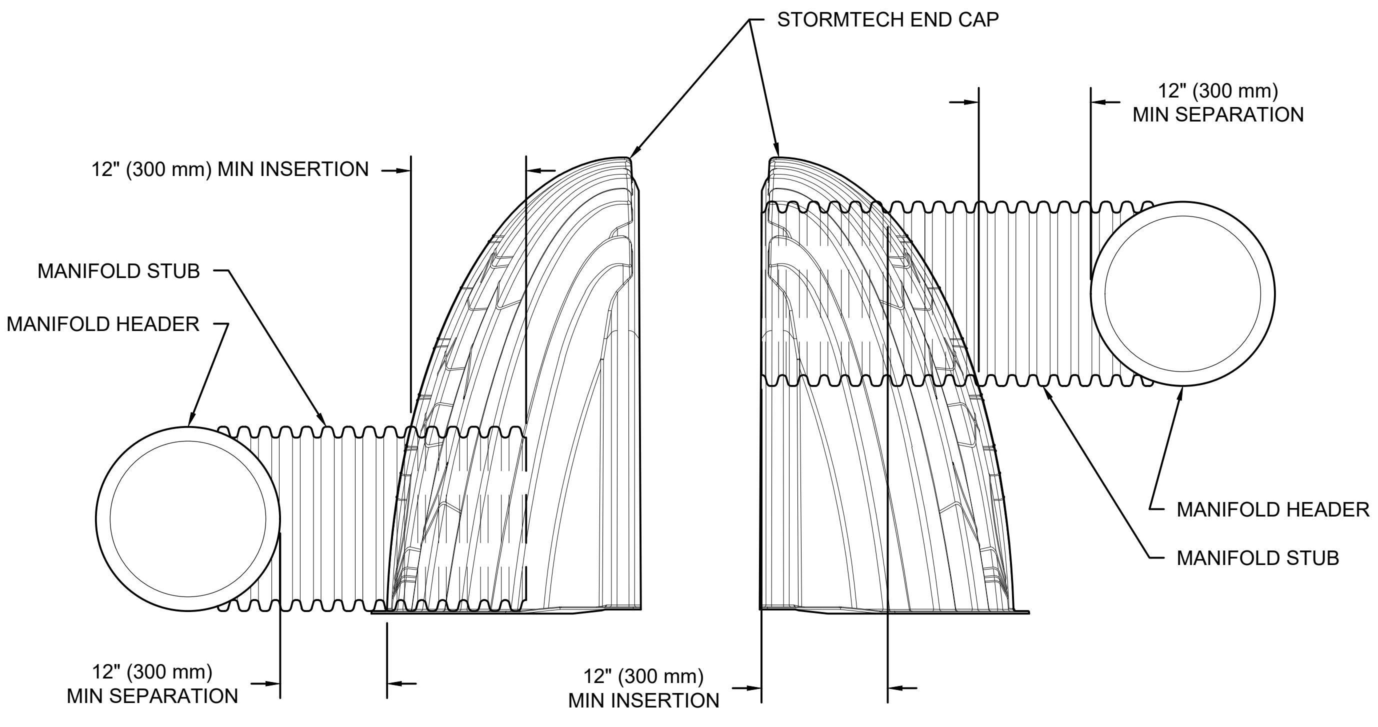
4 OF 5

MC-SERIES END CAP INSERTION DETAIL

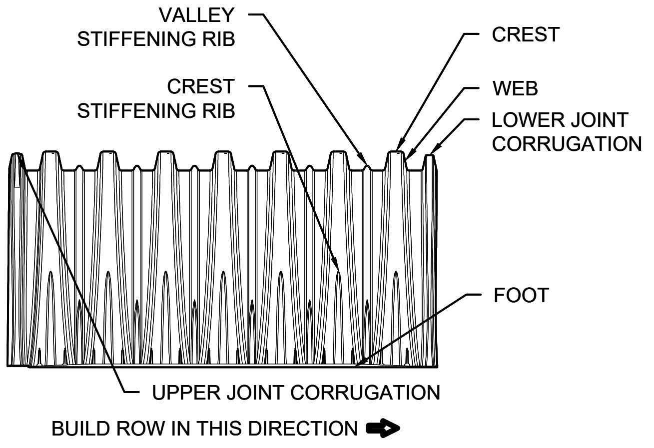
NTS

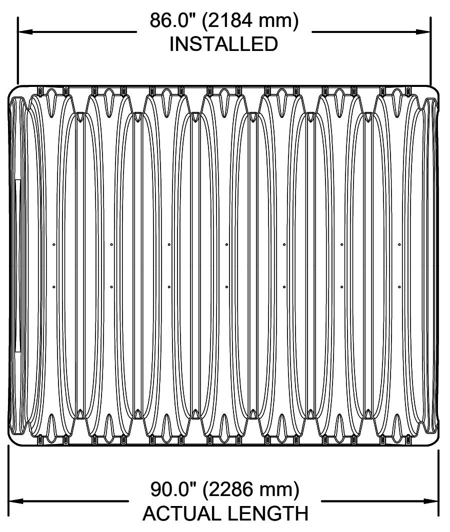


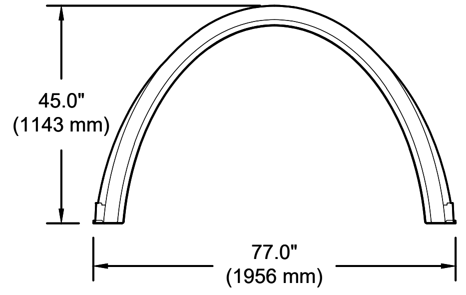
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL
FOR A PROPER FIT IN END CAP OPENING.

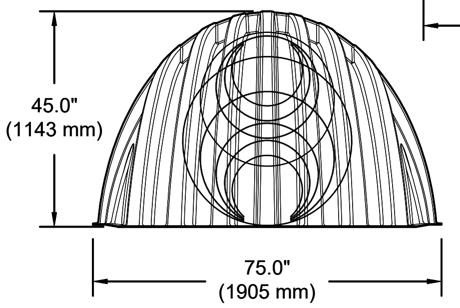
MC-3500 TECHNICAL SPECIFICATION

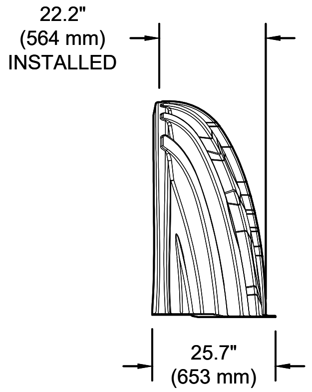
NTS











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

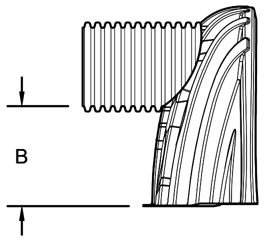
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

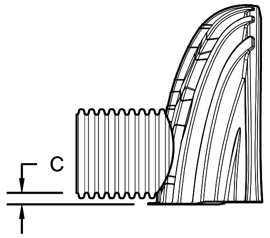
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

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





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.

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APPENDIX D

10-034 Yin’s Subdivision - Phase 5 Stormwater Management Report

vallee

Consulting Engineers,
Architects & Planners

December 10, 2010

Tony Yin
204 McMichael Rd
RR#4
Waterford, ON N0E 1Y0

Attention: Mr. Tony Yin

Dear Sir:

Reference: Storm Water Management Report
Yin's Subdivision – Phase 5
Waterford – Norfolk County
Our File 10034

1.0 Introduction

This storm water report has been completed to summarize the storm water management design for Phase 5 of the Yin's Subdivision in Waterford, Norfolk County, Ontario. It is the intention to submit this report to the Norfolk County and the Long Point Region Conservation Authority for review and approval.

Yin's Subdivision Phase 5 is a single family residential development located at the southern end of Waterford along Main Street (Old Highway 24). The site is bordered by agricultural lands to the south and west; single-family residences to the north and Main Street to the west. Figure 1 shows the overall development. This report will outline the SWM plan for the overall development.

The SWMHYMO computer model has been used to simulate the sub watershed under pre and post development conditions. The simulations were conducted using the 4-hour Chicago Distribution design storm of the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year storm events.

The receiver for the discharge from the development is the Waterford South Municipal Drain. This municipal drain is a storm sewer system and also includes a dry pond facility at the down stream end of the system. Therefore, a basic level of protection is proposed with respect to water quality enhancement.

2.0 Pre-Development

Typically, it is requirement for development sites to reduce or control the post development runoff from the site to levels that do not exceed pre-development conditions. This is achieved by directing the majority of runoff to a retention area or areas. The release from these areas is controlled by means of orifice plates and/or weirs.

However, in this case the outlet for the proposed SWM facility will be the Waterford South Municipal Drain, which is a storm sewer system. Therefore, the Drain has a finite design capacity and the capacity attributable to the portion of the site within the drainage area of the municipal drain will be the limiting factor for the total discharge from the site, post development. Figure 2 shows the overall development site along with the portion of the site that is within the Waterford South Municipal Drain. Design information for the storm sewer along Main Street is unavailable from Norfolk County. However, this office completed the design of the Waterford South Municipal Drain and it is known the 2-year design storm was used.

The total site area is approximately 14.0 ha and the portion within the Waterford South Municipal drain is approximately 6.0 ha.

The SWMHYMO computer model was used to simulate pre-development conditions the portion of the site within the municipal drain's drainage area. The model uses a modified SCS procedure to estimate losses that occur naturally during a rainfall event such as evaporation and infiltration. For the areas with rural runoff characteristics, Table 1 summarizes the background information and input parameters for the computer model with complete notes included with this report as Appendix A.

Table 1
SWMHYMO Model Input – Pre Development

Parameters	**Value**
Area (ha)	6.0 ha
Soil Type	Fox – sand and loamy sand Granby – sand and loamy sand Wilsonville – sandy textures over gravelly sand
Hydrologic Soil Group	A
SCS Curve Number	58
Longest Flow Path (m)	429m
Average Slope (%)	1.63%
Runoff Coeff	0.2
Time to Peak (hrs)	0.52

The estimated peak pre-development storm water runoff generated from portion of the site within the Waterford South Municipal Drain is 0.064 cms.

3.0 Post-Development

Due the topography of the existing site, specifically the low elevation of Main Street relative to the elevation of the proposed SWM facility, Blocks 3 and 4 as well as small portion of Street B will not be able to drain to the SWM facility. These areas will connect directly to the proposed outlet sewer along Main Street. Therefore to achieve the required reduction in post development discharge to the identified criteria for the site, these two blocks will have a limiting post development discharge of 0.015 cms each. Both Blocks 3 and 4 will be subject to a site plan approval process with Norfolk County and as part of any submissions for these sites a SWM plan will need to be included demonstrating that the limiting discharge is achieved for these sites.

As was indicated previously the total development site is approximately 14 ha. Therefore the contributing area to the proposed SWM facility can be estimated by reducing the total area by the areas of Blocks 3 and 4 as will as the portion of Street A (approximately 2.18 ha). This results in a contributing area to the SWM facility of 11.82 ha.

Post development, impervious land areas will be introduced to each of these areas to differing degrees. For the areas within the development the following assumptions have been made with respect to impervious surfaces introduced post development.

• Assumed roof and driveway area per town single family unit	230m^2
• Municipal Road (includes sidewalk one side) (Road area considered directly connected to storm sewers)	11m^2/m

The impervious land area introduced on the town house block and the apartment block has been assumed to be 75% of the total area of these blocks. Of this impervious area, 50% has been attributed to the parking/drive areas and therefore is considered directly connected.

For the commercial blocks, the impervious land area has assumed to 90% of total block areas with 50% of this impervious area corresponding to the parking/drive areas of the sites.

Table 2 summarizes the anticipated impervious land areas for the development.

Table 2
Post Development Impervious Areas

Area	Total Area (ha)	Impervious Area (ha)	Directly Connected (ha)
SFD	9.3	3.47	1.52
Block 1 – TWNHSE	0.57	0.43	0.21
Block 2 – Apartments	0.69	0.52	0.26
Block 3 - Commercial	0.8	0.72	0.36
Block 4 – Commercial	1.4	1.26	0.63
Block 5 – SWM	1.26	1.13	0.57
TOTAL	14.02	3.55	7.53

Discharge to Storage Relationship

To determine the required level of storage for a storm water detention pond, the post-development conditions were modeled, again using the SWMHYMO computer model. In order for the computer model to determine the storage volume required the relationship between the storage volume of the pond and the discharge must be defined and is referred to as the pond-rating curve. This rating curve is determined by calculating volume of the proposed pond facility up to a proposed contour elevation and then calculating the expected discharge from the facility based on the water level at this contour elevation and the proposed outlet control configuration.

Generally orifices or weirs can control discharge from SWM facilities. Each of these control methods can be used by the singular control or they can be used in combination depending on the discharge characteristics desired. For this facility only an orifice and weir will be used to control with the following equations used to estimate discharge

1. Orifice
   - $Q = C * A * \sqrt{2 * g * h}$

     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

For this facility a 125mm orifice will be used as the outlet control beginning at elevation 243.25. The complete rating curve is appended to this report as Appendix B.

Post Development Model
The post development model developed for this report as included as Appendix C. Table 3 summarizes the post development conditions for the storm events analyzed.

Table 3
Post Development Discharge

Event	Post Development to WSMD (cms)	Allowable Discharge to WSMD (cms)
2-Year	0.047	0.064
5-Year	0.050	
10-Year	0.053	
25-Year	0.055	
50-Year	0.057	
100-Year	0.060	

For all storm events the peak post development discharge to the WSMD has been controlled to less than the estimated peak pre development runoff from the contributing area to the WSMD.

4.0 Proposed SWM Facility

The Ministry of the Environment's document titled **Stormwater Management Practices Planning and Design Manual** (March 2003) was used in conjunction with requirements of the Norfolk County to determine the design for the storm water ponds for Yin's Subdivision. The following summarizes the design guidelines presented by the manual along with the corresponding value for the proposed facility. The complete calculations are provided as Appendix D.

a) Storage Sizing: Table 3.2 of the MOE design manual provides levels of storage volume required dependent on the percent impervious land area to provide basic protection. For a dry pond facility based on 54% impervious area of the contributing area to the facility, the required volume of storage is 147m^3/ha of contributing area. For the contributing area of 11.82 ha this results in a required storage of 1,738 m^3 and compares to the 1,768 m^3 provided during the quality storm (2-year event).

b) Detention Time: During the quality storm the design manual indicates a 24 hr detention time as a minimum requirement for dry pond facilities with 48 hr preferred. For the proposed facility the runoff stored during the quality storm (2-year event) is estimated to be between 26 and 35 hours.

c) Minimum Orifice Size: A minimum orifice of 75mm is recommended for wet pond facilities and compares to the 125mm provided by this facility.

d) Active Storage Depth: The MOE guideline recommends a maximum active storage depth of 2.0m. The active storage depth ranges between 0.3m and 0.9m depending on the storm event.

e) Side Slopes: Average side slopes are recommended to be at 4(h):1(v) or flatter. The exposed side slopes of the proposed facility are proposed to be 5(h):1(v).

f) Forebay Settling Length: The design manual outlines the calculation of the required length for the forebay to allow a certain size of particle to settle. The calculation is based on the peak flow rate from the pond during the quality storm, the length to width ratio of the forebay and settling velocity of the particle size (0.0003 m/s). The resulting length is 11m and compares to the 50m provided depending on the pond inlet.

g) Forebay Dispersion Length: The design manual also outlines a calculation to determine the length of forebay required to slow a discharge. This calculation is based on the inlet flow rate during the quality storm (2-year), the depth of the permanent pool in the forebay and the desired velocity in the forebay (0.5 m/s). This results in a target forebay length of 8m and compares to the 38m provided.

h) Sediment Accumulation: Based on the anticipated sediment loading rates outlined by Table 6.3 of the MOE guidelines, the estimated sediment accumulation can be determined based on the impervious land area within the catchment area along with the target removal efficiency of the proposed facility. For the estimated 54% impervious land of the contributing area, sediment accumulation is estimated to be approximately 130m^3 over a 10-year period. This compares to the forebay volume of 444m^3.

5.0 Outlet Capacity

The proposed outlet for the SWM facility outlined by this report is the Waterford South Municipal Drain. The main branch of this drain was constructed along Thompson Road in Waterford and was designed based on the 2-year storm event. Following construction of this drain, the former Regional Municipality of Haldimand Norfolk constructed a storm sewer south along Main Street. The purpose of this storm sewer was to provide an outlet to lands identified within the drainage area of the WSMD. It is unclear as to the genesis of this extension, however it appears that drainage report was not completed to bring this extension under the umbrella of the WSMD.

As was noted previously by this report, the design information for the storm sewer extension along Main Street is unavailable. Therefore to determine if the Main Street storm sewer provides sufficient capacity, design calculations were completed based on the contributing drainage area and at the 2-year storm event, the design event for the WSMD. These calculations, which are appended to this report, indicate that the existing system has insufficient capacity to service the existing drainage area.

Furthermore, a review of the existing system profile has indicated that the system would have insufficient depth to service the proposed development site.

Therefore, it is proposed to reconstruct this system beginning at the intersection of Thompson Road and proceeding southerly along Main Street with a new storm system of sufficient depth and capacity to service the existing drainage area and the development site. As the design of the WSMD is based on the 2-year event, the design of this new system is based on the 2-year event as well as the controlled discharges from the development site up to the 100-year event. The complete calculations for this system are appended to this report.

6.0 Emergency Overflow

As part of the outlet structure for the proposed SWM facility, a 1.8m square precast concrete catch basin structure has been placed with its top corresponding to the anticipated water level of the proposed SWM facility during the 100-year storm event (244.09 +/-). In the event that a storm event in excess of the 100-year storm occurs or the primary outlet is blocked, discharge from the facility will begin to occur over the top of this structure prior to overflowing the top of bank surrounding the SWM facility.

7.0 Proposed SWM Facility Summary

The following summarizes the proposed SWM Facility, shown drawings SWM1, for the Phase 5 of the Yin's Subdivision in Waterford.

- A dry pond facility with a permanent pool elevation in the sediment forebay of 243.25, pond bottom of elevation in the sediment forebay of 242.00 and top of slope 244.25.
- Permanent pool depth of 1.25m in the sediment forebay with a volume of 896m^3
- Total storage volume provided for the 100-year storm event is 5,0690m^3.
- Discharge from the proposed facility controlled by a 125mm diameter orifice at elevation 234.25.
- Outlet from the proposed facility to be provided by an extension of the WSMD along Main Street to the site. The design of this system to based on the 2-year event for the contributing area along Main Street and the controlled discharge from the development site as follows:
    - SWM Facility - 0.03 cms
    - Block 3 Commercial - 0.015 cms
    - Block 4 Commercial - 0.015 cms
- Emergency overflow flow provided by catch basin structure with top of casting elevation placed at the approximate 100-year storage level (244.09 +/-).

8.0 Erosion and Sediment Control

During construction, the contractor is required to protect the work site and all adjacent lands from sediment and erosion regardless of the source to the satisfaction of all applicable parties. The measures installed by the contractor are to remain in place until such time as there is no further threat of damage.

9.0 The Drainage Act

During the draft plan approval stage of this development, County staff recognized that the development site was within the drainage area of the WSMD. Therefore, the following draft plan condition was stipulated:

> " 5. The applicant covenants and agrees to pay all costs related to the Corporation of Norfolk County hiring and engineer on behalf of the applicant as per Section 4(1) of the Drainage Act for the purpose of constructing an extension to the existing municipal drain or to construct an entirely new municipal drainage system to service the severed property(s)."

To begin this process a formal request needs to provided by the applicant to Norfolk County.

11.0 Conclusions and Recommendations

It is concluded that:

1. Post development flows from the development site have been controlled to less then the current discharge of the portion of the site within the drainage area of the WSMD.
2. The proposed storm water pond has sufficient capacity and meets the design guidelines outlined by the MOE's document titled **Stormwater Management Practices Planning and Design Manual** (March 2003) for basic protection and requirements Norfolk County.
3. The existing storm sewer along Main Street has insufficient capacity during the 2-year event for the current contributing area to this system.

It is recommended that:

1. This report is provided to the Norfolk County and the Long Point Region Conservation Authority as part of the engineering approval package for the development.
2. Pending approval by the municipality and receipt of the required Ministry of the Environment approvals, the Facility and associated appurtenances be constructed as outlined by this report.
3. The applicant formally request of Norfolk County the appointment of an engineer under the Drainage Act to address the extension of the WSMD to the development site.

We trust that this is the information for submission. Should you have any questions or require further information please do not hesitate to call. Thank you.

Yours truly,

T. Gregory Smith, P.Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

T. G. SMITH
DEC 9/10

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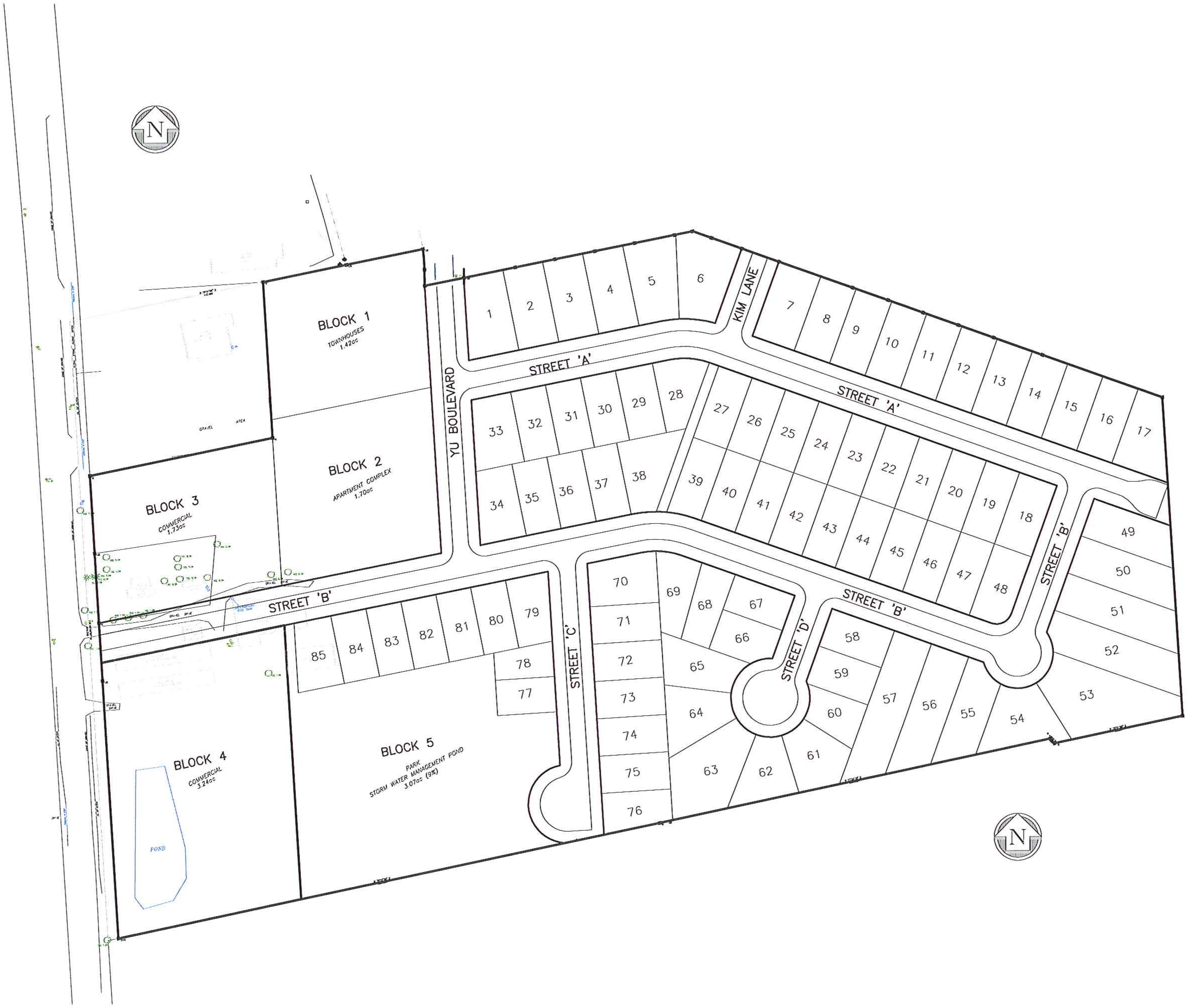
List of Figures

List of Appendices

List of Drawings



DATE	REVISION

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Stamp

vallee

Consulting Engineers,
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G. DOUGLAS VALLEE LIMITED
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2 TALBOT STREET NORTH
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Project Title

YIN'S SUDIVISION
PHASE 5

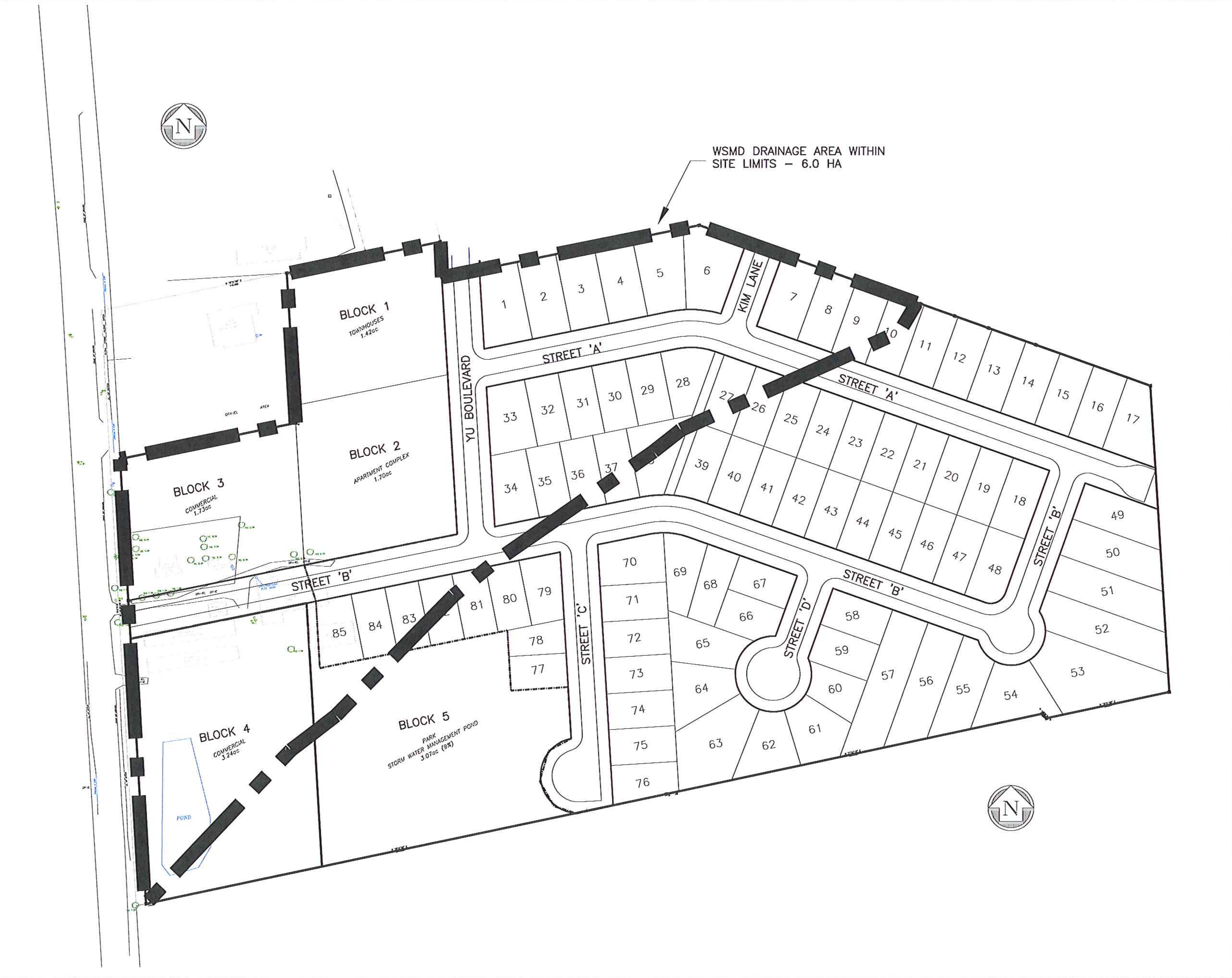
Drawing Title

FIGURE 1
DEVELOPMENT LAYOUT

Designed by :	Drawn By :	Checked By :
TGS	TGS	

Scale :	Date :	Drawing No.
1:2000	DEC 2010	F1

Project No.
10034


WSMD DRAINAGE AREA WITHIN SITE LIMITS – 6.0 HA

DATE	REVISION

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(519) 426–6270

Project Title
YIN'S SUDIVISION
PHASE 5

Drawing Title
FIGURE 2
WSMD DRAINAGE AREA

Designed by :	Drawn By :	Checked By :
TGS	TGS	

Scale :	Date :	Drawing No.
1:2000	DEC 2010	F2

Project No.
10034

Appendix A: Pre-Development Model


FOX1 C
FOX1 C
BRT1 B
BRT4 c>B
BRR5 B>B
SLI1 B
Dugout
WIL1 E
WIL1 E
STD8 d>B
780
STD5 DD
Kilns
STD2 B>B
STD1 c
WIL1 E
NDE3 B>B
Dugout
TVK1 B
GNY1 B
Dugout
BRT1 c
TUC4 BB
BRT1 c
BRT1 D
WIL1 E
BAY1 B
Kilns
WIL3 D
WIL3 d
Kilns
Greenhouse
BRT1 D
BRT1 c
BRT1 D
TUC1 B
WIL5 cB
GNY1 B
WIL3 C
WIL3 d
SLI1 B
BRT4 BB
CWO1 B
CWO1 B
BRT1 BD
770
WIL3 d
WIL5 DD
STD1 B
STD1 B
TUC3 B>C
Greenhouse
BRT1 D
BRT1 e
Kilns
Greenhouse
WIL3 c
800
Kilns
STD1 d
WIL1 E
BAY1 c
730
TUC1 B
FOX4 B>B
BM 737
Nanticoke
Ck
FOX1 c
MAR
UL
VSS2 B>C
WIL5 DD
NDE1 B
BRT1 d
Reservoir
ALU1 B
BRT1 e
BRT1 c
d
Pond
WIL1 F
VSS2 B>C
STD1 D
WIL1 e>d
WIL3 c
BRT1 d
BRT1 d
MICHIGAN
730
BRT1 d
TUO1 B
GNY1 B
OKL3 B
Textile Mill
STD1 c
CENTRAL
BFO3 B
MAR
STD1 cd
WIL1 e>d
UL
Park
Greenhouse
Kilns
STD1 D
BRT1 D
CWO1 B
Dam
BRT1 e
Waterford
STD1 B
STD1 B
WAT1 D>e
Town Limits
Town Limits
Cemetery
TUC1 c
UL
WIL3 C
BOO1 D
BOO3 BB
WAT1 e
Kilns
770
VSS1 B
FOX1 cB
BVY2 B
BAY1 B
PFD2 c
FOX9 DE
BAY4 B>B
BAY1 B
Dugouts
BOO1 B
WIL1 F
Kilns
FOX1 c
Shopping Centre
NDE1 B
WAT1 d
FOX1 dB
WIL1 E
WIL3 C
Kilns
GNY1 B
SITE
BRT1 d
Dugout
SLI10 B>B
WAT1 e
Dugout
WIL13 B>B
Greenhouse
FOX1 c
TVK5 B>B
BFO2 BB
WAT2 e>B
WAT1 d
Kilns
Dugout
STD2 c>B
CWO11 BB
Kilns
FOX1 C
BVY6 B>B
NDE2 B>c
Dugout
GNY1 B
WAT1 e
810
WAT1 d
LAKE ERIE AND NORTHERN
Kilns
800
Kilns
WAT1 dE
FOX4 c>B
Dugou
BOO1 c
BOO3 cB
Auto Wreckers
STD9 C>B
Kilns
Greenhouse
Greenhouse
Dugouts
HMP1 B
Kilns
24
OKL2 B>B
Dugout
SLI10 B>B
WAT1 e
STD1 d>B
PFD2 d>c
BOO1 c
Greenhouse
STD1 c
Greenhouse
OKL2 BB
TUC1 B
Dugout
WAT1 d
OKL4 BB
STD1 d
STD1 c
Dugout
780
800
BM 804
WAT5 BC
GNY1 B
WUS3 cB
BRR5 B>B
6
7
BRT1 c
Kilns
STD1 c
Sips
STD4
STD1

CWO 20	CWO.C	BRR	15-40 cm sandy textures over lacustrine silt loam	see BRR 1	Poor	Imperfect
CWO 22	CWO.P	HMP	15-40 cm organic materials over lacustrine silt loam	see HMP 1	Poor	Very poor
FOX - Fox						
FOX 1	FOX	None	Mainly lacustrine sand and loamy sand		Rapid to well	
FOX 3	FOX	GNY	see FOX 1	see GNY 1	Rapid to well	Poor
FOX 4	FOX	BAY	see FOX 1	see BAY 1	Rapid to well	Imperfect
FOX 8	FOX	BRR	see FOX 1	see BRR 1	Rapid to well	Imperfect
FOX 9	FOX	STD	see FOX 1	see STD 1	Rapid to well	Well
FOX 10	FOX	OKL	see FOX 1	see OKL 1	Rapid to well	Imperfect
FOX 13	FOX	CWO	see FOX 1	see CWO 1	Rapid to well	Poor
FRM - Farmington						
FRM 1	FRM	None	Less than 20 cm variable textures over bedrock		Rapid	
GNY - Granby						
GNY 1	GNY	None	Mainly lacustrine sand and loamy sand		Poor	
GNY 3	GNY.P	None	15-40 cm organic materials over lacustrine sand and loamy sand		Very poor	
GNY 4	GNY	BAY	see GNY 1	see BAY 1	Poor	Imperfect
GNY 6	GNY	FOX	see GNY 1	see FOX 1	Poor	Rapid to well
GNY 7	GNY	CWO	see GNY 1	see CWO 1	Poor	Poor
GNY 11	GNY	GNY.P	see GNY 1	see GNY 3	Poor	Very poor
GNY 15	GNY	OKL	see GNY 1	see OKL 1	Poor	Imperfect
GNY 17	GNY	BRR	see GNY 1	see BRR 1	Poor	Imperfect
GNY 18	GNY.P	TLD.C	see GNY 3	see TLD 2	Very poor	Poor

RAINAGE MPONENTS No. 2
Rapid
Variable
Rapid
Rapid to well
Rapid
Rapid to well
ll

l drainages. This informa-

nate proportions, and the

ents in the map unit. The
ıonent refers to the No. 2
ıent has been mapped in

the slope symbols appear
s, a “greater than” symbol
hat occupies at least 80%

ls B, c, C, d, D, e, E, f, F,
.

tand that many soil bound-
everal hectares, of uniden-
cs to a depth of about 100

MAP UNIT SYMBOL	MAP UNIT COMPONENTS No. 1	MAP UNIT COMPONENTS No. 2	PARENT MATERIAL COMPONENTS No. 1	PARENT MATERIAL COMPONENTS No. 2	DRAINAGE COMPONENTS No. 1	DRAINAGE COMPONENTS No. 2
WIL - Wilsonville						
WIL 1	WIL	None	Mainly gravelly sandy till		Rapid to well	
WIL 3	WIL.C	None	15-40 cm sandy textures over gravelly sandy till		Rapid to well	
WIL 5	WIL	WIL.C	see WIL 1	see WIL 3	Rapid to well	Rapid to well
WIL 9	WIL.L	WIL	15-40 cm loamy textures over gravelly sandy till	see WIL 1	Rapid to well	Rapid to well
WIL 10	WIL.L	BRT	see WIL 9	see BRT 1	Rapid to well	Well
WIL 11	WIL.C	WIL	see WIL 3	see WIL 1	Rapid to well	Rapid to well
WIL 12	WIL.C	STD	see WIL 3	see STD 1	Rapid to well	Rapid to well
WIL 13	WIL.C	NDE	see WIL 3	see NDE 1	Rapid to well	Imperfect
WIL 14	WIL.C	OKL	see WIL 3	see OKL 1	Rapid to well	Imperfect
WSH - Walsher						
WSH 1	WSH	None	40-100 cm sandy textures over lacustrine silt loam		Well	
WUS - Wauseon						
WUS 1	WUS	None	40-100 cm sandy textures over lacustrine silty clay		Poor	
WUS 3	WUS.P	None	15-40 cm organic materials over lacustrine silty clay		Very poor	
WUS 4	WUS	BRR	see WUS 1	see BRR 1	Poor	Imperfect
WUS 6	WUS	TLD.C	see WUS 1	see TLD 2	Poor	Poor
WUS 9	WUS	SLI	see WUS 1	see SLI 1	Poor	Poor
WUS 10	WUS	TUC.C	see WUS 1	15-40 cm sandy textures over lacustrine silt loam	Poor	Imperfect

TVK - Ta
TVK 1
TVK 2
TVK 3
TVK 4
TVK 5
TVK 7
TVK 9
VSS - Va
VSS 1
VSS 2
WAT - V
WAT 1
WAT 2
WAT 3
WAT 4
WAT 5
WAT 8
WAT 1

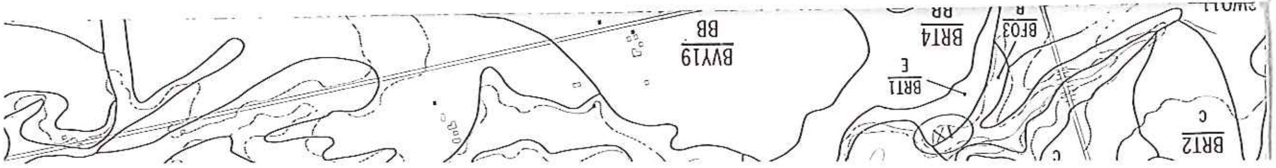


CHART C2-6 –continued

Soil Series	Soil Type	Hyd. Soil Grp.	Soil Series	Soil Type	Hyd. Soil Grp.	Soil Series	Soil Type	Hyd. Soil Grp.
Crombie	s l	B	Englehart	s l	B	Harriston	l	BC
"	si l	BC	Evanturel	si l	BC	"	si l	BC
Dack	c	D	"	si c l	C	Harrow	s	A
Dalton	s	AB	Falardeau	si l	BC	"	s l	AB
Darlington	s	B	"	si c l	C	"	l	B
"	l	C	Farmington	s l	A	Havelock	s /g	A
Dawson	s l	A	"	l	B	Hawkesvi.	l	B
"	l	B	"	c l	C	Haysville	s l	AB
Deloro	l	B	Ferndale	si l	BC	Heidelburg	f s l	B
Devlin	si c /}	C	"	c l	C	Hendrie	s /g	AB
	c l }		Flamboro	s	B	Henwood	s /g	A
Dinorwic	c	BC	Floradale	l	B	Hespeler	s l	B
Dobie	c /l	BC	Fonthill	g	A	Hillier	c	C
Doe	s l	B	Font	g s l	A	Hillsburgh	s l	A
"	si l	BC	Forbes	c	D	Himsworth	si l	BC
Donald	l	B	Fox	s	A	Hinchinbr.	s l	B
Donnybrook	s g	A	"	s l	AB	"	l	BC
"	s l	AB	Foxboro	s	A	"	si l	BC
Dorion	c /l	C	Franktown	l	B	Honeywood	s l	AB
Dorking	si c l	BC	Freeport	s l	B	"	si l	BC
Dumfries	s l	A	Galesburg	s l	A	Howland	s l	B
"	l	AB	"	l	AB	"	l	BC
Dummer	s l	A	Gameland	s /g	AB	Huron	s l	B
"	l	B	Gananoque	c	C	"	l	BC
Dundonald	s l	AB	Gerow	c l	C	"	si l	BC
Dunedin	c	D	Gilford	s l	B	"	c l	CorD
Dymond	s l	AB	"	l	B	Innisville	s l	B
"	l	B	Gordon	si c	C	Jeddo	l	BC
Eagle Lake	s /g	AB	Granby	s	B	"	c l	C
Eamer	l	BC	"	s l	B	Kagawong	si l	BC
Earlton	si l	B	Grand	l	B	Kars	s /g	A
"	c l	C	Grenville	s l	A	Kemble	si l	BC
Eastport	s	A	"	l	BC	"	si c l	C
Edenvale	s	AB	Grimsby	s l	A	"	c l	D
Eganville	l	B	Guelph	s l	A	Kenabeek	s	B
Elderslie	si l	BC	"	l	BC	"	s l	B
"	si c l	C	"	si l	BC	Killean	l/s l	AB
"	c l	C	Guerin	s l	AB	King	si l	BC
Eldorado	s l	A	"	l	B	"	c l	C
"	l	B	Gwillimb.	g	AB	Kirkland	s l	A
Elk Pit	s g	A	Haileybury	si c l	C	Kossuth	s l	B
Ellwood	c l	C	"	si c	C	L'Achigan	s	AB
Elmbrook	si l	BC	"	c	CD	Lambton	l	BC
"	c l	C	Haldimand	si l	BC	"	si l	BC
"	c	C	"	si c l	C	Lanark	c	C
Elmira	l	B	"	c	CorD	Lansdowne	c /si l	C
Elmsley	s l	B	Hanbury	si c l	C	Leech	si c l	C
Embro	s l	BC	"	si c	C	"	c l	D
"	s l	C	"	c	D	Leitrim	g	B
Emily	l	B	Harkaway	l	B	Leith	si l	BC
Emo	c & p	C	"	si l	BC	Lily	l/s l	B

CHART C2-6 - continued

Soil Series	Soil Type	Hyd. Soil Grp.	Soil Series	Soil Type	Hyd. Soil Grp.	Soil Series	Soil Type	Hyd. Soil Grp.
						Late	Addit.	
Smithville	l	BC	Uplands	s	A	Percy	f s l	B
"	si c l	C	"	s l	A	Brisbane	l	B
"	si l	BC	Upsala	f s	AB	Donnybrook	l	B
Snedden	si c l	C	Vars	l	B			
Solmesville	c l	C	Vasey	s l	AB			
South Bay	c l	D	"	l	B			
"	c	D	Vergennes	si l	BC			
Spohn	s /g / }		"	l	BC			
	c }	BC	"	c	C			
Springvale	s l	A	Vincent	si l	BC			
Stafford	l	B	"	si c l	C			
Stockdale	si l/f }		"	c l	D			
	s }	B	Vineland	s l	AB			
St, Clem.	s l	A	Wabi	s l	A			
"	si c l	C	"	l	B			
St. Jacobs	l	B	Wabigoon	c	C			
St. Peter	s /g	A	Waterloo	s	A			
St. Rosalie	c	C	"	s l	A			
St. Samuel	s	B	Watrin	s	B			
"	s l	B	Waupoos	c l	D			
St. Thomas	s	A	"	c	D			
Sullivan	s	A	Wauseon	s l	B			
"	s l	A	Wayside	s	AB			
Sutton Bay	s	B	Welland	c	C			
"	s l	B	Wellesley	s l	AB			
Tansley	c	D	"	si c l	C			
Tavistock	s l	AB	Wemyss	s l	AB			
"	si l	BC	Wendigo	s	A			
Tecumseth	s	AB	"	s l+r	AB			
Teeswater	si l	B	Wendover	c l	D			
Tennyson	s l	A	Westmeath	s	A			
Thames	c l	D	Whitby	l	BC			
Thorah	s	B	White Lake	s /g	A			
Thornloe	c	C	Whitfield	si l	B			
Thwaites	si l	BC	Wiarton	l	B			
Tioga	s	A	"	si l	BC			
"	s l	A	Wilmot	s l	B			
Toledo	si l	BC	"	si c l	C			
"	si c l	C	Winona	s l	AB			
"	c l	C	Woburn	s l	A			
"	c	C	"	l	B*			
Trafalgar	c	D	Wolford	c l	D			
Trent	s	AB	Wolsey	si c	C			
Tuscola	s l	AB	Wooler	si l/f }				
"	si l	BC		s }	AB			
Tweed	s l	A	Woolwich	l	BC			
Undiffer'd	s l +r	AB or B(dep on depth)	Worthing.	s /g /c	BC			
			Wyevale	s /g	A			

} WILSONVILLE NOT LISTED -SANDY => GROUP A.

*Rev. 79 06 01

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)

vallee
Consulting Engineers,
Architects & Planners

Subject: Yin Phase 5
Date: Nov 2/10 By: TGS
Project #: 10034 Page

High Density - predevelopment and current state

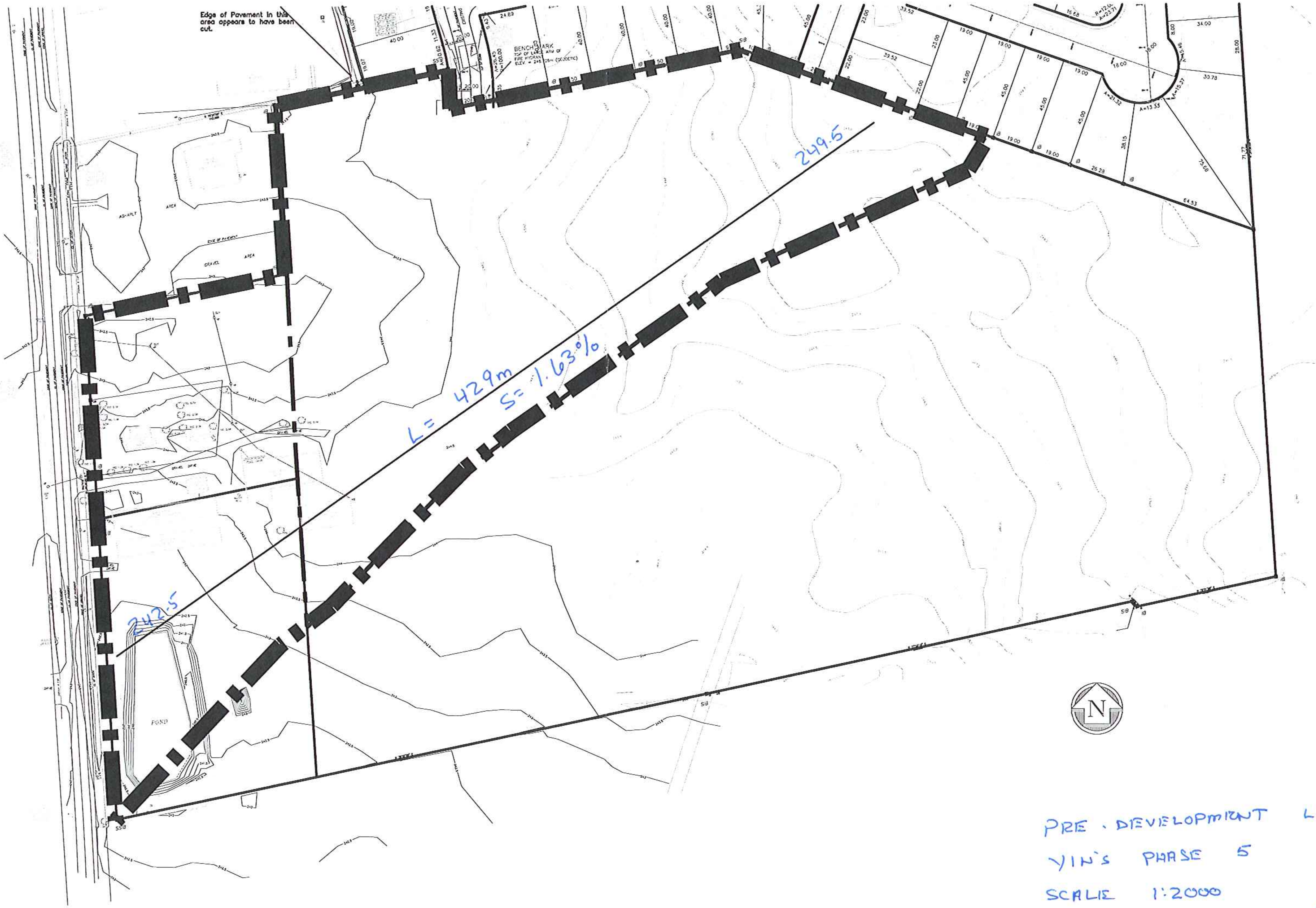
tc calc for upstream drainage area

tc = 3.26*(1.1-C)*L^(0.5)/S^0.333 (airport formula)

L as above	429	m
S as above but as percent	1.63	%
C, rational Runoff Coefficient (Pre dev)	0.2	

tc = 52 min 0.86 hrs

tp = 0.6 *tc tp = 0.52 hrs



PRE - DEVELOPMENT LONGEST FLOWPATH

YIN'S PHASE 5

SCALE 1:2000

PRE-DEV DRAINAGE AREA TO WATERFORD SOUTH MUNICIPAL DRAIN.

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

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
                                                       9   9  9   9 # 3568969
      StormWater Management HYdrologic Model          999    999  =========

 **************************************************************************
 ************************** SWMHYMO-99 Ver/4.02 ***************************
 *******  A single event and continuous hydrologic simulation model  *******
 *******     based on the principles of HYMO and its successors     *******
 *******                 OTTHYMO-83 and OTTHYMO-89.                 *******
 **************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
 *******                  Ottawa,  Ontario: (613) 727-5199          *******
 *******                  Gatineau, Quebec: (819) 243-6858          *******
 *******                  E-Mail: swmhymo@jfsa.Com                  *******
 **************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: G. Douglas Vallee Limited                   +++++++
 +++++++                Simcoe                  SERIAL#:3568969     +++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 **************************************************************************
 *******            ++++++ PROGRAM ARRAY DIMENSIONS ++++++          *******
 *******            Maximum value for ID numbers  :      10         *******
 *******            Max. number of rainfall points:  15000          *******
 *******            Max. number of flow points    :  15000          *******
 **************************************************************************


 ******************    D E T A I L E D   O U T P U T   ******************
 **************************************************************************
 *       DATE: 2010-11-22      TIME: 14:14:54      RUN COUNTER: 001100      *
 **************************************************************************
 * Input   filename: H:\SWMHYM~1\10034Y~1\PREDEV.DAT                        *
 * Output  filename: H:\SWMHYM~1\10034Y~1\PREDEV.out                        *
 * Summary filename: H:\SWMHYM~1\10034Y~1\PREDEV.sum                        *
 * User comments:                                                           *
 * 1:_______________________________________________________________________*
 * 2:_______________________________________________________________________*
 * 3:_______________________________________________________________________*
 **************************************************************************

 ----------------------------------------------------------------------------
 001:0001--------------------------------------------------------------------
 *#**************************************************************************
 *#  Project Name: [YINS PHASE 5]    Project Number: [101034]
 *#  Date         : 02-11-2010
 *#  Modeller     : [TGS]
 *#  Company      : G. Douglas Vallee Limited
 *#  License #    :  3568969
 *#**************************************************************************
 --------------------
 | START              |  Project  dir.: H:\SWMHYM~1\10034Y~1\
 --------------------  Rainfall dir.: H:\SWMHYM~1\10034Y~1\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=CH2.STM
 ----------------------------------------------------------------------------
 001:0002--------------------------------------------------------------------
 --------------------
 | READ STORM        |     Filename: H:\SWMHYM~1\10034Y~1\CH2.STM
 | Ptotal=  39.39 mm|     Comments: 2 YEAR CHICAGO 4 HOUR DESIGN STORM DISTR
 --------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   3.250 |   1.17   8.940 |   2.17   8.150 |   3.17   4.390
               .33   3.560 |   1.33  16.920 |   2.33   7.010 |   3.33   4.110
               .50   3.960 |   1.50  78.820 |   2.50   6.200 |   3.50   3.890
               .67   4.520 |   1.67  21.890 |   2.67   5.590 |   3.67   3.680
               .83   5.310 |   1.83  13.000 |   2.83   5.110 |   3.83   3.510
              1.00   6.550 |   2.00   9.880 |   3.00   4.720 |   4.00   3.350

 ----------------------------------------------------------------------------
 001:0003--------------------------------------------------------------------
 ****************************************************************************
 *
 *
 *   PRE DEVELOPMENT MODEL - ENTIRE SITE
 *
 *
 ****************************************************************************
 ----------------------
 | DESIGN NASHYD        |   Area     (ha)=    14.00   Curve Number   (CN)=58.00
 | 01:PREDEV DT= 1.00 |   Ia       (mm)=    1.500   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=     .670

      Unit Hyd Qpeak  (cms)=      .798

      PEAK FLOW        (cms)=      .111 (i)
      TIME TO PEAK     (hrs)=     2.400
      RUNOFF VOLUME     (mm)=     6.471
      TOTAL RAINFALL    (mm)=    39.385
      RUNOFF COEFFICIENT   =      .164

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ----------------------------------------------------------------------------
 001:0004--------------------------------------------------------------------
 ****************************************************************************
 *
 *
 *   PORTION OF SITE THAT DRAINS TO WSMD AND WILL DRAIN TO POND
 *
 *
 ****************************************************************************
 ----------------------
 | DESIGN NASHYD        |   Area     (ha)=     4.12   Curve Number   (CN)=58.00
 | 02:WSMD   DT= 1.00 |   Ia       (mm)=    1.500   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=     .520

      Unit Hyd Qpeak  (cms)=      .303
```

```
      PEAK FLOW        (cms)=      .038 (i)
      TIME TO PEAK     (hrs)=     2.167
      RUNOFF VOLUME     (mm)=     6.471
      TOTAL RAINFALL    (mm)=    39.385
      RUNOFF COEFFICIENT   =      .164

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ----------------------------------------------------------------------------
 001:0005--------------------------------------------------------------------
 ****************************************************************************
 *
 *
 * PRE DEVELOPMENT TO WSMD
 *
 *
 ****************************************************************************
 ----------------------
 | DESIGN NASHYD        |   Area     (ha)=     6.02   Curve Number   (CN)=62.00
 | 03:WSMD   DT= 1.00 |   Ia       (mm)=    1.500   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=     .520

      Unit Hyd Qpeak  (cms)=      .442

      PEAK FLOW        (cms)=      .064 (i)
      TIME TO PEAK     (hrs)=     2.167
      RUNOFF VOLUME     (mm)=     7.415
      TOTAL RAINFALL    (mm)=    39.385
      RUNOFF COEFFICIENT   =      .188

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ----------------------------------------------------------------------------
 001:0006--------------------------------------------------------------------
       FINISH
 ----------------------------------------------------------------------------
 ****************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
    Simulation ended on 2010-11-22     at 14:14:54
 ============================================================================
```

Appendix B: Pond Rating Curves

vallee

Consulting Engineers,
Architects & Planners

Subject: Yins Phase 5
Date: Dec-10 By: TGS
Project #: 10034 Page

Orifgice Elevation	243.25	m
Orifice Dia	0.125	m
Orifice Area	0.012272	m2
Discharge Coeff	0.63	

	Forebay m2	Main m2	Total m2	Incr Vol m3	Cum Vol m3	H above Orifice m	Orifice Q cms	Storage ha*m	Incr Time to Drain hr	Cum. Time to Drain hr
243.25	717	4485	5202	0	0	0	0	0	0	
243.35	778	4626	5404	530	530	0.0375	0.006632	0.05303		
243.45	841	4769	5610	551	1081	0.1375	0.012698	0.1081	15.8	15.8
243.55	906	4913	5819	571	1652	0.2375	0.016689	0.165245	10.8	26.6
243.65		6042	6042	593	2245	0.3375	0.019895	0.22455	9.0	35.6
243.75		6196	6196	612	2857	0.4375	0.022651	0.28574	8.0	43.6
243.85		6351	6351	627	3485	0.5375	0.025107	0.348475	7.3	50.9
243.95		6508	6508	643	4128	0.6375	0.027343	0.41277	6.8	57.7
244.05		6667	6667	659	4786	0.7375	0.029409	0.478645	6.4	64.2
244.15		6827	6827	675	5461	0.8375	0.03134	0.546115	6.2	70.4
244.25		6989	6989	691	6152	0.9375	0.033158	0.615195	6.0	76.3

244.15	0.5461	
244.05	0.4786	
244.09	0.5069	Elevation at 100-year storage

Appendix C: Post Development Model

Subject: YIN PHASE 5
Date: NOV 2/10 By: TGS
Project #: 10034 Page

IMPERVIOUS AREA ASSUMPTIONS:

AVERAGE DWELLING ROOF AREA:	185 m2	
AVERAGE DWELLING DRIVEWAY AREA:	45 m2	
TOTAL IMPERVIOUS AREA PER DWELLING:	230 m2	0.023 ha
ROADWAY AND ONE SIDE SIDEWALK AREA PER METRE LENGTH OF ROAD:	11 m2	0.0011 ha

Area No.	Total Area (ha)	No. of Dwell	Dwellling Imp Area (ha)	Street Lenth (m)	Street Imp Area (ha)	Dir Conn Ratio	Total Imp Area (ha)	Imp Area Ratio
SFD	9.3	85	1.96	1380	1.52	0.16	3.47	0.37
BLOCK 1 TOWN HOUSES	0.57				0.21	0.38	0.43	0.75
BLOCK 2 APARTMENTS	0.69				0.26	0.38	0.52	0.75
BLOCK 3 COMMERCIAL	0.8				0.36	0.45	0.72	0.90
BLOCK 4 COMMERCIAL	1.4				0.63	0.45	1.26	0.90
BLOCK 5 SWM	1.26				0.57	0.45	1.13	0.90
	14.02				3.5475	0.25	7.532	0.54

1) IMPERVIOUS AREAS FOR BLOCKS 1 THOUGH 5 HAVE BEEN ASSUMED BASED ON RUNOFF COEFFICIENTS FOR APPLICABLE LAND USE PER NORFOLK COUNTY'S CURRENT DESIGN CRITERIA.
2) FOR DIRECTLY CONNECTED AREAS (IE DRIVES AND PARKING) OF BLOCKS 1 THROUGH 5, 50% OF THE TOTAL IMPERVIOUS AREA HAS BEEN ASSUMED.
3) TOTAL AREA DOES NOT EQUAL TOTAL SITE AREA AS APPROXIMATELY 0.2 HA OF STREET B WILL NOT FLOW TO SWM FACILITY.

TOTAL STREET LENGTH

580
150
80
370
50
150

1380m

1:2000

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

SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
    S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
                                                     9   9  9   9 # 3568969
     StormWater Management HYdrologic Model           999    999  =========

**************************************************************************
************************* SWMHYMO-99 Ver/4.02 ****************************
*******  A single event and continuous hydrologic simulation model *******
*******     based on the principles of HYMO and its successors      *******
*******                 OTTHYMO-83 and OTTHYMO-89.                  *******
**************************************************************************
******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
*******                  Ottawa,  Ontario: (613) 727-5199           *******
*******                  Gatineau, Quebec: (819) 243-6858           *******
*******                  E-Mail: swmhymo@jfsa.Com                   *******
**************************************************************************

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++ Licensed user: G. Douglas Vallee Limited                   +++++++
+++++++                  Simcoe                SERIAL#:3568969      +++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

**************************************************************************
*******             ++++++ PROGRAM ARRAY DIMENSIONS ++++++          *******
*******             Maximum value for ID numbers  :     10          *******
*******             Max. number of rainfall points:  15000          *******
*******             Max. number of flow points    :  15000          *******
**************************************************************************


******************   D E T A I L E D   O U T P U T   ********************
**************************************************************************
*      DATE: 2010-11-22     TIME: 14:15:43     RUN COUNTER: 001101       *
**************************************************************************
* Input   filename: H:\SWMHYM~1\10034Y~1\PSTDEV.DAT                      *
* Output  filename: H:\SWMHYM~1\10034Y~1\PSTDEV.out                      *
* Summary filename: H:\SWMHYM~1\10034Y~1\PSTDEV.sum                      *
* User comments:                                                         *
* 1:_____________________________________________________________________*
* 2:_____________________________________________________________________*
* 3:_____________________________________________________________________*
**************************************************************************

----------------------------------------------------------------------------
001:0001--------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [YINS PHASE 5]    Project Number: [10034]
*#  Date         : 02-11-2010
*#  Modeller     : [TGS]
*#  Company      : G. Douglas Vallee Limited
*#  License #    :  3568969
*#**************************************************************************
--------------------
| START             |  Project  dir.: H:\SWMHYM~1\10034Y~1\
--------------------  Rainfall dir.: H:\SWMHYM~1\10034Y~1\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
          #  1=CH2.STM
----------------------------------------------------------------------------
001:0002--------------------------------------------------------------------
--------------------
| READ STORM        |    Filename: H:\SWMHYM~1\10034Y~1\CH2.STM
| Ptotal=  39.39 mm|    Comments: 2 YEAR CHICAGO 4 HOUR DESIGN STORM DISTR
--------------------
                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                  .17   3.250 |   1.17   8.940 |   2.17   8.150 |   3.17   4.390
                  .33   3.560 |   1.33  16.920 |   2.33   7.010 |   3.33   4.110
                  .50   3.960 |   1.50  78.820 |   2.50   6.200 |   3.50   3.890
                  .67   4.520 |   1.67  21.890 |   2.67   5.590 |   3.67   3.680
                  .83   5.310 |   1.83  13.000 |   2.83   5.110 |   3.83   3.510
                 1.00   6.550 |   2.00   9.880 |   3.00   4.720 |   4.00   3.350

----------------------------------------------------------------------------
001:0003--------------------------------------------------------------------
****************************************************************************
*
*
* SFD
*
*
****************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    9.30
| 01:SFD    DT= 1.00 |   Total Imp(%)=   37.00   Dir. Conn.(%)=   16.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      3.44          5.86
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=    249.00         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=     78.82         11.25
                over (min)       5.00         26.00
     Storage Coeff.  (min)=      4.86 (ii)    25.68 (ii)
     Unit Hyd. Tpeak (min)=      5.00         26.00
     Unit Hyd. peak  (cms)=       .23           .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .27           .11        .301 (iii)
     TIME TO PEAK    (hrs)=      1.52          1.92       1.517
     RUNOFF VOLUME    (mm)=     38.58          8.31      13.152
     TOTAL RAINFALL   (mm)=     39.38         39.38      39.385
     RUNOFF COEFFICIENT   =       .98           .21        .334

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

----------------------------------------------------------------------------
001:0004--------------------------------------------------------------------
****************************************************************************
*
*
* BLOCK 1 TOWNHOUSES
*
*
****************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .57
| 02:BLK1   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .43           .14
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     61.64         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=     78.82         48.36
                over (min)       2.00         14.00
     Storage Coeff.  (min)=      2.10 (ii)    13.72 (ii)
     Unit Hyd. Tpeak (min)=      2.00         14.00
     Unit Hyd. peak  (cms)=       .54           .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .05           .01        .052 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.70       1.500
     RUNOFF VOLUME    (mm)=     38.58         13.32      22.918
     TOTAL RAINFALL   (mm)=     39.38         39.38      39.385
     RUNOFF COEFFICIENT   =       .98           .34        .582

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

----------------------------------------------------------------------------
001:0005--------------------------------------------------------------------
****************************************************************************
*
*
* BLOCK 2 APARTMENTS
*
*
****************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .69
| 03:BLK2   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .52           .17
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     67.82         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=     78.82         48.36
                over (min)       2.00         14.00
     Storage Coeff.  (min)=      2.23 (ii)    13.85 (ii)
     Unit Hyd. Tpeak (min)=      2.00         14.00
     Unit Hyd. peak  (cms)=       .52           .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .06           .01        .063 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.70       1.500
     RUNOFF VOLUME    (mm)=     38.58         13.32      22.918
     TOTAL RAINFALL   (mm)=     39.38         39.38      39.385
     RUNOFF COEFFICIENT   =       .98           .34        .582

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

----------------------------------------------------------------------------
001:0006--------------------------------------------------------------------
****************************************************************************
*
*
* BLOCK 5 SWM
*
*
****************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    1.26
| 06:BLK5   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.13           .13
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     91.65         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=     78.82          6.11
                over (min)       3.00         29.00
     Storage Coeff.  (min)=      2.67 (ii)    29.24 (ii)
     Unit Hyd. Tpeak (min)=      3.00         29.00
     Unit Hyd. peak  (cms)=       .40           .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .24           .00        .241 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.97       1.500
     RUNOFF VOLUME    (mm)=     38.58          6.47      35.374
     TOTAL RAINFALL   (mm)=     39.38         39.38      39.385
     RUNOFF COEFFICIENT   =       .98           .16        .898

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

----------------------------------------------------------------------------
001:0007--------------------------------------------------------------------
****************************************************************************
*
*
* DETERMINE INFLOW TO POND
*
*
```

```
*************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 01:SFD      9.30      .301    1.52  13.15    .000
                  +ID2 02:BLK1      .57      .052    1.50  22.92    .000
                  +ID3 03:BLK2      .69      .063    1.50  22.92    .000
                  +ID4 06:BLK5     1.26      .241    1.50  35.37    .000
                   ==================================================
                   SUM 07:PSTDEV  11.82      .651    1.50  16.56    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0008-------------------------------------------------------------------
*************************************************************************
*
*
* ROUTE THROUGH POND
*
*
*************************************************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(PSTDEV)   |
| OUT<08:(PNDOUT)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000  .0000E+00    |     .025  .3535E+00
                           .007  .5520E-01    |     .027  .4178E+00
                           .013  .1118E+00    |     .029  .4837E+00
                           .017  .1700E+00    |     .031  .5512E+00
                           .020  .2296E+00    |     .033  .6203E+00
                           .023  .2908E+00    |     .000  .0000E+00

     ROUTING RESULTS             AREA      QPEAK     TPEAK       R.V.
     --------------------        (ha)      (cms)     (hrs)       (mm)
     INFLOW >07: (PSTDEV)       11.82       .651     1.500     16.562
     OUTFLOW<08: (PNDOUT)       11.82       .017     4.533     16.561
   OVERFLOW<09: (PNDOVR)          .00       .000      .000       .000

                 TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                 CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                 PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=     2.623
                 TIME SHIFT OF PEAK FLOW         (min)=    182.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=.1768E+00

---------------------------------------------------------------------------
001:0009-------------------------------------------------------------------
*************************************************************************
*
*
* BLOCK 3 COMMERCIAL
*
*
*************************************************************************
---------------------
| DESIGN STANDHYD   |   Area    (ha)=      .80
| 04:BLK3   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .72          .08
     Dep. Storage     (mm)=       .80         1.50
     Average Slope     (%)=      1.00         1.00
     Length            (m)=     73.03        40.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=     78.82       230.54
               over (min)       2.00         9.00
     Storage Coeff.  (min)=      2.33 (ii)    8.55 (ii)
     Unit Hyd. Tpeak (min)=      2.00         9.00
     Unit Hyd. peak  (cms)=       .51          .13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .08          .03          .102 (iii)
     TIME TO PEAK    (hrs)=      1.50         1.60         1.500
     RUNOFF VOLUME    (mm)=     38.58        21.08        28.960
     TOTAL RAINFALL   (mm)=     39.38        39.38        39.385
     RUNOFF COEFFICIENT   =       .98          .54          .735

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

---------------------------------------------------------------------------
001:0010-------------------------------------------------------------------
*************************************************************************
*
*
* SIMULATE STORAGE ON BLOCK 3 TO RELEASE AT CONTROLLED RATE
*
*
*************************************************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(BLK3  )   |
| OUT<01:(B3CTRL)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000  .0000E+00    |     .015  .1000E+01
                           .015  .1000E-03    |     .000  .0000E+00

     ROUTING RESULTS             AREA      QPEAK     TPEAK       R.V.
     --------------------        (ha)      (cms)     (hrs)       (mm)
     INFLOW >04: (BLK3  )         .80       .102     1.500     28.960
     OUTFLOW<01: (B3CTRL)         .80       .015     1.233     28.960
   OVERFLOW<02: (3OVR  )          .00       .000      .000       .000

                 TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                 CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                 PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=    14.763
                 TIME SHIFT OF PEAK FLOW         (min)=    -16.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=.9246E-02
```

```
---------------------------------------------------------------------------
001:0011-------------------------------------------------------------------
*************************************************************************
*
*
* BLOCK 4 COMMERCIAL
*
*
*************************************************************************
---------------------
| DESIGN STANDHYD   |   Area    (ha)=     1.40
| 05:BLK4   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.26          .14
     Dep. Storage     (mm)=       .80         1.50
     Average Slope     (%)=      1.00         1.00
     Length            (m)=     96.61        40.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=     78.82       230.54
               over (min)       3.00         9.00
     Storage Coeff.  (min)=      2.75 (ii)    8.97 (ii)
     Unit Hyd. Tpeak (min)=      3.00         9.00
     Unit Hyd. peak  (cms)=       .40          .13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .13          .06          .174 (iii)
     TIME TO PEAK    (hrs)=      1.50         1.60         1.500
     RUNOFF VOLUME    (mm)=     38.58        21.08        28.960
     TOTAL RAINFALL   (mm)=     39.38        39.38        39.385
     RUNOFF COEFFICIENT   =       .98          .54          .735

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

---------------------------------------------------------------------------
001:0012-------------------------------------------------------------------
*************************************************************************
*
*
* SIMULATE STORAGE ON 4 TO RELEASE AT CONTROLLED RATE
*
*
*************************************************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>05:(BLK4  )   |
| OUT<03:(B4CTRL)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000  .0000E+00    |     .015  .1000E+01
                           .015  .1000E-03    |     .000  .0000E+00

     ROUTING RESULTS             AREA      QPEAK     TPEAK       R.V.
     --------------------        (ha)      (cms)     (hrs)       (mm)
     INFLOW >05: (BLK4  )        1.40       .174     1.500     28.960
     OUTFLOW<03: (B4CTRL)        1.40       .015     1.067     28.960
   OVERFLOW<04: (4OVR  )          .00       .000      .000       .000

                 TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                 CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                 PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=     8.616
                 TIME SHIFT OF PEAK FLOW         (min)=    -26.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=.2211E-01

---------------------------------------------------------------------------
001:0013-------------------------------------------------------------------
*************************************************************************
*
*
* TOTAL POST DEVELOPMENT FROM SITE
*
*
*************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 08:PNDOUT  11.82      .017    4.53  16.56    .000
                  +ID2 09:PNDOVR    .00      .000     .00    .00    .000 **DRY**
                  +ID3 01:B3CTRL    .80      .015    1.23  28.96    .000
                  +ID4 02:3OVR      .00      .000     .00    .00    .000 **DRY**
                  +ID5 03:B4CTRL   1.40      .015    1.07  28.96    .000
                  +ID6 04:4OVR      .00      .000     .00    .00    .000 **DRY**
                   ==================================================
                   SUM 05:PSTDEV  14.02      .047    4.53  18.51    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0014-------------------------------------------------------------------
  ** END OF RUN :    1

*************************************************************************





---------------------
| START             |  Project  dir.: H:\SWMHYM~1\10034Y~1\
---------------------  Rainfall dir.: H:\SWMHYM~1\10034Y~1\
    TZERO =    .00 hrs on         0
    METOUT=    2 (output = METRIC)
    NRUN  = 002
    NSTORM=    1
           #  1=CH5.STM
---------------------------------------------------------------------------
002:0002-------------------------------------------------------------------
*#************************************************************************
*#  Project Name: [YINS PHASE 5]    Project Number: [10034]
*#  Date        : 02-11-2010
*#  Modeller    : [TGS]
*#  Company     : G. Douglas Vallee Limited
```

```
*#  License #    :  3568969
*#*************************************************************************
---------------------------------------------------------------------------
002:0002-------------------------------------------------------------------
--------------------
| READ STORM        |     Filename: H:\SWMHYM~1\10034Y~1\CH5.STM
| Ptotal=  48.48 mm|     Comments: 5 YEAR CHICAGO 4 HOUR DESIGN DISTRIBUTIO
--------------------
               TIME    RAIN |   TIME     RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs    mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .17   3.529 |   1.17   10.190 |   2.17   9.150 |   3.17   4.550
                .33   3.658 |   1.33   21.620 |   2.33   7.700 |   3.33   4.220
                .50   4.040 |   1.50  112.370 |   2.50   6.680 |   3.50   3.960
                .67   4.670 |   1.67   27.760 |   2.67   5.940 |   3.67   3.730
                .83   5.610 |   1.83   15.750 |   2.83   5.390 |   3.83   3.530
               1.00   7.110 |   2.00   11.430 |   3.00   4.930 |   4.00   3.350

---------------------------------------------------------------------------
002:0003-------------------------------------------------------------------
**************************************************************************
*
*
* SFD
*
*
**************************************************************************
----------------------
| DESIGN STANDHYD     |    Area     (ha)=     9.30
| 01:SFD    DT= 1.00 |    Total Imp(%)=   37.00   Dir. Conn.(%)=   16.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=        3.44          5.86
    Dep. Storage      (mm)=         .80          1.50
    Average Slope      (%)=        1.00          1.00
    Length             (m)=      249.00         40.00
    Mannings n           =         .013          .250

    Max.eff.Inten.(mm/hr)=      112.37         22.33
               over (min)        4.00         20.00
    Storage Coeff.  (min)=        4.22 (ii)    20.04 (ii)
    Unit Hyd. Tpeak (min)=        4.00         20.00
    Unit Hyd. peak  (cms)=         .27           .06
                                                          *TOTALS*
    PEAK FLOW       (cms)=         .41           .21          .475 (iii)
    TIME TO PEAK    (hrs)=        1.50          1.80         1.517
    RUNOFF VOLUME    (mm)=       47.68         12.10        17.793
    TOTAL RAINFALL   (mm)=       48.48         48.48        48.478
    RUNOFF COEFFICIENT   =         .98           .25          .367

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

---------------------------------------------------------------------------
002:0004-------------------------------------------------------------------
**************************************************************************
*
*
* BLOCK 1 TOWNHOUSES
*
*
**************************************************************************
----------------------
| DESIGN STANDHYD     |    Area     (ha)=      .57
| 02:BLK1   DT= 1.00 |    Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=         .43           .14
    Dep. Storage      (mm)=         .80          1.50
    Average Slope      (%)=        1.00          1.00
    Length             (m)=       61.64         40.00
    Mannings n           =         .013          .250

    Max.eff.Inten.(mm/hr)=      112.37         93.55
               over (min)        2.00         11.00
    Storage Coeff.  (min)=        1.82 (ii)    10.75 (ii)
    Unit Hyd. Tpeak (min)=        2.00         11.00
    Unit Hyd. peak  (cms)=         .59           .10
                                                          *TOTALS*
    PEAK FLOW       (cms)=         .07           .02          .080 (iii)
    TIME TO PEAK    (hrs)=        1.50          1.63         1.500
    RUNOFF VOLUME    (mm)=       47.68         18.78        29.761
    TOTAL RAINFALL   (mm)=       48.48         48.48        48.478
    RUNOFF COEFFICIENT   =         .98           .39          .614

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

---------------------------------------------------------------------------
002:0005-------------------------------------------------------------------
**************************************************************************
*
*
* BLOCK 2 APARTMENTS
*
*
**************************************************************************
----------------------
| DESIGN STANDHYD     |    Area     (ha)=      .69
| 03:BLK2   DT= 1.00 |    Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=         .52           .17
    Dep. Storage      (mm)=         .80          1.50
    Average Slope      (%)=        1.00          1.00
    Length             (m)=       67.82         40.00
    Mannings n           =         .013          .250

    Max.eff.Inten.(mm/hr)=      112.37         93.55
               over (min)        2.00         11.00
    Storage Coeff.  (min)=        1.93 (ii)    10.86 (ii)
    Unit Hyd. Tpeak (min)=        2.00         11.00
    Unit Hyd. peak  (cms)=         .57           .10
                                                          *TOTALS*
    PEAK FLOW       (cms)=         .08           .03          .097 (iii)
    TIME TO PEAK    (hrs)=        1.50          1.63         1.500
    RUNOFF VOLUME    (mm)=       47.68         18.78        29.761
    TOTAL RAINFALL   (mm)=       48.48         48.48        48.478
    RUNOFF COEFFICIENT   =         .98           .39          .614

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

---------------------------------------------------------------------------
002:0006-------------------------------------------------------------------
**************************************************************************
*
*
* BLOCK 5 SWM
*
*
**************************************************************************
----------------------
| DESIGN STANDHYD     |    Area     (ha)=     1.26
| 06:BLK5   DT= 1.00 |    Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=        1.13           .13
    Dep. Storage      (mm)=         .80          1.50
    Average Slope      (%)=        1.00          1.00
    Length             (m)=       91.65         40.00
    Mannings n           =         .013          .250

    Max.eff.Inten.(mm/hr)=      112.37         11.89
               over (min)        2.00         23.00
    Storage Coeff.  (min)=        2.31 (ii)    22.68 (ii)
    Unit Hyd. Tpeak (min)=        2.00         23.00
    Unit Hyd. peak  (cms)=         .51           .05
                                                          *TOTALS*
    PEAK FLOW       (cms)=         .35           .00          .350 (iii)
    TIME TO PEAK    (hrs)=        1.50          1.85         1.500
    RUNOFF VOLUME    (mm)=       47.68          9.56        43.866
    TOTAL RAINFALL   (mm)=       48.48         48.48        48.478
    RUNOFF COEFFICIENT   =         .98           .20          .905

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

---------------------------------------------------------------------------
002:0007-------------------------------------------------------------------
**************************************************************************
*
*
* DETERMINE INFLOW TO POND
*
*
**************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                  ID1 01:SFD        9.30       .475     1.52  17.79     .000
                 +ID2 02:BLK1        .57       .080     1.50  29.76     .000
                 +ID3 03:BLK2        .69       .097     1.50  29.76     .000
                 +ID4 06:BLK5       1.26       .350     1.50  43.87     .000
                  ==================================================
                  SUM 07:PSTDEV    11.82       .995     1.50  21.85     .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
002:0008-------------------------------------------------------------------
**************************************************************************
*
*
* ROUTE THROUGH POND
*
*
**************************************************************************
----------------------
| ROUTE RESERVOIR     |    Requested routing time step =  1.0 min.
|  IN>07:(PSTDEV)     |
| OUT<08:(PNDOUT)     |    =========  OUTLFOW STORAGE TABLE  =========
----------------------    OUTFLOW     STORAGE    |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)    |    (cms)    (ha.m.)
                             .000  .0000E+00    |     .025  .3535E+00
                             .007  .5520E-01    |     .027  .4178E+00
                             .013  .1118E+00    |     .029  .4837E+00
                             .017  .1700E+00    |     .031  .5512E+00
                             .020  .2296E+00    |     .033  .6203E+00
                             .023  .2908E+00    |     .000  .0000E+00

     ROUTING RESULTS             AREA     QPEAK     TPEAK        R.V.
     --------------------        (ha)     (cms)     (hrs)        (mm)
     INFLOW >07: (PSTDEV)       11.82      .995     1.500      21.848
     OUTFLOW<08: (PNDOUT)       11.82      .020     4.400      21.847
    OVERFLOW<09: (PNDOVR)         .00      .000      .000        .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     2.034
                   TIME SHIFT OF PEAK FLOW          (min)=   174.00
                   MAXIMUM  STORAGE   USED        (ha.m.)=.2367E+00

---------------------------------------------------------------------------
002:0009-------------------------------------------------------------------
**************************************************************************
*
*
* BLOCK 3 COMMERCIAL
*
*
**************************************************************************
----------------------
| DESIGN STANDHYD     |    Area     (ha)=      .80
| 04:BLK3   DT= 1.00 |    Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
----------------------
```

```
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=      .72         .08
    Dep. Storage     (mm)=      .80        1.50
    Average Slope     (%)=     1.00        1.00
    Length            (m)=    73.03       40.00
    Mannings n           =     .013        .250

    Max.eff.Inten.(mm/hr)=   112.37      389.75
              over (min)      2.00        7.00
    Storage Coeff.  (min)=     2.02 (ii)   7.06 (ii)
    Unit Hyd. Tpeak (min)=     2.00        7.00
    Unit Hyd. peak  (cms)=      .56         .16
                                                      *TOTALS*
    PEAK FLOW       (cms)=      .11         .06          .160 (iii)
    TIME TO PEAK    (hrs)=     1.50        1.57         1.500
    RUNOFF VOLUME    (mm)=    47.68       28.46        37.108
    TOTAL RAINFALL   (mm)=    48.48       48.48        48.478
    RUNOFF COEFFICIENT   =      .98         .59          .765

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

-----------------------------------------------------------------------
002:0010---------------------------------------------------------------
***********************************************************************
*
*
* SIMULATE STORAGE ON BLOCK 3 TO RELEASE AT CONTROLLED RATE
*
*
***********************************************************************
--------------------
| ROUTE RESERVOIR   |     Requested routing time step =  1.0 min.
|  IN>04:(BLK3  )   |
| OUT<01:(B3CTRL)   |     =========  OUTLFOW STORAGE TABLE  =========
--------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                             .000  .0000E+00   |     .015  .1000E+01
                             .015  .1000E-03   |     .000  .0000E+00

    ROUTING RESULTS              AREA     QPEAK     TPEAK        R.V.
    -------------------          (ha)     (cms)     (hrs)        (mm)
    INFLOW >04: (BLK3  )          .80      .160     1.500      37.108
    OUTFLOW<01: (B3CTRL)          .80      .015     1.200      37.108
   OVERFLOW<02: (3OVR  )          .00      .000      .000        .000

               TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
               CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
               PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


               PEAK   FLOW   REDUCTION [Qout/Qin](%)=     9.363
               TIME SHIFT OF PEAK FLOW         (min)=    -18.00
               MAXIMUM  STORAGE   USED       (ha.m.)=.1520E-01

-----------------------------------------------------------------------
002:0011---------------------------------------------------------------
***********************************************************************
*
*
* BLOCK 4 COMMERCIAL
*
*
***********************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    1.40
| 05:BLK4   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=     1.26         .14
    Dep. Storage     (mm)=      .80        1.50
    Average Slope     (%)=     1.00        1.00
    Length            (m)=    96.61       40.00
    Mannings n           =     .013        .250

    Max.eff.Inten.(mm/hr)=   112.37      389.75
              over (min)      2.00        7.00
    Storage Coeff.  (min)=     2.39 (ii)   7.43 (ii)
    Unit Hyd. Tpeak (min)=     2.00        7.00
    Unit Hyd. peak  (cms)=      .50         .16
                                                      *TOTALS*
    PEAK FLOW       (cms)=      .19         .10          .277 (iii)
    TIME TO PEAK    (hrs)=     1.50        1.57         1.500
    RUNOFF VOLUME    (mm)=    47.68       28.46        37.108
    TOTAL RAINFALL   (mm)=    48.48       48.48        48.478
    RUNOFF COEFFICIENT   =      .98         .59          .765

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

-----------------------------------------------------------------------
002:0012---------------------------------------------------------------
***********************************************************************
*
*
* SIMULATE STORAGE ON 4 TO RELEASE AT CONTROLLED PATE
*
*
***********************************************************************
--------------------
| ROUTE RESERVOIR   |     Requested routing time step =  1.0 min.
|  IN>05:(BLK4  )   |
| OUT<03:(B4CTRL)   |     =========  OUTLFOW STOPAGE TABLE  =========
--------------------      OUTFLOW    STOPAGE   |  OUTFLOW    STOPAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                             .000  .0000E+00   |     .015  .1000E+01
                             .015  .1000E-03   |     .000  .0000E+00

    ROUTING RESULTS              AREA     QPEAK     TPEAK        R.V.
    -------------------          (ha)     (cms)     (hrs)        (mm)
    INFLOW >05: (BLK4  )         1.40      .277     1.500      37.108
    OUTFLOW<03: (B4CTRL)         1.40      .015     1.017      37.108
   OVERFLOW<04: (4OVR  )          .00      .000      .000        .000
```

```
               TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
               CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
               PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


               PEAK   FLOW   REDUCTION [Qout/Qin](%)=     5.425
               TIME SHIFT OF PEAK FLOW         (min)=    -29.00
               MAXIMUM  STORAGE   USED       (ha.m.)=.3323E-01

-----------------------------------------------------------------------
002:0013---------------------------------------------------------------
***********************************************************************
*
*
* TOTAL POST DEVELOPMENT FROM SITE
*
*
***********************************************************************
-------------------
| ADD HYD (PSTDEV) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
-------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
              ID1 08:PNDOUT        11.82       .020     4.40  21.85    .000
             +ID2 09:PNDOVR          .00       .000      .00    .00    .000 **DRY**
             +ID3 01:B3CTRL          .80       .015     1.20  37.11    .000
             +ID4 02:3OVR            .00       .000      .00    .00    .000 **DRY**
             +ID5 03:B4CTRL         1.40       .015     1.02  37.11    .000
             +ID6 04:4OVR            .00       .000      .00    .00    .000 **DRY**
              ===============================================================
              SUM 05:PSTDEV        14.02       .050     4.40  24.24    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------
002:0014---------------------------------------------------------------
-----------------------------------------------------------------------
002:0002---------------------------------------------------------------
 ** END OF RUN :   2

***********************************************************************





-------------------
| START             |  Project  dir.: H:\SWMHYM~1\10034Y~1\
-------------------    Rainfall dir.: H:\SWMHYM~1\10034Y~1\
   TZERO =   .00 hrs on        0
   METOUT=   2 (output = METRIC)
   NRUN  = 003
   NSTORM=   1
         #  1=CH10.STM
-----------------------------------------------------------------------
003:0002---------------------------------------------------------------
*#*********************************************************************
*#  Project Name: [YINS PHASE 5]    Project Number: [10034]
*#  Date          : 02-11-2010
*#  Modeller      : [TGS]
*#  Company       : G. Douglas Vallee Limited
*#  License #     :  3568969
*#*********************************************************************
-----------------------------------------------------------------------
003:0002---------------------------------------------------------------
-------------------
| READ STORM        |     Filename: H:\SWMHYM~1\10034Y~1\CH10.STM
| Ptotal=  56.08 mm|     Comments: 10 YEAR CHICAGO 4 HOURS DESIGN DISTRIBUT
-------------------
              TIME    RAIN |  TIME     RAIN |  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs    mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .17   3.580 |  1.17   11.510 |  2.17  10.310 |  3.17   5.050
               .33   3.990 |  1.33   25.320 |  2.33   8.660 |  3.33   4.700
               .50   4.500 |  1.50  133.600 |  2.50   7.520 |  3.50   4.394
               .67   5.210 |  1.67   32.000 |  2.67   6.650 |  3.67   4.140
               .83   6.270 |  1.83   19.730 |  2.83   5.380 |  3.83   3.910
              1.00   8.000 |  2.00   12.954 |  3.00   5.490 |  4.00   3.632

-----------------------------------------------------------------------
003:0003---------------------------------------------------------------
***********************************************************************
*
*
* SFD
*
*
***********************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    9.30
| 01:SFD    DT= 1.00 |   Total Imp(%)=   37.00   Dir. Conn.(%)=   16.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=     3.44        5.86
    Dep. Storage     (mm)=      .80        1.50
    Average Slope     (%)=     1.00        1.00
    Length            (m)=   249.00       40.00
    Mannings n           =     .013        .250

    Max.eff.Inten.(mm/hr)=   133.60       31.29
              over (min)      4.00       18.00
    Storage Coeff.  (min)=     3.93 (ii)  17.76 (ii)
    Unit Hyd. Tpeak (min)=     4.00       18.00
    Unit Hyd. peak  (cms)=      .29         .06
                                                      *TOTALS*
    PEAK FLOW       (cms)=      .50         .31          .601 (iii)
    TIME TO PEAK    (hrs)=     1.50        1.77         1.517
    RUNOFF VOLUME    (mm)=    55.28       15.66        21.998
    TOTAL RAINFALL   (mm)=    56.08       56.08        56.083
    RUNOFF COEFFICIENT   =      .99         .28          .392

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

-----------------------------------------------------------------------
003:0004---------------------------------------------------------------
***********************************************************************
*
*
* BLOCK 1 TOWNHOUSES
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*
*
**********************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .57
| 02:BLK1   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .43           .14
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     61.64         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    133.60        136.37
                over (min)       2.00          9.00
     Storage Coeff.  (min)=      1.70 (ii)     9.38 (ii)
     Unit Hyd. Tpeak (min)=      2.00          9.00
     Unit Hyd. peak  (cms)=       .62           .12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .08           .03          .102 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.60         1.500
     RUNOFF VOLUME    (mm)=     55.28         23.74        35.727
     TOTAL RAINFALL   (mm)=     56.08         56.08        56.083
     RUNOFF COEFFICIENT   =       .99           .42          .637

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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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003:0005---------------------------------------------------------------
**********************************************************************
*
*
* BLOCK 2 APARTMENTS
*
*
**********************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .69
| 03:BLK2   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .52           .17
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     67.82         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    133.60        131.26
                over (min)       2.00         10.00
     Storage Coeff.  (min)=      1.80 (ii)     9.60 (ii)
     Unit Hyd. Tpeak (min)=      2.00         10.00
     Unit Hyd. peak  (cms)=       .60           .12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .10           .04          .121 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.62         1.500
     RUNOFF VOLUME    (mm)=     55.28         23.74        35.727
     TOTAL RAINFALL   (mm)=     56.08         56.08        56.083
     RUNOFF COEFFICIENT   =       .99           .42          .637

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

-----------------------------------------------------------------------
003:0006---------------------------------------------------------------
**********************************************************************
*
*
* BLOCK 5 SWM
*
*
**********************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    1.26
| 06:BLK5   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.13           .13
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     91.65         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    133.60         17.53
                over (min)       2.00         20.00
     Storage Coeff.  (min)=      2.16 (ii)    19.59 (ii)
     Unit Hyd. Tpeak (min)=      2.00         20.00
     Unit Hyd. peak  (cms)=       .53           .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .42           .00          .417 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.80         1.500
     RUNOFF VOLUME    (mm)=     55.28         12.49        51.004
     TOTAL RAINFALL   (mm)=     56.08         56.08        56.083
     RUNOFF COEFFICIENT   =       .99           .22          .909

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

-----------------------------------------------------------------------
003:0007---------------------------------------------------------------
**********************************************************************
*
*
* DETERMINE INFLOW TO POND
*
*
**********************************************************************
-------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
-------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                  ID1 01:SFD        9.30      .601    1.52  22.00    .000
                 +ID2 02:BLK1        .57      .102    1.50  35.73    .000
                 +ID3 03:BLK2        .69      .121    1.50  35.73    .000
                 +ID4 06:BLK5       1.26      .417    1.50  51.00    .000
                  ===================================================
                  SUM 07:PSTDEV    11.82     1.231    1.50  26.55    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------
003:0008---------------------------------------------------------------
**********************************************************************
*
*
* ROUTE THROUGH POND
*
*
**********************************************************************
--------------------
| ROUTE RESERVOIR   |     Requested routing time step =  1.0 min.
|  IN>07:(PSTDEV)   |
| OUT<08:(PNDOUT)   |     =========  OUTLFOW STORAGE TABLE  =========
--------------------      OUTFLOW     STORAGE    |  OUTFLOW     STORAGE
                           (cms)     (ha.m.)     |   (cms)     (ha.m.)
                            .000  .0000E+00      |     .025  .3535E+00
                            .007  .5520E-01      |     .027  .4178E+00
                            .013  .1118E+00      |     .029  .4837E+00
                            .017  .1700E+00      |     .031  .5512E+00
                            .020  .2296E+00      |     .033  .6203E+00
                            .023  .2908E+00      |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK      TPEAK        R.V.
     -------------------          (ha)      (cms)      (hrs)        (mm)
     INFLOW >07: (PSTDEV)        11.82      1.231      1.500      26.553
     OUTFLOW<08: (PNDOUT)        11.82       .023      4.367      26.552
   OVERFLOW<09: (PNDOVR)           .00       .000       .000        .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=      1.841
                   TIME SHIFT OF PEAK FLOW          (min)=    172.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2900E+00

-----------------------------------------------------------------------
003:0009---------------------------------------------------------------
**********************************************************************
*
*
* BLOCK 3 COMMERCIAL
*
*
**********************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .80
| 04:BLK3   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .72           .08
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     73.03         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    133.60        504.85
                over (min)       2.00          6.00
     Storage Coeff.  (min)=      1.88 (ii)     6.43 (ii)
     Unit Hyd. Tpeak (min)=      2.00          6.00
     Unit Hyd. peak  (cms)=       .58           .18
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .13           .08          .202 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.55         1.500
     RUNOFF VOLUME    (mm)=     55.28         34.90        44.072
     TOTAL RAINFALL   (mm)=     56.08         56.08        56.083
     RUNOFF COEFFICIENT   =       .99           .62          .786

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

-----------------------------------------------------------------------
003:0010---------------------------------------------------------------
**********************************************************************
*
*
* SIMULATE STORAGE ON BLOCK 3 TO RELEASE AT CONTROLLED RATE
*
*
**********************************************************************
--------------------
| ROUTE RESERVOIR   |     Requested routing time step =  1.0 min.
|  IN>04:(BLK3  )   |
| OUT<01:(B3CTRL)   |     =========  OUTLFOW STORAGE TABLE  =========
--------------------      OUTFLOW     STORAGE    |  OUTFLOW     STORAGE
                           (cms)     (ha.m.)     |   (cms)     (ha.m.)
                            .000  .0000E+00      |     .015  .1000E+01
                            .015  .1000E-03      |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK      TPEAK        R.V.
     -------------------          (ha)      (cms)      (hrs)        (mm)
     INFLOW >04: (BLK3  )          .80       .202      1.500      44.072
     OUTFLOW<01: (B3CTRL)          .80       .015      1.183      44.072
   OVERFLOW<02: (3OVR  )           .00       .000       .000        .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=      7.411
                   TIME SHIFT OF PEAK FLOW          (min)=    -19.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1986E-01

-----------------------------------------------------------------------
003:0011---------------------------------------------------------------
**********************************************************************
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*
*
* BLOCK 4 COMMERCIAL
*
*
***************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    1.40
| 05:BLK4   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.26          .14
     Dep. Storage      (mm)=        .80         1.50
     Average Slope      (%)=       1.00         1.00
     Length             (m)=      96.61        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      133.60       494.86
               over (min)          2.00         7.00
     Storage Coeff.  (min)=        2.23 (ii)    6.81 (ii)
     Unit Hyd. Tpeak (min)=        2.00         7.00
     Unit Hyd. peak  (cms)=         .52          .16
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .23          .13         .342 (iii)
     TIME TO PEAK     (hrs)=       1.50         1.57        1.500
     RUNOFF VOLUME     (mm)=      55.28        34.90       44.072
     TOTAL RAINFALL    (mm)=      56.08        56.08       56.083
     RUNOFF COEFFICIENT   =         .99          .62         .786

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

----------------------------------------------------------------------------
003:0012--------------------------------------------------------------------
****************************************************************************
*
*
* SIMULATE STORAGE ON 4 TO RELEASE AT CONTROLLED RATE
*
*
***************************************************************************
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>05:(BLK4  )   |
| OUT<03:(B4CTRL)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |    (cms)     (ha.m.)
                            .000  .0000E+00    |     .015  .1000E+01
                            .015  .1000E-03    |     .000  .0000E+00

     ROUTING RESULTS                AREA     QPEAK      TPEAK        R.V.
     -------------------            (ha)     (cms)      (hrs)        (mm)
     INFLOW >05: (BLK4  )           1.40      .342      1.500      44.072
     OUTFLOW<03: (B4CTRL)           1.40      .015       .917      44.072
   OVERFLOW<04: (4OVR  )             .00      .000       .000        .000

                 TOTAL NUMBER OF SIMULATED OVERFLOWS  =           0
                 CUMULATIVE TIME OF OVERFLOWS  (hours)=         .00
                 PERCENTAGE OF TIME OVERFLOWING    (%)=         .00


                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=      4.387
                 TIME SHIFT OF PEAK FLOW          (min)=    -35.00
                 MAXIMUM  STORAGE   USED        (ha.m.)=.4236E-01

----------------------------------------------------------------------------
003:0013--------------------------------------------------------------------
***************************************************************************
*
*
* TOTAL POST DEVELOPMENT FROM SITE
*
*
***************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------               (ha)      (cms)    (hrs)   (mm)    (cms)
                  ID1 08:PNDOUT    11.82      .023     4.37   26.55    .000
                 +ID2 09:PNDOVR      .00      .000      .00     .00    .000 **DRY**
                 +ID3 01:B3CTRL      .80      .015     1.18   44.07    .000
                 +ID4 02:3OVR        .00      .000      .00     .00    .000 **DRY**
                 +ID5 03:B4CTRL     1.40      .015      .92   44.07    .000
                 +ID6 04:4OVR        .00      .000      .00     .00    .000 **DRY**
                 ======================================================
                  SUM 05:PSTDEV    14.02      .053     4.37   29.30    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
003:0014--------------------------------------------------------------------
----------------------------------------------------------------------------
003:0002--------------------------------------------------------------------
----------------------------------------------------------------------------
003:0002--------------------------------------------------------------------
  ** END OF RUN :   3

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--------------------
| START             |  Project  dir.: H:\SWMHYM~1\10034Y~1\
--------------------  Rainfall dir.: H:\SWMHYM~1\10034Y~1\
   TZERO =   .00 hrs on        0
   METOUT=   2 (output = METRIC)
   NRUN  = 004
   NSTORM=   1
         #  1=CH25.STM
----------------------------------------------------------------------------
004:0002--------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [YINS PHASE 5]    Project Number: [10034]
*#  Date         : 02-11-2010
*#  Modeller     : [TGS]
*#  Company      : G. Douglas Vallee Limited
*#  License #    : 3568969
*#**************************************************************************
----------------------------------------------------------------------------
004:0002--------------------------------------------------------------------
--------------------
| READ STORM        |     Filename: H:\SWMHYM~1\10034Y~1\CH25.STM
| Ptotal=  66.02 mm|     Comments: 25 YEAR CHICAGO 4 HOUR DESIGN DISTRIBUTI
--------------------
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .17   4.500 |  1.17  13.670 |  2.17  12.320 |  3.17   6.270
                .33   4.980 |  1.33  27.690 |  2.33  10.440 |  3.33   5.000
                .50   5.613 |  1.50 158.850 |  2.50   9.144 |  3.50   5.840
                .67   6.450 |  1.67  35.080 |  2.67   8.150 |  3.67   5.180
                .83   7.700 |  1.83  20.600 |  2.83   7.390 |  3.83   4.900
               1.00   9.700 |  2.00  15.240 |  3.00   6.780 |  4.00   4.650

----------------------------------------------------------------------------
004:0003--------------------------------------------------------------------
****************************************************************************
*
*
* SFD
*
*
***************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    9.30
| 01:SFD    DT= 1.00 |   Total Imp(%)=   37.00   Dir. Conn.(%)=   16.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       3.44         5.86
     Dep. Storage      (mm)=        .80         1.50
     Average Slope      (%)=       1.00         1.00
     Length             (m)=     249.00        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      158.85        44.51
               over (min)          4.00        16.00
     Storage Coeff.  (min)=        3.67 (ii)   15.68 (ii)
     Unit Hyd. Tpeak (min)=        4.00        16.00
     Unit Hyd. peak  (cms)=         .30          .07
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .60          .44         .775 (iii)
     TIME TO PEAK     (hrs)=       1.50         1.73        1.517
     RUNOFF VOLUME     (mm)=      65.22        20.76       27.877
     TOTAL RAINFALL    (mm)=      66.02        66.02       66.023
     RUNOFF COEFFICIENT   =         .99          .31         .422

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

----------------------------------------------------------------------------
004:0004--------------------------------------------------------------------
***************************************************************************
*
*
* BLOCK 1 TOWNHOUSES
*
*
***************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .57
| 02:BLK1   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .43          .14
     Dep. Storage      (mm)=        .80         1.50
     Average Slope      (%)=       1.00         1.00
     Length             (m)=      61.64        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      158.85       186.82
               over (min)          2.00         8.00
     Storage Coeff.  (min)=        1.59 (ii)    8.36 (ii)
     Unit Hyd. Tpeak (min)=        2.00         8.00
     Unit Hyd. peak  (cms)=         .64          .14
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .10          .05         .130 (iii)
     TIME TO PEAK     (hrs)=       1.50         1.58        1.500
     RUNOFF VOLUME     (mm)=      65.22        30.66       43.793
     TOTAL RAINFALL    (mm)=      66.02        66.02       66.023
     RUNOFF COEFFICIENT   =         .99          .46         .663

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

----------------------------------------------------------------------------
004:0005--------------------------------------------------------------------
***************************************************************************
*
*
* BLOCK 2 APARTMENTS
*
*
***************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .69
| 03:BLK2   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .52          .17
     Dep. Storage      (mm)=        .80         1.50
     Average Slope      (%)=       1.00         1.00
     Length             (m)=      67.82        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      158.85       186.82
               over (min)          2.00         8.00
     Storage Coeff.  (min)=        1.68 (ii)    8.45 (ii)
     Unit Hyd. Tpeak (min)=        2.00         8.00
     Unit Hyd. peak  (cms)=         .62          .14
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .12          .05         .157 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.50          1.58          1.500
     RUNOFF VOLUME    (mm)=      65.22         30.66         43.793
     TOTAL RAINFALL   (mm)=      66.02         66.02         66.023
     RUNOFF COEFFICIENT   =        .99           .46           .663

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

------------------------------------------------------------------------------
004:0006----------------------------------------------------------------------
******************************************************************************
*
*
* BLOCK 5 SWM
*
*
******************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    1.26
| 06:BLK5   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.13           .13
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     91.65         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    158.85         25.55
              over (min)        2.00         17.00
     Storage Coeff.  (min)=      2.01 (ii)    17.01 (ii)
     Unit Hyd. Tpeak (min)=      2.00         17.00
     Unit Hyd. peak  (cms)=       .56           .07
                                                         *TOTALS*
     PEAK FLOW       (cms)=       .50           .01          .498 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.75         1.500
     RUNOFF VOLUME    (mm)=     65.22         16.76        60.376
     TOTAL RAINFALL   (mm)=     66.02         66.02        66.023
     RUNOFF COEFFICIENT   =       .99           .25          .914

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

------------------------------------------------------------------------------
004:0007----------------------------------------------------------------------
******************************************************************************
*
*
* DETERMINE INFLOW TO POND
*
*
******************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 01:SFD         9.30       .775     1.52  27.88     .000
                +ID2 02:BLK1         .57       .130     1.50  43.79     .000
                +ID3 03:BLK2         .69       .157     1.50  43.79     .000
                +ID4 06:BLK5        1.26       .498     1.50  60.38     .000
                 ====================================================
                 SUM 07:PSTDEV     11.82      1.542     1.50  33.04     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
004:0008----------------------------------------------------------------------
******************************************************************************
*
*
* ROUTE THROUGH POND
*
*
******************************************************************************
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>07:(PSTDEV)    |
| OUT<08:(PNDOUT)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
                              .000  .0000E+00    |     .025  .3535E+00
                              .007  .5520E-01    |     .027  .4178E+00
                              .013  .1118E+00    |     .029  .4837E+00
                              .017  .1700E+00    |     .031  .5512E+00
                              .020  .2296E+00    |     .033  .6203E+00
                              .023  .2908E+00    |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK      TPEAK        R.V.
     --------------------         (ha)      (cms)      (hrs)        (mm)
     INFLOW >07: (PSTDEV)        11.82      1.542      1.500      33.038
     OUTFLOW<08: (PNDOUT)        11.82       .025      4.383      33.036
   OVERFLOW<09: (PNDOVR)           .00       .000       .000        .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=     1.651
                  TIME SHIFT OF PEAK FLOW          (min)=   173.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3637E+00

------------------------------------------------------------------------------
004:0009----------------------------------------------------------------------
******************************************************************************
*
*
* BLOCK 3 COMMERCIAL
*
*
******************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=     .80
| 04:BLK3   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
```

```
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .72           .08
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     73.03         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    158.85        639.53
              over (min)        2.00          6.00
     Storage Coeff.  (min)=      1.76 (ii)     5.89 (ii)
     Unit Hyd. Tpeak (min)=      2.00          6.00
     Unit Hyd. peak  (cms)=       .61           .19
                                                         *TOTALS*
     PEAK FLOW       (cms)=       .16           .10          .251 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.53         1.500
     RUNOFF VOLUME    (mm)=     65.22         43.58        53.321
     TOTAL RAINFALL   (mm)=     66.02         66.02        66.023
     RUNOFF COEFFICIENT   =       .99           .66          .808

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

------------------------------------------------------------------------------
004:0010----------------------------------------------------------------------
******************************************************************************
*
*
* SIMULATE STORAGE ON BLOCK 3 TO RELEASE AT CONTROLLED RATE
*
*
******************************************************************************
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>04:(BLK3  )    |
| OUT<01:(B3CTRL)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
                              .000  .0000E+00    |     .015  .1000E+01
                              .015  .1000E-03    |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK      TPEAK        R.V.
     --------------------         (ha)      (cms)      (hrs)        (mm)
     INFLOW >04: (BLK3  )          .80       .251      1.500      53.321
     OUTFLOW<01: (B3CTRL)          .80       .015      1.067      53.321
   OVERFLOW<02: (3OVR  )           .00       .000       .000        .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=     5.978
                  TIME SHIFT OF PEAK FLOW          (min)=   -26.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.2536E-01

------------------------------------------------------------------------------
004:0011----------------------------------------------------------------------
******************************************************************************
*
*
* BLOCK 4 COMMERCIAL
*
*
******************************************************************************
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    1.40
| 05:BLK4   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.26           .14
     Dep. Storage     (mm)=       .80          1.50
     Average Slope     (%)=      1.00          1.00
     Length            (m)=     96.61         40.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    158.85        639.53
              over (min)        2.00          6.00
     Storage Coeff.  (min)=      2.08 (ii)     6.22 (ii)
     Unit Hyd. Tpeak (min)=      2.00          6.00
     Unit Hyd. peak  (cms)=       .54           .18
                                                         *TOTALS*
     PEAK FLOW       (cms)=       .28           .17          .434 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.55         1.500
     RUNOFF VOLUME    (mm)=     65.22         43.58        53.321
     TOTAL RAINFALL   (mm)=     66.02         66.02        66.023
     RUNOFF COEFFICIENT   =       .99           .66          .808

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

------------------------------------------------------------------------------
004:0012----------------------------------------------------------------------
******************************************************************************
*
*
* SIMULATE STORAGE ON 4 TO RELEASE AT CONTROLLED RATE
*
*
******************************************************************************
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>05:(BLK4  )    |
| OUT<03:(B4CTRL)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
                              .000  .0000E+00    |     .015  .1000E+01
                              .015  .1000E-03    |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK      TPEAK        R.V.
     --------------------         (ha)      (cms)      (hrs)        (mm)
     INFLOW >05: (BLK4  )         1.40       .434      1.500      53.321
     OUTFLOW<03: (B4CTRL)         1.40       .015       .750      53.321
   OVERFLOW<04: (4OVR  )           .00       .000       .000        .000
```

```
                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =         0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=       .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=       .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.459
                   TIME SHIFT OF PEAK FLOW          (min)=   -45.00
                   MAXIMUM  STORAGE   USED        (ha.m.)=.5446E-01

-----------------------------------------------------------------------------
004:0013---------------------------------------------------------------------
****************************************************************************
*
*
* TOTAL POST DEVELOPMENT FROM SITE
*
*
****************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 08:PNDOUT     11.82      .025     4.38  33.04    .000
                +ID2 09:PNDOVR       .00      .000      .00    .00    .000 **DRY**
                +ID3 01:B3CTRL       .80      .015     1.07  53.32    .000
                +ID4 02:3OVR         .00      .000      .00    .00    .000 **DRY**
                +ID5 03:B4CTRL      1.40      .015      .75  53.32    .000
                +ID6 04:4OVR         .00      .000      .00    .00    .000 **DRY**
                 ==================================================
                 SUM 05:PSTDEV     14.02      .055     4.38  36.22    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
004:0014---------------------------------------------------------------------
-----------------------------------------------------------------------------
004:0002---------------------------------------------------------------------
-----------------------------------------------------------------------------
004:0002---------------------------------------------------------------------
-----------------------------------------------------------------------------
004:0002---------------------------------------------------------------------
 ** END OF RUN :    4

****************************************************************************




--------------------
| START            |  Project  dir.: H:\SWMHYM~1\10034Y~1\
--------------------  Rainfall dir.: H:\SWMHYM~1\10034Y~1\
   TZERO =    .00 hrs on         0
   METOUT=    2 (output = METRIC)
   NRUN  = 005
   NSTORM=    1
          #   1=CH50.STM
-----------------------------------------------------------------------------
005:0002---------------------------------------------------------------------
*#***************************************************************************
*#  Project Name: [YINS PHASE 5]     Project Number: [10034]
*#  Date          : 02-11-2010
*#  Modeller      : [TGS]
*#  Company       : G. Douglas Vallee Limited
*#  License #     :  3568969
*#***************************************************************************
-----------------------------------------------------------------------------
005:0002---------------------------------------------------------------------
--------------------
| READ STORM       |     Filename: H:\SWMHYM~1\10034Y~1\CH50.STM
| Ptotal=  72.96 mm|     Comments: 50 YEAR CHICAGO 4 HOUR DESIGN DISTRIBUTI
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   3.990 |   1.17  14.270 |   2.17  12.620 |   3.17   5.790
               .33   4.450 |   1.33  33.900 |   2.33  10.390 |   3.33   5.330
               .50   5.080 |   1.50 186.560 |   2.50   8.890 |   3.50   4.980
               .67   5.970 |   1.67  44.810 |   2.67   7.800 |   3.67   4.650
               .83   7.290 |   1.83  23.440 |   2.83   6.960 |   3.83   4.370
              1.00   9.530 |   2.00  16.260 |   3.00   6.300 |   4.00   4.140

-----------------------------------------------------------------------------
005:0003---------------------------------------------------------------------
****************************************************************************
*
*
* SFD
*
*
****************************************************************************
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     9.30
| 01:SFD    DT= 1.00 |   Total Imp(%)=   37.00   Dir. Conn.(%)=   16.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.44         5.86
    Dep. Storage     (mm)=        .80         1.50
    Average Slope     (%)=       1.00         1.00
    Length            (m)=     249.00        40.00
    Mannings n           =       .013         .250

    Max.eff.Inten.(mm/hr)=     186.56        61.99
               over (min)        3.00        14.00
    Storage Coeff.  (min)=       3.44 (ii)   13.96 (ii)
    Unit Hyd. Tpeak (min)=       3.00        14.00
    Unit Hyd. peak  (cms)=        .34          .08
                                                           *TOTALS*
    PEAK FLOW       (cms)=        .72          .62           .987 (iii)
    TIME TO PEAK    (hrs)=       1.50         1.70          1.517
    RUNOFF VOLUME    (mm)=      72.16        24.60         32.209
    TOTAL RAINFALL   (mm)=      72.96        72.96         72.962
    RUNOFF COEFFICIENT   =        .99          .34           .441

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

-----------------------------------------------------------------------------
005:0004---------------------------------------------------------------------
```

```
****************************************************************************
*
*
* BLOCK 1 TOWNHOUSES
*
*
****************************************************************************
----------------------
| DESIGN STANDHYD    |   Area    (ha)=      .57
| 02:BLK1   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=        .43          .14
    Dep. Storage     (mm)=        .80         1.50
    Average Slope     (%)=       1.00         1.00
    Length            (m)=      61.64        40.00
    Mannings n           =       .013         .250

    Max.eff.Inten.(mm/hr)=     186.56       234.31
               over (min)        1.00         8.00
    Storage Coeff.  (min)=       1.49 (ii)    7.67 (ii)
    Unit Hyd. Tpeak (min)=       1.00         8.00
    Unit Hyd. peak  (cms)=        .83          .15
                                                           *TOTALS*
    PEAK FLOW       (cms)=        .11          .06           .157 (iii)
    TIME TO PEAK    (hrs)=       1.50         1.58          1.500
    RUNOFF VOLUME    (mm)=      72.16        35.73         49.575
    TOTAL RAINFALL   (mm)=      72.96        72.96         72.962
    RUNOFF COEFFICIENT   =        .99          .49           .679

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

-----------------------------------------------------------------------------
005:0005---------------------------------------------------------------------
****************************************************************************
*
*
* BLOCK 2 APARTMENTS
*
*
****************************************************************************
----------------------
| DESIGN STANDHYD    |   Area    (ha)=      .69
| 03:BLK2   DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   38.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=        .52          .17
    Dep. Storage     (mm)=        .80         1.50
    Average Slope     (%)=       1.00         1.00
    Length            (m)=      67.82        40.00
    Mannings n           =       .013         .250

    Max.eff.Inten.(mm/hr)=     186.56       234.31
               over (min)        2.00         8.00
    Storage Coeff.  (min)=       1.58 (ii)    7.76 (ii)
    Unit Hyd. Tpeak (min)=       2.00         8.00
    Unit Hyd. peak  (cms)=        .65          .14
                                                           *TOTALS*
    PEAK FLOW       (cms)=        .14          .07           .190 (iii)
    TIME TO PEAK    (hrs)=       1.50         1.58          1.500
    RUNOFF VOLUME    (mm)=      72.16        35.73         49.575
    TOTAL RAINFALL   (mm)=      72.96        72.96         72.962
    RUNOFF COEFFICIENT   =        .99          .49           .679

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

-----------------------------------------------------------------------------
005:0006---------------------------------------------------------------------
****************************************************************************
*
*
* BLOCK 5 SWM
*
*
****************************************************************************
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     1.26
| 06:BLK5   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   90.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.13          .13
    Dep. Storage     (mm)=        .80         1.50
    Average Slope     (%)=       1.00         1.00
    Length            (m)=      91.65        40.00
    Mannings n           =       .013         .250

    Max.eff.Inten.(mm/hr)=     186.56        35.64
               over (min)        2.00        15.00
    Storage Coeff.  (min)=       1.89 (ii)   15.02 (ii)
    Unit Hyd. Tpeak (min)=       2.00        15.00
    Unit Hyd. peak  (cms)=        .58          .08
                                                           *TOTALS*
    PEAK FLOW       (cms)=        .58          .01           .587 (iii)
    TIME TO PEAK    (hrs)=       1.50         1.72          1.500
    RUNOFF VOLUME    (mm)=      72.16        20.00         66.945
    TOTAL RAINFALL   (mm)=      72.96        72.96         72.962
    RUNOFF COEFFICIENT   =        .99          .27           .918

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  58.0    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.

-----------------------------------------------------------------------------
005:0007---------------------------------------------------------------------
****************************************************************************
*
*
* DETERMINE INFLOW TO POND
*
*
```

```
*************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.    DWF
--------------------               (ha)      (cms)    (hrs)   (mm)   (cms)
                  ID1 01:SFD        9.30      .987     1.52  32.21    .000
                 +ID2 02:BLK1        .57      .157     1.50  49.58    .000
                 +ID3 03:BLK2        .69      .190     1.50  49.58    .000
                 +ID4 06:BLK5       1.26      .587     1.50  66.95    .000
                  ==================================================
                  SUM 07:PSTDEV    11.82     1.905     1.50  37.76    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------
005:0008------------------------------------------------------------------
*************************************************************************
*
*
* ROUTE THROUGH POND
*
*
*************************************************************************
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>07:(PSTDEV)    |
| OUT<08:(PNDOUT)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00    |     .025  .3535E+00
                             .007  .5520E-01    |     .027  .4178E+00
                             .013  .1118E+00    |     .029  .4837E+00
                             .017  .1700E+00    |     .031  .5512E+00
                             .020  .2296E+00    |     .033  .6203E+00
                             .023  .2908E+00    |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK     TPEAK        R.V.
     --------------------         (ha)      (cms)     (hrs)        (mm)
     INFLOW >07: (PSTDEV)        11.82      1.905     1.500      37.763
     OUTFLOW<08: (PNDOUT)        11.82       .027     4.300      37.761
    OVERFLOW<09: (PNDOVR)          .00       .000      .000        .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=      1.434
                  TIME SHIFT OF PEAK FLOW          (min)=    168.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=.4182E+00

--------------------------------------------------------------------------
005:0009------------------------------------------------------------------
*************************************************************************
*
*
* BLOCK 3 COMMERCIAL
*
*
*************************************************************************
---------------------
| DESIGN STANDHYD    |   Area     (ha)=      .80
| 04:BLK3   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .72          .08
     Dep. Storage      (mm)=        .80         1.50
     Average Slope      (%)=       1.00         1.00
     Length             (m)=      73.03        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      186.56       792.82
               over (min)         2.00         5.00
     Storage Coeff.  (min)=        1.65 (ii)    5.44 (ii)
     Unit Hyd. Tpeak (min)=       2.00         5.00
     Unit Hyd. peak  (cms)=        .63          .21
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .19          .13        .310 (iii)
     TIME TO PEAK     (hrs)=       1.50         1.53       1.500
     RUNOFF VOLUME     (mm)=      72.16        49.78      59.854
     TOTAL RAINFALL    (mm)=      72.96        72.96      72.962
     RUNOFF COEFFICIENT   =        .99          .68        .820

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0     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.

--------------------------------------------------------------------------
005:0010------------------------------------------------------------------
*************************************************************************
*
*
* SIMULATE STORAGE ON BLOCK 3 TO RELEASE AT CONTROLLED RATE
*
*
*************************************************************************
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>04:(BLK3  )    |
| OUT<01:(B3CTRL)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00    |     .015  .1000E+01
                             .015  .1000E-03    |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK     TPEAK        R.V.
     --------------------         (ha)      (cms)     (hrs)        (mm)
     INFLOW >04: (BLK3  )          .80       .310     1.500      59.854
     OUTFLOW<01: (B3CTRL)          .80       .015     1.067      59.854
    OVERFLOW<02: (3OVR  )          .00       .000      .000        .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=      4.840
                  TIME SHIFT OF PEAK FLOW          (min)=    -26.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=.3117E-01
```

```
--------------------------------------------------------------------------
005:0011------------------------------------------------------------------
*************************************************************************
*
*
* BLOCK 4 COMMERCIAL
*
*
*************************************************************************
---------------------
| DESIGN STANDHYD    |   Area     (ha)=     1.40
| 05:BLK4   DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.26          .14
     Dep. Storage      (mm)=        .80         1.50
     Average Slope      (%)=       1.00         1.00
     Length             (m)=      96.61        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      186.56       780.67
               over (min)         2.00         6.00
     Storage Coeff.  (min)=        1.95 (ii)    5.77 (ii)
     Unit Hyd. Tpeak (min)=       2.00         6.00
     Unit Hyd. peak  (cms)=        .57          .19
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .32          .22        .525 (iii)
     TIME TO PEAK     (hrs)=       1.50         1.53       1.500
     RUNOFF VOLUME     (mm)=      72.16        49.78      59.854
     TOTAL RAINFALL    (mm)=      72.96        72.96      72.962
     RUNOFF COEFFICIENT   =        .99          .68        .820

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0     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.

--------------------------------------------------------------------------
005:0012------------------------------------------------------------------
*************************************************************************
*
*
* SIMULATE STORAGE ON 4 TO RELEASE AT CONTROLLED RATE
*
*
*************************************************************************
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>05:(BLK4  )    |
| OUT<03:(B4CTRL)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00    |     .015  .1000E+01
                             .015  .1000E-03    |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK     TPEAK        R.V.
     --------------------         (ha)      (cms)     (hrs)        (mm)
     INFLOW >05: (BLK4  )         1.40       .525     1.500      59.854
     OUTFLOW<03: (B4CTRL)         1.40       .015      .833      59.854
    OVERFLOW<04: (4OVR  )          .00       .000      .000        .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=      2.859
                  TIME SHIFT OF PEAK FLOW          (min)=    -40.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=.6394E-01

--------------------------------------------------------------------------
005:0013------------------------------------------------------------------
*************************************************************************
*
*
* TOTAL POST DEVELOPMENT FROM SITE
*
*
*************************************************************************
--------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.    DWF
--------------------               (ha)      (cms)    (hrs)   (mm)   (cms)
                  ID1 08:PNDOUT    11.82      .027     4.30  37.76    .000
                 +ID2 09:PNDOVR      .00      .000      .00    .00    .000 **DRY**
                 +ID3 01:B3CTRL      .80      .015     1.07  59.85    .000
                 +ID4 02:3OVR        .00      .000      .00    .00    .000 **DRY**
                 +ID5 03:B4CTRL     1.40      .015      .83  59.85    .000
                 +ID6 04:4OVR        .00      .000      .00    .00    .000 **DRY**
                  ==================================================
                  SUM 05:PSTDEV    14.02      .057     4.30  41.23    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------
005:0014------------------------------------------------------------------
--------------------------------------------------------------------------
005:0002------------------------------------------------------------------
--------------------------------------------------------------------------
005:0002------------------------------------------------------------------
--------------------------------------------------------------------------
005:0002------------------------------------------------------------------
--------------------------------------------------------------------------
005:0002------------------------------------------------------------------
  ** END OF RUN :    5

*************************************************************************





--------------------
| START              |   Project  dir.: H:\SWMHYM~1\10034Y~1\
--------------------     Rainfall dir.: H:\SWMHYM~1\10034Y~1\
    TZERO =    .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
```

```
            #  1=CH100.STM
 ------------------------------------------------------------------------------
 006:0002----------------------------------------------------------------------
 *#*****************************************************************************
 *#  Project Name: [YINS PHASE 5]    Project Number: [10034]
 *#  Date          : 02-11-2010
 *#  Modeller      : [TGS]
 *#  Company       : G. Douglas Vallee Limited
 *#  License #    :  3568969
 *#*****************************************************************************
 ------------------------------------------------------------------------------
 006:0002----------------------------------------------------------------------
 -------------------
 | READ STORM       |     Filename: H:\SWMHYM~1\10034Y~1\CH100.STM
 | Ptotal=  83.90 mm|     Comments: 100 YEAR CHICAGO 4 HOUR DESIGN STORM DIS
 -------------------
                TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
                 hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
                 .17    4.500 |   1.17   16.860 |   2.17   14.830 |   3.17    6.600
                 .33    5.050 |   1.33   41.070 |   2.33   12.120 |   3.33    6.100
                 .50    5.820 |   1.50  205.920 |   2.50   10.310 |   3.50    5.660
                 .67    6.830 |   1.67   54.560 |   2.67    9.020 |   3.67    5.280
                 .83    8.410 |   1.83   29.170 |   2.83    8.030 |   3.83    4.980
                1.00   11.070 |   2.00   19.280 |   3.00    7.240 |   4.00    4.700

 ------------------------------------------------------------------------------
 006:0003----------------------------------------------------------------------
 ******************************************************************************
 *
 *
 * SFD
 *
 *
 ******************************************************************************
 ---------------------
 | DESIGN STANDHYD    |   Area     (ha)=     9.30
 | 01:SFD    DT= 1.00 |   Total Imp(%)=    37.00   Dir. Conn.(%)=   16.00
 ---------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      3.44          5.86
      Dep. Storage      (mm)=       .80          1.50
      Average Slope      (%)=      1.00          1.00
      Length             (m)=    249.00         40.00
      Mannings n            =      .013          .250

      Max.eff.Inten.(mm/hr)=     205.92         79.53
                 over (min)       3.00         13.00
      Storage Coeff.  (min)=      3.31 (ii)    12.83 (ii)
      Unit Hyd. Tpeak (min)=      3.00         13.00
      Unit Hyd. peak  (cms)=       .35           .09
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .80           .80          1.192 (iii)
      TIME TO PEAK    (hrs)=      1.50          1.68          1.517
      RUNOFF VOLUME    (mm)=     83.10         31.04         39.372
      TOTAL RAINFALL   (mm)=     83.90         83.90         83.902
      RUNOFF COEFFICIENT   =       .99           .37           .469

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  58.0     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.

 ------------------------------------------------------------------------------
 006:0004----------------------------------------------------------------------
 ******************************************************************************
 *
 *
 * BLOCK 1 TOWNHOUSES
 *
 *
 ******************************************************************************
 ---------------------
 | DESIGN STANDHYD    |   Area     (ha)=      .57
 | 02:BLK1   DT= 1.00 |   Total Imp(%)=    75.00   Dir. Conn.(%)=   38.00
 ---------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       .43           .14
      Dep. Storage      (mm)=       .80          1.50
      Average Slope      (%)=      1.00          1.00
      Length             (m)=     61.64         40.00
      Mannings n            =      .013          .250

      Max.eff.Inten.(mm/hr)=     205.92        286.05
                 over (min)       1.00          7.00
      Storage Coeff.  (min)=      1.43 (ii)     7.14 (ii)
      Unit Hyd. Tpeak (min)=      1.00          7.00
      Unit Hyd. peak  (cms)=       .85           .16
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .12           .07           .185 (iii)
      TIME TO PEAK    (hrs)=      1.50          1.57          1.500
      RUNOFF VOLUME    (mm)=     83.10         44.06         58.898
      TOTAL RAINFALL   (mm)=     83.90         83.90         83.902
      RUNOFF COEFFICIENT   =       .99           .53           .702

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  58.0     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.

 ------------------------------------------------------------------------------
 006:0005----------------------------------------------------------------------
 ******************************************************************************
 *
 *
 * BLOCK 2 APARTMENTS
 *
 *
 ******************************************************************************
 ---------------------
 | DESIGN STANDHYD    |   Area     (ha)=      .69
 | 03:BLK2   DT= 1.00 |   Total Imp(%)=    75.00   Dir. Conn.(%)=   38.00
 ---------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       .52           .17
      Dep. Storage      (mm)=       .80          1.50
      Average Slope      (%)=      1.00          1.00
      Length             (m)=     67.82         40.00
      Mannings n            =      .013          .250
```

```
      Max.eff.Inten.(mm/hr)=     205.92        286.05
                 over (min)       2.00          7.00
      Storage Coeff.  (min)=      1.52 (ii)     7.22 (ii)
      Unit Hyd. Tpeak (min)=      2.00          7.00
      Unit Hyd. peak  (cms)=       .66           .16
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .15           .09           .224 (iii)
      TIME TO PEAK    (hrs)=      1.50          1.57          1.500
      RUNOFF VOLUME    (mm)=     83.10         44.06         58.898
      TOTAL RAINFALL   (mm)=     83.90         83.90         83.902
      RUNOFF COEFFICIENT   =       .99           .53           .702

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  58.0     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.

 ------------------------------------------------------------------------------
 006:0006----------------------------------------------------------------------
 ******************************************************************************
 *
 *
 * BLOCK 5 SWM
 *
 *
 ******************************************************************************
 ---------------------
 | DESIGN STANDHYD    |   Area     (ha)=     1.26
 | 06:BLK5   DT= 1.00 |   Total Imp(%)=    90.00   Dir. Conn.(%)=   90.00
 ---------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      1.13           .13
      Dep. Storage      (mm)=       .80          1.50
      Average Slope      (%)=      1.00          1.00
      Length             (m)=     91.65         40.00
      Mannings n            =      .013          .250

      Max.eff.Inten.(mm/hr)=     205.92         46.00
                 over (min)       2.00         14.00
      Storage Coeff.  (min)=      1.82 (ii)    13.67 (ii)
      Unit Hyd. Tpeak (min)=      2.00         14.00
      Unit Hyd. peak  (cms)=       .59           .08
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .65           .01           .650 (iii)
      TIME TO PEAK    (hrs)=      1.50          1.70          1.500
      RUNOFF VOLUME    (mm)=     83.10         25.49         77.341
      TOTAL RAINFALL   (mm)=     83.90         83.90         83.902
      RUNOFF COEFFICIENT   =       .99           .30           .922

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  58.0     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.

 ------------------------------------------------------------------------------
 006:0007----------------------------------------------------------------------
 ******************************************************************************
 *
 *
 * DETERMINE INFLOW TO POND
 *
 *
 ******************************************************************************
 --------------------
 | ADD HYD (PSTDEV) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)    (hrs)   (mm)    (cms)
                   ID1 01:SFD       9.30     1.192     1.52  39.37    .000
                  +ID2 02:BLK1       .57      .185     1.50  58.90    .000
                  +ID3 03:BLK2       .69      .224     1.50  58.90    .000
                  +ID4 06:BLK5      1.26      .650     1.50  77.34    .000
                   ==================================================
                   SUM 07:PSTDEV   11.82     2.221     1.50  45.50    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 006:0008----------------------------------------------------------------------
 ******************************************************************************
 *
 *
 * ROUTE THROUGH POND
 *
 *
 ******************************************************************************
 --------------------
 | ROUTE RESERVOIR   |     Requested routing time step =  1.0 min.
 |  IN>07:(PSTDEV)   |
 | OUT<08:(PNDOUT)   |     =========  OUTLFOW STORAGE TABLE  =========
 --------------------      OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)   |    (cms)    (ha.m.)
                              .000   .0000E+00   |     .025  .3535E+00
                              .007   .5520E-01   |     .027  .4178E+00
                              .013   .1118E+00   |     .029  .4837E+00
                              .017   .1700E+00   |     .031  .5512E+00
                              .020   .2296E+00   |     .033  .6203E+00
                              .023   .2908E+00   |     .000  .0000E+00

      ROUTING RESULTS              AREA      QPEAK      TPEAK        R.V.
      --------------------         (ha)      (cms)      (hrs)        (mm)
       INFLOW >07: (PSTDEV)       11.82      2.221      1.500      45.501
       OUTFLOW<08: (PNDOUT)       11.82       .030      4.300      45.500
     OVERFLOW<09: (PNDOVR)          .00       .000       .000        .000

                       TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                       CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                       PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                       PEAK   FLOW   REDUCTION [Qout/Qin](%)=     1.353
                       TIME SHIFT OF PEAK FLOW         (min)=   168.00
                       MAXIMUM  STORAGE   USED      (ha.m.)=.5069E+00

 ------------------------------------------------------------------------------
 006:0009----------------------------------------------------------------------
 ******************************************************************************
 *
 *
```

```
* BLOCK 3 COMMERCIAL
*
*
************************************************************************
 ---------------------
| DESIGN STANDHYD     |   Area     (ha)=      .80
| 04:BLK3   DT= 1.00  |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
 ---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .72           .08
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       1.00          1.00
     Length            (m)=      73.03         40.00
     Mannings n          =        .013          .250

     Max.eff.Inten.(mm/hr)=     205.92        907.51
                over (min)       2.00          5.00
     Storage Coeff.  (min)=       1.58 (ii)     5.18 (ii)
     Unit Hyd. Tpeak (min)=       2.00          5.00
     Unit Hyd. peak  (cms)=        .64           .22
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .21           .15          .353 (iii)
     TIME TO PEAK    (hrs)=       1.50          1.53         1.500
     RUNOFF VOLUME    (mm)=      83.10         59.74        70.253
     TOTAL RAINFALL   (mm)=      83.90         83.90        83.902
     RUNOFF COEFFICIENT   =        .99           .71          .837

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

--------------------------------------------------------------------------
006:0010------------------------------------------------------------------
************************************************************************
*
*
* SIMULATE STORAGE ON BLOCK 3 TO RELEASE AT CONTROLLED RATE
*
*
************************************************************************
 --------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>04:(BLK3  )    |
| OUT<01:(B3CTRL)    |    =========  OUTLFOW STORAGE TABLE  =========
 --------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |    .015  .1000E+01
                            .015  .1000E-03    |    .000  .0000E+00

     ROUTING RESULTS              AREA     QPEAK      TPEAK       R.V.
     -------------------          (ha)     (cms)      (hrs)       (mm)
     INFLOW >04: (BLK3  )          .80      .353      1.500     70.253
     OUTFLOW<01: (B3CTRL)          .80      .015      1.033     70.253
   OVERFLOW<02: (3OVR  )           .00      .000       .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=     4.253
                  TIME SHIFT OF PEAK FLOW          (min)=    -28.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3841E-01

--------------------------------------------------------------------------
006:0011------------------------------------------------------------------
************************************************************************
*
*
* BLOCK 4 COMMERCIAL
*
*
************************************************************************
 ---------------------
| DESIGN STANDHYD     |   Area     (ha)=     1.40
| 05:BLK4   DT= 1.00  |   Total Imp(%)=   90.00   Dir. Conn.(%)=   45.00
 ---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.26           .14
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       1.00          1.00
     Length            (m)=      96.61         40.00
     Mannings n          =        .013          .250

     Max.eff.Inten.(mm/hr)=     205.92        907.51
                over (min)       2.00          5.00
     Storage Coeff.  (min)=       1.87 (ii)     5.47 (ii)
     Unit Hyd. Tpeak (min)=       2.00          5.00
     Unit Hyd. peak  (cms)=        .58           .21
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .36           .27          .610 (iii)
     TIME TO PEAK    (hrs)=       1.50          1.53         1.500
     RUNOFF VOLUME    (mm)=      83.10         59.74        70.253
     TOTAL RAINFALL   (mm)=      83.90         83.90        83.902
     RUNOFF COEFFICIENT   =        .99           .71          .837

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  58.0    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.

--------------------------------------------------------------------------
006:0012------------------------------------------------------------------
************************************************************************
*
*
* SIMULATE STORAGE ON 4 TO RELEASE AT CONTROLLED RATE
*
*
************************************************************************
 --------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>05:(BLK4  )    |
| OUT<03:(B4CTRL)    |    =========  OUTLFOW STORAGE TABLE  =========
 --------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |    .015  .1000E+01
                            .015  .1000E-03    |    .000  .0000E+00

     ROUTING RESULTS              AREA     QPEAK      TPEAK       R.V.
     -------------------          (ha)     (cms)      (hrs)       (mm)
     INFLOW >05: (BLK4  )         1.40      .610      1.500     70.253
     OUTFLOW<03: (B4CTRL)         1.40      .015       .717     70.253
   OVERFLOW<04: (4OVR  )           .00      .000       .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =          0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=        .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=        .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=     2.457
                  TIME SHIFT OF PEAK FLOW          (min)=    -47.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.7812E-01

--------------------------------------------------------------------------
006:0013------------------------------------------------------------------
************************************************************************
*
*
* TOTAL POST DEVELOPMENT FROM SITE
*
*
************************************************************************
 ------------------
| ADD HYD (PSTDEV) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
 ------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 08:PNDOUT   11.82     .030    4.30  45.50    .000
                  +ID2 09:PNDOVR     .00     .000     .00    .00    .000 **DRY**
                  +ID3 01:B3CTRL     .80     .015    1.03  70.25    .000
                  +ID4 02:3OVR       .00     .000     .00    .00    .000 **DRY**
                  +ID5 03:B4CTRL    1.40     .015     .72  70.25    .000
                  +ID6 04:4OVR       .00     .000     .00    .00    .000 **DRY**
                   =================================================
                   SUM 05:PSTDEV   14.02     .060    4.30  49.38    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------
006:0014------------------------------------------------------------------
--------------------------------------------------------------------------
006:0002------------------------------------------------------------------
--------------------------------------------------------------------------
006:0002------------------------------------------------------------------
--------------------------------------------------------------------------
006:0002------------------------------------------------------------------
--------------------------------------------------------------------------
006:0002------------------------------------------------------------------
--------------------------------------------------------------------------
006:0002------------------------------------------------------------------
      FINISH
--------------------------------------------------------------------------
**************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2010-11-22     at 14:15:45
==========================================================================
```

Appendix D: Miscellaneous Pond Design Calculations

Water Quality Sizing

35% Impervious	90
55% Impervious	150
54% Impervious	147
Contributing Area	11.82
Volume Req.	1738

1) Forebay Design: Settling

Equation 4.5 Dist= sqrt(r*Qp/Vs)

Dist = forebay length
r = length to width of forebay
Qp = peak flow rate from pond during quality storm
Vs= target settling velocity, recommended at 0.0003 m/s

Given
r= 2 Target 2:1
Qp = 0.017
Vs= 0.0003

Dist= 11

2) Forebary Design: Dispersion Length

Equation 4.6 Dist = 8*Q/(d*Vf)

Dist = forebay length
Q= inlet flow rate for quality storm
d= depth of perm pool
Vf = desired velocity in forebay (<0.5m/s)

Given
Q= 0.651 SYMHYMO results to pond for 2-year event
d= 1.25
Vf= 0.5

dist= 8

3) Forebay Design: Bottom Width

Equation 4.7 Width=Dist/8

Given Dist= 11

width= 1.375

4) Forebay Design: Cleanout Frequency

Table 6.3 of SWM Planning and Design Manual

35% Impervious	0.6 m3/ha, annual sediment loading
55% Impervious	1.9 m3/ha, annual sediment loading

Reference Calculation of Impervious areas spreadsheet for this development==> 39% impervious
Therefore extrapolate
54% 1.835 m3/ha

Total site area, including external contributing area 11.82 ha

Sediment Accummulation	21.6897 m3/year
Target Removal eff. For basic protection	60%
Anticipate Accumulation	13.01382 m3/year
Clean Frequency	10 year
Total Anticipated Accumulation	130.1382 m3

Contour	Area	Incr V	Volume
242	73	0	
242.45	187	59	59
242.65	380	57	115
243.25	717	329	444

Appendix E: Main Street Storm Sewer Design Calculations (Existing and Proposed)

Subject: Yins Phase 5 Main Street Ex Storm
Date: Dec-10 By: TGS
Project #: 10034 Page

Existing storm services drainage area from Thompson Road to Area 4-3.

	Area	Runoff C	C*A
1-ex	1.26	0.45	0.567
2-1	1.71	0.45	0.7695
3-2	1.81	0.9	1.629
4-3	2.09	0.9	1.881
			4.8465

WSMD Designed for 2-year storm

Norfolk County Design criteria for 2-year storm, I = A/(t+B)^C

A	529.711
B	4.501
C	0.745

Assume and inlet time of 10 min to account for initial estimate of 5.0min per design criteria for commercial areas and some transit time in system

I 72.243 mm/hr

Q 973 L/s

Existing storm sewer along Main Street is all 525mm at 0.4%

Dia	0.525	m
n	0.013	
Hyd R	0.13125	m
Slope	0.4%	
C/S A	0.21647537	m2

Q 272 L/s

Therefore insufficient capacity to service drainage area for the 2-year event.

REV. No.	DATE	REVISION
0	DEC 8/10	SUBMIT TO COUNTY FOR REVIEW

⑩ STORM MANHOLE AND NUMBER

10-10A — AREA NUMBER
0.69 — AREA (Ha)
0.75 — RUNOFF COEFF.

vallee
Consulting Engineers,
Architects & Planners

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SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270

Stamp

PRELIMINARY
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Project Title

YIN PHASE 5

NORFOLK COUNTY - WATERFORD

Drawing Title

STORM DRAINAGE AREAS

Designed by : DJB
Drawn By : TJC
Checked by : TGS
Date Started : SEPTEMBER 2010
Drawing Scale : 1:100
Drawing No. ST1
Project No. 10-034

DATE LAST PLOTTED :

STORM SEWER DESIGN SHEET

Storm 2-year Simcoe

A= 529.71 B= 4.501 C= 0.745

Pipe Material PVC<=450, Concrete >450

n 0.013

Project 10034 Yin's Phase 5 - Main Street Storm

Town/County Waterford - Norfolk County

Date Nov 24/10

Designed by TGS

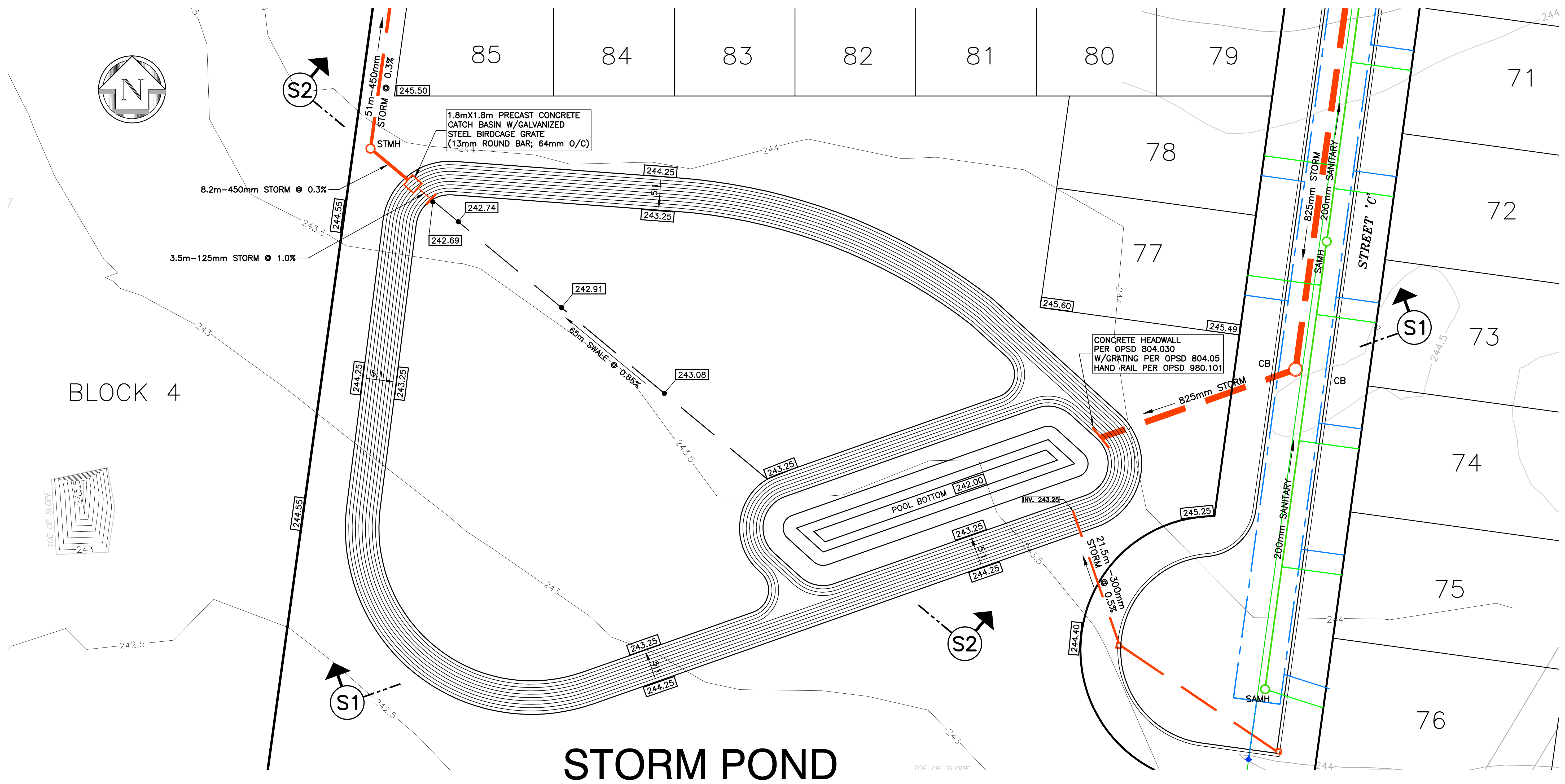
Checked by JDV

Sheet of : 1 of

Location			Area			Cumlative	Time	Rainfall	Flow	Sewer Design					
Area	From	To			TOTAL	R*A	of		2.78*I*A*R	Size	Slope	Cap	Vel	Length	Time
			Ha	Ha	Ha		Concentration	mm/hr							
			0.45	0.9			min		L/s	mm	%	L/s	m/s	m	min
Pond	Pond	7	0		0.00	0	0.00	N/A	30.0	450	0.30%	156.2	0.982	59.2	1
7-6	7	6	0.37		0.17	0.17	15.00	57.94	56.8	450	0.40%	180.3	1.134	104.5	1.54
6-5	6	5	0		0.00	0.17	16.54	54.75	85.3	600	0.20%	274.6	0.971	114	1.96
5-4	5	4		1.34	1.21	1.37	18.49	51.24	255.5	600	0.20%	274.6	0.971	119	2.04
4-3	4	3		2.09	1.88	3.25	20.53	48.10	495.0	750	0.25%	556.6	1.26	119.4	1.58
3-2	3	2		1.81	1.63	4.88	22.11	45.95	683.7	825	0.25%	717.7	1.343	84	1.04
2-1	2	1	1.71		0.77	5.65	23.16	44.66	761.7	825	0.30%	786.2	1.471	29.9	0.34
1-EX	1	EX	1.26		0.57	6.22	23.50	44.25	825.1	825	0.35%	849.2	1.589	107	1.12

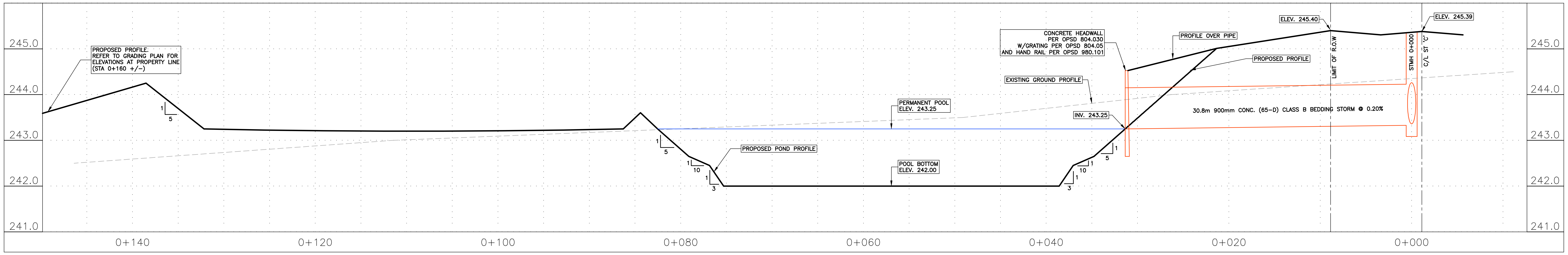
Note:

Peak Discharge from Pond (100-yr storm)	0.03	Applied at Area POND
Peak Dischare from Block 3	0.015	Applied at Area 6-5
Peak Discharge from Block 4	0.015	Applied at Area 6-6



STORM POND

SCALE 1:500



SECTION S1-S1

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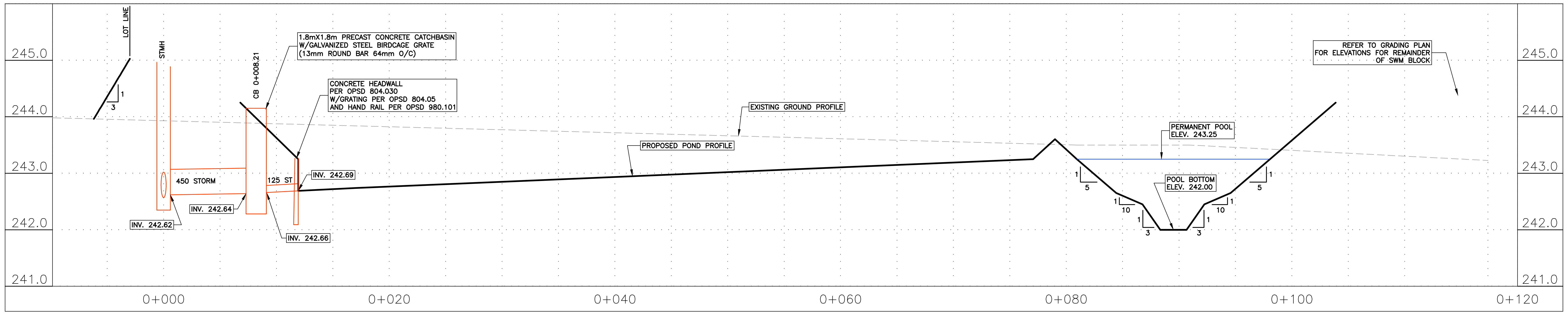

SECTION S2-S2

SCALE HORIZONTAL=1:250
VERTICAL=1:50

REV. No.	DATE	REVISION
0	DEC 8/10	SUBMIT TO COUNTY FOR REVIEW

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Stamp

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project Title
YIN PHASE 5
NORFOLK COUNTY - WATERFORD

Drawing Title
PLAN AND SECTION DETAILS

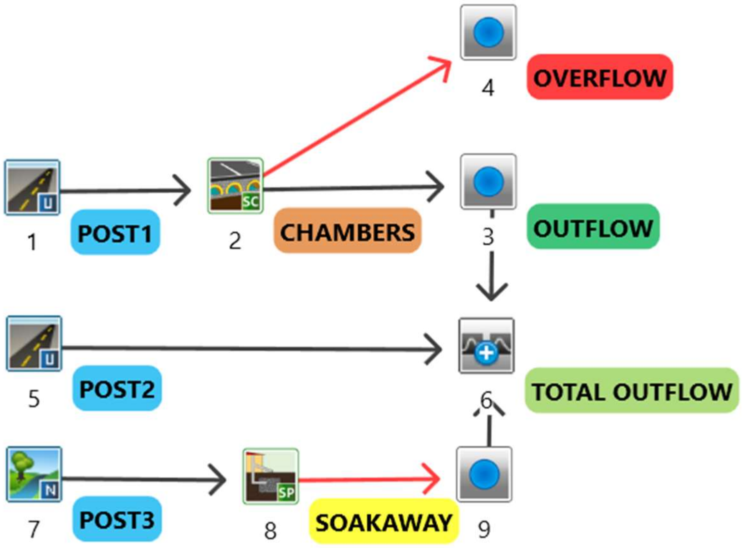
Designed by : GRB
Drawn By : TJC
Checked by : TGS
Date Started : NOVEMBER 2010
Drawing Scale : AS NOTED
Drawing No. SWM1
Project No. 10-034

DATE LAST PLOTTED :

APPENDIX E

Visual OTTHYMO Summary Outputs

21-059 LAM BOULEVARD DEVELOPMENT
POST-DEVELEPMENT OTTHYMO MODEL



2-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  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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  Output  filename: C:\Users\Natalie\AppData\Local\Civica\VH5\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\ab41c84a-79d7-4e16-8ab4-ec410b271652\scen
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9c0f-9f2fb80764f6\ab41c84a-79d7-4e16-8ab4-ec410b271652\scen


DATE: 09/22/2023                           TIME: 11:47:59

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 (  0001)|   Area     (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       0.54          0.06
     Dep. Storage      (mm)=       1.00         16.50
```

```
     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          1.16
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       2.21 (ii)     5.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.30          0.16
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.11          0.00          0.107 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.58           1.33
     RUNOFF VOLUME    (mm)=      34.21          1.73          30.96
     TOTAL RAINFALL   (mm)=      35.21         35.21          35.21
     RUNOFF COEFFICIENT   =       0.97          0.05           0.88

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

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  58.0    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.

 --------------------------------------------------------------------------------
 ------------------
 | CHAMBER(  0002)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: ON
 |IN= 2--> OUT= 3 |  CHAMBER:
 | DT=  5.0 min   |  MAX STO VOL (cu.m.)=  336.06  Bottom Area(m2)   =  315.20
 ------------------
                      DEPTH       STORAGE           |   DEPTH       STORAGE
                      (mm)        (cu.m.)           |   (mm)        (cu.m.)
                        0.00           0.00         |    889.00       189.24
                       25.00           3.20         |    914.00       195.28
                       51.00           6.40         |    940.00       201.26
                       76.00           9.61         |    965.00       207.17
                      102.00          12.81         |    991.00       213.01
                      127.00          16.01         |   1016.00       218.78
                      152.00          19.21         |   1041.00       224.47
                      178.00          22.41         |   1067.00       230.08
                      203.00          25.61         |   1092.00       235.60
                      229.00          28.82         |   1118.00       241.03
                      254.00          32.02         |   1143.00       246.35
                      279.00          35.22         |   1168.00       251.57
                      305.00          38.42         |   1194.00       256.67
                      330.00          45.32         |   1219.00       261.65
                      356.00          52.18         |   1245.00       266.48
                      381.00          59.02         |   1270.00       271.16
                      406.00          65.83         |   1295.00       275.66
                      432.00          72.63         |   1321.00       279.93
                      457.00          79.39         |   1346.00       283.84
                      483.00          86.14         |   1372.00       287.47
                      508.00          92.85         |   1397.00       290.98
                      533.00          99.54         |   1422.00       294.38
```

```
                    559.00        106.20        |   1448.00       297.64
                    584.00        112.83        |   1473.00       300.84
                    610.00        119.42        |   1499.00       304.05
                    635.00        125.98        |   1524.00       307.25
                    660.00        132.50        |   1549.00       310.45
                    686.00        138.99        |   1575.00       313.65
                    711.00        145.43        |   1600.00       316.85
                    737.00        151.84        |   1626.00       320.05
                    762.00        158.19        |   1651.00       323.26
                    787.00        164.51        |   1676.00       326.46
                    813.00        170.77        |   1702.00       329.66
                    838.00        176.98        |   1727.00       332.86
                    864.00        183.14        |   1753.00       336.06

                  DEPTH       DISCHARGE       |   DEPTH      DISCHARGE
                   (m)          (cms)         |    (m)         (cms)
                  0.000         0.000         |   0.431        0.011
                  0.025         0.004         |   0.532        0.012
                  0.126         0.007         |   0.633        0.013
                  0.228         0.008         |   0.710        0.014
                  0.330         0.010         |   0.000        0.000

                 NATIVE SOIL LAYER:
                 Infiltration (m/hr) = 0.0120

                    AREA         QPEAK            TPEAK         R.V.
                    (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.60         0.107             1.33         30.96
     OUTFLOW:ID= 1     0.00         0.000             0.00          0.00
    OVERFLOW:ID= 3     0.00         0.000             0.00          0.00

             Volume Reduction Rate[(RVin-RVout)/RVin](%)=      100.00
             Time to reach Max storage               (Hr)=        4.00
             Volume of water for drawdown in LID (cu.m.)=      171.26
             Volume of maximum water storage     (cu.m.)=      171.76
             Calculated Drawdown Time                (Hr)=       45.25

  --------------------------
  | Junction Command(0004) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0002)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0004)    0.00     0.00    0.00     0.00

  ---------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area    (ha)=   0.05   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  16.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

        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

    Unit Hyd Qpeak  (cms)=   0.038

    PEAK FLOW       (cms)=   0.000 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=   1.313
    TOTAL RAINFALL   (mm)=  35.210
    RUNOFF COEFFICIENT   =   0.037

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------------------
|SOAKAWAY(  0008)|  UNDERDRAIN: OFF
|IN= 2--> OUT= 3 |
|DT=  5.0 MIN    |  STORAGE LAYER:
------------------  Length          (m)=   8.00   Height                   (m)=   1.00
                    Porosity          =   0.40   Initial Water Level      (m)=   0.00
                    Width           (m)=   4.00   Min. Drawdown           (hr)=  96.00
                    Max. Drawdown  (hr)=  33.33   Available Storage   (cu.m.)=  12.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.05         0.000             4.08          1.57
    OVERFLOW:ID= 3     0.00         0.000             0.00          0.00

             Volume Reduction Rate[(RVin-RVout)/RVin](%):
                       If RVout= (Overflow             )=      100.00
             Time to reach Max storage               (Hr)=        4.08
             Volume of water for drawdown in LID (cu.m.)=        0.06
             Volume of maximum water storage     (cu.m.)=        0.09
             Calculated Drawdown Time                (Hr)=        0.08

  --------------------------
  | Junction Command(0009) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0008)    0.00     0.00    0.00     0.00
```

```
  OUTFLOW: ID= 2(  0009)    0.00     0.00    0.00     0.00

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

  --------------------------
  | Junction Command(0003) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0002)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0003)    0.00     0.00    0.00     0.00

  ---------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=   0.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.04
     Dep. Storage     (mm)=       1.00        16.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      18.44        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         3.31
                over (min)        5.00        30.00
     Storage Coeff.  (min)=       1.06 (ii)   28.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.34         0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.000 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.08           2.08
     RUNOFF VOLUME    (mm)=      34.21         3.24           2.83
     TOTAL RAINFALL   (mm)=      35.21        35.21          35.21
     RUNOFF COEFFICIENT   =       0.97         0.09           0.08

***** 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*  =  58.0    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  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0003 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0006 = HYDROGRAPH 0005
        ID1= 1 (  0003):     0.00   0.000     0.00     0.00
      + ID2= 2 (  0005):     0.05   0.000     2.08     2.83
        ==================================================
        ID = 3 (  0006):     0.05   0.000     2.08     2.83

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

--------------------
| ADD HYD  (  0006)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0009 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0006):     0.05   0.000     2.08     2.83
      + ID2= 2 (  0009):     0.00   0.000     0.00     0.00
        ==================================================
        ID = 1 (  0006):     0.05   0.000     2.08     2.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
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5-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    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\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\003f8050-3112-4ebc-b885-b2344297f50f\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\003f8050-3112-4ebc-b885-b2344297f50f\scen


DATE: 09/22/2023                          TIME: 11:47:58

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 ( 0001)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.54         0.06
     Dep. Storage     (mm)=       1.00        16.50
     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          4.65
               over (min)        5.00          5.00
     Storage Coeff.  (min)=       1.97 (ii)     4.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.31          0.22
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14          0.00        0.144 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.33         1.33
     RUNOFF VOLUME    (mm)=      48.03          4.89        43.71
     TOTAL RAINFALL   (mm)=      49.03         49.03        49.03
     RUNOFF COEFFICIENT   =       0.98          0.10         0.89

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  58.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
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```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------------
------------------
| CHAMBER(  0002)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: ON
|IN= 2--> OUT= 3 |  CHAMBER:
| DT=  5.0 min   |  MAX STO VOL (cu.m.)=  336.06  Bottom Area(m2)   =  315.20
------------------
                      DEPTH       STORAGE          |   DEPTH      STORAGE
                      (mm)        (cu.m.)          |   (mm)       (cu.m.)
                        0.00          0.00         |    889.00       189.24
                       25.00          3.20         |    914.00       195.28
                       51.00          6.40         |    940.00       201.26
                       76.00          9.61         |    965.00       207.17
                      102.00         12.81         |    991.00       213.01
                      127.00         16.01         |   1016.00       218.78
                      152.00         19.21         |   1041.00       224.47
                      178.00         22.41         |   1067.00       230.08
                      203.00         25.61         |   1092.00       235.60
                      229.00         28.82         |   1118.00       241.03
                      254.00         32.02         |   1143.00       246.35
                      279.00         35.22         |   1168.00       251.57
                      305.00         38.42         |   1194.00       256.67
                      330.00         45.32         |   1219.00       261.65
                      356.00         52.18         |   1245.00       266.48
                      381.00         59.02         |   1270.00       271.16
                      406.00         65.83         |   1295.00       275.66
                      432.00         72.63         |   1321.00       279.93
                      457.00         79.39         |   1346.00       283.84
                      483.00         86.14         |   1372.00       287.47
                      508.00         92.85         |   1397.00       290.98
                      533.00         99.54         |   1422.00       294.38
                      559.00        106.20         |   1448.00       297.64
                      584.00        112.83         |   1473.00       300.84
                      610.00        119.42         |   1499.00       304.05
                      635.00        125.98         |   1524.00       307.25
                      660.00        132.50         |   1549.00       310.45
                      686.00        138.99         |   1575.00       313.65
                      711.00        145.43         |   1600.00       316.85
                      737.00        151.84         |   1626.00       320.05
                      762.00        158.19         |   1651.00       323.26
                      787.00        164.51         |   1676.00       326.46
                      813.00        170.77         |   1702.00       329.66
                      838.00        176.98         |   1727.00       332.86
                      864.00        183.14         |   1753.00       336.06

                     DEPTH      DISCHARGE       |   DEPTH      DISCHARGE
                      (m)         (cms)         |    (m)         (cms)
                     0.000        0.000         |   0.431        0.011
                     0.025        0.004         |   0.532        0.012
                     0.126        0.007         |   0.633        0.013
                     0.228        0.008         |   0.710        0.014
                     0.330        0.010         |   0.000        0.000

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
         INFLOW:ID= 2   0.60         0.144            1.33          43.71
        OUTFLOW:ID= 1   0.60         0.005            4.00           4.92
       OVERFLOW:ID= 3   0.00         0.000            0.00           0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=       88.75
               Time to reach Max storage              (Hr)=        4.00
               Volume of water for drawdown in LID (cu.m.)=      221.93
               Volume of maximum water storage     (cu.m.)=      225.08
               Calculated Drawdown Time               (Hr)=       57.50

  --------------------------
  | Junction Command(0004) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3( 0002)    0.00     0.00     0.00     0.00
  OUTFLOW: ID= 2( 0004)    0.00     0.00     0.00     0.00

  -----------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   ( 0007)|   Area    (ha)=   0.05   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  16.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

         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

     Unit Hyd Qpeak  (cms)=    0.038

     PEAK FLOW       (cms)=    0.001 (i)
     TIME TO PEAK    (hrs)=    1.333
     RUNOFF VOLUME    (mm)=    3.730
     TOTAL RAINFALL   (mm)=   49.033
     RUNOFF COEFFICIENT   =    0.076

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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-------------------------------------------------------------------------------
------------------
|SOAKAWAY( 0008)|  UNDERDRAIN: OFF
|IN= 2--> OUT= 3 |
|DT=  5.0 MIN    |  STORAGE LAYER:
------------------  Length          (m)=   8.00   Height                  (m)=   1.00
                    Porosity          =   0.40   Initial Water Level     (m)=   0.00
                    Width           (m)=   4.00   Min. Drawdown          (hr)=  96.00
                    Max. Drawdown  (hr)=  33.33   Available Storage   (cu.m.)=  12.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.05         0.001             1.33         3.73
    OVERFLOW:ID= 3     0.00         0.000             0.00         0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%):
                         If RVout= (Overflow             )=      100.00
               Time to reach Max storage              (Hr)=        4.00
               Volume of water for drawdown in LID (cu.m.)=        0.74
               Volume of maximum water storage     (cu.m.)=        0.80
               Calculated Drawdown Time               (Hr)=        1.92

  --------------------------
  | Junction Command(0009) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0008)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0009)    0.00     0.00    0.00     0.00

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

  --------------------------
  | Junction Command(0003) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0002)    0.60     0.00    4.00     4.92
  OUTFLOW: ID= 2(  0003)    0.60     0.00    4.00     4.92

  -------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=   0.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.04
     Dep. Storage     (mm)=       1.00        16.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      18.44        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         9.57
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       0.94 (ii)   18.99 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.34         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.001 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75           1.75
     RUNOFF VOLUME    (mm)=      48.03         7.70           7.47
     TOTAL RAINFALL   (mm)=      49.03        49.03          49.03
     RUNOFF COEFFICIENT   =       0.98         0.16           0.15

***** 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*  =  58.0    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  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.005     4.00     4.92
      + ID2= 2 (  0005):     0.05   0.001     1.75     7.47
        ==================================================
        ID = 3 (  0006):     0.65   0.005     3.83     5.12

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

```
--------------------
| ADD HYD  (  0006)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0009 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0006):     0.65   0.005     3.83     5.12
      + ID2= 2 (  0009):     0.00   0.000     0.00     0.00
        ==================================================
        ID = 1 (  0006):     0.65   0.005     3.83     5.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
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10-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    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\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\b38ffe88-12df-40e8-b2b4-b8168c71addf\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\b38ffe88-12df-40e8-b2b4-b8168c71addf\scen


DATE: 09/22/2023                           TIME: 11:47:59

USER:



COMMENTS: ____________________________________________________________


-------------------------------------------------------------------------------------
  ***********************************************
  ** SIMULATION : 03_10-Year Norfolk           **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 670.324
| Ptotal= 57.94 mm |                          B=   3.007
--------------------                          C=   0.698
                        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    5.04 |  1.00   27.43 |  2.00   10.30 |  3.00    5.84
                 0.17    5.66 |  1.17  111.84 |  2.17    9.03 |  3.17    5.49
                 0.33    6.49 |  1.33   34.58 |  2.33    8.07 |  3.33    5.18
                 0.50    7.70 |  1.50   20.31 |  2.50    7.33 |  3.50    4.92
                 0.67    9.66 |  1.67   15.00 |  2.67    6.74 |  3.67    4.68
                 0.83   13.55 |  1.83   12.13 |  2.83    6.25 |  3.83    4.47


-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0001)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.54         0.06
     Dep. Storage     (mm)=       1.00        16.50
     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    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
               0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
               0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
               0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
               0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
               0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
               0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
               0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
               0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
               0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
               0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
               1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Max.Eff.Inten.(mm/hr)=     111.84          8.30
               over (min)       5.00          5.00
     Storage Coeff.  (min)=       1.86 (ii)     4.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.32          0.22
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.17          0.00          0.168 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.33           1.33
     RUNOFF VOLUME    (mm)=      56.94          7.62          52.01
     TOTAL RAINFALL   (mm)=      57.94         57.94          57.94
     RUNOFF COEFFICIENT   =       0.98          0.13           0.90

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  58.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

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     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
------------------
| CHAMBER( 0002)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: ON
|IN= 2--> OUT= 3 |  CHAMBER:
| DT=  5.0 min   |  MAX STO VOL (cu.m.)=  336.06  Bottom Area(m2)   =  315.20
------------------
                      DEPTH       STORAGE          |  DEPTH      STORAGE
                       (mm)       (cu.m.)          |   (mm)      (cu.m.)
                        0.00         0.00          |   889.00       189.24
                       25.00         3.20          |   914.00       195.28
                       51.00         6.40          |   940.00       201.26
                       76.00         9.61          |   965.00       207.17
                      102.00        12.81          |   991.00       213.01
                      127.00        16.01          |  1016.00       218.78
                      152.00        19.21          |  1041.00       224.47
                      178.00        22.41          |  1067.00       230.08
                      203.00        25.61          |  1092.00       235.60
                      229.00        28.82          |  1118.00       241.03
                      254.00        32.02          |  1143.00       246.35
                      279.00        35.22          |  1168.00       251.57
                      305.00        38.42          |  1194.00       256.67
                      330.00        45.32          |  1219.00       261.65
                      356.00        52.18          |  1245.00       266.48
                      381.00        59.02          |  1270.00       271.16
                      406.00        65.83          |  1295.00       275.66
                      432.00        72.63          |  1321.00       279.93
                      457.00        79.39          |  1346.00       283.84
                      483.00        86.14          |  1372.00       287.47
                      508.00        92.85          |  1397.00       290.98
                      533.00        99.54          |  1422.00       294.38
                      559.00       106.20          |  1448.00       297.64
                      584.00       112.83          |  1473.00       300.84
                      610.00       119.42          |  1499.00       304.05
                      635.00       125.98          |  1524.00       307.25
                      660.00       132.50          |  1549.00       310.45
                      686.00       138.99          |  1575.00       313.65
                      711.00       145.43          |  1600.00       316.85
                      737.00       151.84          |  1626.00       320.05
                      762.00       158.19          |  1651.00       323.26
                      787.00       164.51          |  1676.00       326.46
                      813.00       170.77          |  1702.00       329.66
                      838.00       176.98          |  1727.00       332.86
                      864.00       183.14          |  1753.00       336.06

                     DEPTH       DISCHARGE      |   DEPTH      DISCHARGE
                      (m)          (cms)        |    (m)         (cms)
                     0.000         0.000        |   0.431        0.011
                     0.025         0.004        |   0.532        0.012
                     0.126         0.007        |   0.633        0.013
                     0.228         0.008        |   0.710        0.014
                     0.330         0.010        |   0.000        0.000

                   NATIVE SOIL LAYER:
                   Infiltration (m/hr) = 0.0120

                      AREA         QPEAK            TPEAK          R.V.
                      (ha)         (cms)            (hrs)          (mm)
        INFLOW:ID= 2   0.60         0.168             1.33          52.01
       OUTFLOW:ID= 1   0.60         0.007             3.50          12.69
      OVERFLOW:ID= 3   0.00         0.000             0.00           0.00

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=       75.61
              Time to reach Max storage               (Hr)=        3.50
              Volume of water for drawdown in LID (cu.m.)=      240.97
              Volume of maximum water storage     (cu.m.)=      246.60
              Calculated Drawdown Time                (Hr)=       58.33

  --------------------------
  | Junction Command(0004) |
  --------------------------


                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0002)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0004)    0.00     0.00    0.00     0.00

  -------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area     (ha)=   0.05   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=  16.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    0.05

         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    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
               0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
               0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
               0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
               0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
               0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
               0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
               0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
               0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
               0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
               0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
               1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Unit Hyd Qpeak  (cms)=    0.038

     PEAK FLOW       (cms)=   0.001 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=   5.814
     TOTAL RAINFALL   (mm)=  57.945
     RUNOFF COEFFICIENT   =   0.100

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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-------------------------------------------------------------------------------
------------------
|SOAKAWAY(  0008)|  UNDERDRAIN: OFF
|IN= 2--> OUT= 3 |
|DT=  5.0 MIN    |  STORAGE LAYER:
------------------  Length          (m)=   8.00   Height                   (m)=   1.00
                    Porosity          =   0.40   Initial Water Level      (m)=   0.00
                    Width           (m)=   4.00   Min. Drawdown           (hr)=  96.00
                    Max. Drawdown  (hr)=  33.33   Available Storage   (cu.m.)=  12.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.05         0.001             1.33         5.81
    OVERFLOW:ID= 3     0.00         0.000             0.00         0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%):
                         If RVout= (Overflow            )=      100.00
               Time to reach Max storage              (Hr)=        4.00
               Volume of water for drawdown in LID (cu.m.)=        1.75
               Volume of maximum water storage     (cu.m.)=        1.81
               Calculated Drawdown Time               (Hr)=        4.50

  --------------------------
  | Junction Command(0009) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 3(  0008)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0009)    0.00     0.00    0.00     0.00

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

  --------------------------
  | Junction Command(0003) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 1(  0002)    0.60     0.01    3.50    12.69
  OUTFLOW: ID= 2(  0003)    0.60     0.01    3.50    12.69

  -------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=   0.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.04
     Dep. Storage     (mm)=       1.00        16.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      18.44        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    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
                0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
                0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
                0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
                0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
                0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
                0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
                0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
                0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
                0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
                0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
                1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Max.Eff.Inten.(mm/hr)=     111.84        16.59
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       0.89 (ii)   15.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.34         0.07
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.001 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67           1.67
     RUNOFF VOLUME    (mm)=      56.94        11.32          11.16
     TOTAL RAINFALL   (mm)=      57.94        57.94          57.94
     RUNOFF COEFFICIENT   =       0.98         0.20           0.19

***** 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*  =  58.0    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  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
        ID1= 1 (  0003):     0.60   0.007     3.50    12.69
      + ID2= 2 (  0005):     0.05   0.001     1.67    11.16
        ===================================================
        ID = 3 (  0006):     0.65   0.007     3.33    12.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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```
| ADD HYD  (  0006)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
*** W A R N I N G :  HYDROGRAPH   0009 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0006):     0.65   0.007     3.33    12.57
      + ID2= 2 (  0009):     0.00   0.000     0.00     0.00
        ===================================================
        ID = 1 (  0006):     0.65   0.007     3.33    12.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
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25-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    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\f825abd2-5f32-4c68-
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9c0f-9f2fb80764f6\3e20fda6-85dc-4ee8-af42-3fc621202e87\scen


DATE: 09/22/2023                       TIME: 11:47:59

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 (  0001)|   Area     (ha)=    0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.54        0.06
     Dep. Storage     (mm)=       1.00       16.50
     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        13.63
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.74 (ii)    4.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.32         0.23
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.00         0.199 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33         1.33
     RUNOFF VOLUME    (mm)=      68.38        11.81        62.72
     TOTAL RAINFALL   (mm)=      69.38        69.38        69.38
     RUNOFF COEFFICIENT  =        0.99         0.17         0.90

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

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  58.0    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.
```

```
--------------------------------------------------------------------------------
------------------
| CHAMBER(  0002)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: ON
|IN= 2--> OUT= 3 |  CHAMBER:
| DT=  5.0 min   |  MAX STO VOL (cu.m.)=  336.06  Bottom Area(m2)   =  315.20
------------------
                     DEPTH       STORAGE            |   DEPTH      STORAGE
                     (mm)        (cu.m.)            |   (mm)       (cu.m.)
                      0.00          0.00            |   889.00      189.24
                     25.00          3.20            |   914.00      195.28
                     51.00          6.40            |   940.00      201.26
                     76.00          9.61            |   965.00      207.17
                    102.00         12.81            |   991.00      213.01
                    127.00         16.01            |  1016.00      218.78
                    152.00         19.21            |  1041.00      224.47
                    178.00         22.41            |  1067.00      230.08
                    203.00         25.61            |  1092.00      235.60
                    229.00         28.82            |  1118.00      241.03
                    254.00         32.02            |  1143.00      246.35
                    279.00         35.22            |  1168.00      251.57
                    305.00         38.42            |  1194.00      256.67
                    330.00         45.32            |  1219.00      261.65
                    356.00         52.18            |  1245.00      266.48
                    381.00         59.02            |  1270.00      271.16
                    406.00         65.83            |  1295.00      275.66
                    432.00         72.63            |  1321.00      279.93
                    457.00         79.39            |  1346.00      283.84
                    483.00         86.14            |  1372.00      287.47
                    508.00         92.85            |  1397.00      290.98
                    533.00         99.54            |  1422.00      294.38
                    559.00        106.20            |  1448.00      297.64
                    584.00        112.83            |  1473.00      300.84
                    610.00        119.42            |  1499.00      304.05
                    635.00        125.98            |  1524.00      307.25
                    660.00        132.50            |  1549.00      310.45
                    686.00        138.99            |  1575.00      313.65
                    711.00        145.43            |  1600.00      316.85
                    737.00        151.84            |  1626.00      320.05
                    762.00        158.19            |  1651.00      323.26
                    787.00        164.51            |  1676.00      326.46
                    813.00        170.77            |  1702.00      329.66
                    838.00        176.98            |  1727.00      332.86
                    864.00        183.14            |  1753.00      336.06

                   DEPTH       DISCHARGE          |   DEPTH      DISCHARGE
                    (m)          (cms)            |    (m)         (cms)
                   0.000         0.000            |   0.431        0.011
                   0.025         0.004            |   0.532        0.012
                   0.126         0.007            |   0.633        0.013
                   0.228         0.008            |   0.710        0.014
                   0.330         0.010            |   0.000        0.000

                  NATIVE SOIL LAYER:
                  Infiltration (m/hr) = 0.0120

                     AREA         QPEAK              TPEAK          R.V.
                     (ha)         (cms)              (hrs)          (mm)
      INFLOW:ID= 2   0.60         0.199               1.33         62.72
     OUTFLOW:ID= 1   0.60         0.010               3.17         22.73
    OVERFLOW:ID= 3   0.00         0.000               0.00          0.00

             Volume Reduction Rate[(RVin-RVout)/RVin](%)=       63.76
             Time to reach Max storage              (Hr)=        3.17
             Volume of water for drawdown in LID (cu.m.)=      271.61
             Volume of maximum water storage     (cu.m.)=      280.86
             Calculated Drawdown Time               (Hr)=       59.33

  -------------------------
  | Junction Command(0004) |
  -------------------------

                               AREA     QPEAK   TPEAK     R.V.
                               (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 3(  0002)       0.00      0.00    0.00      0.00
  OUTFLOW: ID= 2(  0004)       0.00      0.00    0.00      0.00

  ----------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0007)|   Area     (ha)=    0.05   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   16.50   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=    0.05

         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

     Unit Hyd Qpeak  (cms)=    0.038

     PEAK FLOW       (cms)=    0.002 (i)
     TIME TO PEAK    (hrs)=    1.333
     RUNOFF VOLUME    (mm)=    9.007
     TOTAL RAINFALL   (mm)=   69.379
     RUNOFF COEFFICIENT  =     0.130

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------------------
|SOAKAWAY( 0008)|  UNDERDRAIN: OFF
|IN= 2--> OUT= 3 |
|DT=  5.0 MIN    |  STORAGE LAYER:
------------------  Length          (m)=   8.00   Height                    (m)=   1.00
                    Porosity          =   0.40   Initial Water Level       (m)=   0.00
                    Width           (m)=   4.00   Min. Drawdown            (hr)=  96.00
                    Max. Drawdown  (hr)=  33.33   Available Storage   (cu.m.)=  12.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2      0.05         0.002             1.33         9.01
   OVERFLOW:ID= 3      0.00         0.000             0.00         0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%):
                         If RVout= (Overflow              )=      100.00
               Time to reach Max storage              (Hr)=         4.00
               Volume of water for drawdown in LID (cu.m.)=         3.35
               Volume of maximum water storage     (cu.m.)=         3.41
               Calculated Drawdown Time               (Hr)=         8.67

  -------------------------
  | Junction Command(0009) |
  -------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0008)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0009)    0.00     0.00    0.00     0.00

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

  -------------------------
  | Junction Command(0003) |
  -------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0002)    0.60     0.01    3.17    22.73
  OUTFLOW: ID= 2(  0003)    0.60     0.01    3.17    22.73

  -------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=   0.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.04
     Dep. Storage     (mm)=       1.00        16.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      18.44        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        24.97
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.83 (ii)   13.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.08
                                                             *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00           0.002 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50            1.50
     RUNOFF VOLUME    (mm)=      68.38        16.67           16.48
     TOTAL RAINFALL   (mm)=      69.38        69.38           69.38
     RUNOFF COEFFICIENT   =       0.99         0.24            0.24

***** 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*  =  58.0    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  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.010     3.17    22.73
      + ID2= 2 (  0005):     0.05   0.002     1.50    16.48
        ==================================================
        ID = 3 (  0006):     0.65   0.010     3.00    22.24

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

--------------------
| ADD HYD  (  0006)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0009 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0006):     0.65   0.010     3.00    22.24
      + ID2= 2 (  0009):     0.00   0.000     0.00     0.00
        ==================================================
        ID = 1 (  0006):     0.65   0.010     3.00    22.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
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50-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    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\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\9131306f-00d5-4591-81ed-305d2d49c3a0\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\9131306f-00d5-4591-81ed-305d2d49c3a0\scen


DATE: 09/22/2023                           TIME: 11:47:59

USER:



COMMENTS: ____________________________________________________________


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  ************************************************
  ** 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 ( 0001)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.54         0.06
     Dep. Storage     (mm)=       1.00        16.50
     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        18.29
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.67 (ii)    4.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.32         0.24
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.00         0.223 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      77.32        15.55         71.14
     TOTAL RAINFALL   (mm)=      78.32        78.32         78.32
     RUNOFF COEFFICIENT  =       0.99         0.20          0.91

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  58.0    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.

--------------------------------------------------------------------------------
------------------
| CHAMBER(  0002)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: ON
|IN= 2--> OUT= 3 |  CHAMBER:
| DT=  5.0 min   |  MAX STO VOL (cu.m.)=  336.06  Bottom Area(m2)   =  315.20
------------------
                      DEPTH       STORAGE          |   DEPTH      STORAGE
                      (mm)        (cu.m.)          |   (mm)       (cu.m.)
                        0.00          0.00         |    889.00      189.24
                       25.00          3.20         |    914.00      195.28
                       51.00          6.40         |    940.00      201.26
                       76.00          9.61         |    965.00      207.17
                      102.00         12.81         |    991.00      213.01
                      127.00         16.01         |   1016.00      218.78
                      152.00         19.21         |   1041.00      224.47
                      178.00         22.41         |   1067.00      230.08
                      203.00         25.61         |   1092.00      235.60
                      229.00         28.82         |   1118.00      241.03
                      254.00         32.02         |   1143.00      246.35
                      279.00         35.22         |   1168.00      251.57
                      305.00         38.42         |   1194.00      256.67
                      330.00         45.32         |   1219.00      261.65
                      356.00         52.18         |   1245.00      266.48
                      381.00         59.02         |   1270.00      271.16
                      406.00         65.83         |   1295.00      275.66
                      432.00         72.63         |   1321.00      279.93
                      457.00         79.39         |   1346.00      283.84
                      483.00         86.14         |   1372.00      287.47
                      508.00         92.85         |   1397.00      290.98
                      533.00         99.54         |   1422.00      294.38
                      559.00        106.20         |   1448.00      297.64
                      584.00        112.83         |   1473.00      300.84
                      610.00        119.42         |   1499.00      304.05
                      635.00        125.98         |   1524.00      307.25
                      660.00        132.50         |   1549.00      310.45
                      686.00        138.99         |   1575.00      313.65
                      711.00        145.43         |   1600.00      316.85
                      737.00        151.84         |   1626.00      320.05
                      762.00        158.19         |   1651.00      323.26
                      787.00        164.51         |   1676.00      326.46
                      813.00        170.77         |   1702.00      329.66
                      838.00        176.98         |   1727.00      332.86
                      864.00        183.14         |   1753.00      336.06

                     DEPTH       DISCHARGE        |   DEPTH      DISCHARGE
                      (m)          (cms)          |    (m)         (cms)
                     0.000         0.000          |   0.431        0.011
                     0.025         0.004          |   0.532        0.012
                     0.126         0.007          |   0.633        0.013
                     0.228         0.008          |   0.710        0.014
                     0.330         0.010          |   0.000        0.000

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                           AREA         QPEAK             TPEAK          R.V.
                           (ha)         (cms)             (hrs)          (mm)
           INFLOW:ID= 2    0.60         0.223              1.33         71.14
          OUTFLOW:ID= 1    0.60         0.012              3.00         30.76
         OVERFLOW:ID= 3    0.00         0.000              0.00          0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=      56.77
               Time to reach Max storage              (Hr)=       3.00
               Volume of water for drawdown in LID (cu.m.)=     296.16
               Volume of maximum water storage     (cu.m.)=     309.02
               Calculated Drawdown Time               (Hr)=      59.92

  --------------------------
  | Junction Command(0004) |
  --------------------------

                              AREA    QPEAK   TPEAK     R.V.
                              (ha)    (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0002)      0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0004)      0.00     0.00    0.00     0.00

  ---------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area    (ha)=   0.05   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  16.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

         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

     Unit Hyd Qpeak  (cms)=   0.038

     PEAK FLOW       (cms)=   0.003 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  11.863
     TOTAL RAINFALL   (mm)=  78.320
     RUNOFF COEFFICIENT  =    0.151

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
-------------------------------------------------------------------------------
------------------
|SOAKAWAY(  0008)|  UNDERDRAIN: OFF
|IN= 2--> OUT= 3 |
|DT=  5.0 MIN    |  STORAGE LAYER:
------------------  Length          (m)=   8.00   Height                  (m)=   1.00
                    Porosity          =   0.40   Initial Water Level     (m)=   0.00
                    Width           (m)=   4.00   Min. Drawdown          (hr)=  96.00
                    Max. Drawdown  (hr)=  33.33   Available Storage   (cu.m.)=  12.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.05         0.003             1.33        11.86
    OVERFLOW:ID= 3     0.00         0.000             0.00         0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%):
                         If RVout= (Overflow             )=      100.00
               Time to reach Max storage              (Hr)=        4.00
               Volume of water for drawdown in LID (cu.m.)=        4.78
               Volume of maximum water storage     (cu.m.)=        4.83
               Calculated Drawdown Time               (Hr)=       12.42

  --------------------------
  | Junction Command(0009) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0008)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0009)    0.00     0.00    0.00     0.00

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

  --------------------------
  | Junction Command(0003) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0002)    0.60     0.01    3.00    30.76
  OUTFLOW: ID= 2(  0003)    0.60     0.01    3.00    30.76

  -------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=   0.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.04
     Dep. Storage     (mm)=       1.00        16.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      18.44        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        32.94
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.80 (ii)   11.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.09
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.50
     RUNOFF VOLUME    (mm)=      77.32        21.33          21.21
     TOTAL RAINFALL   (mm)=      78.32        78.32          78.32
     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*  =  58.0    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  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.012     3.00    30.76
      + ID2= 2 (  0005):     0.05   0.002     1.50    21.21
        ==================================================
        ID = 3 (  0006):     0.65   0.013     2.83    30.01

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

```
--------------------
| ADD HYD  (  0006)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0009 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0006):     0.65   0.013     2.83    30.01
      + ID2= 2 (  0009):     0.00   0.000     0.00     0.00
        ==================================================
        ID = 1 (  0006):     0.65   0.013     2.83    30.01

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

100-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  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\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\5571497b-80a6-4ff9-91f4-f033832caa30\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\5571497b-80a6-4ff9-91f4-f033832caa30\scen


DATE: 09/22/2023                           TIME: 11:47:59

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 ( 0001)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                                IMPERVIOUS   PERVIOUS (i)
     Surface Area     (ha)=       0.54         0.06
     Dep. Storage     (mm)=       1.00        16.50
     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        24.31
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.60 (ii)    4.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.32         0.24
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.00          0.246 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      86.09        19.58         79.43
     TOTAL RAINFALL   (mm)=      87.09        87.09         87.09
     RUNOFF COEFFICIENT   =       0.99         0.22          0.91

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  58.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
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      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
------------------
| CHAMBER( 0002)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: ON
|IN= 2--> OUT= 3 |  CHAMBER:
| DT=  5.0 min   |  MAX STO VOL (cu.m.)=  336.06  Bottom Area(m2)   =  315.20
------------------
                      DEPTH       STORAGE          |  DEPTH      STORAGE
                      (mm)        (cu.m.)          |  (mm)       (cu.m.)
                        0.00         0.00          |   889.00      189.24
                       25.00         3.20          |   914.00      195.28
                       51.00         6.40          |   940.00      201.26
                       76.00         9.61          |   965.00      207.17
                      102.00        12.81          |   991.00      213.01
                      127.00        16.01          |  1016.00      218.78
                      152.00        19.21          |  1041.00      224.47
                      178.00        22.41          |  1067.00      230.08
                      203.00        25.61          |  1092.00      235.60
                      229.00        28.82          |  1118.00      241.03
                      254.00        32.02          |  1143.00      246.35
                      279.00        35.22          |  1168.00      251.57
                      305.00        38.42          |  1194.00      256.67
                      330.00        45.32          |  1219.00      261.65
                      356.00        52.18          |  1245.00      266.48
                      381.00        59.02          |  1270.00      271.16
                      406.00        65.83          |  1295.00      275.66
                      432.00        72.63          |  1321.00      279.93
                      457.00        79.39          |  1346.00      283.84
                      483.00        86.14          |  1372.00      287.47
                      508.00        92.85          |  1397.00      290.98
                      533.00        99.54          |  1422.00      294.38
                      559.00       106.20          |  1448.00      297.64
                      584.00       112.83          |  1473.00      300.84
                      610.00       119.42          |  1499.00      304.05
                      635.00       125.98          |  1524.00      307.25
                      660.00       132.50          |  1549.00      310.45
                      686.00       138.99          |  1575.00      313.65
                      711.00       145.43          |  1600.00      316.85
                      737.00       151.84          |  1626.00      320.05
                      762.00       158.19          |  1651.00      323.26
                      787.00       164.51          |  1676.00      326.46
                      813.00       170.77          |  1702.00      329.66
                      838.00       176.98          |  1727.00      332.86
                      864.00       183.14          |  1753.00      336.06

                     DEPTH      DISCHARGE      |   DEPTH      DISCHARGE
                      (m)         (cms)        |    (m)         (cms)
                     0.000        0.000        |   0.431        0.011
                     0.025        0.004        |   0.532        0.012
                     0.126        0.007        |   0.633        0.013
                     0.228        0.008        |   0.710        0.014
                     0.330        0.010        |   0.000        0.000

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA        QPEAK            TPEAK         R.V.
                       (ha)        (cms)            (hrs)         (mm)
          INFLOW:ID= 2  0.60        0.246             1.33         79.43
         OUTFLOW:ID= 1  0.58        0.014             2.42         38.76
        OVERFLOW:ID= 3  0.02        0.005             2.50         38.76

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=       51.20
               Time to reach Max storage              (Hr)=        2.42
               Volume of water for drawdown in LID (cu.m.)=      317.72
               Volume of maximum water storage     (cu.m.)=      331.83
               Calculated Drawdown Time               (Hr)=       60.42

  -------------------------
  | Junction Command(0004) |
  -------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 3( 0002)    0.02     0.01    2.50    38.76
  OUTFLOW: ID= 2( 0004)    0.02     0.01    2.50    38.76

  -------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   ( 0007)|   Area    (ha)=   0.05   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  16.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

         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

     Unit Hyd Qpeak  (cms)=   0.038

     PEAK FLOW       (cms)=   0.003 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  14.934
     TOTAL RAINFALL   (mm)=  87.089
     RUNOFF COEFFICIENT   =   0.171

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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-------------------------------------------------------------------------------
------------------
|SOAKAWAY( 0008)|  UNDERDRAIN: OFF
|IN= 2--> OUT= 3 |
|DT=  5.0 MIN    |  STORAGE LAYER:
------------------  Length          (m)=   8.00   Height                  (m)=   1.00
                    Porosity           =   0.40   Initial Water Level     (m)=   0.00
                    Width           (m)=   4.00   Min. Drawdown          (hr)=  96.00
                    Max. Drawdown  (hr)=  33.33   Available Storage   (cu.m.)=  12.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.05         0.003             1.33        14.93
    OVERFLOW:ID= 3     0.00         0.000             0.00         0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%):
                         If RVout= (Overflow            )=      100.00
               Time to reach Max storage              (Hr)=        4.00
               Volume of water for drawdown in LID (cu.m.)=        6.30
               Volume of maximum water storage     (cu.m.)=        6.35
               Calculated Drawdown Time               (Hr)=       16.33

  --------------------------
  | Junction Command(0009) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0008)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0009)    0.00     0.00    0.00     0.00

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

  --------------------------
  | Junction Command(0003) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0002)    0.58     0.01    2.42    38.76
  OUTFLOW: ID= 2(  0003)    0.58     0.01    2.42    38.76

  -------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0005)|   Area    (ha)=   0.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=   0.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.04
     Dep. Storage     (mm)=       1.00        16.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      18.44        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        50.28
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.77 (ii)   10.06 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.10
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.003 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.50
     RUNOFF VOLUME    (mm)=      86.09        26.25          26.16
     TOTAL RAINFALL   (mm)=      87.09        87.09          87.09
     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*  =  58.0    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  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
        ID1= 1 (  0003):     0.58   0.014     2.42    38.76
      + ID2= 2 (  0005):     0.05   0.003     1.50    26.16
        ================================================
        ID = 3 (  0006):     0.63   0.015     2.33    37.75

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

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

```
| ADD HYD  (  0006)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
*** W A R N I N G :  HYDROGRAPH   0009 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0006):     0.63   0.015     2.33    37.75
      + ID2= 2 (  0009):     0.00   0.000     0.00     0.00
        ================================================
        ID = 1 (  0006):     0.63   0.015     2.33    37.75

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

25mm QUALITY COONTROL 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  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\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\3cc0d564-6fec-402f-86a3-c03bc58f7b7d\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\f825abd2-5f32-4c68-
9c0f-9f2fb80764f6\3cc0d564-6fec-402f-86a3-c03bc58f7b7d\scen


DATE: 09/22/2023                           TIME: 11:47:59

USER:



COMMENTS: ____________________________________________________________



-------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 25 mm, 4 hr Norfolk           **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Natalie\AppD
|                  |              ata\Local\Temp\
|                  |              d00b964b-4974-4c67-b350-e12f0f3b9a4b\4f3af082
| Ptotal= 25.00 mm |    Comments: 25 mm, 4 hr Norfolk
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.00    0.00 |  1.17   12.56 |  2.33    3.61 |  3.50    1.96
                 0.17    1.90 |  1.33   51.29 |  2.50    3.19 |  3.67    1.85
                 0.33    2.16 |  1.50   16.17 |  2.67    2.87 |  3.83    1.75
                 0.50    2.51 |  1.67    8.96 |  2.83    2.61 |  4.00    1.67
                 0.67    3.03 |  1.83    6.38 |  3.00    2.41 |
                 0.83    3.90 |  2.00    5.03 |  3.17    2.23 |
                 1.00    5.69 |  2.17    4.19 |  3.33    2.09 |

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


--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        0.54          0.06
     Dep. Storage     (mm)=        1.00         16.50
     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    0.00 | 1.167    5.69 | 2.250    4.19 |  3.33    2.23
                0.167    0.00 | 1.250   12.56 | 2.333    4.19 |  3.42    2.09
                0.250    1.90 | 1.333   12.56 | 2.417    3.61 |  3.50    2.09
                0.333    1.90 | 1.417   51.29 | 2.500    3.61 |  3.58    1.96
                0.417    2.16 | 1.500   51.29 | 2.583    3.19 |  3.67    1.96
                0.500    2.16 | 1.583   16.17 | 2.667    3.19 |  3.75    1.85
                0.583    2.51 | 1.667   16.17 | 2.750    2.87 |  3.83    1.85
                0.667    2.51 | 1.750    8.96 | 2.833    2.87 |  3.92    1.75
                0.750    3.03 | 1.833    8.96 | 2.917    2.61 |  4.00    1.75
                0.833    3.03 | 1.917    6.38 | 3.000    2.61 |  4.08    1.67
                0.917    3.89 | 2.000    6.38 | 3.083    2.41 |  4.17    1.67
                1.000    3.90 | 2.083    5.03 | 3.167    2.41 |
                1.083    5.69 | 2.167    5.03 | 3.250    2.23 |

     Max.Eff.Inten.(mm/hr)=      51.29         0.17
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.53 (ii)    6.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.00           0.076 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.58            1.50
     RUNOFF VOLUME    (mm)=      24.00         0.38           21.63
     TOTAL RAINFALL   (mm)=      25.00        25.00           25.00
     RUNOFF COEFFICIENT   =       0.96         0.02            0.87

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

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  58.0    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.
```

```
-----------------------------------------------------------------------------
------------------
| CHAMBER(  0002)|  OUTFLOW: ON,   UNDERDRAIN: OFF,  INFIL: ON
|IN= 2--> OUT= 3 |  CHAMBER:
| DT=  5.0 min   |  MAX STO VOL (cu.m.)=  336.06  Bottom Area(m2)   =  315.20
------------------
                     DEPTH      STORAGE          |   DEPTH      STORAGE
                     (mm)       (cu.m.)          |   (mm)       (cu.m.)
                       0.00         0.00         |    889.00      189.24
                      25.00         3.20         |    914.00      195.28
                      51.00         6.40         |    940.00      201.26
                      76.00         9.61         |    965.00      207.17
                     102.00        12.81         |    991.00      213.01
                     127.00        16.01         |   1016.00      218.78
                     152.00        19.21         |   1041.00      224.47
                     178.00        22.41         |   1067.00      230.08
                     203.00        25.61         |   1092.00      235.60
                     229.00        28.82         |   1118.00      241.03
                     254.00        32.02         |   1143.00      246.35
                     279.00        35.22         |   1168.00      251.57
                     305.00        38.42         |   1194.00      256.67
                     330.00        45.32         |   1219.00      261.65
                     356.00        52.18         |   1245.00      266.48
                     381.00        59.02         |   1270.00      271.16
                     406.00        65.83         |   1295.00      275.66
                     432.00        72.63         |   1321.00      279.93
                     457.00        79.39         |   1346.00      283.84
                     483.00        86.14         |   1372.00      287.47
                     508.00        92.85         |   1397.00      290.98
                     533.00        99.54         |   1422.00      294.38
                     559.00       106.20         |   1448.00      297.64
                     584.00       112.83         |   1473.00      300.84
                     610.00       119.42         |   1499.00      304.05
                     635.00       125.98         |   1524.00      307.25
                     660.00       132.50         |   1549.00      310.45
                     686.00       138.99         |   1575.00      313.65
                     711.00       145.43         |   1600.00      316.85
                     737.00       151.84         |   1626.00      320.05
                     762.00       158.19         |   1651.00      323.26
                     787.00       164.51         |   1676.00      326.46
                     813.00       170.77         |   1702.00      329.66
                     838.00       176.98         |   1727.00      332.86
                     864.00       183.14         |   1753.00      336.06

                    DEPTH       DISCHARGE        |  DEPTH      DISCHARGE
                     (m)         (cms)           |   (m)        (cms)
                    0.000        0.000           |  0.431       0.011
                    0.025        0.004           |  0.532       0.012
                    0.126        0.007           |  0.633       0.013
                    0.228        0.008           |  0.710       0.014
                    0.330        0.010           |  0.000       0.000

                   NATIVE SOIL LAYER:
                   Infiltration (m/hr) = 0.0120

                      AREA        QPEAK            TPEAK        R.V.
                      (ha)        (cms)            (hrs)        (mm)
      INFLOW:ID= 2    0.60        0.076             1.50        21.63
     OUTFLOW:ID= 1    0.00        0.000             0.00         0.00
    OVERFLOW:ID= 3    0.00        0.000             0.00         0.00

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=      100.00
              Time to reach Max storage               (Hr)=       4.17
              Volume of water for drawdown in LID (cu.m.)=      115.62
              Volume of maximum water storage     (cu.m.)=      116.14
              Calculated Drawdown Time                (Hr)=      30.50

  --------------------------
  | Junction Command(0004) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0002)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0004)    0.00     0.00    0.00     0.00

  -----------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area    (ha)=   0.05   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=  16.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

         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    0.00 | 1.167    5.69 | 2.250    4.19 |  3.33    2.23
                0.167    0.00 | 1.250   12.56 | 2.333    4.19 |  3.42    2.09
                0.250    1.90 | 1.333   12.56 | 2.417    3.61 |  3.50    2.09
                0.333    1.90 | 1.417   51.29 | 2.500    3.61 |  3.58    1.96
                0.417    2.16 | 1.500   51.29 | 2.583    3.19 |  3.67    1.96
                0.500    2.16 | 1.583   16.17 | 2.667    3.19 |  3.75    1.85
                0.583    2.51 | 1.667   16.17 | 2.750    2.87 |  3.83    1.85
                0.667    2.51 | 1.750    8.96 | 2.833    2.87 |  3.92    1.75
                0.750    3.03 | 1.833    8.96 | 2.917    2.61 |  4.00    1.75
                0.833    3.03 | 1.917    6.38 | 3.000    2.61 |  4.08    1.67
                0.917    3.89 | 2.000    6.38 | 3.083    2.41 |  4.17    1.67
                1.000    3.90 | 2.083    5.03 | 3.167    2.41 |
                1.083    5.69 | 2.167    5.03 | 3.250    2.23 |

     Unit Hyd Qpeak  (cms)=   0.038

     PEAK FLOW       (cms)=   0.000 (i)
     TIME TO PEAK    (hrs)=   2.333
     RUNOFF VOLUME    (mm)=   0.285
     TOTAL RAINFALL   (mm)=  24.999
     RUNOFF COEFFICIENT   =   0.011

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
------------------
|SOAKAWAY(  0008)|  UNDERDRAIN: OFF
|IN= 2--> OUT= 3 |
|DT=  5.0 MIN    |  STORAGE LAYER:
------------------  Length          (m)=   8.00   Height                   (m)=   1.00
                    Porosity           =   0.40   Initial Water Level      (m)=   0.00
                    Width           (m)=   4.00   Min. Drawdown           (hr)=  96.00
                    Max. Drawdown  (hr)=  33.33   Available Storage   (cu.m.)=  12.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0120

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.05         0.000             4.25         0.51
    OVERFLOW:ID= 3     0.00         0.000             0.00         0.00

               Volume Reduction Rate[(RVin-RVout)/RVin](%):
                         If RVout= (Overflow            )=      100.00
               Time to reach Max storage               (Hr)=        4.25
               Volume of water for drawdown in LID (cu.m.)=        0.05
               Volume of maximum water storage     (cu.m.)=        0.08
               Calculated Drawdown Time                (Hr)=        0.08

  --------------------------
  | Junction Command(0009) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 3(  0008)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0009)    0.00     0.00    0.00     0.00

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

  --------------------------
  | Junction Command(0003) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 1(  0002)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0003)    0.00     0.00    0.00     0.00

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=   0.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.04
     Dep. Storage     (mm)=       1.00        16.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      18.44        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    0.00 | 1.167    5.69 | 2.250    4.19 |  3.33    2.23
                0.167    0.00 | 1.250   12.56 | 2.333    4.19 |  3.42    2.09
                0.250    1.90 | 1.333   12.56 | 2.417    3.61 |  3.50    2.09
                0.333    1.90 | 1.417   51.29 | 2.500    3.61 |  3.58    1.96
                0.417    2.16 | 1.500   51.29 | 2.583    3.19 |  3.67    1.96
                0.500    2.16 | 1.583   16.17 | 2.667    3.19 |  3.75    1.85
                0.583    2.51 | 1.667   16.17 | 2.750    2.87 |  3.83    1.85
                0.667    2.51 | 1.750    8.96 | 2.833    2.87 |  3.92    1.75
                0.750    3.03 | 1.833    8.96 | 2.917    2.61 |  4.00    1.75
                0.833    3.03 | 1.917    6.38 | 3.000    2.61 |  4.08    1.67
                0.917    3.89 | 2.000    6.38 | 3.083    2.41 |  4.17    1.67
                1.000    3.90 | 2.083    5.03 | 3.167    2.41 |
                1.083    5.69 | 2.167    5.03 | 3.250    2.23 |

     Max.Eff.Inten.(mm/hr)=      51.29         0.70
                over (min)        5.00        55.00
     Storage Coeff.  (min)=       1.21 (ii)   52.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.33         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.000 (iii)
     TIME TO PEAK    (hrs)=       1.50         3.42           0.00
     RUNOFF VOLUME    (mm)=      24.00         1.06           0.00
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.96         0.04           0.00

***** 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*  =  58.0    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  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
*** W A R N I N G :  HYDROGRAPH   0003 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0006 = HYDROGRAPH 0005
        ID1= 1 (  0003):     0.00   0.000     0.00     0.00
      + ID2= 2 (  0005):     0.05   0.000     0.00     0.00
        ===============================================
        ID = 3 (  0006):     0.05   0.000     0.00     0.00

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

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

--------------------
| ADD HYD  (  0006)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
*** W A R N I N G :  HYDROGRAPH   0009 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0006):     0.05   0.000     0.00     0.00
      + ID2= 2 (  0009):     0.00   0.000     0.00     0.00
        ===============================================
        ID = 1 (  0006):     0.05   0.000     0.00     0.00

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

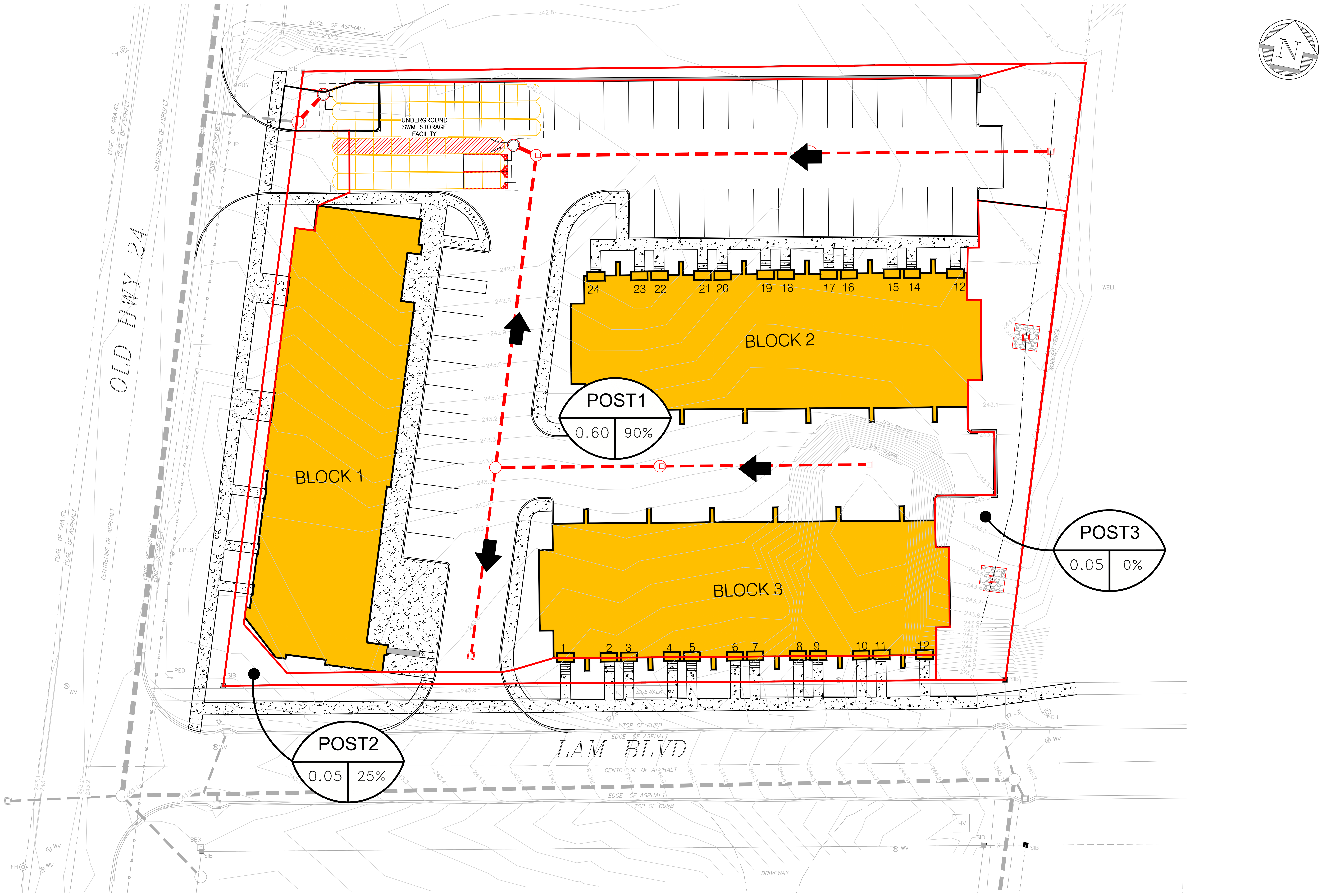
APPENDIX F

21-059 DWG SWM – Stormwater Management Drainage Areas

REV. No.	DATE	REVISION

LEGEND

➡	OVERLAND FLOW (MAJOR)
🟥	CATCHMENT BOUNDARY
SWM	SWM DRAINAGE AREA
35.0%	TOTAL IMPERVIOUS PERCENTAGE (%)
0.99	AREA (ha)



SCALE:
5 10 15
HORIZONTAL : 1:250

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

Stamp

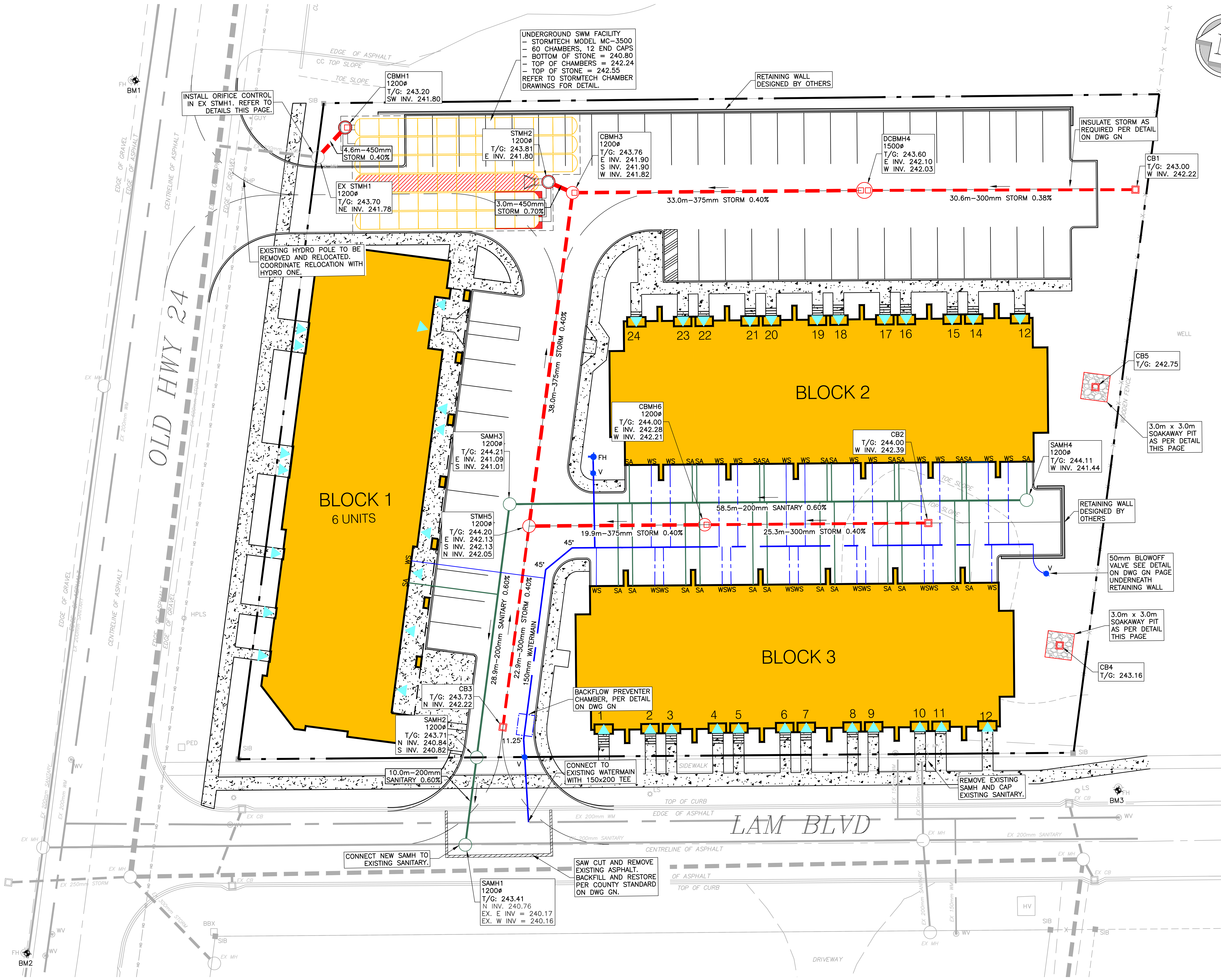
PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

Project Title
LAM BOULEVARD
WATERFORD, NORFOLK COUNTY

Drawing Title
STORMWATER MANAGEMENT
DRAINAGE AREAS

Designed by : NLB	Drawn By : NLB
Checked by : JI	Date Started : 9/22/2023
Drawing Scale : 1:250	Drawing No. SWM
Project No. 21-059	

DATE LAST PLOTTED : September 22, 2023



LEGEND

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

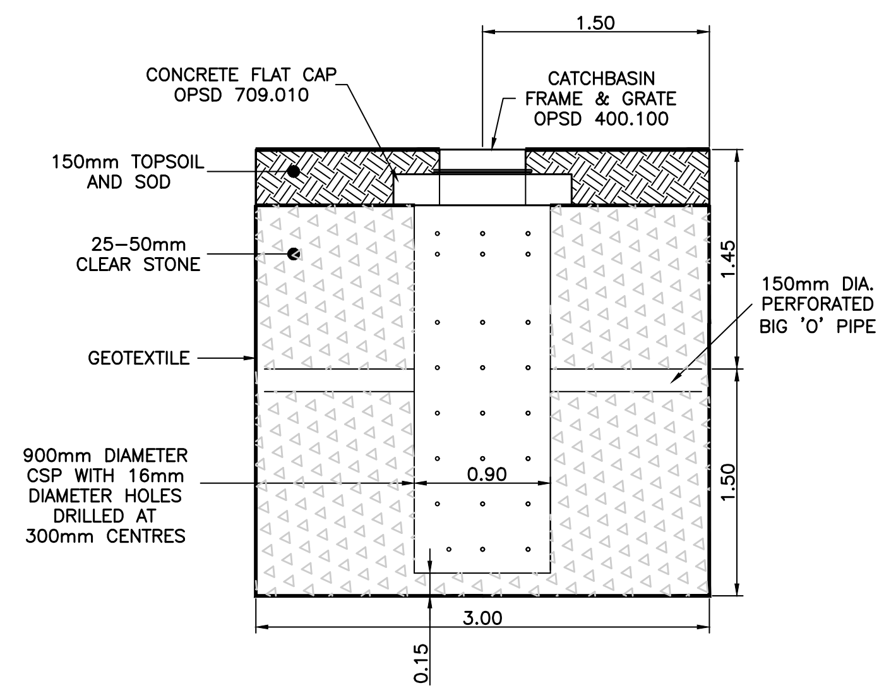
NOTES:

1. PARKING AND AISLE PAVEMENT TO ADHERE TO PAVEMENT DESIGNS CONTAINED WITHIN THE GEOTECHNICAL REPORT AND NORFOLK COUNTY DESIGN CRITERIA:

   LIGHT DUTY:

   40mm HL3
   50mm HL8
   150mm GRANULAR A
   300mm GRANULAR B

2. GENERAL CONTRACTOR TO COORDINATE ALL WORK WITHIN THE SITE WITH THE COUNTY AND OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM LOCAL AUTHORITIES. EXECUTE ALL WORK AS PER NORFOLK COUNTY REQUIREMENTS.
3. GENERAL CONTRACTOR TO EXECUTE WORK TO CONSTRUCTION SITE ACCESS UNDER SUPERVISION OF THE ENGINEER. REFER TO ENTRANCE PERMIT REQUIREMENTS WHERE APPLICABLE. DRIVEWAY ENTRANCE TO BE MODIFIED OR INSTALLATION OF NEW ENTRANCE AS PER NORFOLK COUNTY REQUIREMENTS. PROVIDE NEW CONC. ENTRANCE CURBS TO MATCH EXISTING AS REQUIRED.
4. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL BENCHMARKS, ELEVATIONS, DIMENSIONS AND GRADES MUST BE CHECKED BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE ENGINEER.
5. AT LEAST TWO DIFFERENT BENCHMARKS MUST BE REFERRED TO AT ALL TIMES.
6. COORDINATE WITH SITE GRADING PLAN FOR PROPOSED FINAL FINISH GRADE ELEVATIONS AND DRAINAGE SLOPES.
7. TRAFFIC CONTROL SHALL BE IMPLEMENTED BY THE CONTRACTOR IN ACCORDANCE WITH OTM TEMPORARY CONDITIONS BOOK 7. APPROVAL FOR THE TRAFFIC CONTROL WILL BE SOUGHT FROM THE MUNICIPALITY BY THE CONTRACTOR.



SOAKAWAY DETAIL
N.T.S.

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.

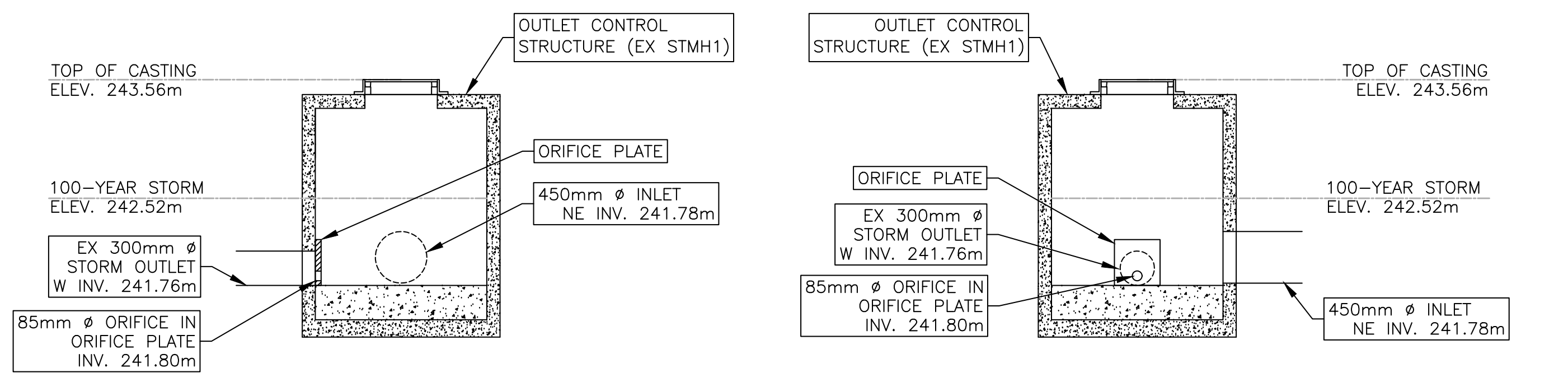
4. ALL WATERMAIN TO BE RESTRAINED AT ALL BENDS, TEES, REDUCERS, DEAD–ENDS, AND VALVES AS PER DETAILS ON DWG. GN.

NOTES:

ORIFICE PLATE TO BE BOLTED TO MANHOLE FACE AND SEALED WITH NON–SHRINK GROUT. INVERT OF ORFICE TO MATCH OUTLET PIPES.

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.



OUTLET CONTROL STRUCTURE DETAIL (EX STMH1)
N.T.S.

REV. No.	DATE	REVISION
0	2023/10/12	ISSUED FOR SPA

NOTE:
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ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO NORFOLK COUNTY STANDARDS AND SPECIFICATIONS

LEGAL DESCRIPTION

PLAN 37M-57, BLOCK 60, ROLL NUMBER 33605062848 IN THE TOWN OF WATERFORD IN NORFOLK COUNTY.

APPLICANT INFORMATION

APPLICANT:	PRAMUKH DEVELOPMENTS Ltd.
TELEPHONE:	416-871-0086 OR 416-829-6620
ADDRESS:	2324 WEST HAM RD OAKVILLE, ON L6M 4N6

BENCHMARKS

BM #1: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON WEST SIDE OF OLD HIGHWAY 24 AT NORTHWEST CORNER OF PROPERTY.
ELEV.....243.92m

BM #2: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON WEST SIDE OF OLD HIGHWAY 24 AT THE INTERSECTION OF LAM BLVD AND OLD HIGHWAY 24.
ELEV.....243.85m

BM #3: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON NORTH SIDE OF LAM BLVD AT SOUTHEAST CORNER OF PROPERTY.
ELEV.....245.84m

DRAWING LIST

G. DOUGLAS VALLEE LIMITED DRAWINGS

21-059-C100	SERVICING PLAN
21-059-C101	GRADING PLAN
21-059-C102	EROSION & SEDIMENT CONTROL PLAN
21-059-GN	GENERAL NOTES AND DETAILS
21-059-SAN	SANITARY DRAINAGE AREAS PLAN
21-059-STM	STORM DRAINAGE AREAS PLAN

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

SCALE:
5 10 15
HORIZONTAL : 1:250

vallee
Consulting Engineers, Architects & Planners

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

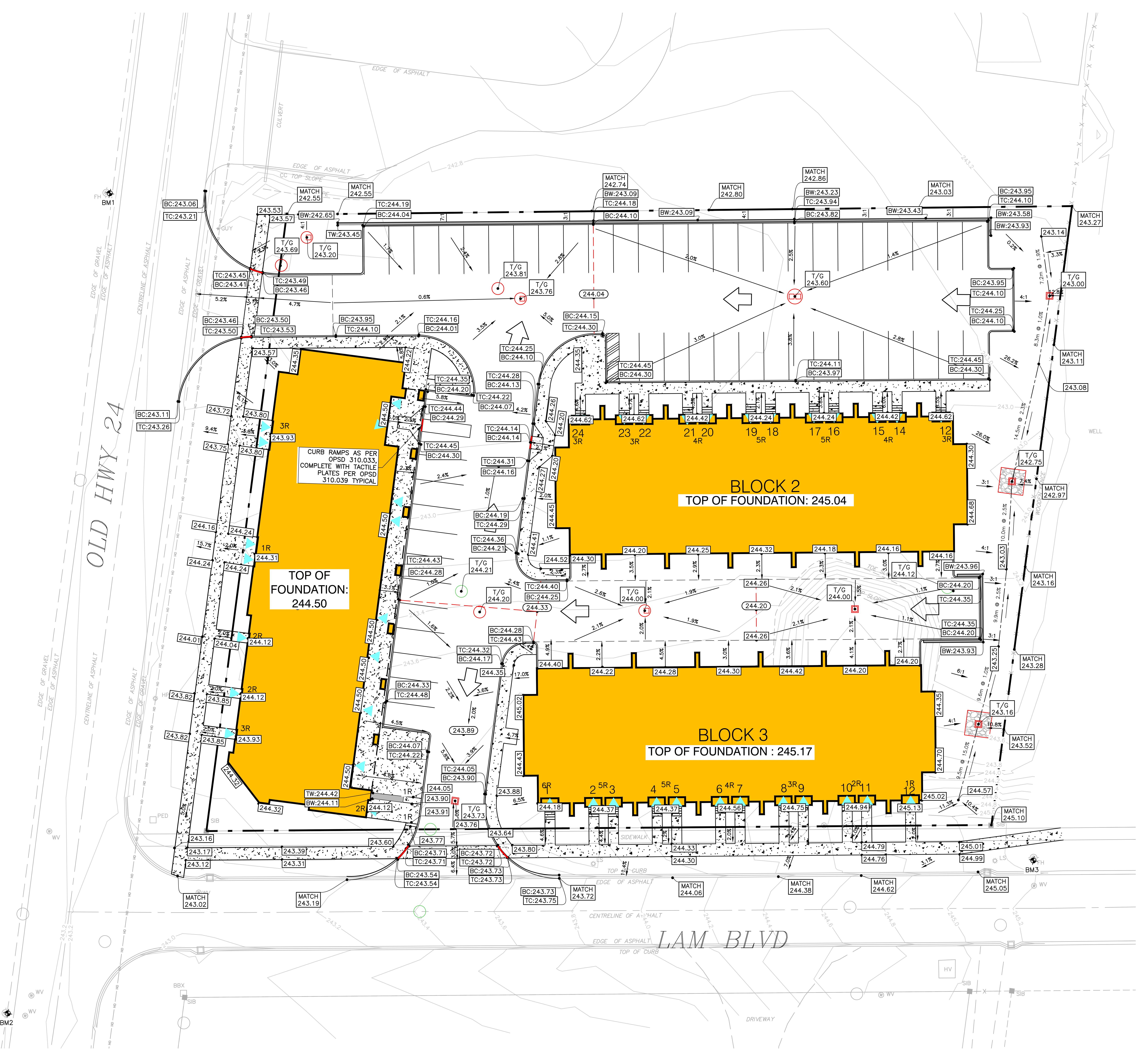
Stamp
2023-10-12
J. T. IEZZI
100189485

Project Title
LAM BOULEVARD
WATERFORD, NORFOLK COUNTY

Drawing Title
SERVICING PLAN

Designed by : NBN/NLB	Drawn By : NBN
Checked by : JTI	Date Started : 10/12/2023
Drawing Scale : 1:250	Drawing No. C100
Project No. 21-059	

DATE LAST PLOTTED : October 30, 2023



LEGEND

247.20	PROPOSED SPOT ELEVATION
⬅	EMERGENCY OVERLAND FLOW DIRECTION
───	TOP OF SLOPE
246.2	EXISTING GROUND CONTOUR
235.16	ROAD C/L ELEVATION
← 10m–2.0%	FLOW DIRECTION WITH GRADE AND DISTANCE BETWEEN POINTS
- - - - -	PROPOSED GRADE BREAK
—-—-—	PROPOSED SWALE
━━━	PROPOSED PROPERTY LINE
━━━	PROPOSED DROPCURB PER OPSD 600.110
🟨	PROPOSED BUILDING

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:

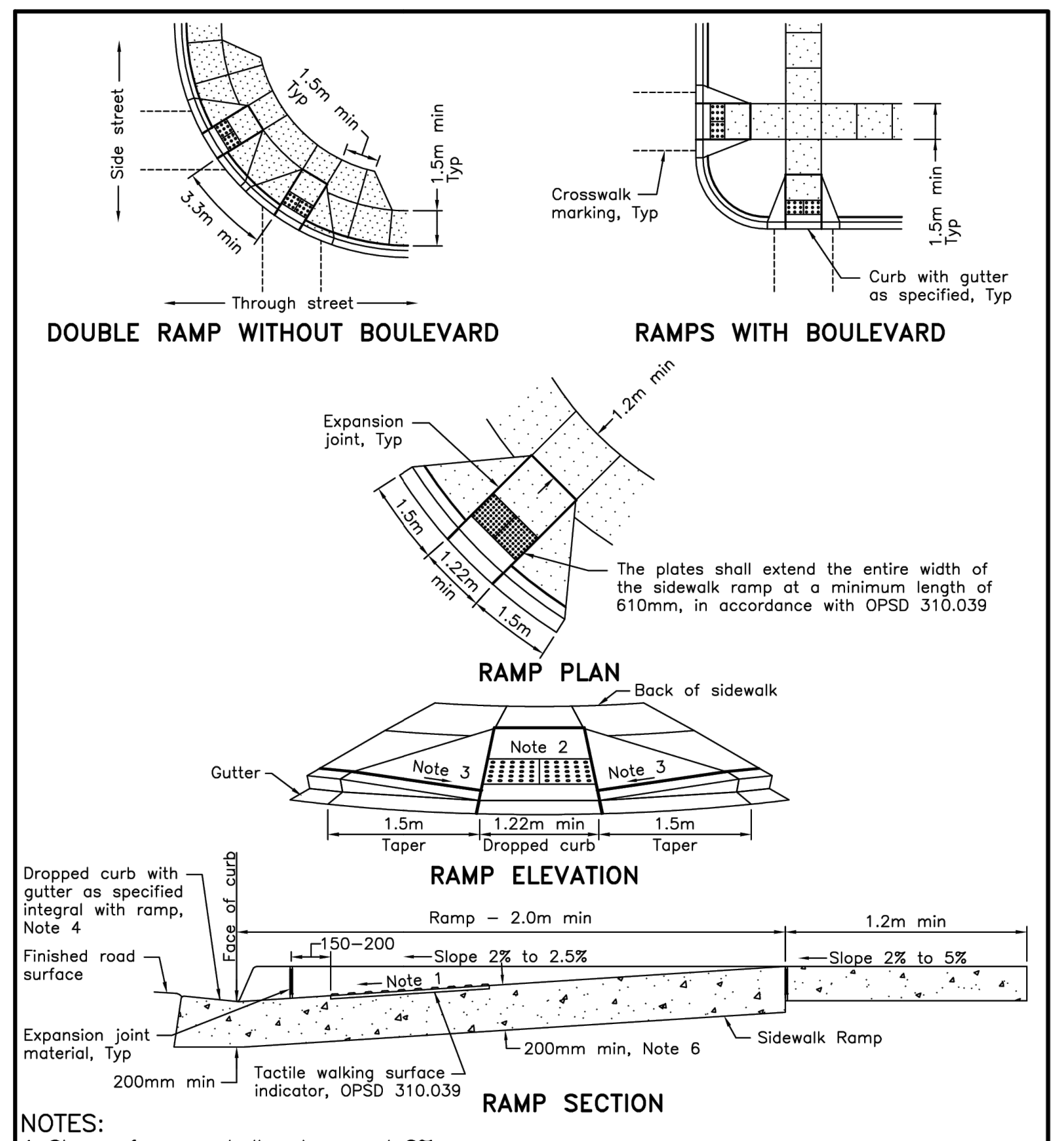
ALL ROAD CATCH BASINS TO HAVE FILTER CLOTH COVER IN PLACE UNTIL BASE ASPHALT IS IN PLACE. STORMWATER INLET STRUCTURES (DITCH INLET CATCH BASINS, CATCH BASINS, CATCH BASIN MANHOLES ETC.) TO HAVE SILT PROTECTION. ALL EROSION CONTROL TO BE TO THE SATISFACTION OF ENGINEER AND L.P.R.C.A.

MATCH ELEVATIONS:

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

RETAINING WALL:

TO BE DESIGNED BY OTHERS



NOTES:
1 Slope of ramp shall not exceed 8%.
2 Cross slope of ramp shall not exceed 2% in either direction.
3 Cross slope of flared side of ramp shall not exceed 8%.
4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
5 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2019 | Rev 1

CONCRETE SIDEWALK RAMPS AT UNSIGNALIZED INTERSECTIONS

OPSD 310.033

REV. No.	DATE	REVISION
0	2023/10/12	ISSUED FOR SPA

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SCALE: 5 10 15
HORIZONTAL : 1:250

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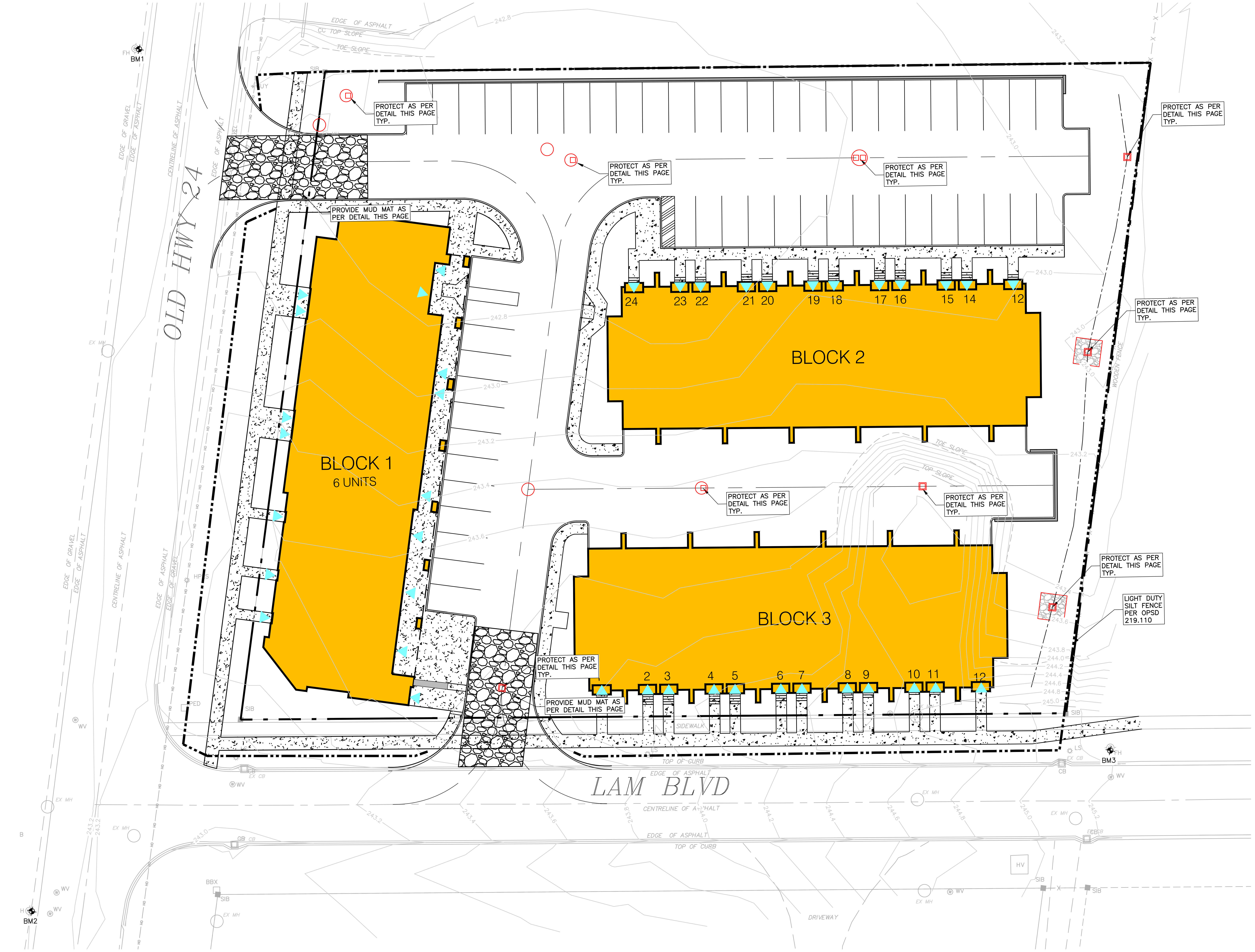
(519) 426-6270

Stamp
LICENSED PROFESSIONAL ENGINEER
2023-10-12
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

Project Title
LAM BOULEVARD
WATERFORD, NORFOLK COUNTY

Drawing Title
GRADING PLAN

Designed by : NBN	Drawn By : NBN
Checked by : JTI	Date Started : 10/12/2023
Drawing Scale : 1:250	Drawing No. C101
Project No. 21-059	



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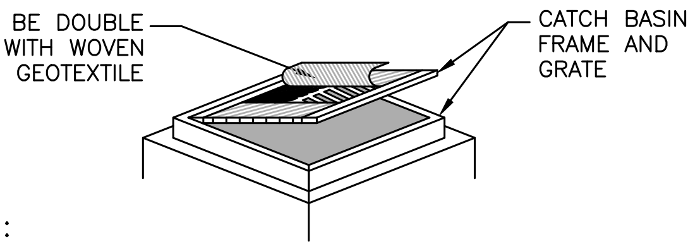
Stamp
2023-10-12
J. T. IEZZI
100189485

Project Title
LAM BOULEVARD
WATERFORD, NORFOLK COUNTY

Drawing Title
EROSION & SEDIMENT
CONTROL PLAN

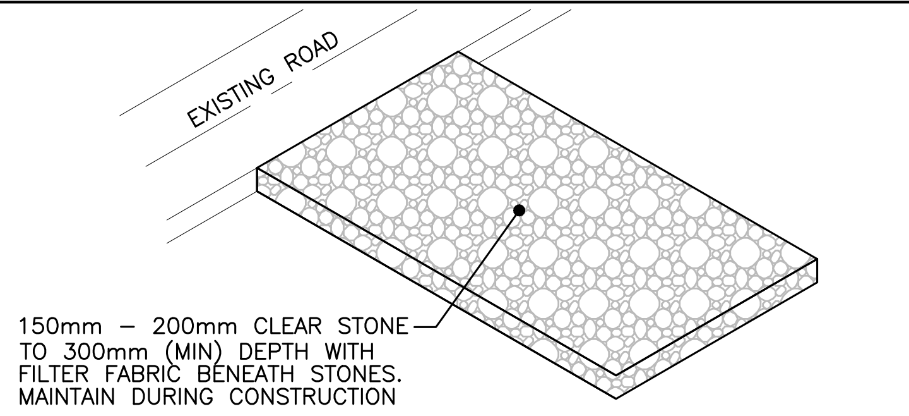
Designed by : NBN	Drawn By : NBN
Checked by : JTI	Date Started : 10/12/2023
Drawing Scale : 1:250	Drawing No. C102
Project No. 21-059	



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.

CATCHBASIN SEDIMENT PROTECTION DETAIL
N.T.S.



MUD MAT – CONSTRUCTION ACCESS
N.T.S.

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 ENGINEER'S 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 CONTRACTOR'S 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.

LEGEND

— 246.0 —	EXISTING GROUND CONTOUR
—·—·—	PROPOSED SWALE
—··—··—	PROPOSED LIGHT DUTY SILT FENCE AS PER OPSD 219.110
— — —	PROPOSED GRADING MATCH LINE
□	PROPOSED CATCHBASIN
◎	PROPOSED CATCHBASIN MANHOLE

DATE LAST PLOTTED : October 30, 2023

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 MAXIMUM 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.

LEGEND

▬	EX. STORM SEWER	▬	PROPOSED WATERMAIN
▬	PROPOSED STORM SEWER	▬	EX. WATERMAIN
▬	EX. SANITARY SEWER	●▬●	PROPOSED 3–WAY FIRE HYDRANT C/W STORZ CONNECTION
▬	PROPOSED SANITARY SEWER	●–◎	EX. FIRE HYDRANT
○	PROPOSED STORM MANHOLE	▬●▬	PROPOSED WATERVALVE
○	PROPOSED SANITARY MANHOLE	▬●▬	EX. WATERVALVE
○	EX. MANHOLE	— G —	EX. BURIED GAS LINE
□	PROPOSED CATCHBASIN	— B —	EX. BURIED BELL LINE
□□	PROPOSED TWIN INLET CATCHBASIN	— CATV —	EX. BURIED CABLE LINE
⊡	PROPOSED CATCHBASIN MANHOLE	— UH —	EX. UNDERGROUND HYDRO LINE
□	EX. CATCHBASIN		

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 SEDIMENTATION BASIN
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:

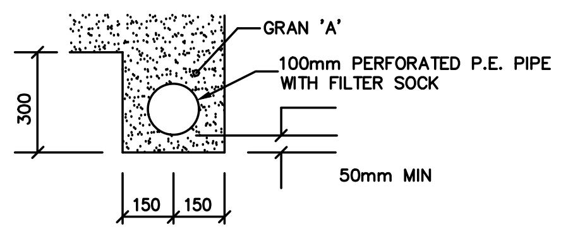
i. ALL ROAD CUTS SHALL BE RESTORED WITH
   - –40mm HL3 SURFACE ASPHALT (97% MARSHALL)
   - –50mm HL8 BASE ASPHALT (97% MARSHALL)
   - –150mm GRANULAR "A" BASE (100% SPMDD)
   - –300mm GRANULAR "B" TYPE 2 SUBBASE (100% SPMDD) GRANULAR "B" TO BE EXTENDED 0.3m BEHIND EDGE OF THE PAVEMENT

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

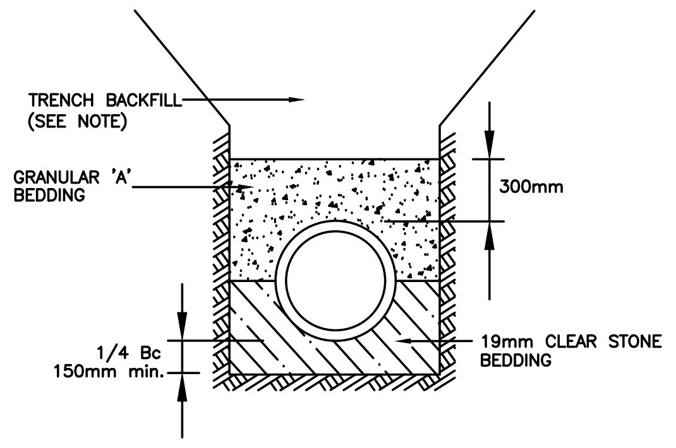
iii. ASPHALT DRIVEWAYS SHALL BE RESTORED WITH 150mm OF GRANULAR "A" (100% SPMDD) WITH 50mm OF HL3A ASPHALT (97% MARSHALL)

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)

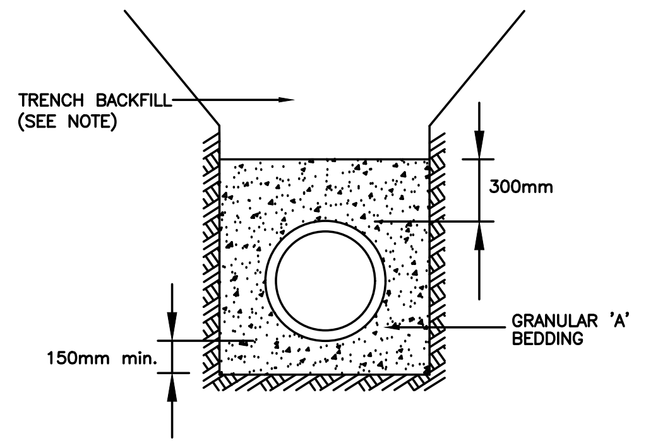


SUBDRAIN DETAIL



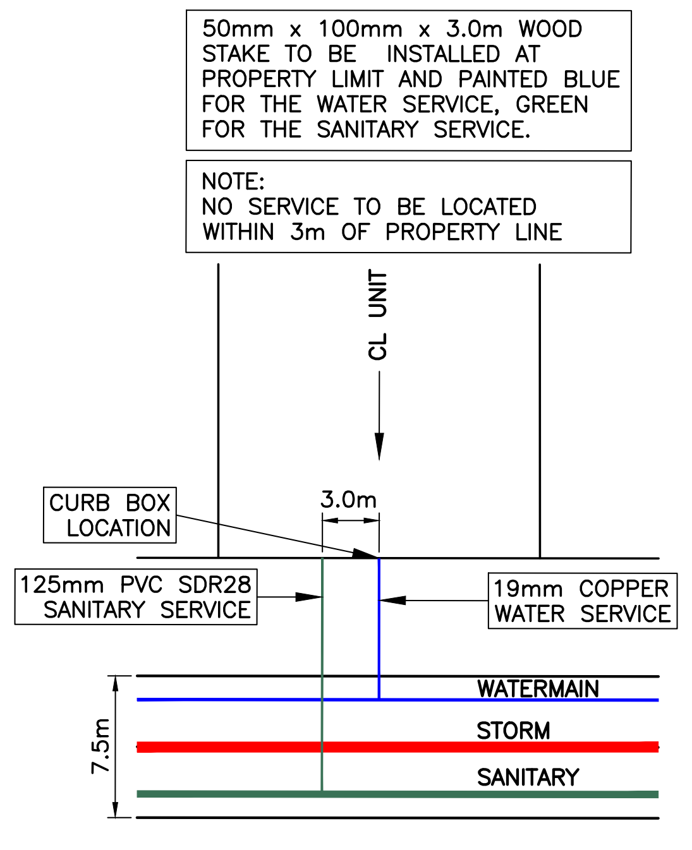
STONE BEDDING

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.



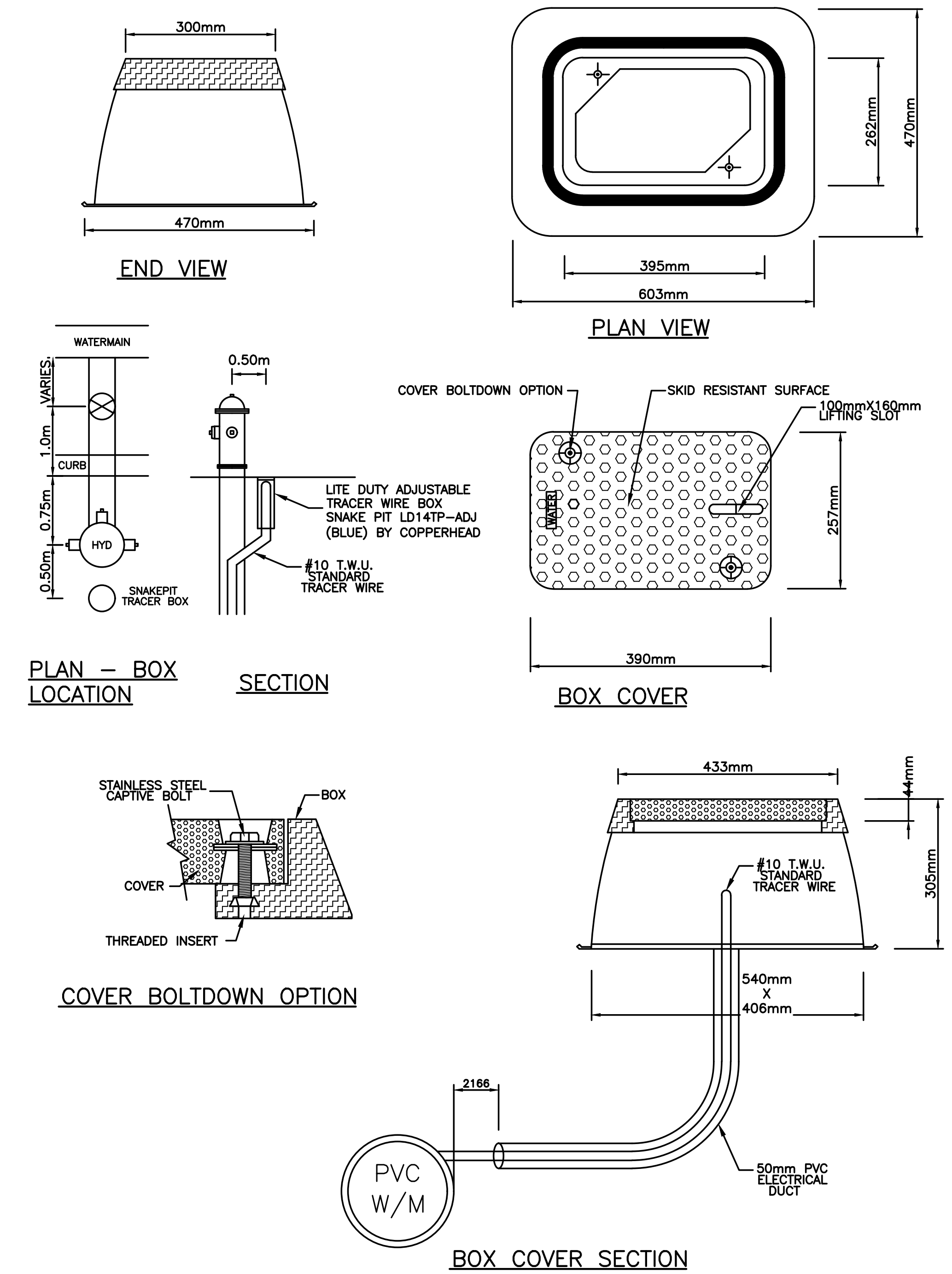
CLASS B BEDDING

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



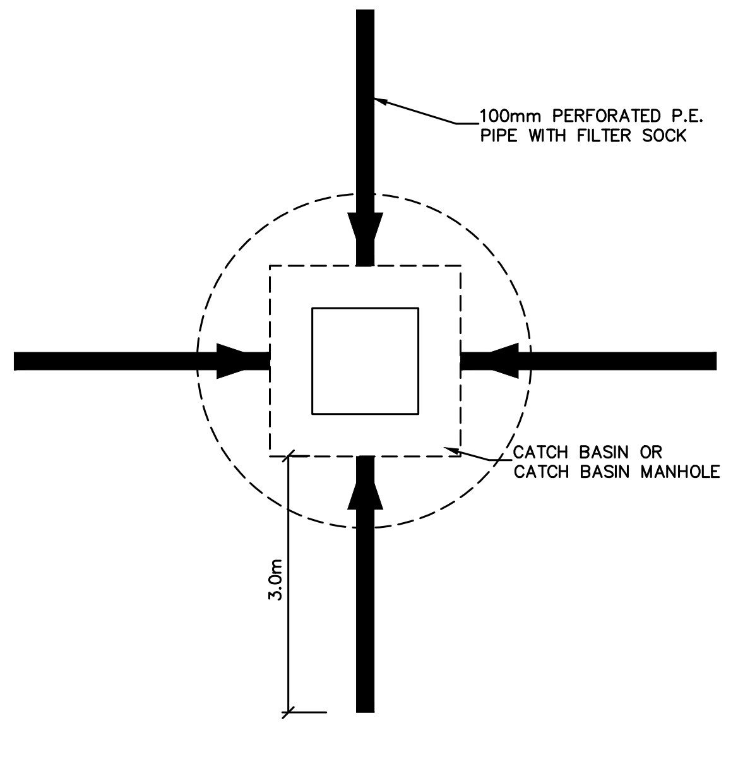
TYPICAL UNIT SERVICING

SCALE 1:400



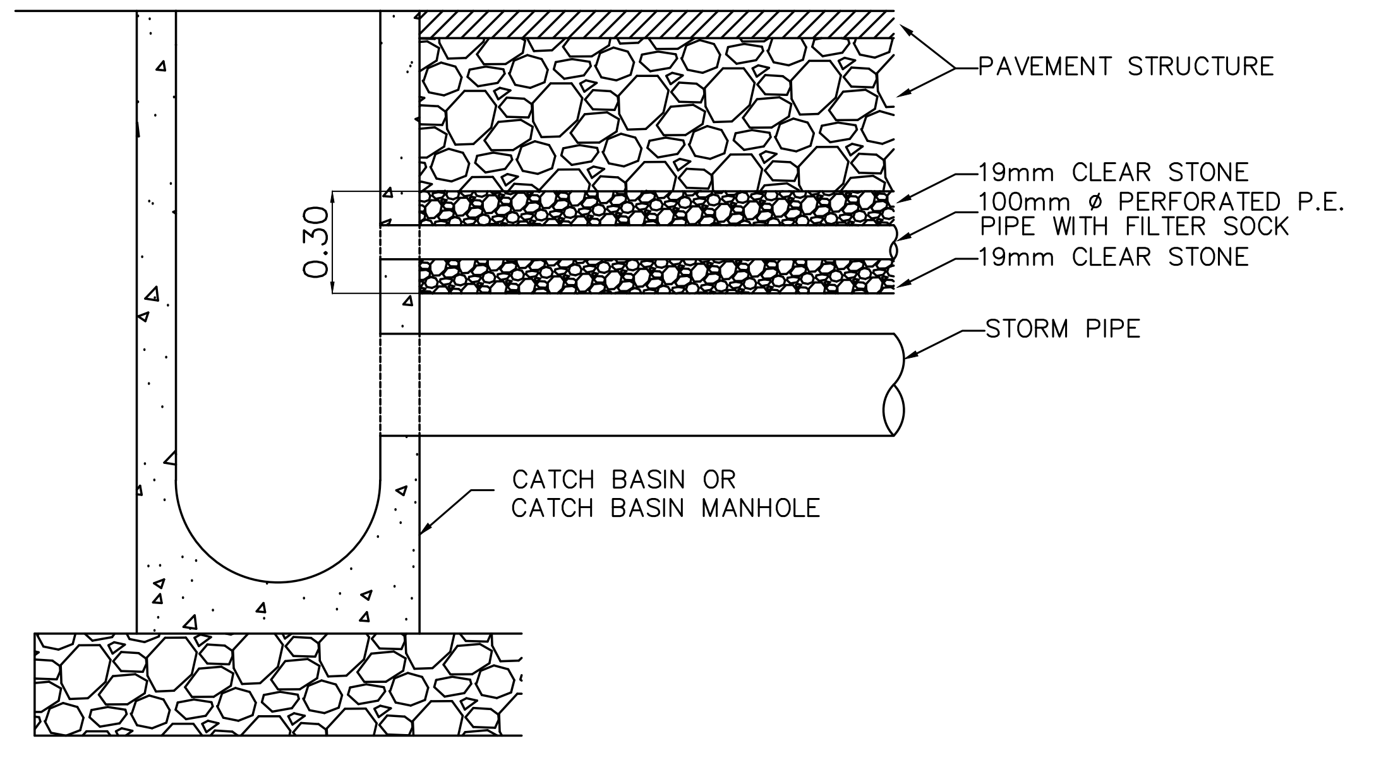
TRACER WIRE HAND HOLE DETAIL

N.T.S.



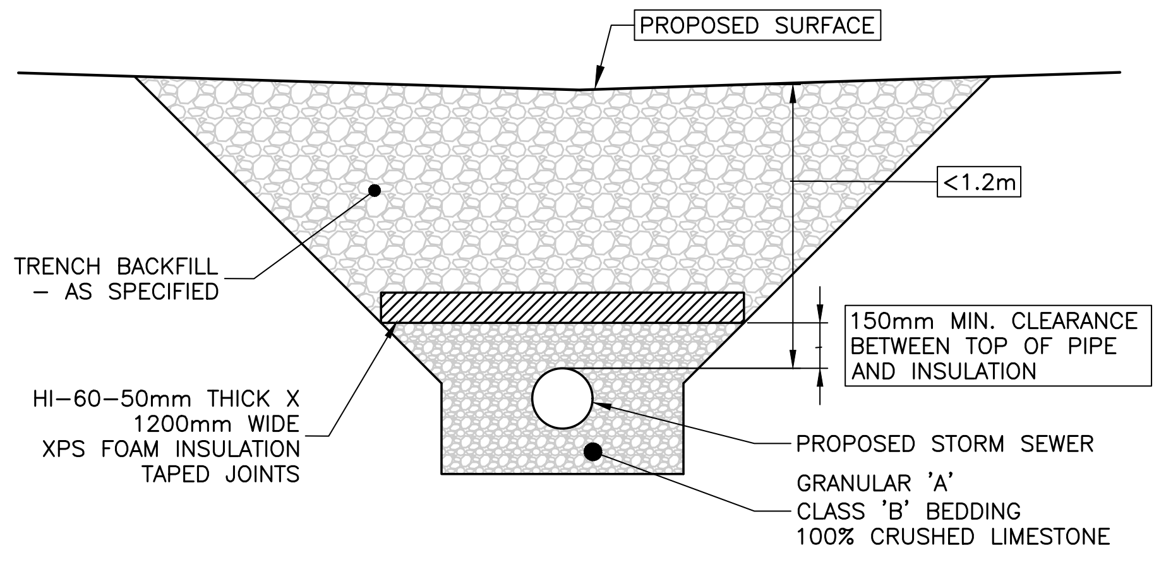
SUBDRAIN PLAN DETAIL

N.T.S.



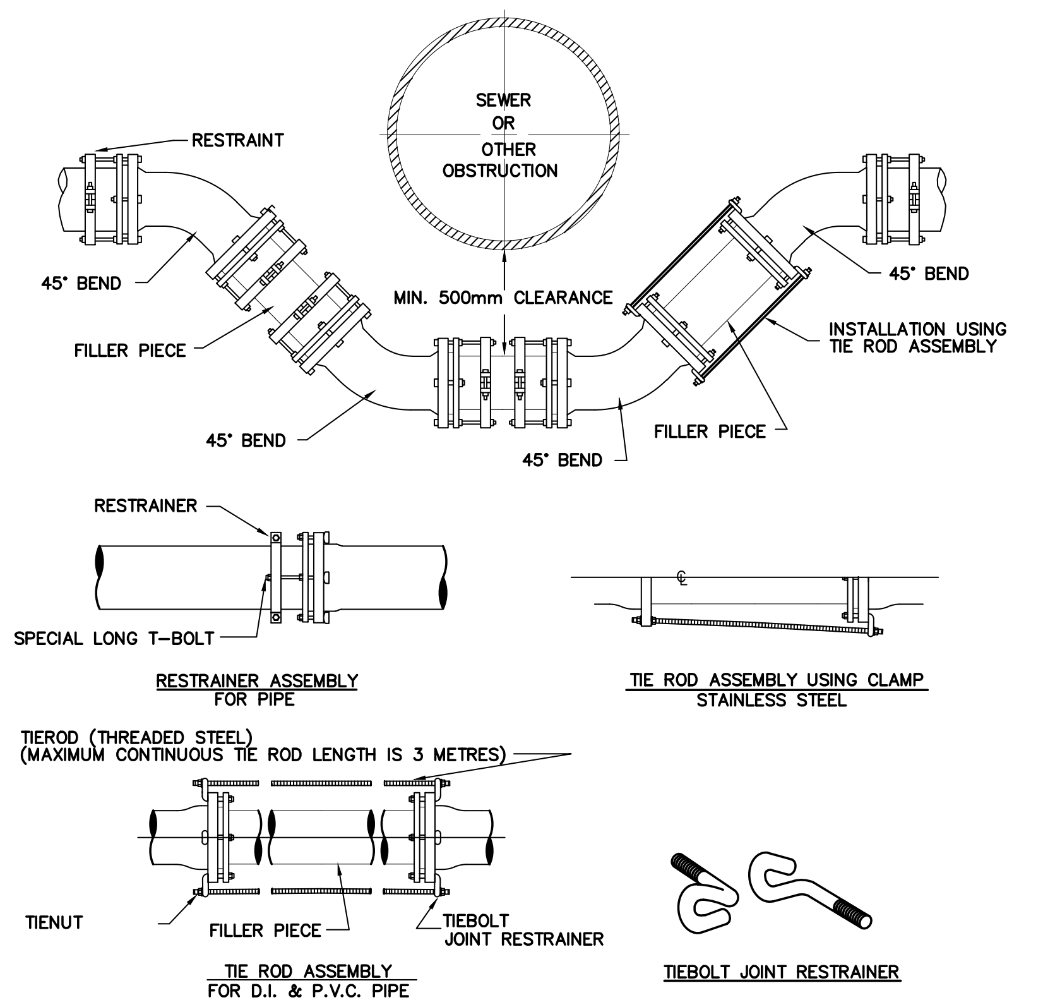
SUBDRAIN SECTION DETAIL

N.T.S.



TYPICAL STORM INSULATION FOR STORM WITH <1.2m COVER

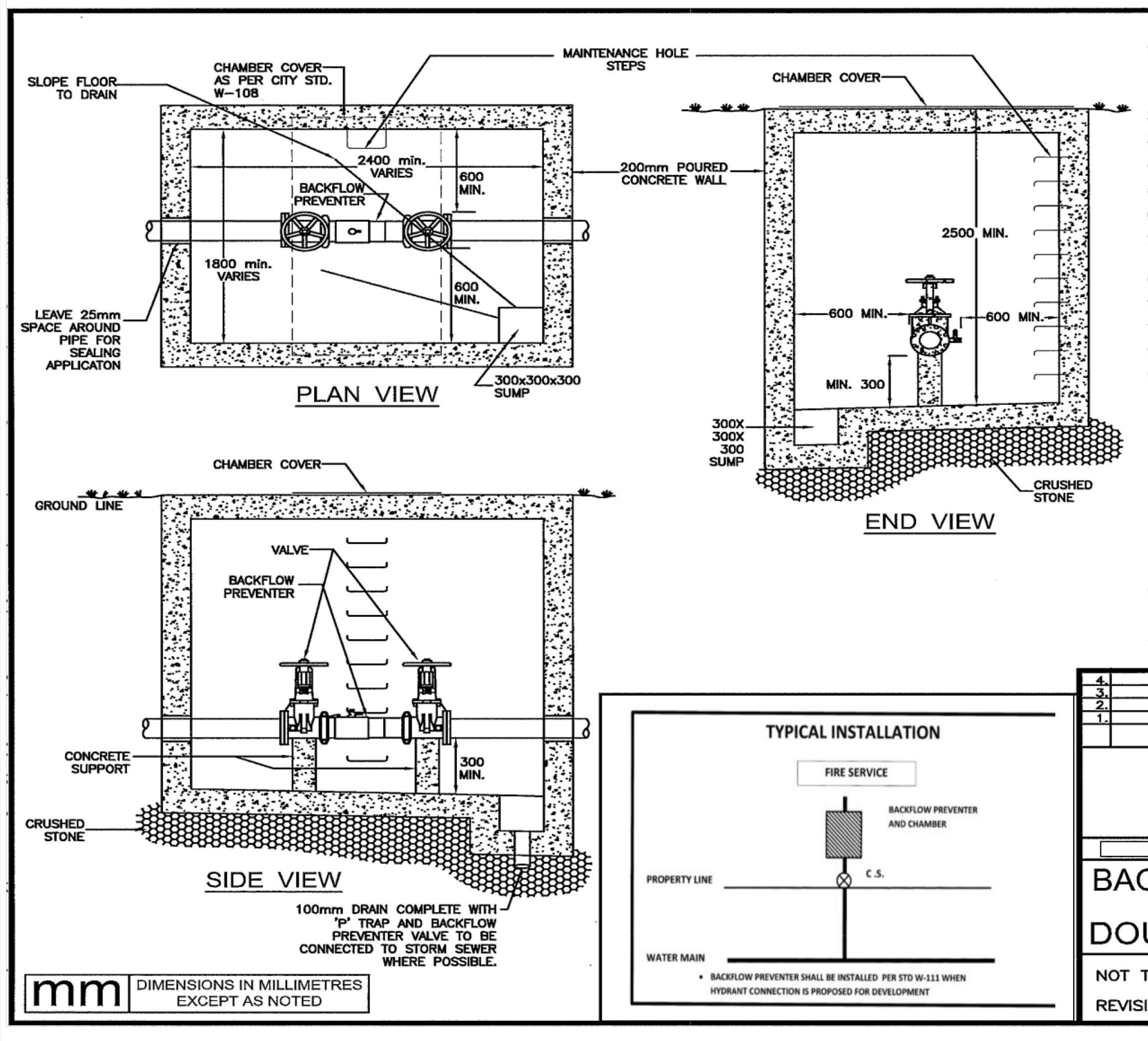
N.T.S.



WATERMAIN DEFLECTION DETAIL

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 (IN DIRECTION OF LARGER PIPE)	DEAD END AND VALVES
150	4			N/A	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.



mm	DIMENSIONS IN MILLIMETRES EXCEPT AS NOTED

NOTES

1. WATTS SERIES 007DCVA BACKFLOW PREVENTER FOR ½" THROUGH 2", SERIES 757DCVA BACKFLOW PREVENTER FOR 2–1/2" THROUGH 10", SERIES 774DCVA 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 PROTECTED WITH WATER TIGHT PLUGS.
11. MINIMUM DEPTH OF CHAMBER = 2.5 METRES.
12. AS PER ONTARIO BUILDING CODE SECTION 7.6.2.2:
    A) EVERY POTABLE WATER SYSTEM THAT SUPPLIES A FIXTURE OR TANK THAT IS NOT SUBJECT TO PRESSURE ABOVE ATMOSPHERIC SHALL BE PROTECTED AGAINST BACK–SIPHONAGE BY A BACKFLOW PREVENTER.

    B) WHERE A POTABLE WATER SUPPLY IS CONNECTED TO A TANK, COOLING JACKET, LAWN SPRINKLER SYSTEM, YARD HYDRANT OR OTHER DEVICE WHERE A NON–PORTABLE FLUID MAY BE UNDER PRESSURE THAT IS ABOVE ATMOSPHERIC OR THE WATER OUTLET MAY BE SUBMERGED IN THE NON–PORTABLE FLUID, THE WATER SUPPLY SHALL BE PROTECTED AGAINST BACKFLOW BY A BACKFLOW PREVENTER.

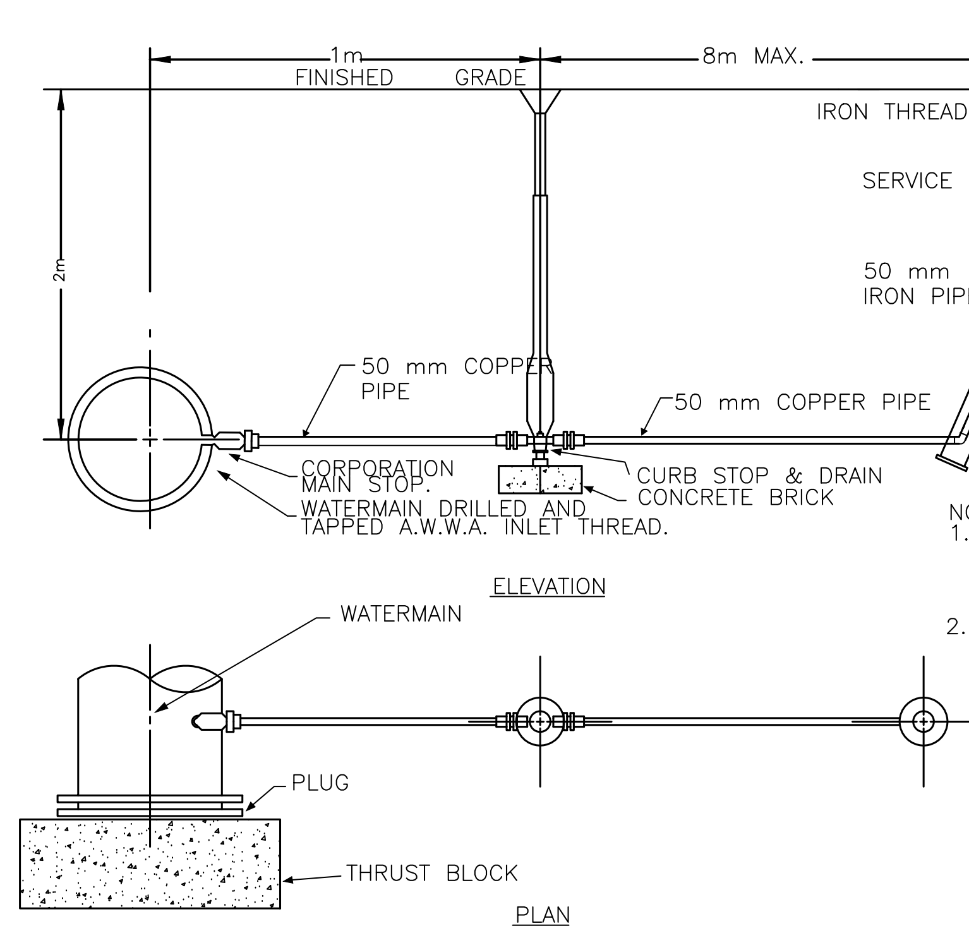
    C) WHERE A HOSE BIB IS INSTALLED OUTSIDE A BUILDING, INSIDE A GARAGE, OR WHERE THERE IS AN IDENTIFIABLE RISK OF CONTAMINATION, THE POTABLE WATER SYSTEM SHALL BE PROTECTED AGAINST BY A BACKFLOW PREVENTER.
13. WHERE PRECAST CONCRETE ADJUSTER RINGS (E.G., MODULOC) ARE REQUIRED, THEY ARE TO BE MAX. 300 mm OTHERWISE POURED COLLARS ARE TO BE USED IN CONJUNCTION WITH RINGS.
14. THIS STANDARD APPLIES TO BUILDINGS WITH OUTSIDE HYDRANTS

	REVISIONS	APR'D	DATE
4.			
3.			
2.			
1.			

Norfolk COUNTY

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

NOT TO SCALE | DESIGNED: | STD. DWG.
REVISION: | DATE: | W - 111



NOTE:
1. ALL BLOW OFF'S TO BE INSTALLED AT RIGHT ANGLES TO THE WATERMAIN UNLESS APPROVED OTHERWISE.
2. TEMPORARY BLOW OFF'S CAN BE INSTALLED DIRECTLY ONTO THE END CAP IF PREVIOUSLY APPROVED.

STANDARD BLOW–OFF N.T.S.

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ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO NORFOLK COUNTY STANDARDS AND SPECIFICATIONS

LEGAL DESCRIPTION

PLAN 37M-57, BLOCK 60, ROLL NUMBER 33605062848 IN THE TOWN OF WATERFORD IN NORFOLK COUNTY.

APPLICANT INFORMATION

APPLICANT:	PRAMUKH DEVELOPMENTS Ltd.
TELEPHONE:	416-871-0086 OR 416-829-6620
ADDRESS:	2324 WEST HAM RD OAKVILLE, ON L6M 4N6

BENCHMARKS

BM #1: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON WEST SIDE OF OLD HIGHWAY 24 AT NORTHWEST CORNER OF PROPERTY.
ELEV.......243.92m

BM #2: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON WEST SIDE OF OLD HIGHWAY 24 AT THE INTERSECTION OF LAM BLVD AND OLD HIGHWAY 24.
ELEV.......243.85m

BM #3: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT ON NORTH SIDE OF LAM BLVD AT SOUTHEAST CORNER OF PROPERTY.
ELEV.......245.84m

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G. DOUGLAS VALLEE LIMITED DRAWINGS

21-059-C100	SERVICING PLAN
21-059-C101	GRADING PLAN
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21-059-STM	STORM DRAINAGE AREAS PLAN

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vallee
Consulting Engineers, Architects & Planners

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

Stamp
LICENSED PROFESSIONAL ENGINEER
2023-10-12
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

Project Title
LAM BOULEVARD
WATERFORD, NORFOLK COUNTY

Drawing Title
GENERAL NOTES & DETAILS

Designed by : NBN	Drawn By : NBN
Checked by : JTI	Date Started : 10/12/2023
Drawing Scale : AS SHOWN	Drawing No. GN
Project No. 21-059	

DATE LAST PLOTTED : October 30, 2023

SANITARY SEWER DESIGN SHEET

Date: 9/22/2023
Project: 21-059 Lam Boulevard Development
Town/County: Waterford - Norfolk County

Pipe Material: PVC
N 0.013

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

Location			Residential Area		Commercial Area		Total	Residential Services					Flow			Sewer Design							
Area	From	To	Section	Cumul.	Section	Cumul.	Area	Section	Cumul	Cumul	KAV	M=Peak	Q(i)	Q(s)	Q(d)	Material	Size	Length	N	Slope	Cap	Q(d)/Cap	Full V
	MH	MH	Ha	Ha	Ha	Ha	Ha	Services	Services	Population	Factor	Factor	L/s	L/s	L/s		mm	m		%	L/s	%	m/s
SA1	SAMH4	SAMH3	0.50	0.50			0.50	24	24	66	1.000	4.289	0.14	1.47	1.61	PVC	200	59.2	0.013	0.60%	25.4	✓ 6.4%	0.81
SA2	SAMH3	SAMH2		0.50	0.20	0.20	0.70		24	84	0.943	4.020	0.20	1.76	1.95	PVC	200	28.9	0.013	0.60%	25.4	✓ 7.7%	0.81
	SAMH2	SAMH1		0.50		0.20	0.70		24	84	0.943	4.020	0.20	1.76	1.95	PVC	200	10	0.013	0.60%	25.4	✓ 7.7%	0.81

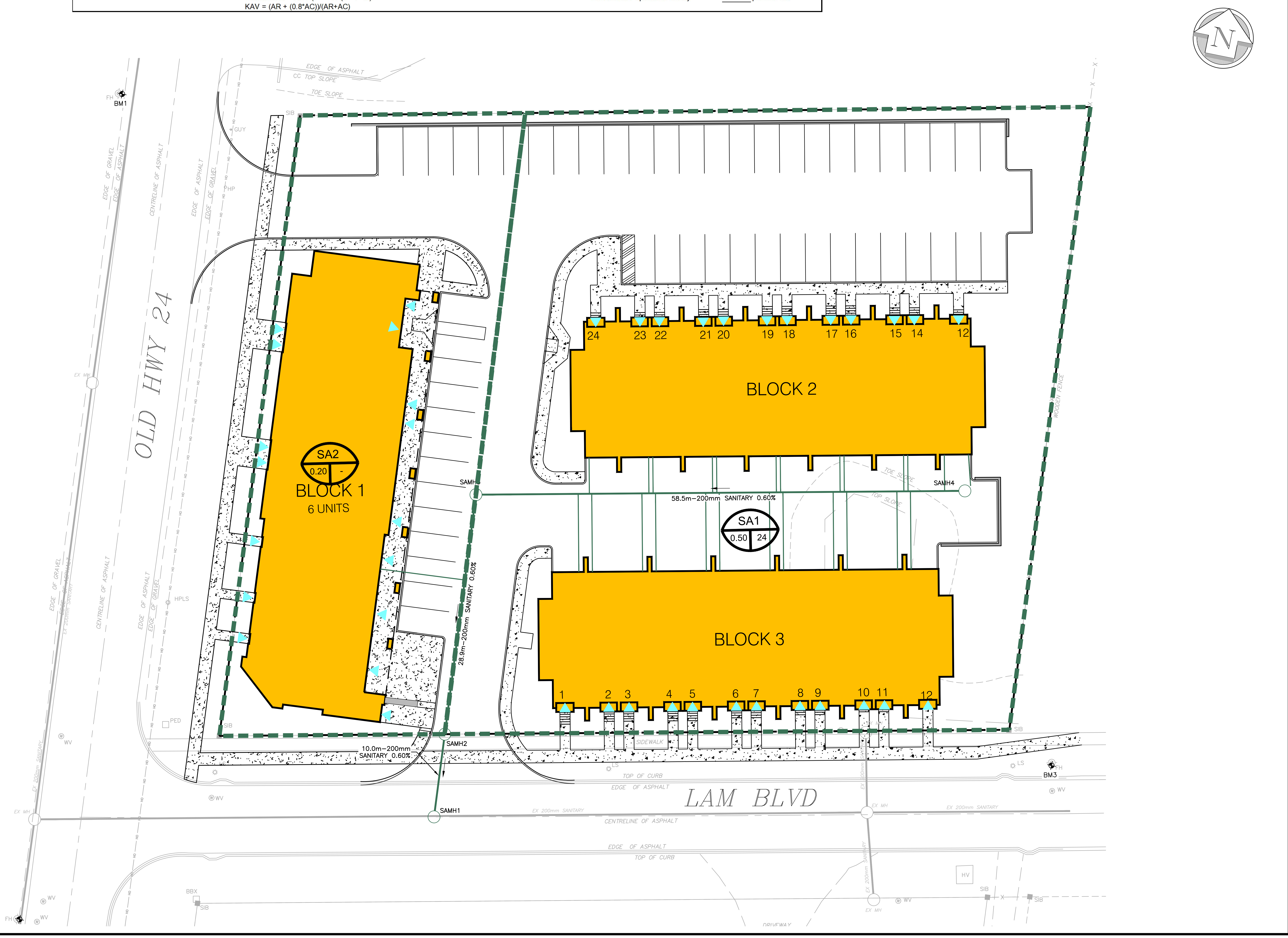
Design Information:
Q(s) = Sewage Flow = P q M / 86.4
Q(i) = Infiltration Flow = I A
Q(d) = Peak Design Flow = Q(s) + Q(i)

P = Population in thousands
A = Tributary Area
Residential M = Peaking Factor = 1 + 14 / (4 + P^.5)
Commerical M = Peaking Factor = 0.8 (1 + 14 / (4 + P^.5)
Combined M = KAV (1 + 14 / (4 + P^.5)
KAV = (AR + (0.8*AC))/(AR+AC)

Residential q = Per Capita Flow=	**450**	L/cap/d
Commercial q = Per Capita Flow=	**40000**	L/ha/d
I = Peak Extraneous Flow =	**0.28**	L/s/ha
Residential Population Density =	**2.75**	persons /unit
Commercial Population Density =	**90**	persons /ha

LEGEND

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



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SCALE: 5 10 15
HORIZONTAL : 1:250

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SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270

Stamp
LICENSED PROFESSIONAL ENGINEER
2023-10-12
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

Project Title
LAM BOULEVARD
WATERFORD, NORFOLK COUNTY

Drawing Title
STORM DRAINAGE AREAS

Designed by : NBN	Drawn By : NBN
Checked by : JTI	Date Started : 10/12/2023
Drawing Scale : 1:250	Drawing No. SAN
Project No. 21-059	

DATE LAST PLOTTED : October 30, 2023

STORM SEWER DESIGN SHEET

Date: 9/22/2023
Project: 21-059 Lam Boulevard Development
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

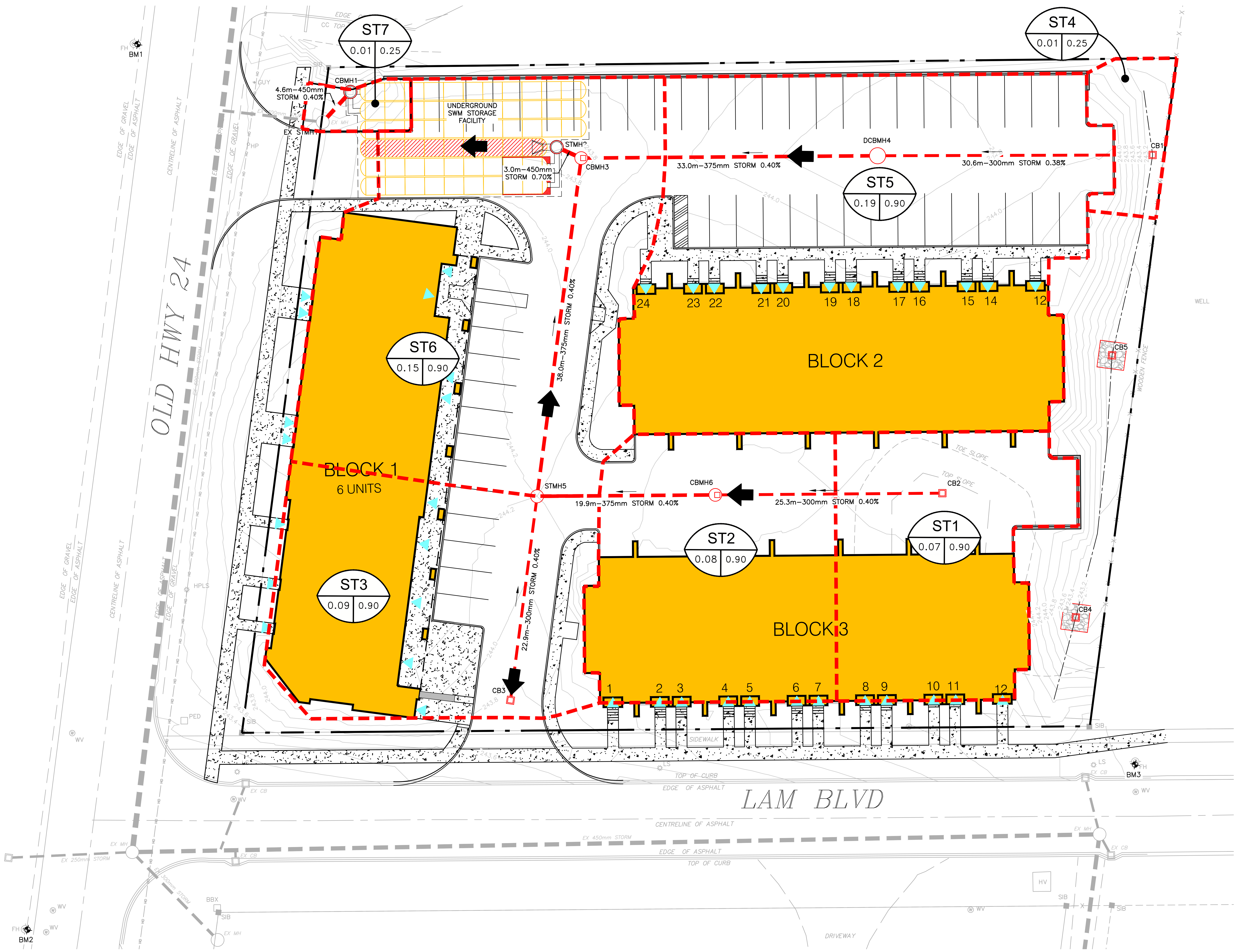
Designed by: NLB
Checked by: JI

Sheet: 1 of 1

Location				Area			Total	Individual	Cumulative	Time of	Rainfall	Flow	Sewer Design						
Area	Street	From	To	Ha 0.25	Ha 0.75	Ha 0.90	Area Ha	C*A	C*A	Concentration 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		CB2	CBMH6			0.07	0.07	0.06	0.06	10.00	160.97	28.2	300	0.40%	61.2	0.87	25.3	0.49	✓ 46%
ST2		CBMH6	STMH5			0.08	0.08	0.07	0.14	10.49	156.64	58.8	375	0.40%	110.9	1.00	19.9	0.33	✓ 53%
ST3		CB3	STMH5			0.09	0.09	0.08	0.08	10.00	160.97	36.2	300	0.40%	61.2	0.87	22.9	0.44	✓ 59%
		STMH5	CBMH3				0.00	0.00	0.22	10.82	153.87	92.4	375	0.40%	110.9	1.00	38.0	0.63	✓ 83%
ST4		CB1	DCBMH4	0.01			0.01	0.00	0.00	10.00	160.97	1.1	300	0.40%	61.2	0.87	29.1	0.56	✓ 2%
ST5		DCBMH4	CBMH3			0.19	0.19	0.17	0.17	10.56	156.02	75.3	375	0.40%	110.9	1.00	33.0	0.55	✓ 68%
ST6		CBMH3	STMH2			0.15	0.15	0.14	0.52	11.45	148.90	217.1	450	0.70%	238.5	1.50	3.0	0.03	✓ 91%

LEGEND

ST1 / 0.99 / 0.45	STORM DRAINAGE AREA NUMBER; AREA (ha); RUN–OFF COEFFICIENT
➡	OVERLAND FLOW (MAJOR)
→	STORM SEWER FLOW (MINOR)
STMH5 ○	PROPOSED STORM MANHOLE
▨	PROPOSED INFILTRATION TRENCH
▣	PROPOSED SINGLE CATCH BASIN MH
◫	PROPOSED DOUBLE CATCH BASIN MH
🟥	STORM DRAINAGE BOUNDARY



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2023-10-12
J. T. IEZZI
100189485

Project Title
LAM BOULEVARD
WATERFORD, NORFOLK COUNTY

Drawing Title
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Designed by : NLB	Drawn By : NLB
Checked by : JTI	Date Started : 10/12/2023
Drawing Scale : 1:250	Drawing No. STM
Project No. 21-059	

DATE LAST PLOTTED : October 30, 2023

LVM

Mr. Tony Yin

Proposed Residential Subdivision
Yin Street
Waterford, Ontario

Geotechnical Engineering Report

LICENSED PROFESSIONAL ENGINEER
D.J. KELLY
2010-08-19
PROVINCE OF ONTARIO

Prepared by:

Montana Brown, B.Sc.
Project Manager

Reviewed by :

Dennis Kelly, B.Sc., P.Eng.
Senior Consulting Engineer

TABLE OF CONTENTS

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Tables

Appendices

Property and Confidentiality

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Test results mentioned herein are only valid for the sample(s) stated in this report.

LVM inc's subcontractors who may have accomplished work either on site or in laboratory are duly qualified as stated in our Quality Manual's procurement procedure. Should you require any further information, please contact your Project Manager."

Mr. Tony Yin
204 McMichael Road, R.R. 4
Waterford, Ontario N0E 1Y0

REVISION AND PUBLICATION REGISTER		
Revision N°	**Date**	**Modification And/Or Publication Details**
00	2010-08-18	Report Issued

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INTRODUCTION

LVM inc. was retained by Mr. Tony Yin to carry out a geotechnical investigation at the site of a proposed residential development in the southeast end of Waterford, Ontario. This work was authorized by Mr. Tony Yin on July 15, 2010.

The project involves the proposed construction of a residential subdivision to be situated on a 14.1 ha parcel of land located in Waterford, Ontario at the location shown on Drawing 1, in Appendix 1. The development plans include eighty-five single detached lots, one townhouse block (Block 1), one apartment complex block (Block 2), two commercial blocks (Blocks 3 and 4), a stormwater management pond (Block 5) and four new streets. Access to the subdivision will be via Yu Boulevard, Kim Lane, and Regional Road 24. The house lots will be serviced with municipal sewer and water.

The purpose of the investigation was to determine the subsurface soil and groundwater conditions at the site and, based on that information, prepare this engineering report with geotechnical recommendations pertaining to development including site grading, site servicing, pavement construction, house construction, excavations and dewatering, stormwater infiltration and stormwater management. The report does not address site environmental issues or concerns.

1 INVESTIGATION PROCEDURE

1.1 FIELD PROGRAM

The fieldwork for this investigation was carried out on July 26, 2010, and involved the drilling of eight boreholes (Boreholes 01-10 to 08-10) to a depth of 8.1 m. The locations of the boreholes are shown on the Site Plan, Drawing 2 in Appendix 1.

Local utility companies were contacted prior to the start of drilling activities in order to demarcate underground utilities near the boring locations.

The boreholes were advanced with a CME-75 track mounted drillrig equipped with continuous flight solid stem augers supplied and operated by a specialist drilling contractor.

In the boreholes, representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard Penetration Tests (SPT) were carried out during sampling operations in the boreholes using conventional split spoon equipment. The SPT N-values recorded are plotted on the borehole logs in Appendix 2.

Standpipes were installed in six boreholes (Boreholes 01-10 to 06-10) to allow measurement of the stabilized groundwater levels. The standpipe installations comprised 19 mm diameter pipes with slotted and filtered screens, as well as a bentonite seals near the ground surface. Details of the installations and groundwater observations and measurements are provided on the borehole logs, and the measurements are summarized in Table 3.

All boreholes without standpipes were backfilled with bentonite in accordance with Ontario Regulation 372/07 (formerly Ontario Reg. 903). The standpipes were tagged and a complete well record was submitted to the Ministry of Environment. A licensed well technician must properly decommission all standpipes and monitoring wells within six months of last use (water level measurements) and certainly before construction.

The fieldwork was monitored throughout by a member of our geotechnical engineering staff, who directed the drilling and excavating procedures; conducted SPT tests; documented the soil stratigraphies; monitored the groundwater conditions; installed the standpipes; and, cared for the recovered soil samples.

The borehole locations and ground surface elevations were surveyed by G. Douglas Vallee Limited and supplied to us in AutoCAD format. It is understood that the elevations are related to a geodetic datum.

1.2 LABORATORY TESTING

All soil samples secured during this investigation were returned to our laboratory for visual examination, as well as moisture content tests. The moisture content test results are plotted on the borehole logs in Appendix 2.

The geotechnical laboratory tests carried out on selected samples of the major subsurface soils from the investigation comprised the following:

- three grain size distribution analyses with the results plotted on Figure 1 in Appendix 3;
- one particle size distribution analysis with results plotted on Figure 1 in Appendix 3; and,
- two standard Proctor moisture density tests with results plotted on Figures 2 and 3 in Appendix 3.

The soil samples will be stored for a period of three months from the date of sampling. After this time, they will be discarded unless prior arrangements have been made for longer storage.

2 SUMMARIZED CONDITIONS

2.1 SITE DESCRIPTION

The subject property covers approximately 14.1 ha and is located in the southeast part of Waterford, Ontario. The property is bordered on the west by County Road 24, on the south and east by agricultural land, and on the north by an existing residential subdivision.

The property is currently used for agricultural purposes and was most recently planted with wheat. A farm exists on the west part of the site including barns, a house, sheds and a pond. A gravel driveway extends into the site from this farm.

The ground surface at the site generally slopes down from the east to the west with a topographical relief of approximately 5 to 6 m at the borehole locations. Photographs of the site are provided in Appendix 4.

2.2 PLEISTOCENE GEOLOGY

The site is located within the physiographic region of Southern Ontario known as the Norfolk Sand Plain. The region is generally composed of broad plains of sand and silt which were deposited as a delta in Glacial Lakes Whittlesey and Warren. Small rivers and streams have cut deep valleys across the plains.

The region is underlain by Silurian bedrock of the Paleozoic system. The predominant rock types are dolomite, shale and gypsum of the Salina Formation. The bedrock is approximately 400 million years old and was formed in a shallow inland sea.

2.3 SUBSOIL CONDITIONS

We refer to the appended borehole logs for detailed soil descriptions and stratigraphies; results of SPT testing; moisture content profiles; details of standpipe installations; and, groundwater observations and measurements.

In general, the subsurface stratigraphy contacted at the site comprise topsoil overlying sand, with thin silt deposits. Borehole 01-10 encountered pavement structure and fill because it was drilled in the northbound lane of County Road 24. Descriptions of the various soil deposits encountered are provided in the following subsections.

2.3.1 Pavement Structure

Borehole 01-10 encountered a pavement structure comprising 180 mm of asphalt hot mix, 205 mm of Portland cement concrete and 75 mm of Granular 'A'.

2.3.2 Fill

Fill was encountered beneath the pavement structure in Borehole 01-10 and was 250 mm thick. The fill comprises silty sand that was moist at the time of fieldwork.

2.3.3 Topsoil

Topsoil was encountered surfically across the site. The topsoil is 200 to 450 mm thick at the borehole locations. The topsoil typically comprises dark brown silt and was moist to very moist at the time of the fieldwork.

2.3.4 Silt

Silt deposits were contacted beneath the topsoil in Borehole 03-10 and between sand deposits at a depth of 1.8 m in Borehole 04-10. The silt deposits are 300 mm thick and range in composition from sandy silt to silt with trace sand. The silt was moist at the time of fieldwork.

2.3.5 Sand

Sand deposits were encountered beneath the fill in Borehole 01-10, beneath the silt in Borehole 02-10 and below the topsoil in the remaining boreholes. The sand extends beneath termination depth of all boreholes. The sand ranges in composition from brown sand with trace silt to sand with some silt and trace clay. The results of three grain size distribution analyses and one particle size distribution analysis carried out on samples of the sand are plotted on Figure 1 in Appendix 3 and are provided in the following table:

Table 1: Grain and Particle Size Distribution Analyses Results

BOREHOLE NUMBER	SAMPLE DEPTH (m)	SAND (%)	SILT (%)	CLAY (%)
02-10	4.57 – 5.03	92	8	--
04-10	2.13 – 3.05	81	14	5
05-10	4.57 – 5.03	90	10	--
07-10	1.22 – 2.44	90	10	--

The native sand has a compact to very dense relative density based on SPT N-values of 10 to 88 blows per 300 mm penetration of the split spoon sampler. The moisture content of the sand ranges from 3 to 11% above the groundwater table and from 18 to 23% below the groundwater table.

The results of two standard Proctor moisture-density tests conducted on samples of sand are provided on Figures 2 and 3 in Appendix 3, and summarized in the following table:

Table 2: Standard Proctor Moisture-Density Test Results

BOREHOLE NUMBER	SAMPLE DEPTH (m)	MAXIMUM DRY DENSITY (t/m^3)	OPTIMUM MOISTURE CONTENT (%)	SOIL TYPE
04-10	2.13 – 3.05	1.925	10.4	Sand, some silt, trace clay
07-10	1.22 – 2.44	1.725	12.5	Sand, trace silt

2.4 GROUNDWATER

Groundwater observations and measurements carried out in the open boreholes and in standpipes installed in the boreholes, are provided on the appended borehole logs, and are summarized in the following table:

Table 3: Groundwater Depths and Elevations

BOREHOLE NUMBER	BOREHOLE ELEVATION (m)	GROUNDWATER DEPTH (m)	GROUNDWATER ELEVATION (m)
01-10	243.14	4.02	239.12
02-10	243.66	4.57	239.09
03-10	243.96	4.59	239.37
04-10	243.59	4.26	239.33
05-10	244.43	4.98	239.45
06-10	244.78	5.24	239.54

Groundwater measurements taken on August 6, 2010.

The groundwater observations indicate that the stabilized unconfined groundwater table typically occurs between Elevations 239.1 and 239.5 m throughout the centre and west half of the site. The groundwater table is below the depth of exploration at the northeast end of the site (Borehole 07-10 and Borehole 08-10). The horizontal hydraulic gradient appears to be from the southwest to the northeast. Local variations and seasonal fluctuations in the groundwater levels would be expected.

3 DISCUSSIONS AND RECOMMENDATIONS

3.1 GENERAL

The project involves the proposed construction of a residential subdivision to be situated on a 14.1 ha parcel of land located in Waterford, Ontario at the location shown on Drawing 1, in Appendix 1. The development plans include eighty-five single detached lots, two commercial blocks, one apartment complex block, one townhouse block, a storm water management pond and four new streets. Access to the subdivision will be via Yu Boulevard, Kim Lane, and County Road 24. The house lots will be serviced with municipal sewer and water.

Based on the results of the geotechnical investigation, the subsurface stratigraphy comprises topsoil overlying a major deposit of sand with some silt seams. The stabilized unconfined groundwater table generally occurs between Elevation 239.1 and 239.5 m.

Based on the results of this geotechnical investigation the site is well suited for the proposed residential development. The following subsections of this report contain geotechnical recommendations pertaining to development of the property including site grading, site servicing, pavements, residential buildings, excavations, and stormwater management.

3.2 SITE GRADING

Minor area grading of the property will likely be required to prepare the land for the construction of the proposed residential subdivision. It should be noted no grading plan was available at the time this report was issued.

Prior to carrying out any cutting and engineered fill placement, the surficial topsoil should be removed from cuts and critical fill areas. In calculating the approximate quantity of topsoil to be stripped, we recommend that the topsoil thicknesses on the individual borehole logs be increased by 50 mm to account for variations and some stripping of the mineral soil below. The topsoil material could be used for landscaping fill to raise grades in the rear yards of the house lots or in park areas. The topsoil typically is 200 to 450 mm thick.

Following removal of the topsoil, the exposed subgrade should be inspected by LVM inc. The fill should be placed in maximum 300 mm thick lifts and compacted to the following minimum percentages of standard Proctor maximum dry density (SPMDD):

Table 4: Compaction Specifications

FILL USE	MINIMUM COMPACTION REQUIRED
Structural fill to support houses	98% SPMDD
Subgrade fill beneath streets or beneath services	95% SPMDD
Bulk fill in landscaped areas	90% SPMDD

Major soils likely to be generated from the site are sand with silt seams. Based on the results of insitu moisture content and standard Proctor moisture density tests the majority of the on-site sand soils will be well suited for reuse for road subgrade fill and structural fill. If work is carried out during very dry weather then water may have to be added to the sand to improve compaction.

The native mineral soils are expected to undergo volume shrinkage during cut and fill operations. The estimated shrinkage factors are 5 to 10% for topsoil and silt, and 10 to 15% for sand.

The structural fill pads should extend at least 1.0 m beyond the footing edge of any building and down to the subgrade level at a slope of 45° to the horizontal. A typical detail for structural fill placement beneath building foundations is shown on Drawing 3, in Appendix 1.

Full-time testing by experienced geotechnical personnel should be carried out during fill placement and compaction to examine and approve potential sources of fill material, and to carefully monitor the placement and verify the compaction by insitu density testing (ASTM D2167 or ASTM 2922).

3.3 SITE SERVICING

3.3.1 Excavations and Dewatering

Following site grading operations, the subdivision will be serviced to provide the individual lots and blocks with full municipal services. It is understood that the invert levels for the watermain, storm, and sanitary sewers will be at conventional depths, some 2 to 5 m below finished grade through most of the site. We recommend that LVM inc. be allowed to check the final site grading and servicing plans for the subdivision to ensure that the exploratory boreholes extend below the design sewer invert elevations.

Temporary excavations to conventional depths for installation of underground pipes at this site must comply with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects. The predominant soils encountered in the boreholes would be classified as Type 3 soils (O.Reg. 213/91, s. 226(4)). Temporary side slopes must be cut at an inclination of 1 horizontal to 1 vertical or less from the base of the excavation for open cut pipe installation (exclusive of groundwater effects) as per O.Reg. 213/91, s. 234(2).

No major groundwater problems are envisaged for excavations above Elevation 240.0 m and any minor groundwater infiltration should be handled using conventional sump pumping techniques. Every excavation that a worker may be required to enter shall be kept reasonably free of water (O.Reg. 213/91, s. 230).

If trenches are planned to extend below Elevation 240.0 m, and below the groundwater table, then special dewatering procedures and a Permit to Transport Water (PTTW) will be required.

It is noted that pavement cuts to connect sewers at County Road 24 will contact Portland cement concrete in the old road bed (see Borehole 01-10). It is recommended that several test pits be dug during the tendering stage of the project in order that prospective contractors may familiarize themselves with the soil and groundwater conditions to be contacted.

3.3.2 Pipe Bedding

The subgrade soils beneath the watermain and sewer pipes will comprise native mineral soils or compacted fill placed during the site grading operations. No support problems are anticipated for flexible or rigid pipes founded in the native deposits or compacted on-site soils.

The native sand may be geotechnically suitable for use as pipe bedding (see Figures 1 and 2) but the sand must meet the specifications of Norfolk County, otherwise, the pipe bedding for water and sewer services should be conventional Class 'B' pipe bedding comprising a minimum of 150 mm thick layer of OPSS Granular 'A' below the pipe invert. Pipe bedding should be provided around the pipe to at least 300 mm above the pipe. The bedding aggregate should be compacted to a minimum of 95% standard Proctor maximum dry density.

3.3.3 Trench Backfilling

The trenches above the specified pipe bedding should be backfilled with inorganic on-site soils placed in 300 mm thick lifts and compacted to at least 95% SPMDD.

Based on the results of insitu moisture content and standard Proctor moisture density tests carried out on the native overburden deposits, the on-site excavated sand above the groundwater table will be compactable to the required density. It is recommended that the native soils be used as backfill in the trenches to prevent problems with differential frost heaving of imported subgrade materials.

To minimize potential problems, backfilling operations should follow closely after excavation so that only a minimal length of trench is exposed. Care should be taken to protect side slopes of excavations by diverting surface run-off away from the excavations. If construction extends into the winter, then the backfilling operations should be planned so that exposure of the backfill material to frost is kept to a minimum and to ensure that frozen material is not used as backfill.

Frequent compaction testing by experienced geotechnical personnel should be carried out to examine and approve backfill materials, and to verify that the specified degree of compaction has been achieved.

3.4 PAVEMENTS

3.4.1 Pavement Design

Following site grading and servicing operations, the pavement subgrade will comprise native and recompacted silt and sand soils.

The following pavement component thicknesses are recommended based on the proposed pavement usage, and the frost-susceptibility and strength of the subgrade soils:

Table 5: Pavement Designs

PAVEMENT COMPONENT	RESIDENTIAL STREET (SAND SUBGRADE)	RESIDENTIAL STREET (SILT SUBGRADE)
Asphalt Hot Mix	90 mm	90 mm
OPSS 1010 Granular 'A' Base	150 mm	150 mm
OPSS 1010 Granular 'B' Type 1 Subbase	300 mm	450 mm

The pavement designs are based on the assumption that construction will be carried out during the drier time of the year and that the subgrade soil is stable as determined by proof-rolling inspected by a Geotechnical Engineer. If the subgrade is wet and unstable additional granular subbase will be required particularly in areas where the subgrade comprises silt.

Samples of both the Granular 'A' and Granular 'B' aggregates should be checked for conformance to OPSS 1010 prior to utilization on site and during construction. The Granular 'B' subbase and Granular 'A' base courses must be compacted to 100% standard Proctor maximum dry density (SPMDD), as verified by insitu density testing.

The asphaltic concrete should comprise a binder layer of HL4 and a surface layer of HL3. It is recommended that the compacted thicknesses be 50 mm of HL4 binder and 40 mm of HL3 surface.

The asphaltic concrete paving materials should conform to the requirements of OPSS 1150. The asphalt should be placed and compacted in accordance with OPSS 310. The Performance Graded Asphalt Cement designation for the asphaltic concrete is 58-28.

3.4.2 Subdrains

The sand soils have fair to good natural drainage and therefore subdrains will not be required. This should be confirmed by a Geotechnical Engineer at the time of subgrade preparation.

If silt subgrade soils are contacted extensively, then we recommend that subdrains be installed beneath the low areas of the pavement and connected to the catch basins. The purpose of the subdrains is to remove excess subsurface water in order to improve pavement serviceability and increase the pavement life. A detail for a typical pavement subdrain is provided on Drawing 4, in Appendix 4.

The work of subdrain installation shall be in accordance with OPSS 405 and OPSD 216.021. The subdrain shall be 100 or 150 mm diameter perforated pipe conforming to OPSS 1801 or 1840, and wrapped with geotextile conforming to OPSS 1860.

3.4.3 Curbs and Sidewalks

The concrete for curbs and sidewalks should be proportioned, mixed, placed, and cured in accordance with the requirements of OPSS 353 and OPSS 1350, and shall meet the following specific requirements (OPSS 353.05.01):

- minimum 28-day compressive strength = 30 MPa
- coarse aggregate = 19.0 mm nominal max. size
- maximum slump = 60 mm for curbs and 90 mm for sidewalks
- air entrainment = 7.0 ± 1.5%

During cold weather (when the air temperature is at or is likely to fall below 5°C within 96 hours of concrete placement) the freshly placed concrete must be covered with insulating blankets to protect against freezing, as per OPSS 904. Ice and snow must be removed from the area where concrete is to be placed and the concrete must not be placed against frozen ground. All cold weather protection material shall be on site prior to each concrete placement.

The subgrade for the concrete sidewalks should comprise undisturbed native mineral soil or well-compacted fill. A minimum 150 mm thick layer of compacted Granular 'A' type aggregate should be placed beneath the sidewalk slabs. The subgrade and granular base should be prepared in accordance with the requirements of OPSS 315.

3.5 RESIDENTIAL BUILDINGS

3.5.1 Foundations

In general, the undisturbed native mineral soils are considered suitable to support residential house foundations. Where the footing levels will be above existing native mineral soil grade, structural fill will probably be used. House footings constructed on the compact native mineral soil or approved structural fill may be designed using the minimum footing sizes provided in the Ontario Building Code.

All founding surfaces for residential dwellings on structural fill or native soils should be inspected by LVM inc. personnel prior to placing concrete. The purpose of the inspection is to ensure that the founding conditions are consistent with the design bearing intended by the geotechnical engineer. The on-site review of the condition of the foundation soil as foundations are constructed is an integral part of the geotechnical design function and cannot be over emphasized. These reviews are required by Section 4.2.2.2 of the Ontario Building Code, 2006.

Further geotechnical investigation will be necessary for large structures such as schools, plazas or apartment buildings to provide specific recommendations for design of these structures. The Seismic Site Class is 'D'.

The subgrade soils are considered to be frost susceptible and must be protected from freezing at all times including during construction. The exterior footings or footings in unheated areas should be provided with a minimum 1.20 m of earth cover upon final grading for frost protection.

3.5.2 Basements

The basement floors should be designed at least 600 mm above the seasonally high groundwater levels. We recommend that the site grading plans be reviewed by LVM inc. to ensure that the basements meet this condition. The measured groundwater elevations at Boreholes 01-10 to 06-10 are shown on Drawing 2 in Appendix 1.

House basements at this site must be provided with perimeter weeping tile systems as per the Ontario Building Code (Section 9.14). The drain tile or pipe should be laid on undisturbed or well-compacted soil so that the top of the tile or pipe (minimum 100 mm diameter) is below the bottom of the basement floor slab. The top and sides of the drain tile or pipe shall be covered with not less than 150 mm of crushed stone or other clean coarse granular material containing no more than 10% of material that will pass the 4 mm sieve. The weeping tile must drain to a suitable frost-free outlet or sump. The sump shall be equipped with an automatic pump that will discharge the water into a sewer, drainage ditch or dry well.

The portion of the exterior basement wall below finished ground level must be damp-proofed as per Section 9.13.2 of the Ontario Building Code (2006). The basement wall backfill should be graded to prevent drainage towards the foundation after settling as per OBC 9.12.3.

The basement walls should be designed to resist the lateral earth pressure. For calculating the lateral earth pressure, the coefficient of earth pressure (K) may be assumed as 0.50 for cohesionless sandy soils and 1.0 for silt. The bulk unit weight of the retained backfill may be taken as 21 kN/m^3 for well-compacted soil. An appropriate factor of safety should be employed.

The subgrade for the basement floor slabs should comprise undisturbed native soil or well-compacted fill. A minimum 100 mm thick layer of coarse clean granular material containing not more than 10% material that will pass a 4 mm sieve shall be placed beneath slabs in houses as per Section 9.16.2 of the Ontario Building Code. If the subgrade soil is wet, we recommend that LVM inc. be notified and subfloor weeping tiles be placed and connected to the sump pit.

3.6 STORMWATER MANAGEMENT

3.6.1 At-Source Infiltration

At-source infiltration of water from house leaders in the subdivision will be feasible provided the native soils are sand and the natural groundwater level is below the bottom of the pit or gallery. The factored infiltration rate for the sand is in the order of 30 mm/h. The soak-away pits should be more than 5.0 m from the building foundations and located so that drainage is away from the houses as per the Ontario Building Code.

The native silt deposits are not free draining and are not suitable for at-source stormwater infiltration.

The soak-away pits must be checked by LVM inc. at the time of construction to confirm satisfactory soil conditions, and to check that the pits are being constructed in accordance with the specifications

3.6.2 Stormwater Management Pond

3.6.2.1 *Infiltration*

A stormwater management pond is to be located within Block 5 at the southwest corner of the site. The existing subsurface soils in this area comprise topsoil overlying sand with silt layers and the groundwater table is at 4.2 to 5.0 m below the existing ground surface (Elevation 239.4 m). This area would be suitable for stormwater infiltration provided the topsoil is removed and there is a sufficient head of water in the pond. The permeability of the sand is in the order of 10^{-3} cm/sec which corresponds to an infiltration rate of approximately 30 mm/hr. Infiltration could be restricted by the silt layers and, therefore, it would be beneficial to subexcavate any localized silt layers and replace the silt with permeable sand fill if infiltration is required. Also long-term maintenance would be required to remove silt build-up in the bottom of the pond. The bottom of the pond should be designed at Elevation 239.5 m or higher if dry conditions are required.

3.6.2.2 *Slopes*

We recommend that the pond slopes be constructed with an inclination of 3 horizontal to 1 vertical or less. The finished slopes should be topsoiled and vegetated as soon as possible after construction to minimize surface erosion. The minimum topsoil thickness should be 100 mm.

Erosion protection of slopes should be placed in accordance with OPSS Section 572. Erosion control blanket Type W secured with staples should be placed, as required.

If any berms are planned within the pond (i.e. to separate forebays from infiltration cells), then berm geotechnical stability analysis should be done. We would be pleased to carry out this work, if required.

Some routine maintenance of the slope surfaces will likely be required to address minor long-term weathering and erosion, and to check for the presence of burrowing animals in the face of the slopes.

3.6.2.3 *Subdrains*

If the pond extends below the stabilized groundwater table (i.e. below Elevation 239.5 m) then slope drains may be needed to prevent excessive sloughing.

The slope drains should comprise a 150 mm diameter perforated PVC subdrain tile in geotextile sock and bedded in filter sand (OPSS 1002 Fine Aggregate for Concrete). The filter sand must extend at least 150 mm below the pipe invert and to 150 mm on each side of the pipe. Sand must extend above the pipe to a minimum 300 mm from the surface. The filter sand must be compacted to 95% standard Proctor maximum dry density (SPMDD). All works should be as per OPSS 410, OPSS 314 and OPSS 1004. A typical detail for a slope subdrain is provided on Drawing 5, in Appendix 1.

If the bank seepage is too extensive (i.e. spread over the entire face of the bank) then loose revetments and 5 horizontal to 1 vertical slopes should be used.

3.6.2.4 *Inlet/Outlet Structures*

The inlet and outlet pipes should be carefully backfilled with excavated sand and silt soils. The backfill should be in intimate contact with complete circumference of the pipe. In places where proper compaction may be difficult to achieve, lean concrete backfill should be used. We also recommend seepage collars be provided on the pipes to reduce the risk of internal piping erosion along the pipe/soil interface.

If headwall structures are proposed, then the support for these structures must be derived from the native mineral soil deposits. An allowable bearing pressure of 150 kPa is available in the undisturbed native soil. The founding soil must be inspected by a Geotechnical Engineer at the time of the construction in order to confirm the bearing capacity. The headwalls and wingwalls should be backfilled using free-draining granular material and may be designed using an active earth pressure coefficient of 0.35 and a unit weight of 21 kN/m^3. Any footings must be protected with a minimum 1.2 m of earth cover or equivalent insulation to provide protection against potential frost damage (concrete headwall as per OPSD 804.030).

Geotechnical inspections and insitu density testing should be conducted during stormwater management facility construction in order to verify that all topsoil has been properly stripped and to ensure that all fill materials are being adequately compacted.

4 STATEMENT OF LIMITATIONS

The geotechnical recommendations provided in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known at the time of report preparation, we recommend that we be retained during the final design stage to verify that the geotechnical recommendations have been correctly interpreted in the design. We also recommend that we be retained during construction to confirm that the subsurface conditions do not deviate materially from those encountered in the boreholes and to ensure that our recommendations are properly understood.

The geotechnical recommendations provided in this report are applicable only to the project described in the text and are intended for the use of the project designer. They are not intended as specifications or instructions to contractors. Any use which a contractor makes of this report, or decisions made based on it, are the responsibility of the contractor. The contractor must also accept the responsibility for means and methods of construction, seek additional information if required, and draw their own conclusions as to how the subsurface conditions may affect their work.

It is important to note that the geotechnical investigation involves a limited sampling of the site gathered at specific test hole locations and the conclusions in this report are based on this information gathered. The subsurface conditions between and beyond the test pits will differ from those encountered at the test holes. Should subsurface conditions be encountered which differ materially from those indicated at the test holes, we request that we be notified in order to assess the additional information and determine whether or not changes should be made as a result of the conditions.

Appendix 1 Drawings

Drawing 1: Location Plan
Drawing 2: Site Plan
Drawing 3: Structural Fill Pad Detail
Drawing 4: Typical Pavement Subdrain Detail
Drawing 5: Typical Pond Subdrain Detail

10 cm
5
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3
2
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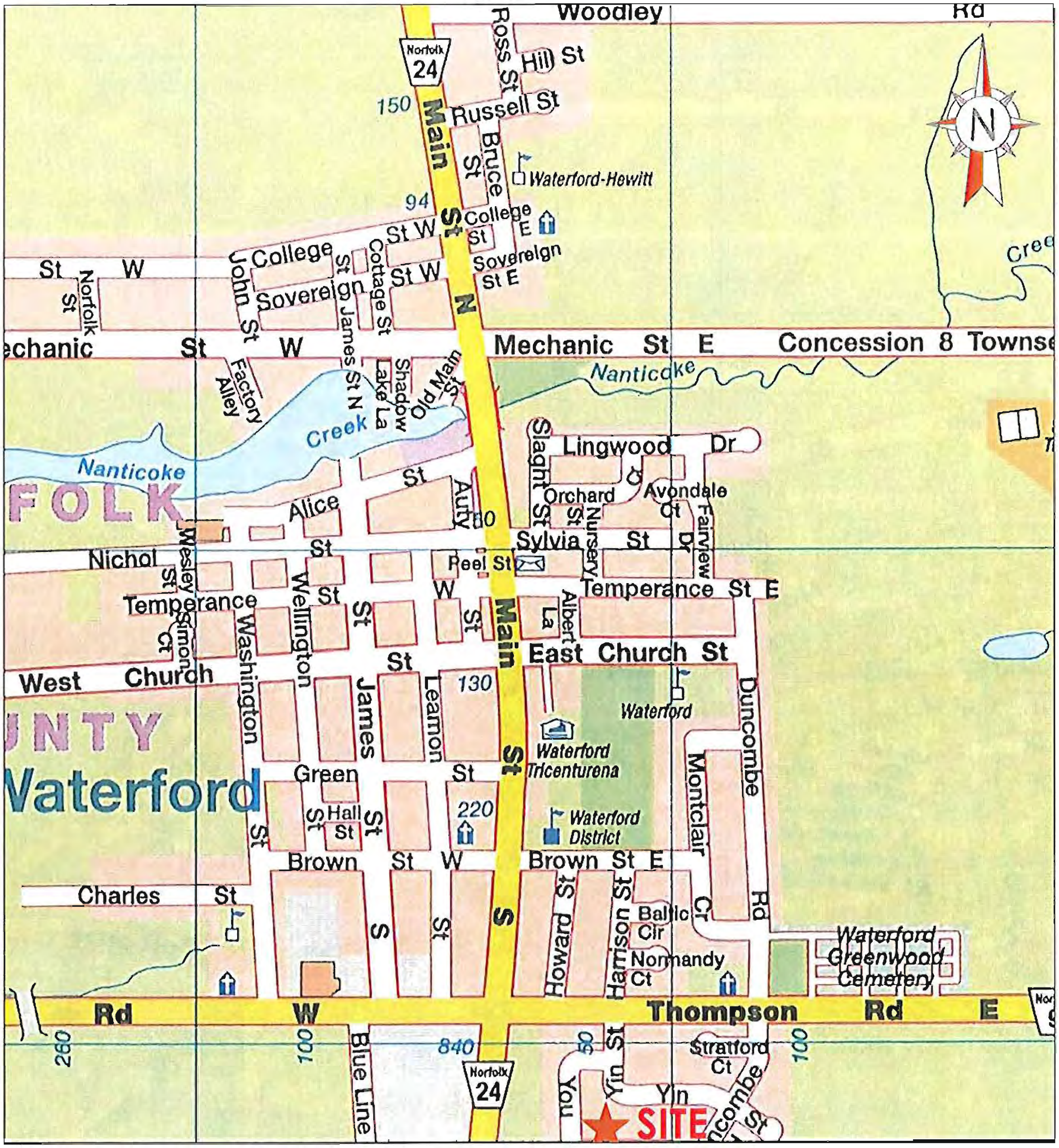

NOTES :
1-REFERENCES : MAPART PUBLISHING (2009), KITCHENER-WATERLOO MAP BOOK, PAGE 68

0 100 200 300 400 500 m

SCALE 1:12500

Project

Geotechnical Investigation for Yin Subdivision

Yin Street, Waterford, Ontario

Title

LOCATION PLAN

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Prepared	JGray	Discipline	GEOTECHNICAL
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Checked	MBrown	Date	2010-08-13

Project manager
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Sequence no.
01 of 05

M. dept.	Project	Work pckg.	Sub-w.p.	Disc.	Drawing no.	Rev.
161	P035511	100		GE	1	00

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LEGEND :

●	BOREHOLE LOCATION
EL. 243.14	GROUND SURFACE ELEVATION (mASL)
239.09	GROUNDWATER ELEVATION 2010-08-06

NOTES :

1-REFERENCES : Site plan provided by G. Douglas Vallee Limited,Drawing YINBoreholeLocates.dwg, 2010-07-28

Project

Geotechnical Investigation for Yin Subdivision

Yin Street, Waterford, Ontario

Title

SITE PLAN

LVM

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M. dept.	Project	Work pckg.	Sub-w.p.	Disc.	Drawing no.	Rev.
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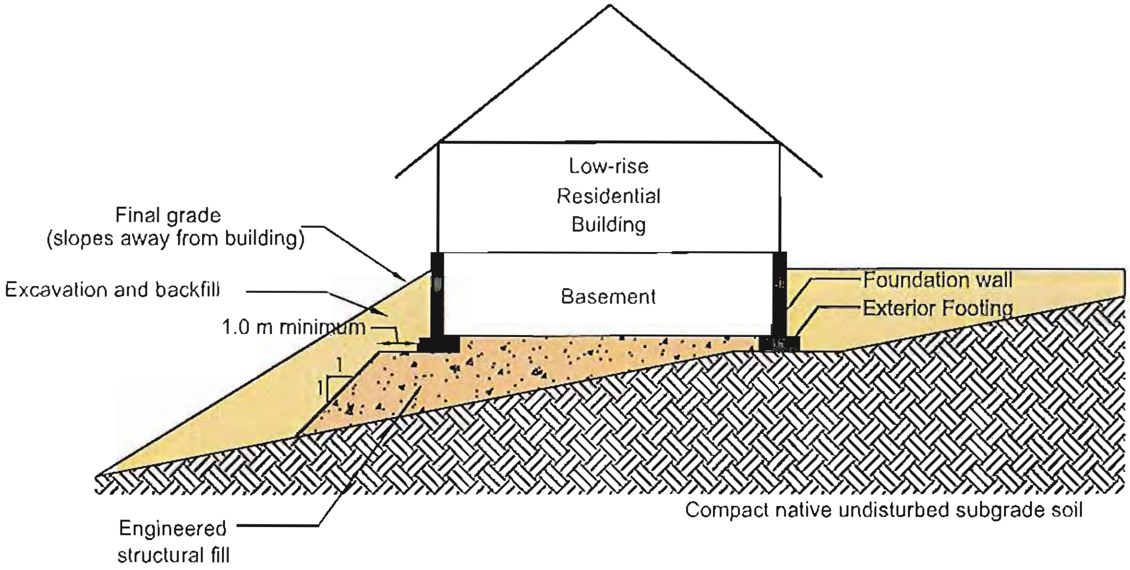

GENERAL REQUIREMENTS FOR ENGINEERED STRUCTURAL FILL

1. The area must be excavated of all pre-existing loose fill, topsoil, and/or organic soil until compact native undisturbed soil is reached.

2. The excavation should allow for the structural fill to extend 1.0 m beyond the outside edge of the building footings and down to the approved subgrade soil at a slope of 1 horizontal to 1 vertical (45 °).

3. The subgrade below the engineered fill should be inspected and approved by a geotechnical engineer prior to fill construction. Fill placement and compaction operations to be carried out under full-time geotechnical supervision.

4. The structural fill should comprise sand and gravel aggregate placed in 300 mm thick lifts and compacted to at least 98% Standard Proctor Maximum Dry Density (SPMDD). The exterior backfill should consist of approved inorganic soil also placed in 300 mm thick lifts and compacted to minimum 95% SPMDD.

5. Exterior footings should be provided with minimum 1.2 m of soil cover for frost protection.

6. All excavations must be carried out in conformance with the current Ontario Occupational Health and Safety Act and Regulations 213/91 for construction projects.

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Project

Geotechnical Investigation
for Yin Subdivision

Yin Street, Waterford, Ontario

Title

STRUCTURAL FILL PAD DETAIL

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Date 2010-08-13

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03 of 05

M. dept.	Project	Work pckg.	Sub-w.p.	Disc.	Drawing no.	Rev.
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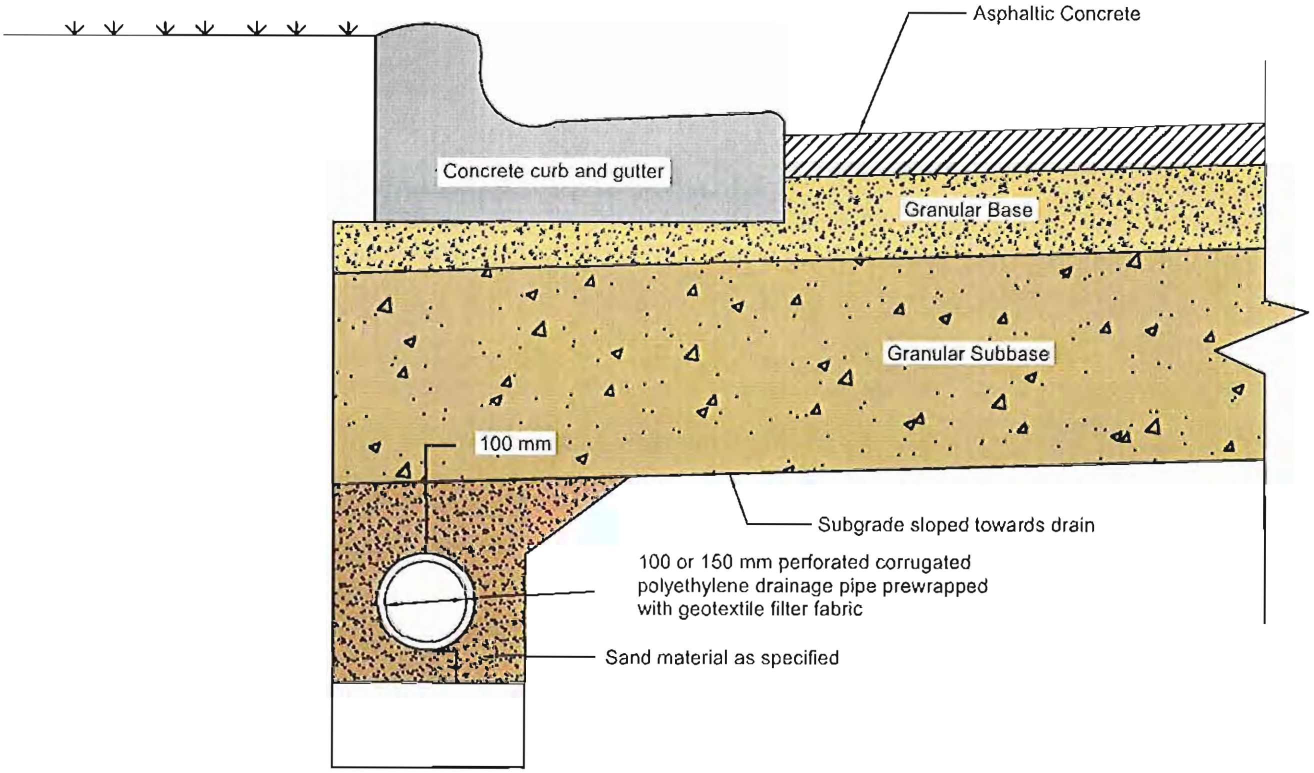

GENERAL REQUIREMENTS FOR PAVEMENT SUBDRAINS

1. Perforated corrugated polyethylene drainage pipe shall meet the requirements of OPSS 1840.
2. Pipe filter fabric conforming to OPSS 1860 for geotextile Class 1 with a filtration opening size of 150 to 450 microns shall be supplied on all sections of perforated pipe.
3. The open upstream ends of pipes should be capped.
4. Subdrain pipes to be set on at least 1% grade draining to a positive frost-free outlet. If the subdrains are outletted to a ditch then the last 1.5 m of the outlet pipe should consist of a corrugated galvanized steel pipe equipped with a rodent gate.
5. Bedding and backfill material shall be concrete sand meeting the gradation requirements of OPSS 1002 (Fine Aggregate for Concrete).

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Project

Geotechnical Investigation
for Yin Subdivision

Yin Street, Waterford, Ontario

Title

TYPICAL PAVEMENT SUBDRAIN DETAIL

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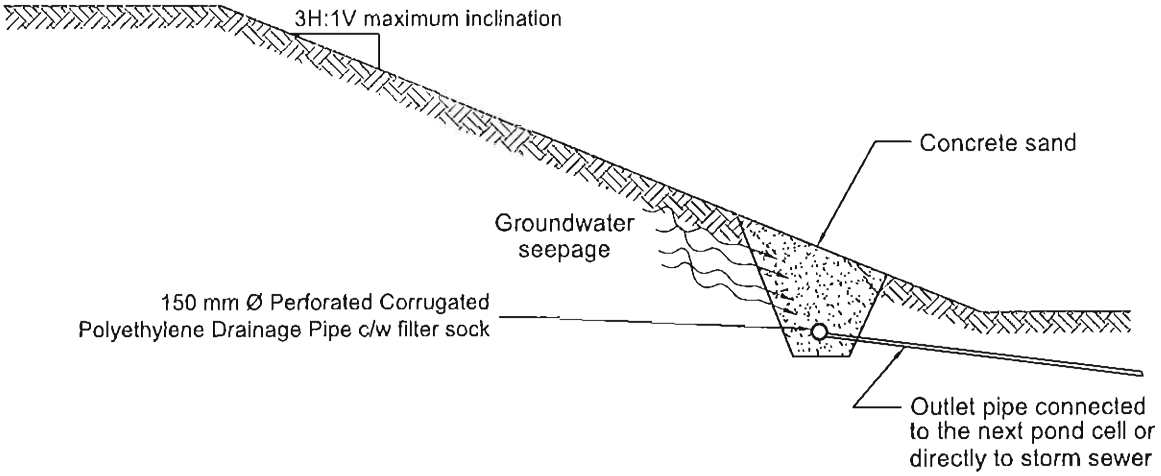
Sequence no. 04 of 05

M. dept.	Project	Work pckg.	Sub-w.p.	Disc.	Drawing no.	Rev.
161	P035511	100		GE	4	00

STORMWATER MANAGEMENT POND SLOPE SUBDRAIN INSTALLATION



GENERAL REQUIREMENTS

1. Perforated corrugated polyethylene drainage pipe shall meet the requirements of OPSS 1840.
2. Pipe filter fabric conforming to OPSS 1860 for geotextile Class 1 with a filtration opening size of 150 to 450 microns shall be supplied on all sections of perforated pipe.
3. Subdrain pipes to be set on at least 1% grade and draining to a positive outlet. If the pipe is outletted to the pond, then the last 1.5 m should comprise a corrugated steel pipe equipped with a rodent gate.
4. Bedding and backfill material shall be concrete sand meeting the gradation requirements of OPSS 1002 (Fine Aggregate for Concrete).
5. The open upstream ends of pipes should be capped.
6. The subgrade on the original slope should be inspected and approved by LVM prior to fill construction. Fill placement and compaction operations to be carried out under engineering supervision.

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Project

**Geotechnical Investigation
for Yin Subdivision**

Yin Street, Waterford, Ontario

Title

TYPICAL POND SUBDRAIN DETAIL

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Sequence no. 05 of 05

M. dept.	Project	Work pckg.	Sub-w.p.	Disc.	Drawing no.	Rev.
161	P035511	100		GE	5	00

Appendix 2 Borehole Logs

List of Abbreviations
Boreholes 01-10 to 08-10

LIST OF ABBREVIATIONS

The abbreviations commonly employed on the borehole logs, on the figures, and in the text of the report, are as follows:

Sample Types		**Soil Tests and Properties**	
AS	auger sample	SPT	Standard Penetration Test
CS	chunk sample	UC	unconfined compression
RC	rock core	FV	field vane test
SS	split spoon	ø	angle of internal friction
TW	thin-walled, open	γ	unit weight
WS	wash sample	w_p	plastic limit
		w	water content
		w_l	liquid limit
		I_L	liquidity index
		I_p	plasticity index
		PP	pocket penetrometer

Penetration Resistances

Dynamic Penetration Resistance	The number of blows by a 63.5 kg (140 lb.) hammer dropped 0.76 m (30 in.) required to drive a 50 mm (2 in.) diameter 60 º cone a distance 0.30 m (12 in.). The cone is attached to 'A' size drill rods and casing is not used.
Standard Penetration Resistance, N (ASTM D1586)	The number of blows by a 63.5 kg (140 lb.) hammer dropped 0.76 m (30 in.) required to drive a standard split spoon sampler 0.30 m (12 in.)
WH	sampler advanced by static weight of hammer
PH	sampler advanced by hydraulic pressure
PM	sampler advanced by manual pressure

Soil Description

Cohesionless Soils	**SPT N-Value**	**D_r (%)**
Relative Density (D_r)	(blows per 0.30 m)	
Very Loose	0 to 4	0 to 20
Loose	4 to 10	20 to 40
Compact	10 to 30	40 to 60
Dense	30 to 50	60 to 80
Very Dense	over 50	80 to 100

Cohesive Soils	Undrained Shear Strength (C_u)	
Consistency	**kPa**	**psf**
Very Soft	less than 12	less than 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very Stiff	100 to 200	2000 to 4000
Hard	over 200	over 4000

DTPL	Drier than plastic limit
APL	About plastic limit
WTPL	Wetter than plastic limit

LVM

Borehole Number: 01-10

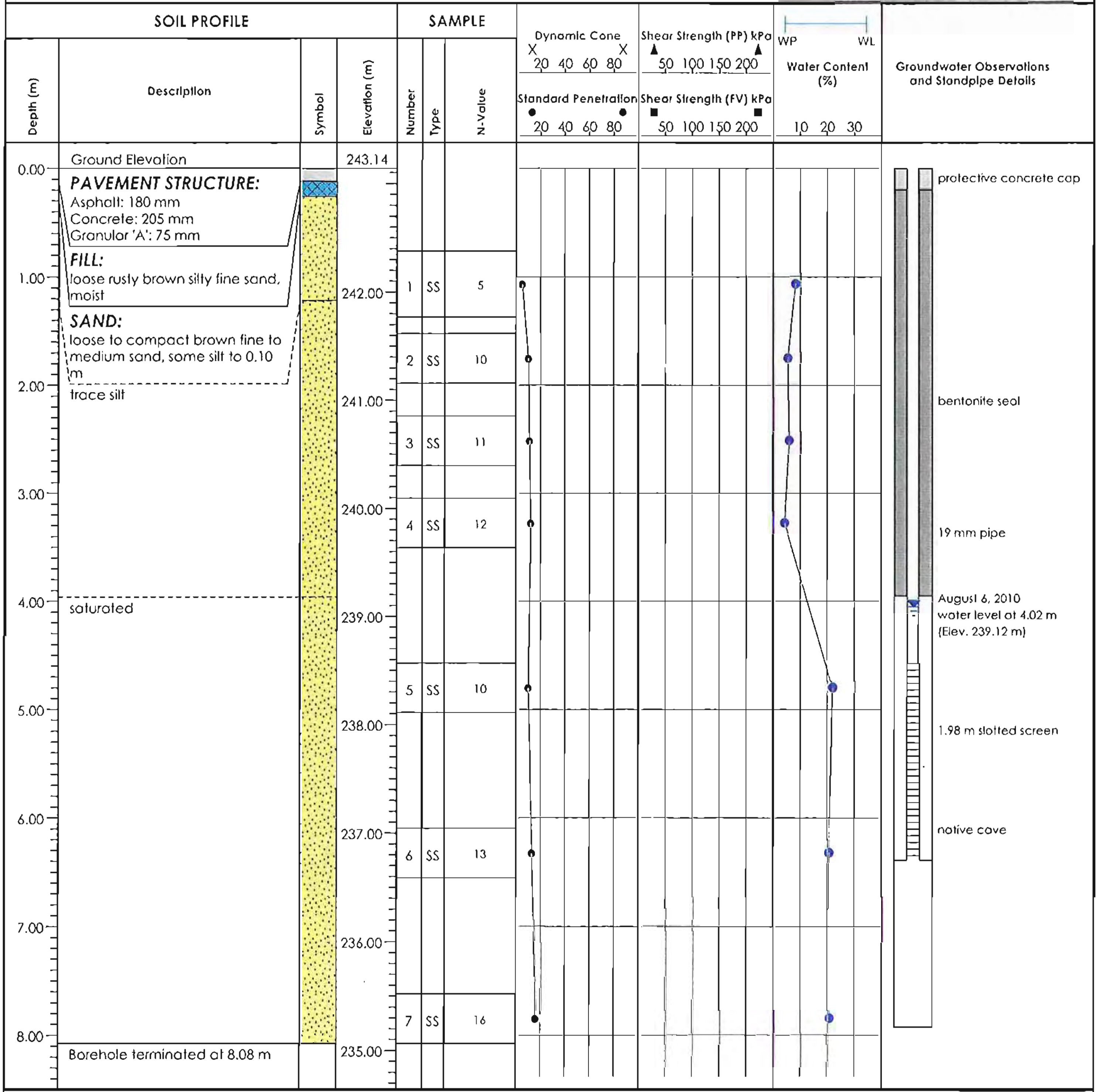
Ground Elevation: *243.14 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Job No.: *161-P035511-0100*

Location: *Yin Street, Waterford, Ontario*

Drill Date: *2010-07-26*



SOIL PROFILE

Ground Elevation 243.14

PAVEMENT STRUCTURE:
Asphalt: 180 mm
Concrete: 205 mm
Granular 'A': 75 mm

FILL:
loose rusty brown silty fine sand, moist

SAND:
loose to compact brown fine to medium sand, some silt to 0.10 m

trace silt

saturated

Borehole terminated at 8.08 m

SAMPLE

Number	Type	N-Value
1	SS	5
2	SS	10
3	SS	11
4	SS	12
5	SS	10
6	SS	13
7	SS	16

Reviewed by: *TS*

Field Tech.: *RM*

Drill Method: *Solid Stem Auger*

Sheet: *1 of 1*

Notes:

Drafted by: *JG*

LVM

Borehole Number: 02-10

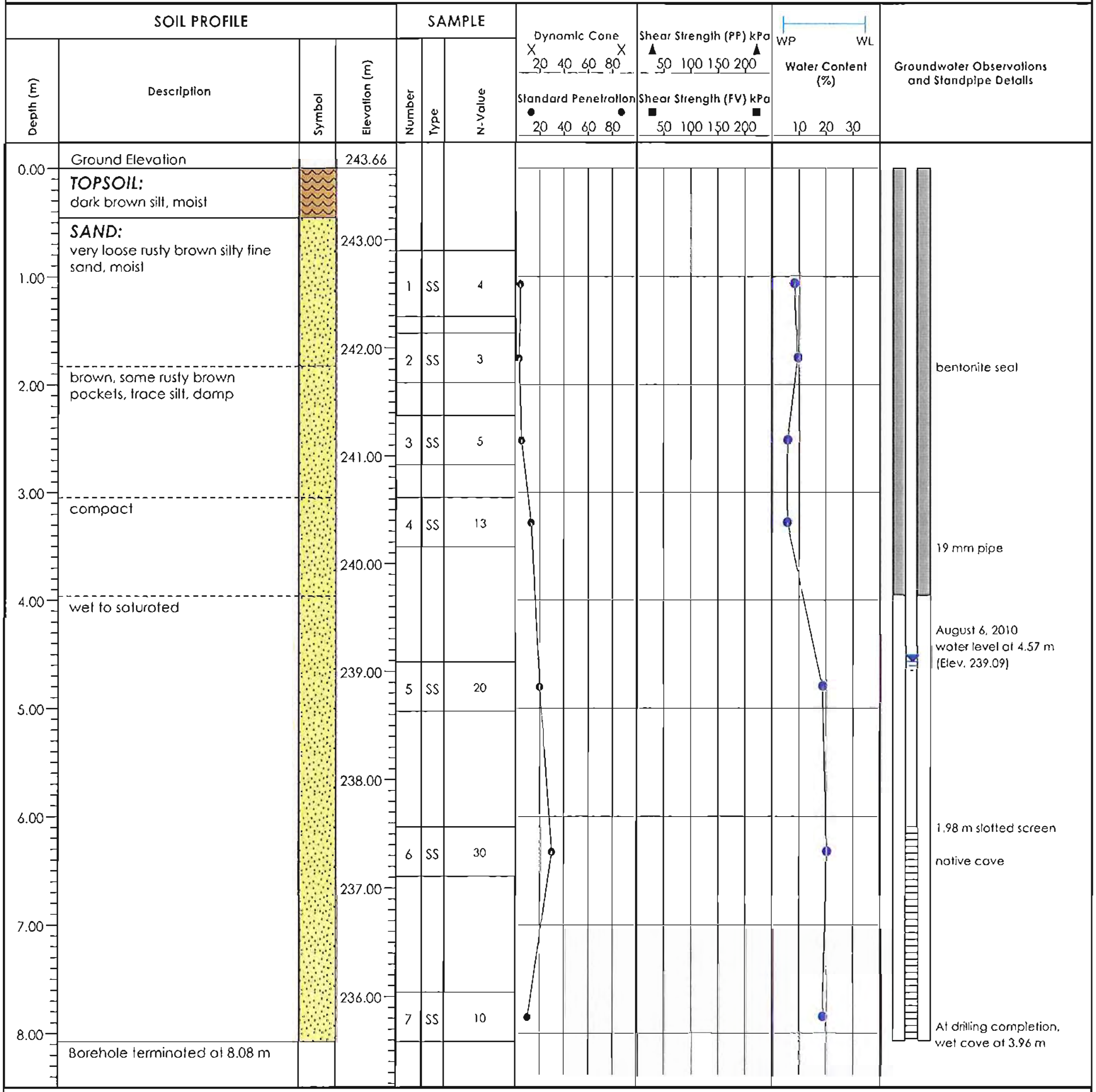
Ground Elevation: *243.66 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Location: *Yin Street, Waterford, Ontario*

Job No.: *161-P035511-0100*

Drill Date: *2010-07-26*



Ground Elevation 243.66

TOPSOIL:
dark brown silt, moist

SAND:
very loose rusty brown silty fine sand, moist

brown, some rusty brown pockets, trace silt, damp

compact

wet to saturated

Borehole terminated at 8.08 m

Number	Type	N-Value
1	SS	4
2	SS	3
3	SS	5
4	SS	13
5	SS	20
6	SS	30
7	SS	10

bentonite seal

19 mm pipe

August 6, 2010
water level at 4.57 m
(Elev. 239.09)

1.98 m slotted screen

native cave

At drilling completion, wet cave at 3.96 m

Reviewed by: *TS*

Drill Method: *Solid Stem Auger*

Notes:

Field Tech.: *RM*

Sheet: *1 of 1*

Drafted by: *JG*

LVM

Borehole Number: 03-10

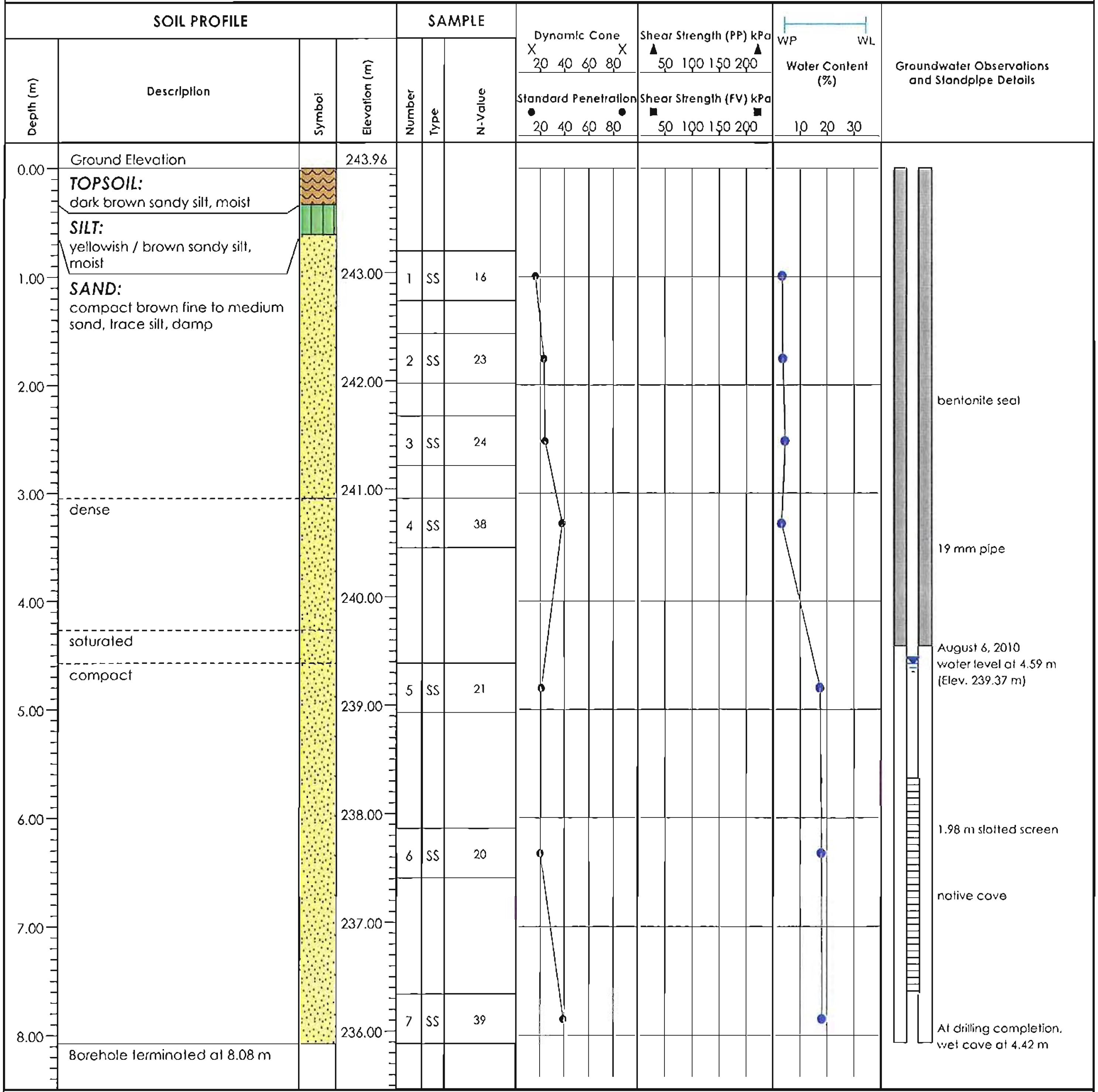
Ground Elevation: *243.96 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Job No.: *161-P035511-0100*

Location: *Yin Street, Waterford, Ontario*

Drill Date: *2010-07-26*



Ground Elevation 243.96

TOPSOIL: dark brown sandy silt, moist

SILT: yellowish / brown sandy silt, moist

SAND: compact brown fine to medium sand, trace silt, damp

dense

saturated

compact

Borehole terminated at 8.08 m

Number	Type	N-Value
1	SS	16
2	SS	23
3	SS	24
4	SS	38
5	SS	21
6	SS	20
7	SS	39

August 6, 2010 water level at 4.59 m (Elev. 239.37 m)

At drilling completion, wet cave at 4.42 m

Reviewed by: *TS*

Drill Method: *Solid Stem Auger*

Notes:

Field Tech.: *RM*

Sheet: *1 of 1*

Drafted by: *JG*

Borehole Number: 04-10

Ground Elevation: *243.59 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Location: *Yin Street, Waterford, Ontario*

Job No.: *161-P035511-0100*

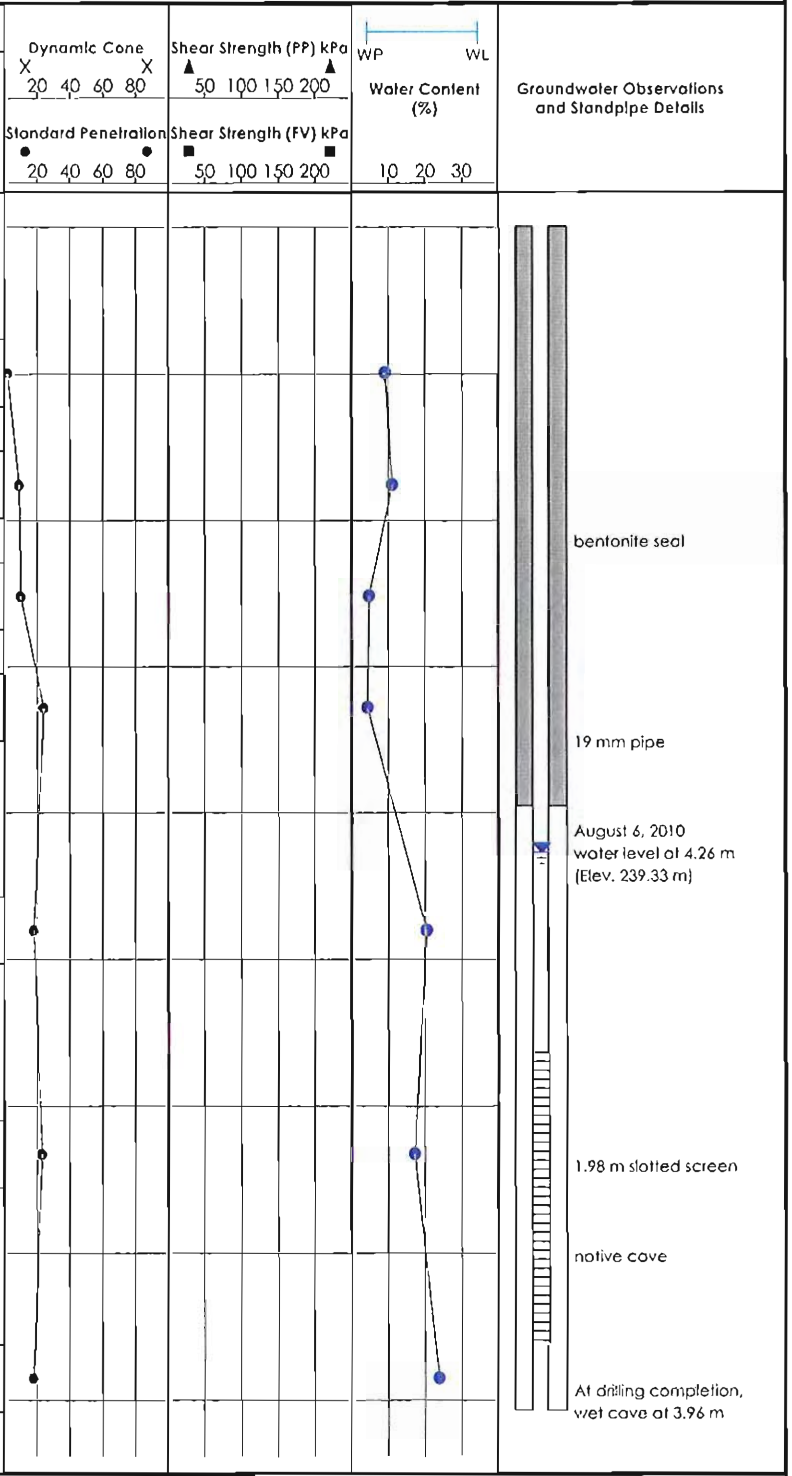
Drill Date: *2010-07-26*

SOIL PROFILE

Depth (m)	Description	Elevation (m)
	Ground Elevation	243.59
0.00	***TOPSOIL:*** dark brown sandy silt, moist	
	SAND: very loose rusty brown silty fine sand, damp	243.00
1.00		
	brown	242.00
2.00	***SILT:*** compact brown silt, trace sand, moist	
	SAND: compact brown fine to medium sand, trace silt, damp	241.00
3.00		
		240.00
4.00	saturated	
		239.00
5.00		
		238.00
6.00		
		237.00
7.00		
		236.00
8.00	Borehole terminated at 8.08 m	

SAMPLE

Number	Type	N-Value
1	SS	2
2	SS	9
3	SS	10
4	SS	24
5	SS	18
6	SS	23
7	SS	18



bentonite seal

19 mm pipe

August 6, 2010 water level at 4.26 m (Elev. 239.33 m)

1.98 m slotted screen

native cave

At drilling completion, wet cave at 3.96 m

Reviewed by: *TS*

Drill Method: *Solid Stem Auger*

Notes: *Bulk sample taken from 2.13 - 3.05 m*

Field Tech.: *RM*

Sheet: *1 of 1*

Drafted by: *JG*

Borehole Number: 05-10

Ground Elevation: *244.43 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Location: *Yin Street, Waterford, Ontario*

Job No.: *161-P035511-0100*

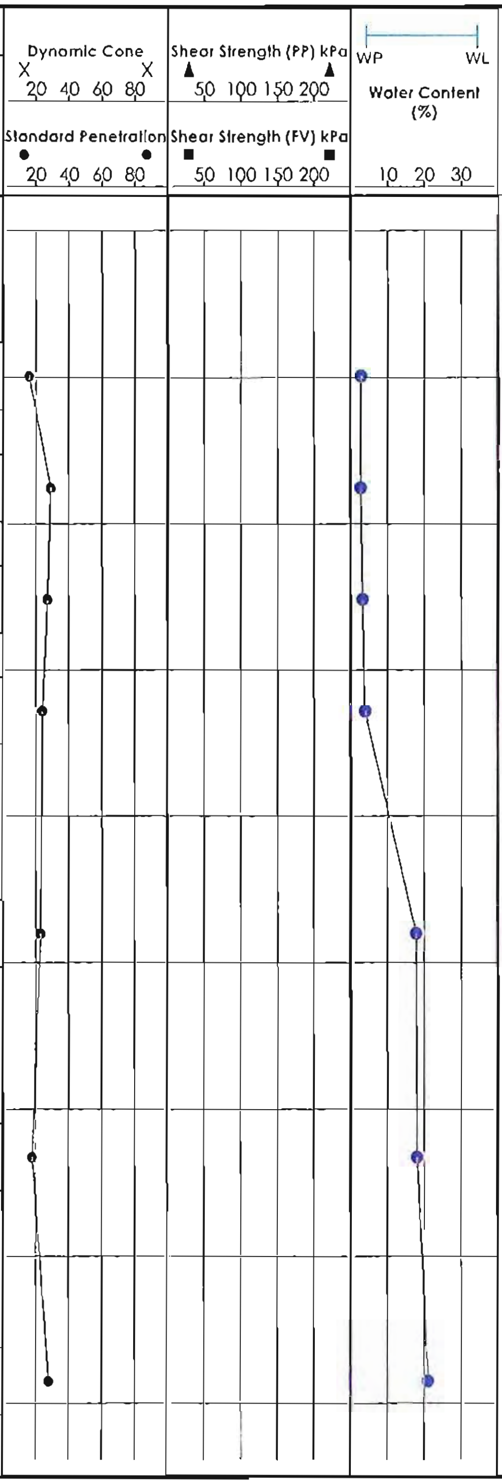
Drill Date: *2010-07-26*

SOIL PROFILE

Depth (m)	Description	Elevation (m)
	Ground Elevation	244.43
0.00	***TOPSOIL:*** dark brown sandy silt, moist	
	SAND: yellow rusty brown silty fine sand, moist	244.00
1.00	compact brown fine to medium sand, trace silt, damp	243.00
2.00		242.00
3.00		241.00
4.00		240.00
	saturated	
5.00		239.00
6.00		238.00
7.00		237.00
8.00	Borehole terminated at 8.08 m	

SAMPLE

Number	Type	N-Value
1	SS	16
2	SS	29
3	SS	27
4	SS	24
5	SS	23
6	SS	18
7	SS	28



Groundwater Observations and Standpipe Details

bentonite seal

19 mm pipe

August 6, 2010 water level at 4.98 m (Elev. 239.45 m)

1.98 m slotted screen

native cave

At drilling completion, wet cave at 4.88 m

Reviewed by: *TS*

Drill Method: *Solid Stem Auger*

Notes:

Field Tech.: *RM*

Sheet: *1 of 1*

Drafted by: *JG*

LVM

Borehole Number: 06-10

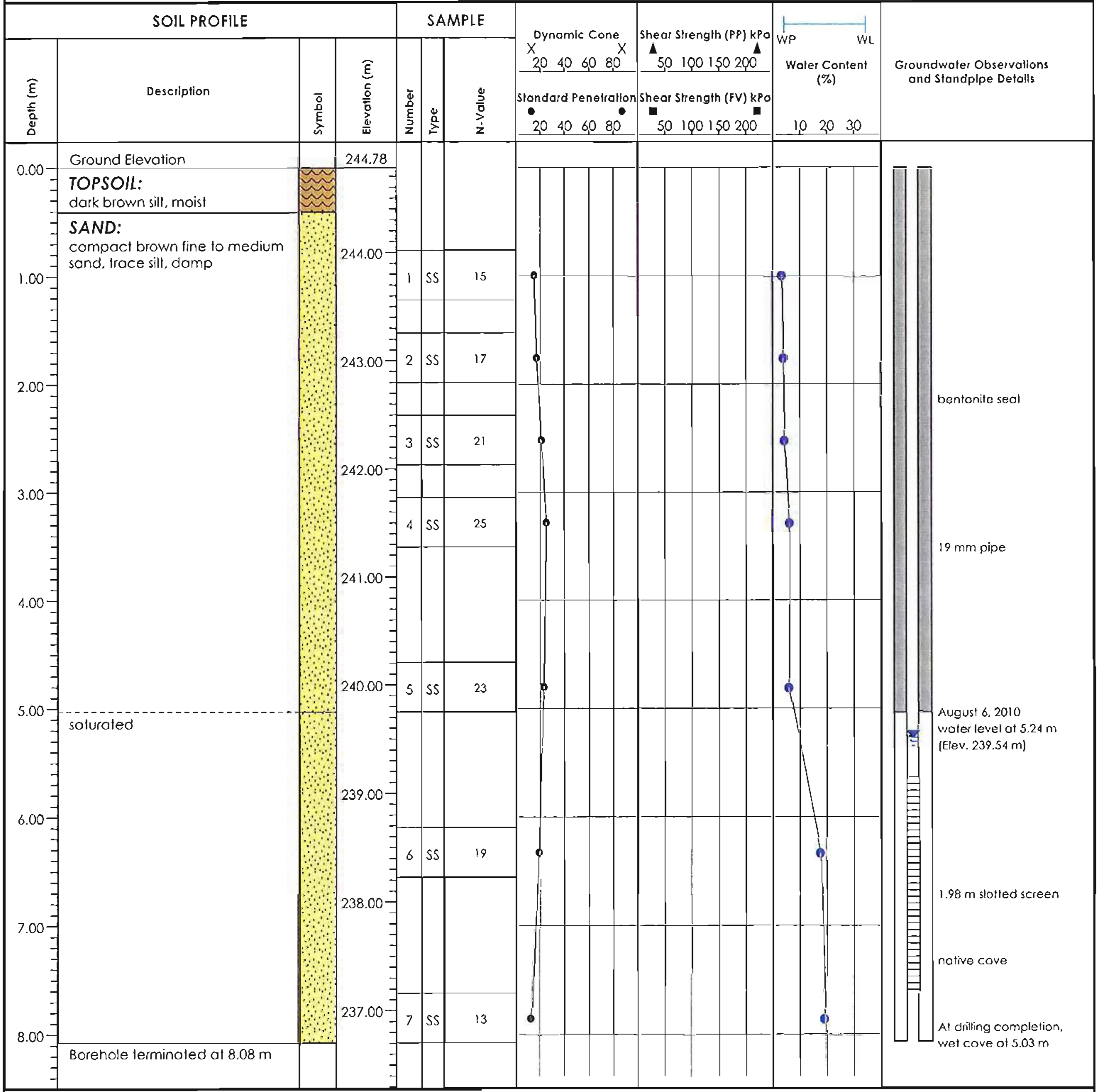
Ground Elevation: *244.78 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Location: *Yin Street, Waterford, Ontario*

Job No.: *161-P035511-0100*

Drill Date: *2010-07-26*



Ground Elevation

TOPSOIL:
dark brown silt, moist

SAND:
compact brown fine to medium sand, trace silt, damp

saturated

Borehole terminated at 8.08 m

Number	Type	N-Value
1	SS	15
2	SS	17
3	SS	21
4	SS	25
5	SS	23
6	SS	19
7	SS	13

bentonite seal

19 mm pipe

August 6, 2010
water level at 5.24 m
(Elev. 239.54 m)

1.98 m slotted screen

native cave

At drilling completion,
wet cave at 5.03 m

Reviewed by: *TS*

Drill Method: *Solid Stem Auger*

Notes: *Bulk sample taken from 1.22 to 2.44 m*

Field Tech.: *RM*

Sheet: *1 of 1*

Drafted by: *JG*

Borehole Number: 07-10

Ground Elevation: *248.32 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Location: *Yin Street, Waterford, Ontario*

Job No.: *161-P035511-0100*

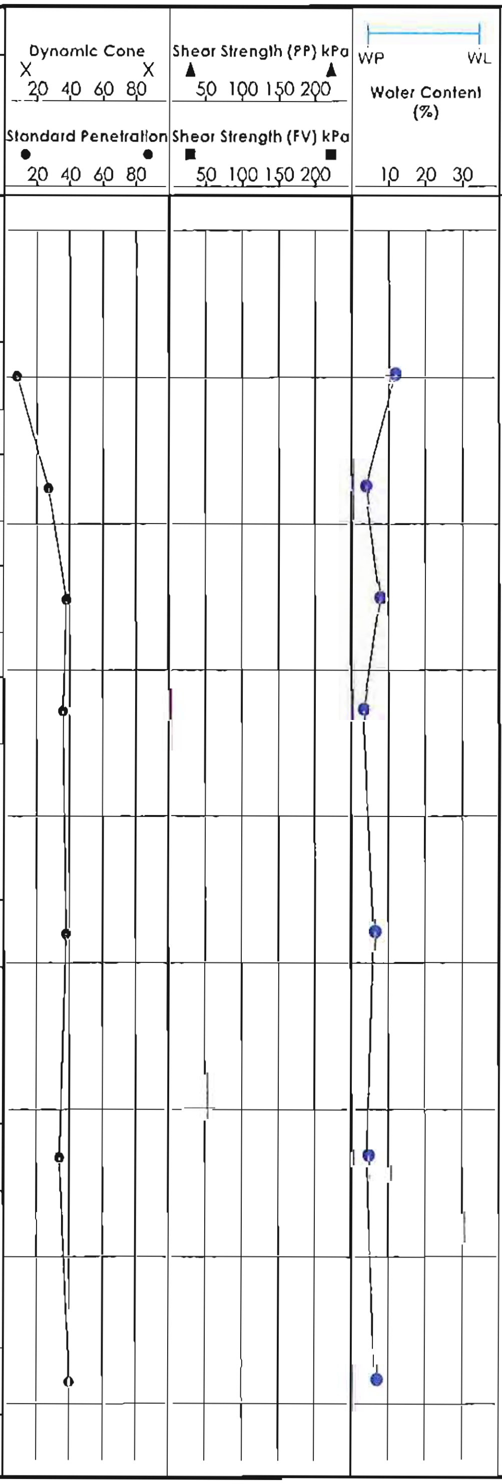
Drill Date: *2010-07-26*

SOIL PROFILE

Depth (m)	Description	Elevation (m)
	Ground Elevation	248.32
0.00	**TOPSOIL:** dark brown silt, moist	
	SAND: loose brown silty fine sand, damp to moist	
1.00	compact brown fine to medium sand, trace silt, damp	247.00
2.00	dense	246.00
3.00		245.00
4.00		244.00
5.00		243.00
6.00		242.00
7.00		241.00
8.00	Borehole terminated at 8.08 m	240.00

SAMPLE

Number	Type	N-Value
1	SS	8
2	SS	27
3	SS	38
4	SS	36
5	SS	38
6	SS	34
7	SS	40



Groundwater Observations and Standpipe Details

bentonite seal

At drilling completion, dry cave at 8.08 m

Reviewed by: *TS*

Drill Method: *Solid Stem Auger*

Notes:

Field Tech.: *RM*

Sheet: *1 of 1*

Drafted by: *JG*

LVM

Borehole Number: 08-10

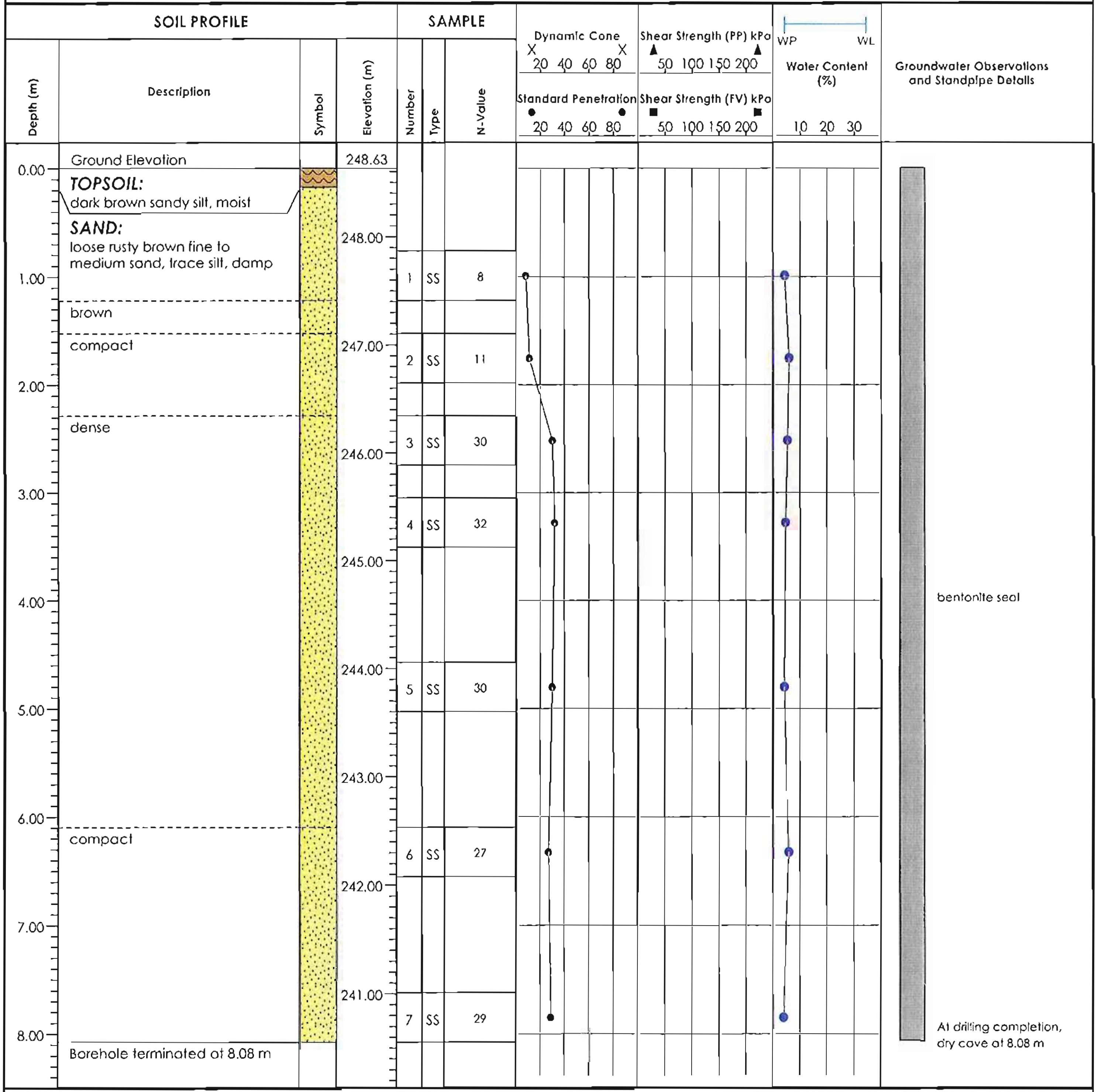
Ground Elevation: *248.63 m*

Project: *Yin Subdivision - Geotechnical Investigation*

Location: *Yin Street, Waterford, Ontario*

Job No.: *161-P035511-0100*

Drill Date: *2010-07-26*



Reviewed by: *TS*

Drill Method: *Solid Stem Auger*

Notes: *Bulk sample taken from 1.22 - 3.05 m*

Field Tech.: *RM*

Sheet: *1 of 1*

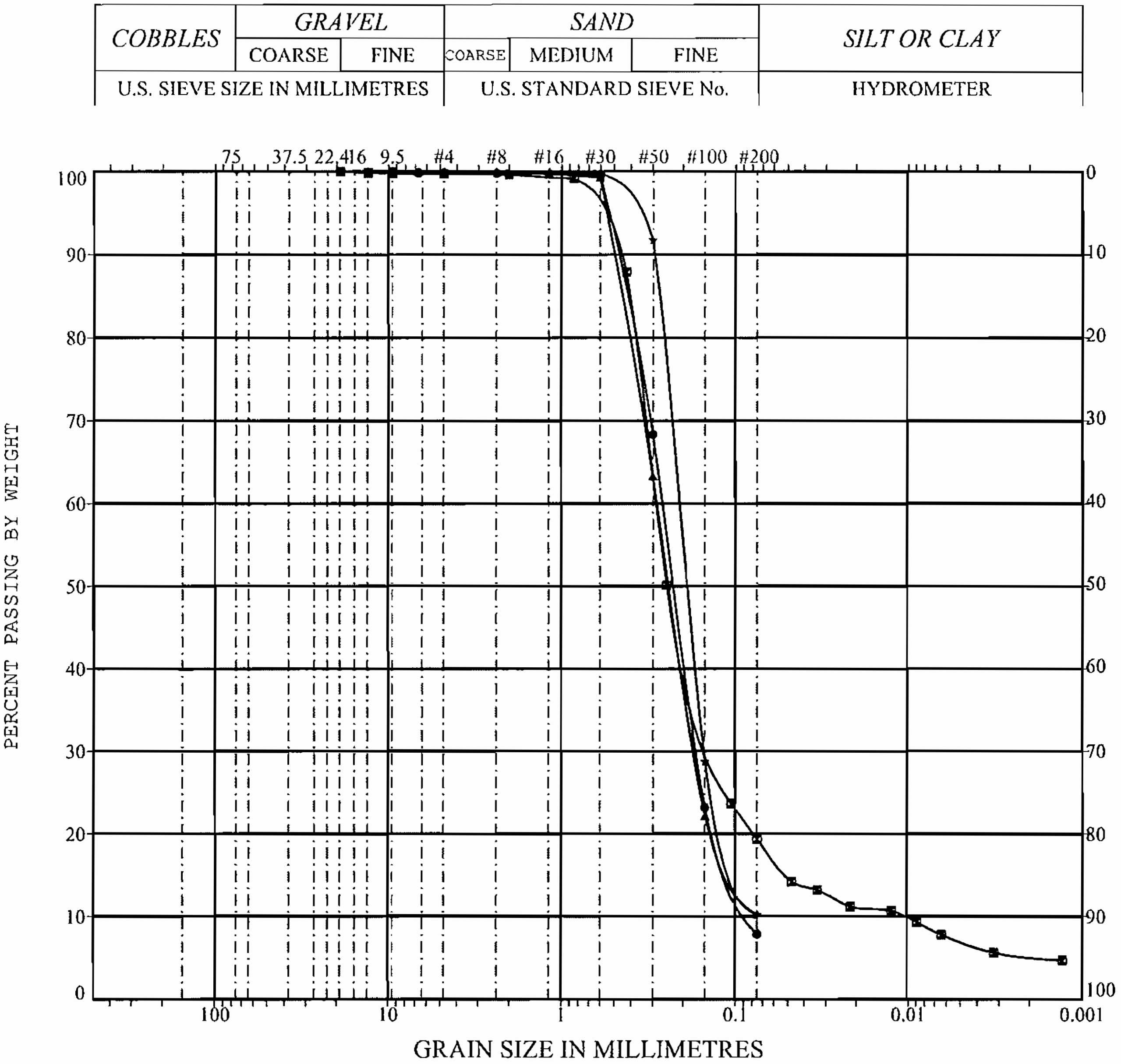
Drafted by: *JG*

Appendix 3 Figures

Figure 1: Particle Size Distribution Analyses
Figure 2 and 3: Standard Proctor Moisture-Density Test Results

LVM

UNIFIED SOIL CLASSIFICATION



PROJECT Yin Subdivision

LOCATION Yin Street, Waterford, Ontario JOB NO. P035511

CURVE ID	BOREHOLE/ TEST PIT	SAMPLE NO.	DEPTH (m)	SOIL DESCRIPTION
●	BH02-10	5	4.57-5.03	SAND, trace Silt
☒	BH04-10	BS	2.13-3.05	SAND, some Silt, trace Clay
▲	BH05-10	5	4.57-5.03	SAND, trace Silt
★	BH07-10	BS	1.22-2.44	SAND, trace Silt

REMARKS

LVM

Figure No. 1

FIGURE NO. 2

LVM

LABORATORY PROCTOR MOISTURE-DENSITY TEST

PROJECT Yin Subdivision

LOCATION Yin Street, Waterford, Ontario JOB NO. P035511-100

BOREHOLE NO. 04-10 DATE TESTED July 30, 2010

SAMPLE DEPTH 2.13-3.05 m TESTED BY L. Roberts

SOIL TYPE Sand, some Silt, trace Clay MOISTURE CONTENT 5.5%

REMARKS Particle Size Analysis shown on Figure 1.

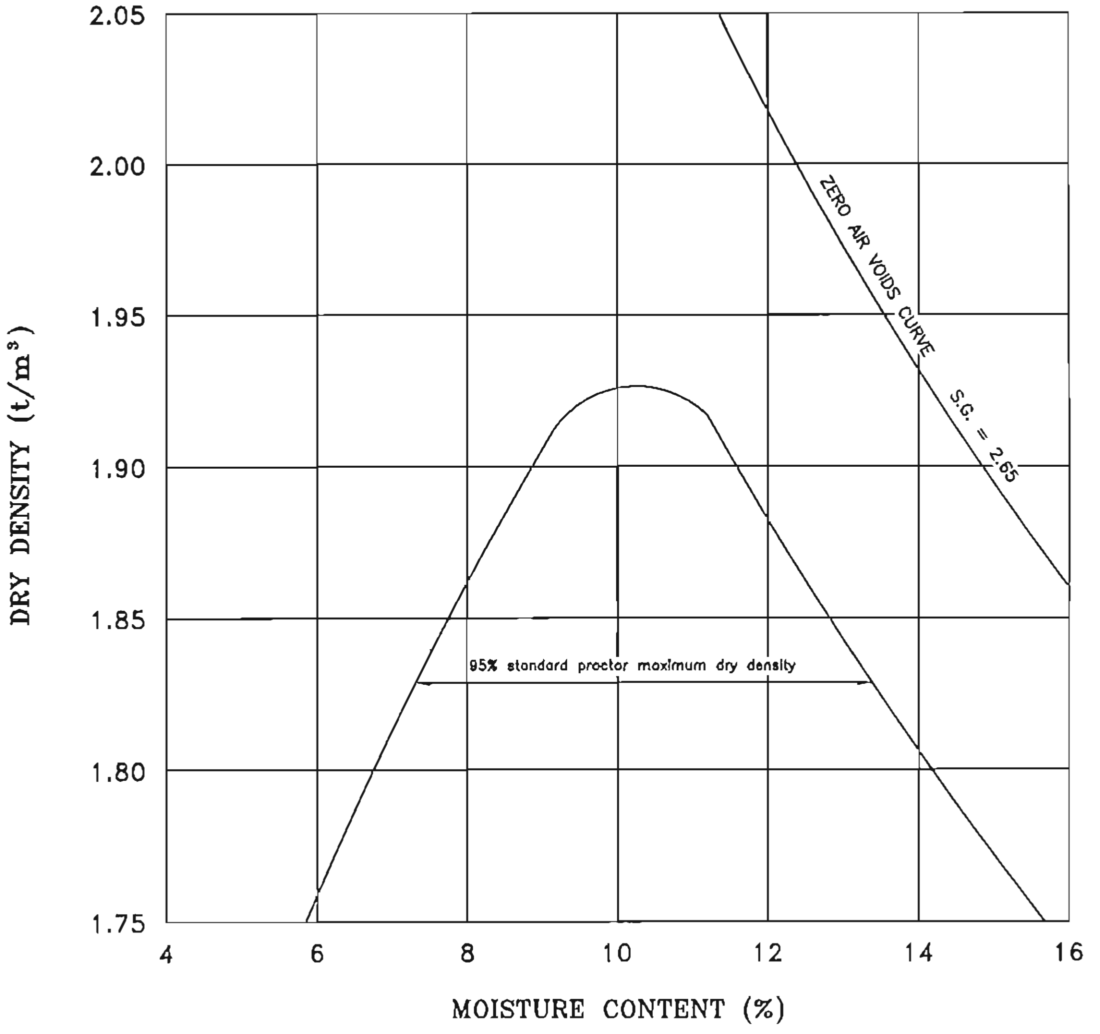
METHOD LS - 706

PROCEDURE: 1☑ 2☐ 3☐

Procedure 1 (Mold ø - 101.6 mm)
Procedure 2 (Mold ø - 101.6 mm)
Procedure 3 (Mold ø - 152.4 mm)

MAXIMUM DRY DENSITY 1.925 t/m³

OPTIMUM MOISTURE 10.4%



G:\161\P035511\z5_CAD\P035511-100_Figure02.dwg

FIGURE NO. 3

LVM

LABORATORY PROCTOR MOISTURE-DENSITY TEST

PROJECT Yin Subdivision

LOCATION Yin Street, Waterford, Ontario

JOB NO. P035511-100

BOREHOLE NO. 07-10

DATE TESTED July 30, 2010

SAMPLE DEPTH 1.22-2.44 m

TESTED BY L. Roberts

SOIL TYPE Sand, trace silt

MOISTURE CONTENT 5.4%

REMARKS Particle Size Analysis shown on Figure 1

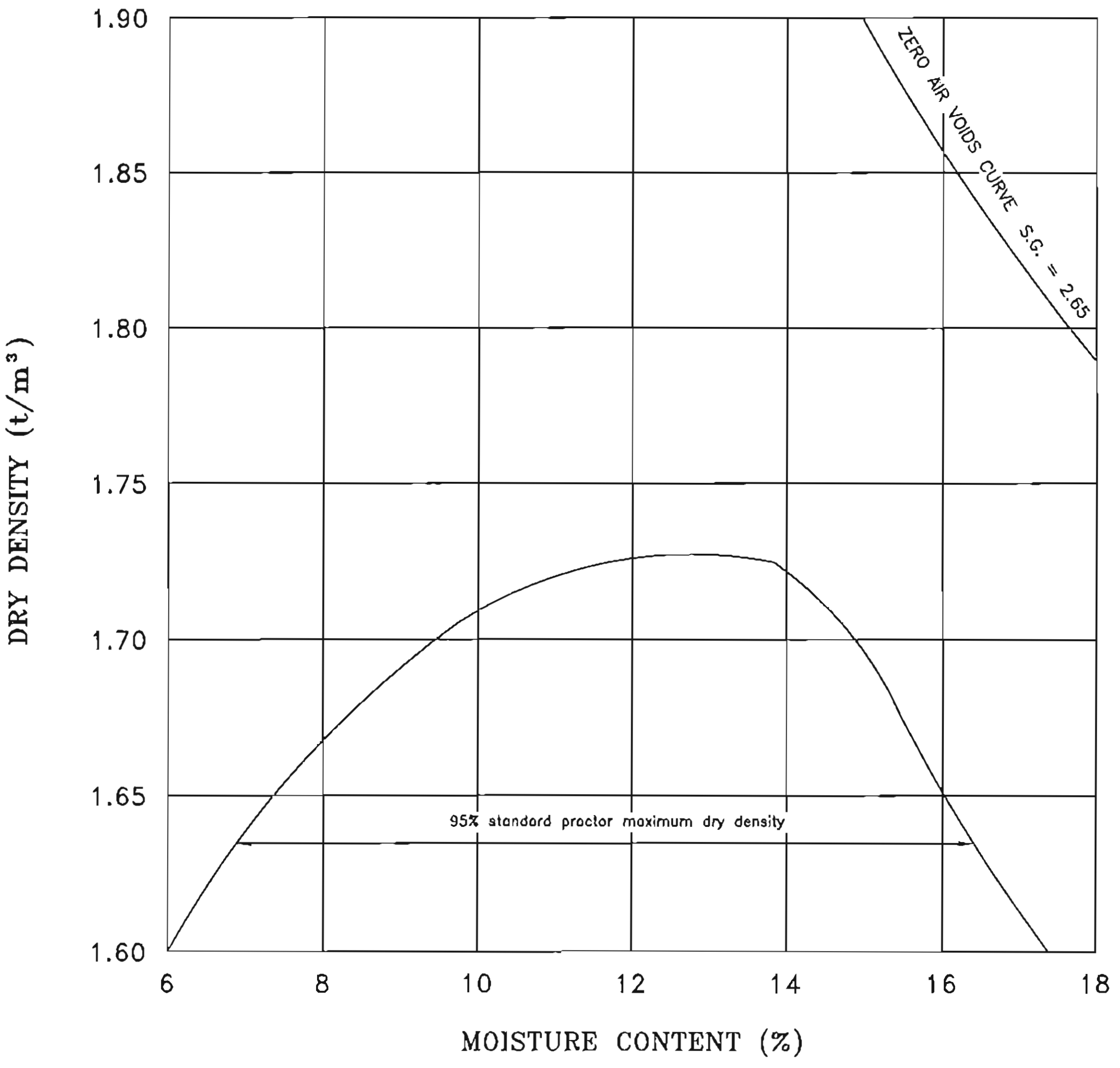
METHOD LS - 706

PROCEDURE: 1☑ 2☐ 3☐

Procedure 1 (Mold ø - 101.6 mm)
Procedure 2 (Mold ø - 101.6 mm)
Procedure 3 (Mold ø - 152.4 mm)

MAXIMUM DRY DENSITY 1.725 t/m³

OPTIMUM MOISTURE 12.5%



G:\161\P035511\z5_CAD\P035511-100_Figure03.dwg

Appendix 4 Site Photographs

Photographs: 1 to 7

Photo 1: Looking east towards BH-03-10, BH-04-10, and BH-05-10 in SWM Block.

Photo 2: Looking northeast from near southwest corner of site.

Photo 3: Looking northeast from near BH-03-10.

Photo 4: Looking northeast towards BH-08-10.

Photo 5: Looking southeast towards BH-03-10 and BH-05-10.

Photo 6: Looking north on old Highway 24 at BH-01-10.

Photo 7: Looking east towards BH-02-10 from existing parking lot.

Lam Boulevard & Old Highway 24 Development Traffic Impact Study Update

Paradigm Transportation Solutions Limited

July 2023
230332 (210680)

ptsl.com

Project Number
230332 (210680)

Date: July 2023
Version 1.0.0

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Lam Boulevard & Old Highway 24 Development Traffic Impact Study Update

<< Original Signed By >>

Rajan Philips, P.Eng.

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Executive Summary

Content

Paradigm Transportation Solutions Limited (Paradigm) completed a Traffic Impact Study (TIS) in January 2022[1] for a proposed Residential Development located at the northeast corner of Old Highway 24 and Lam Boulevard in Waterford, Norfolk County.

The January 2022 TIS was based on a Residential Development comprising 50 Townhouses and a single access located on Old Highway 24.

The Development Plan has since been changed, and this TIS Update has been prepared based on changes to the Development Plan. The new Development Plan provides for a Mixed-use Development comprising a two-storey commercial plaza and two three-storey residential buildings with 24 units. Two accesses are now proposed, one to Lam Boulevard and one to Old Highway 24.

This TIS Update includes an analysis of base year (2023) traffic conditions; a description of the proposed development; traffic forecasts for development opening year (2024), five years after development opening (2029), and ten years after development opening (2034); review of the proposed access spacing on Old Highway 24; and recommendations as required for improvements to address the traffic impacts of the proposed development.

Proposed Development

The proposed development will include a two-storey commercial plaza with 14,766 sq. ft. GFA, and two three-storey residential buildings with 24 units. Two accesses are proposed, one to Lam Boulevard and one to Old Highway 24.

The development is anticipated to be completed by 2024.

TIS Scope

The scope of the Traffic Impact Study for the proposed development includes:

- **Study Area Intersections:**

---

[1] Paradigm Transportation Solutions Limited, *Lam Boulevard & Old Highway 24 Townhouse Development, Traffic Impact Study*, January 2022.

  - Old Highway 24 and Lam Boulevard; and
  - Access intersections on Old Highway 24 and on Lam Boulevard.
- **Analysis Periods:** Weekday AM and PM peak hours.
- **Background Developments:** Mixed-Use development located at the southeast corner of Old Highway 24 and Lam Boulevard.
- **Traffic Conditions:** Base Year (2023), development completion (2024), five years after development completion (2029), and ten years after development completion (2034).

Conclusions

Based on the investigations carried out, it is concluded that:

- **Existing Traffic Conditions:** The intersection of Old Highway 24 and Lam Boulevard is currently operating at satisfactory levels of service (LOS A/B).
- **Development Trip Generation:** The development is forecast to generate 42 and 103 net new trips during the AM and PM peak hours, respectively.
- **Background Traffic Conditions:** The intersection of Old Highway 24 and Lam Boulevard is forecast to operate at acceptable levels of service under 2024, 2029, and 2034 background horizon years.
- **Total Traffic Conditions:** The intersection of Old Highway 24 and Lam Boulevard and the access intersections on Old Highway 24 and Lam Boulevard are forecast to operate at acceptable levels of service under 2024, 2029, and 2034 total horizon years.
- **Roadway Traffic Volumes:** The peak hour, peak direction traffic volume on Old Highway 24 is currently less than 350 vph, well within the lane capacity of 900 vph. Under the 2034 total traffic conditions, the peak hour, peak direction traffic volume will increase to less than 450 vph and will be within the lane capacity of 900 vph. The projected increase will have minimal impacts on Old Highway 24 traffic flows.
- **Old Highway 24 and Lam Boulevard:** An auxiliary southbound left-turn lane is not warranted under 2034 total traffic conditions.
- **Site Driveways:** Operational analysis and review of driveway geometry indicates the following:
  - The driveway traffic movements register acceptable levels of service.

- A southbound auxiliary left-turn lane is not warranted on Old Highway 24 at the site driveway.
- An eastbound auxiliary left-turn lane is not warranted on Lam Boulevard at the site driveway.
- The location of the driveway on Old Highway 24 is 66 metres from the Old Highway 24/Lam Boulevard intersection, which satisfies the corner clearance requirement of 35 metres recommended by TAC design guidelines.

Recommendations

Based on the findings of this study, it is recommended that the subject development be considered for approval as proposed.

Contents

Appendices

Figures

Tables

1 Introduction

1.1 Overview

Paradigm Transportation Solutions Limited (Paradigm) completed a Traffic Impact Study (TIS) in January 2022[2] for a proposed Residential Development located at the northeast corner of Old Highway 24 and Lam Boulevard in Waterford, Norfolk County. **Figure 1.1** details the subject development location.

The January 2022 TIS was based on a Residential Development comprising 50 Townhouses and a single access located on Old Highway 24.

The Development Plan has since been changed, and this TIS Update has been prepared based on changes to the Development Plan. The new Development Plan provides for a Mixed-use Development comprising a two-storey commercial plaza and two three-storey residential buildings with 24 units. Two accesses are now proposed, one to Lam Boulevard and one to Old Highway 24.

The proposed development will include a two-storey commercial plaza with 14,766 sq. ft. GFA, and two three-storey residential buildings with 24 units. Two accesses are proposed, one to Lam Boulevard and one to Old Highway 24.

The development is anticipated to be completed by 2024.

1.2 Purpose and Scope

The purpose of this report is to identify and assess the potential traffic impact resulting from the proposed development. The scope of the study update is the same as the scope for the January 2022 TIS, shared with Norfolk County staff via e-mail in November 2021, and includes:

- assessment of the current traffic and site conditions within the study area;
- estimates of background traffic growth for development completion (2024), five years after development completion (2029), and ten years after development completion (2034);
- the Mixed-Use development at the southeast corner of Old Highway 24 and Lam Boulevard is included in the background

---

[2] Paradigm Transportation Solutions Limited, *Lam Boulevard & Old Highway 24 Townhouse Development, Traffic Impact Study*, January 2022.

traffic forecasts and consists of a five-storey residential building with 44 units, a 5,005 sq. ft. fast food restaurant with drive-through, and a 9,426 sq. ft. commercial building;

- estimates of additional traffic generated by the subject site;
- analyses of the impact of the future traffic on the surrounding road network, including the following study area intersections and roadways:
  - Old Highway 24 and Lam Boulevard;
  - access intersections on Old Highway 24 and on Lam Boulevard; and
  - roadway traffic volumes – Old Highway 24 and Lam Boulevard.
- recommendations, if necessary, to mitigate the site generated traffic in a satisfactory manner.

Appendix A contains the pre-study consultation material.

This study has been prepared in accordance with the requirements detailed by the Norfolk County TIS Guidelines[3].

---

[3] Norfolk County Integrated Sustainable Master Plan (ISMP), Appendix J: TIS Guidelines, September 2016.

Source: Google Maps

paradigm
TRANSPORTATION SOLUTIONS LIMITED

Location of Subject Site

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

Figure 1.1

2 Existing Conditions

2.1 Existing Roadways

The main roadways near the subject site considered in assessing the traffic impacts of the development include:

- **Old Highway 24 (Highway 24)** is a north-south arterial road[4] with a two-lane cross section and a posted speed limit of 60 km/h. Approximately two-metre gravel shoulders are provided along both sides of the road. The nearest intersections to Lam Boulevard along Old Highway 24 are Thompson Road, approximately 560 metres north, and Blueline Road, approximately 510 metres south. Neither intersection is likely to be impacted by traffic from the proposed development.
- **Lam Boulevard** is an east-west local road with a two-lane cross section. The speed limit is not posted; therefore, it is assumed the statutory speed limit of 50 km/h governs. A sidewalk is provided along the north side of the road. Lam Boulevard terminates approximately 575 metres east of Old Highway 24.

Figure 2.1 displays the traffic control and lane configuration at the Old Highway 24 and Lam Boulevard intersection.

---

[4] Norfolk County Official Plan Schedule E-2: Transportation, Revised October 2018.

Existing Lane Configuration and Traffic Control

Figure 2.1

2.2 Transit Service

Norfolk County operates Ride Norfolk Transit, which provides fixed route transit service in Waterford via the Brantford route on weekdays. The stops in Waterford are located at Waterford Medical on Sovereign Street, Waterford Library, and Waterford Plaza.

The Brantford route operates three times per day Monday through Friday and departs the Simcoe Library at 9:15 AM, 1:15 PM, and 3:20 PM. The Delhi and Waterford route operates five times every Monday to Delhi.

The service costs $2.50 to travel within Waterford and $6.00 to travel to other towns in Norfolk County.

The nearest transit stops to the subject site are located approximately 175 metres north of Lam Boulevard in the Waterford Plaza.

Figure 2.2 illustrates the location of the Brantford transit route in Waterford.

2.3 Traffic Volumes

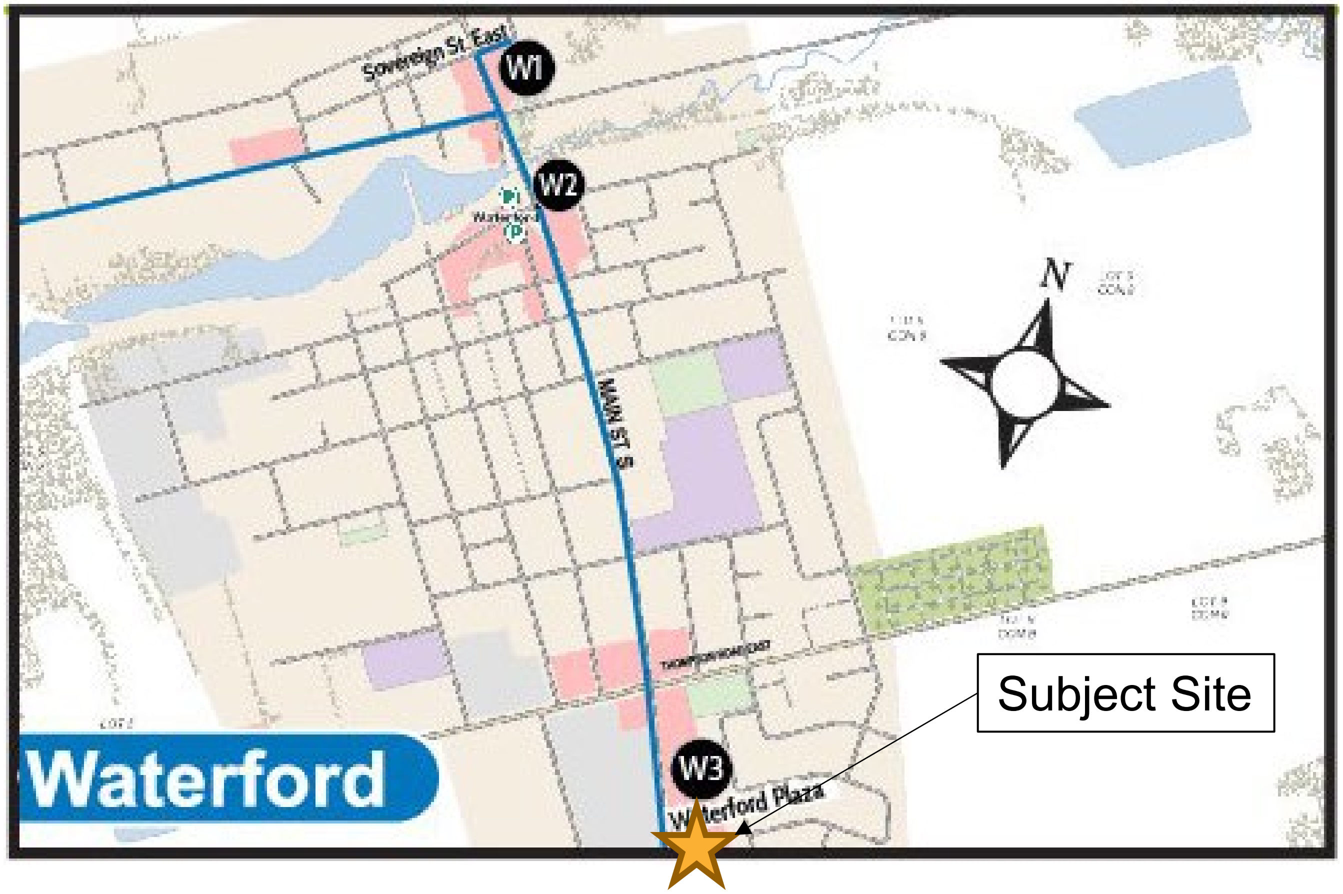
Paradigm conducted intersection traffic counts on 14 September 2021. These counts were used in the January 2022 TIS. Intersection traffic counts were conducted again on 17 May 2022 to determine if the September 2021 traffic counts would have been impacted by COVID-19 restrictions. However, road traffic volumes based on the September 2021 traffic counts were found to be slightly higher than the volumes based on the counts in May 2022. As such, the traffic counts from 14 September 2021 are used as base year traffic volumes in this TIS Update and are grown to a base year 2023 using a 1.5% per annum growth rate.

Figure 2.3 illustrates the base year (2023) AM (8:15 AM – 9:15 AM) and PM (4:00 PM – 5:00 PM) weekday peak hour turning movement traffic volumes based on 14 September 2021 traffic counts.

It is noted that the peak hour, peak direction traffic volume on Old Highway 24 is less than 350 vehicles per hour (vph) and well within the lane capacity of 900 vph.

The peak hour, peak directional volume on Lam Boulevard is noted to be 53 vph.

Appendix B contains the detailed traffic counts for the study area intersections.

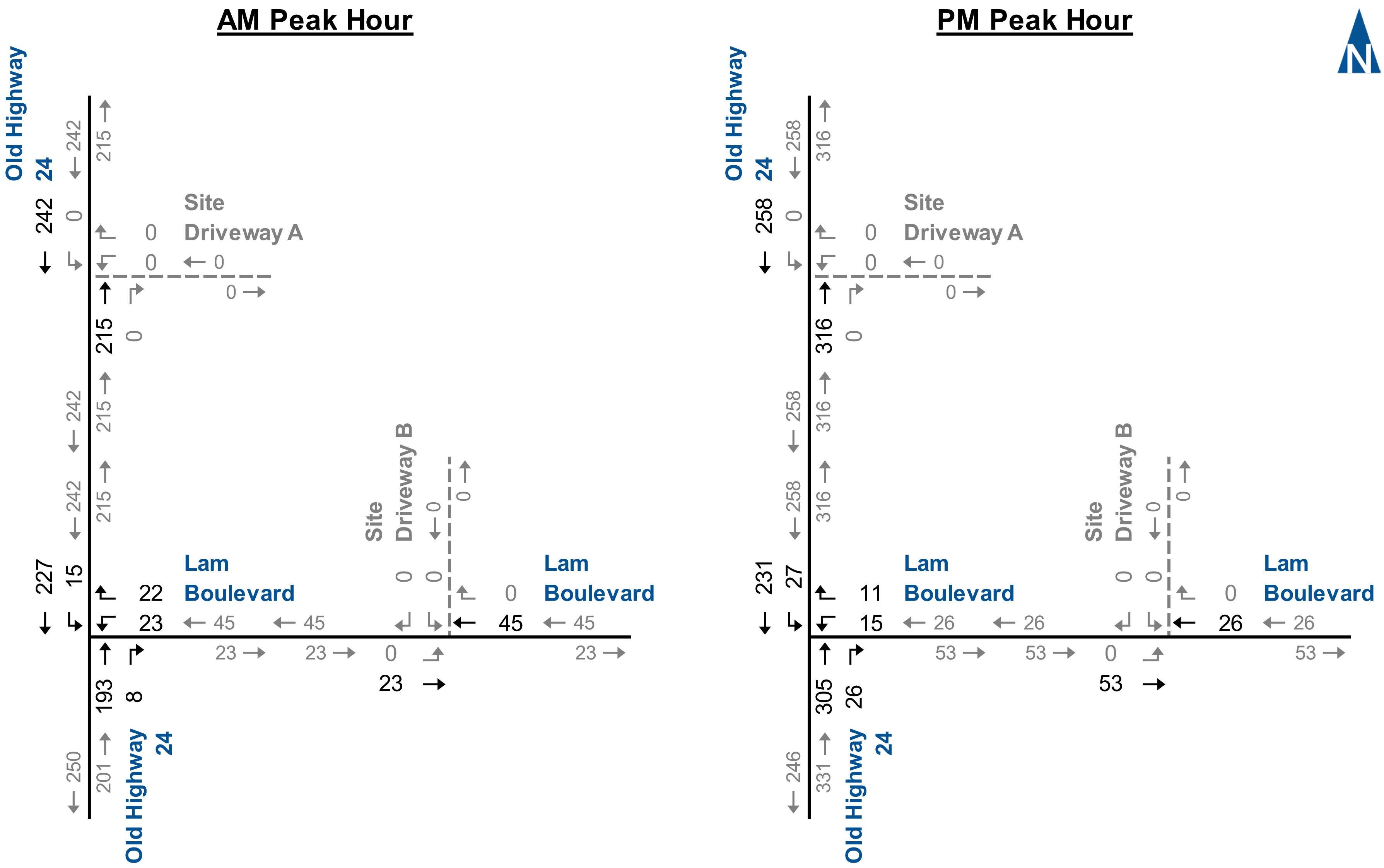


NTS
Source: Ride Norfolk Transit

Existing Transit Network

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

Figure 2.2



Base Year (2023) Traffic Volumes

Figure 2.3

2.4 Traffic Operations

The level of service conditions at the study area intersection has been assessed using Synchro 11. As per the County's TIS guidelines, movements at signalized intersections with a volume to capacity (v/c) ratio greater than 0.85 is considered critical. As the TIS guidelines do not specify a threshold for unsignalized intersections, it is assumed that movements with Level of Service (LOS) 'F' are deemed critical.

Intersection LOS is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles intending to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on a number of criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections, 50 seconds for unsignalized intersections or when the v/c ratio is greater than 1.00, the movement is classed as LOS F and remedial measures are usually implemented, if they are feasible. LOS E is usually used as a guideline for the determination of road improvement needs on through lanes, while LOS F may be acceptable for left-turn movements at peak times, depending on delays.

Table 2.1 summarizes the results of the intersection operational analysis under existing conditions, including the AM and PM peak hour LOS, v/c ratios, and 95th percentile queues experienced.

The results indicate that the intersection of Old Highway 24 and Lam Boulevard is operating at LOS A/B and within capacity.

Appendix C contains the detailed Synchro 11 reports.

TABLE 2.1: BASE YEAR (2023) TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					12		>	**12**		0	>	**0**	<	8		**0**	
			V/C					0.10		>			0.00	>		<	0.01			
			Q					2		>			0	>		<	0			
PM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.07		>			0.00	>		<	0.03			
			Q					2		>			0	>		<	1			

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

3 Development Concept

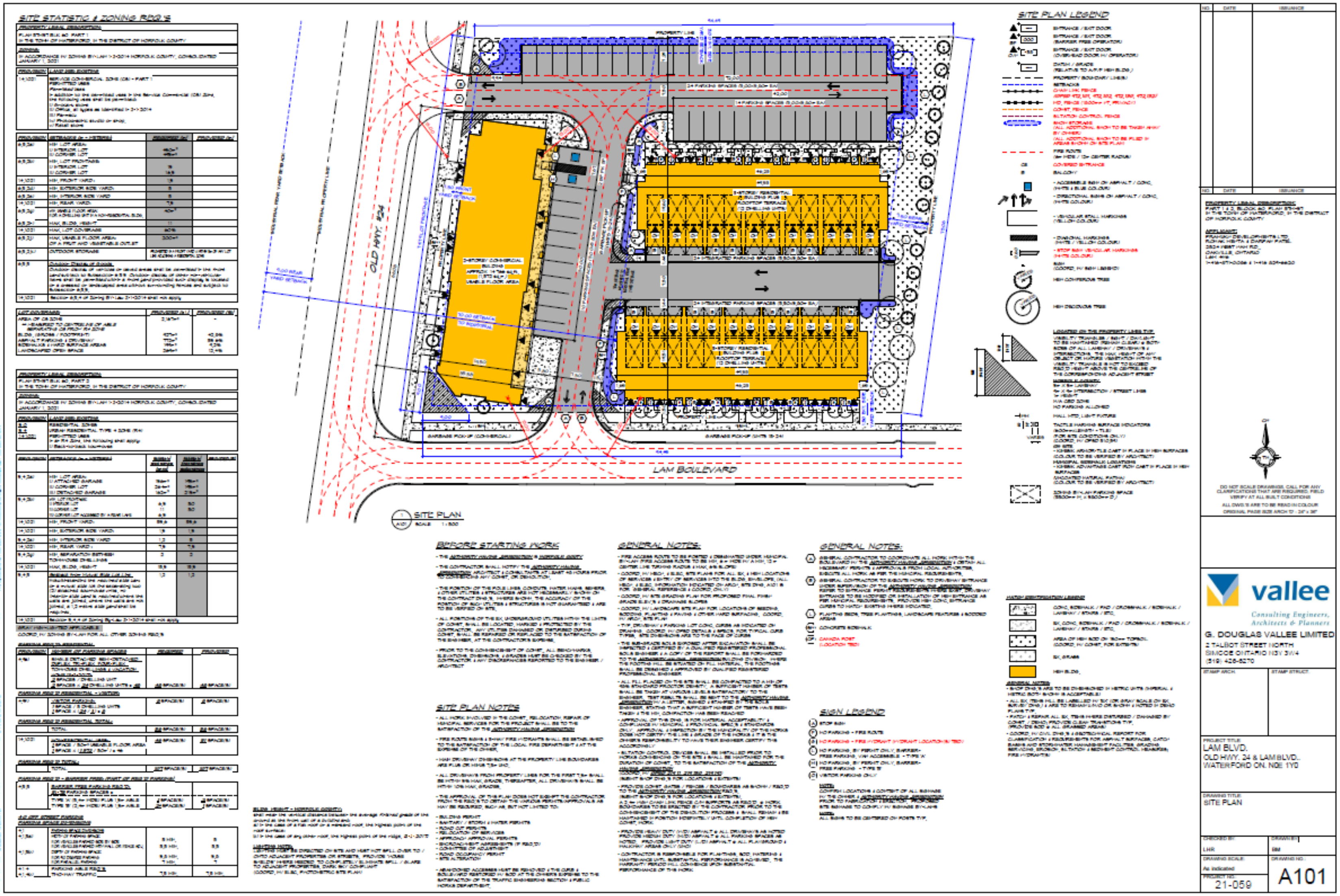
3.1 Development Description

The proposed development will include a two-storey commercial plaza with 14,766 sq. ft. GFA, and two three-storey residential buildings with 24 units. Two accesses are proposed, one to Lam Boulevard and one to Old Highway 24.

The development is anticipated to be completed by 2024.

Figure 3.1 shows the proposed site plan.

The driveway on Old Highway 24 is located at 66 metres from the Old Highway 24/Lam Boulevard intersection, which satisfies the corner clearance requirement of 35 metres recommended by TAC design guidelines.



Proposed Site Plan

Figure 3.1

3.2 Development Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation Manual[5] provides rates and equations used to estimate the peak hour traffic volumes generated by the subject development based on the following ITE Land Use Codes:

- 215, Single-Family Attached Housing; and
- 822, Strip Retail Plaza (<40k).

Table 3.1 summarizes the forecast number of net new trips generated by the proposed development.

Internal capture trips have been estimated using the National Cooperative Highway Research Program (NCHRP)[6] Internal Trip Capture Estimation Tool included in **Appendix D** contains the internal capture (trips within the development between the retail and restaurant uses).

TABLE 3.1: TRIP GENERATION

Land Use Code	Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
215: Single-Family Attached Housing	24	0.48	2	5	**7**	0.57	6	4	**10**
822: Strip Retail Plaza (<40k)	14,766 sq. ft.	2.36	21	14	**35**	Eq	52	51	**103**
Internal Trips		-	*0*	*0*	***0***	-	*-5*	*-5*	***-10***
Total Trip Generation			**23**	**19**	**42**		**53**	**50**	**103**

LUC 215 | **AM:** T = 0.52(X) - 5.70 | **PM:** T = 0.60(X) - 3.93

LUC 822 | **PM:** Ln(T) = 0.71 Ln(X) + 2.72

3.3 Development Trip Distribution and Assignment

The trip distribution was determined based on existing travel patterns along Old Highway 24. **Table 3.2** displays the breakdown of trip distributions used in this study.

---

[5] Institute of Transportation Engineers Trip Generation Manual 11th Edition, September 2021.

[6] NCHRP, “Enhancing Internal Trip Capture Estimation for Mixed-Use Developments”, 2010.

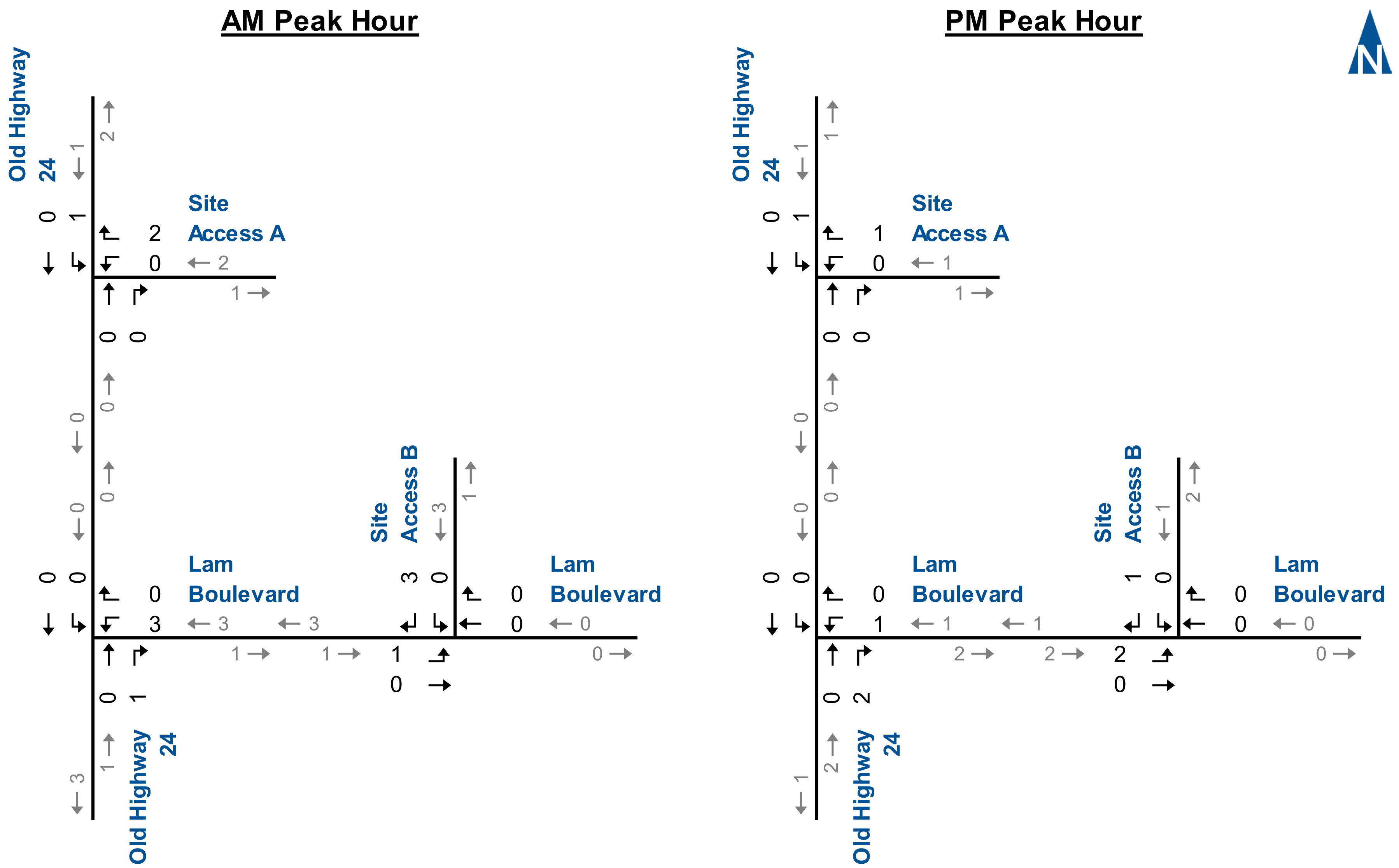
TABLE 3.2: ESTIMATED TRIP DISTRIBUTION

To/From	AM Peak Hour		PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
North via Old Highway 24	56%	49%	46%	58%
South via Old Highway 24	44%	51%	54%	42%
Total	**100%**	**100%**	**100%**	**100%**

Figure 3.2a and **Figure 3.2b** illustrate the site-generated traffic volumes for the residential and commercial use, respectively. The site trips for the respective land uses were assigned to the site driveways based on logical routing.

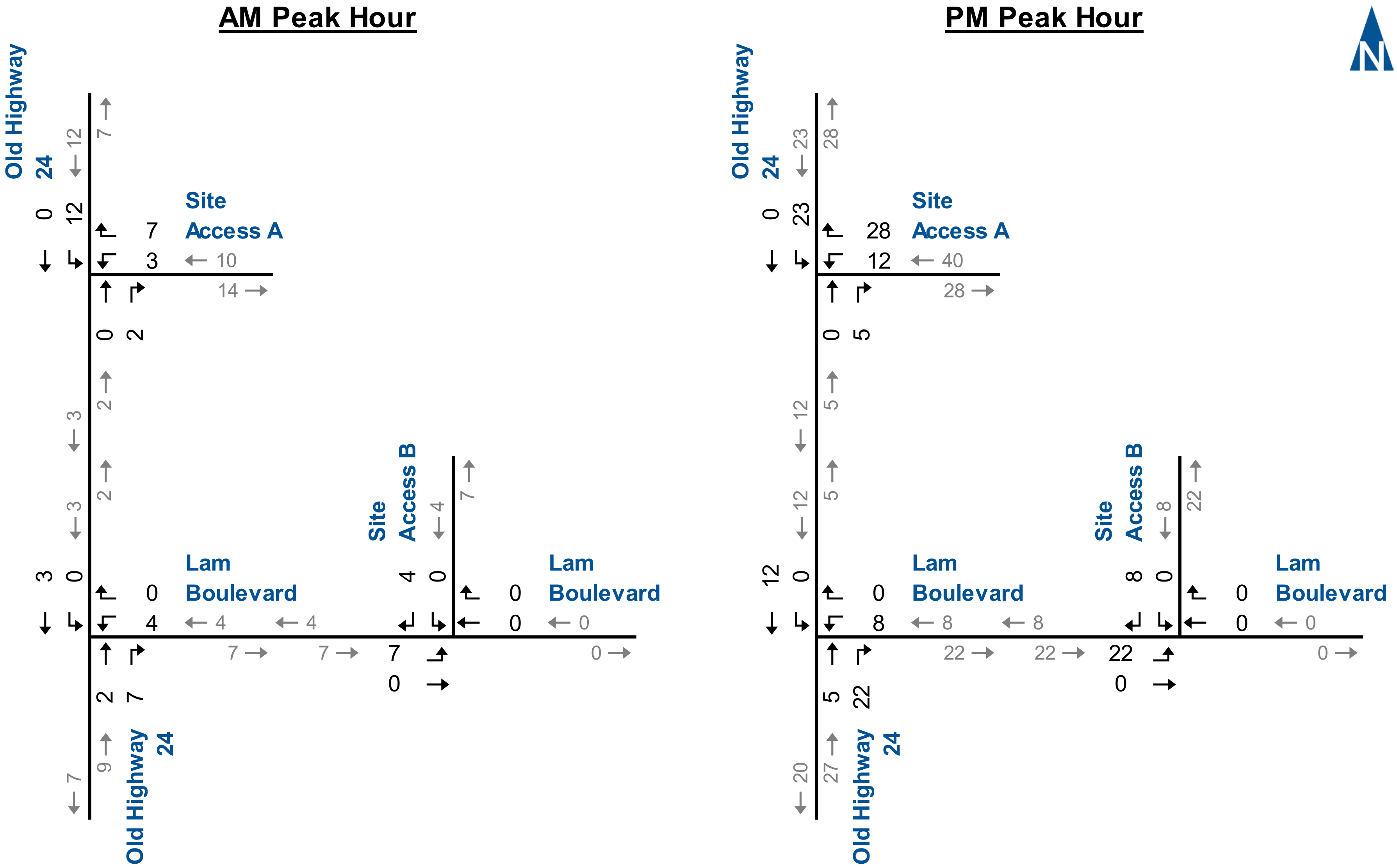
Figure 3.2c illustrates the combined (**Figure 3.2a** and **Figure 3.2b**) net site-generated traffic volumes for the two land uses for AM and PM peak hours.

It is noted that the access to the development on Old Highway 24 is located to the north of the intersection at Lam Boulevard. The southbound left-turn movements from Old Highway 24 to the development are more likely to use the access (Driveway A) on Old Highway 24 than turn left at Lam Boulevard, as indicated in **Figure 3.2c**.



Site Generated Traffic Volumes Residential Land Uses

Figure 3.2a



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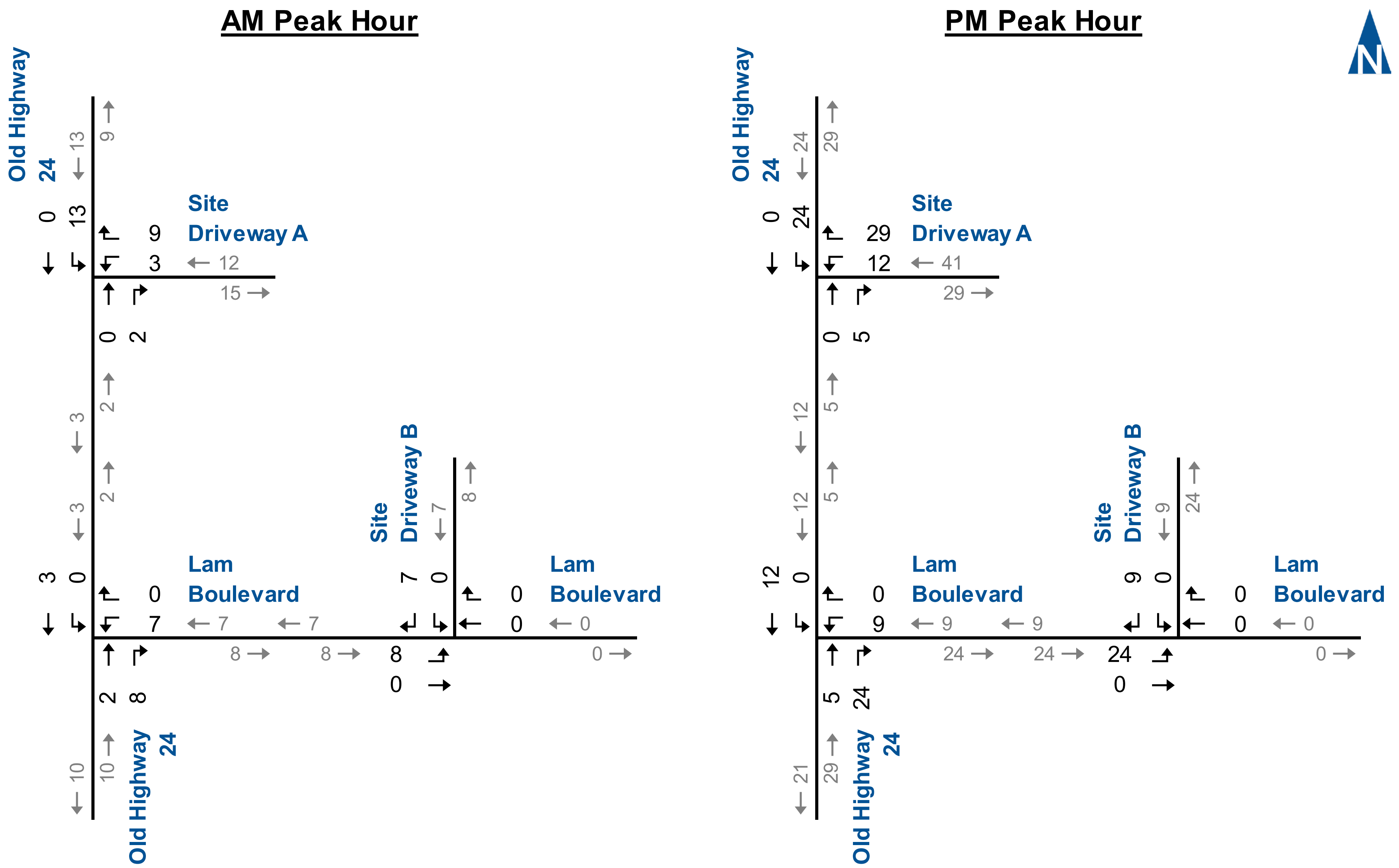
Site Generated Traffic Volumes Commercial Land Uses

Figure 3.2b



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Net Site Generated Traffic Volumes

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

Figure 3.2c

4 Evaluation of Future Traffic Conditions

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic volumes, and the analyses for the year of development opening (2024), five years after opening (2029), and ten years after opening (2034).

4.1 Background Traffic Forecasts

In order to derive the generalized background traffic volumes, a growth rate of 1.5% was applied to the existing roadway traffic volumes, similar to the traffic study at the southeast corner of Old Highway 24 and Lam Boulevard.

4.1.1 Other Area Developments

The proposed development at the southeast corner of Old Highway 24 and Lam Boulevard, which was included in the January 2022 TIS for estimating background traffic is again included in the TIS Update based on its new Development Plan.

Figure 4.1 illustrates the location of the background development.

The now proposed Mixed-Use development will include a five-storey residential building with 44 units, a 5,005 sq. ft. fast food restaurant with drive-through, and a 9,426 sq. ft. commercial building and is expected to be completed by 2024.

The TIS Update completed by Paradigm[7] for this location indicates the development is forecast to generate 131 trips during the AM peak hour and 94 trips during the PM peak hour.

Appendix E contains the background development traffic volumes.

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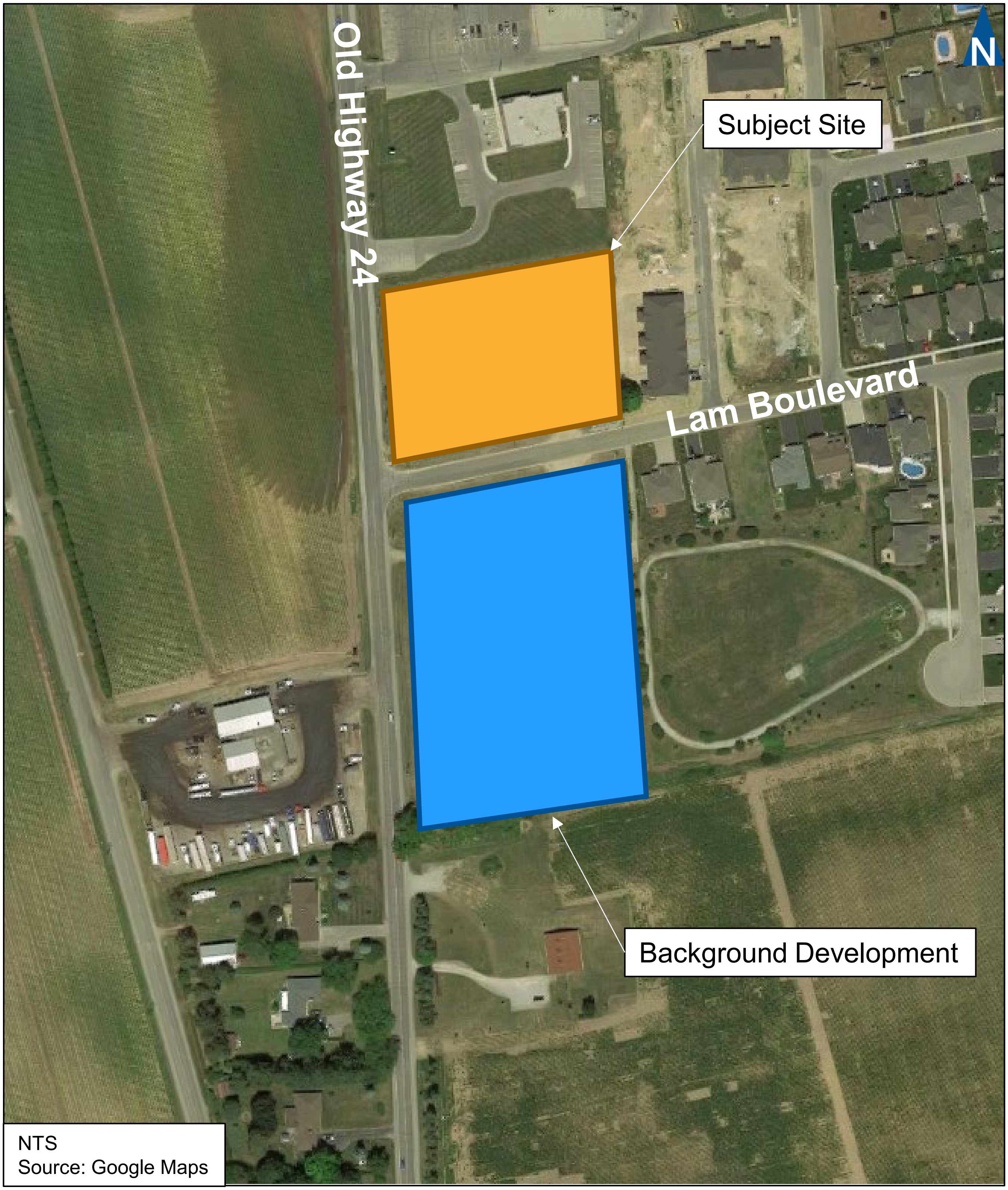
[7] Paradigm Transportation Solutions Limited, *Orchard Square Development, Transportation Impact Study Update*, June 2023.



Background Development Location

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

Figure 4.1

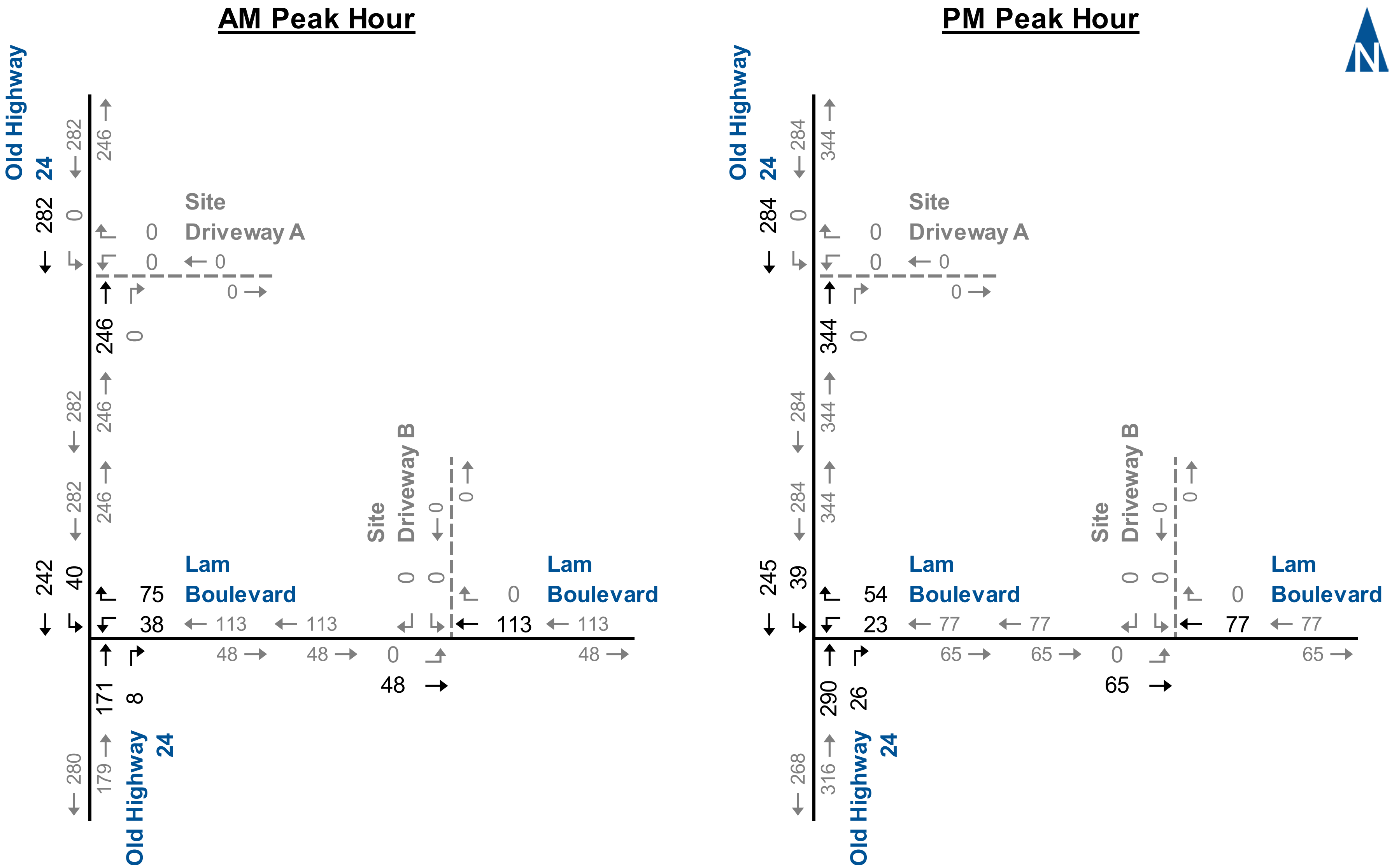
4.2 2024 Background Traffic Operations

Figure 4.2 illustrates the 2024 background traffic volumes, including road traffic growth and other area development traffic.

The 2024 background traffic volumes have been analyzed using the same methodology as under existing traffic conditions.

Table 4.1 summarizes the results of the 2024 background traffic operations. The results indicate that the intersection of Old Highway 24 and Lam Boulevard is forecast to operate at acceptable levels of service and within capacity during the AM and PM peak hours.

Appendix F contains the supporting detailed Synchro 11 reports.



2024 Background Traffic Volumes

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

Figure 4.2

TABLE 4.1: 2024 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
AM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.23		>			0.00	>		<	0.04			
			Q					7		>			0	>		<	1			
PM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.17		>			0.00	>		<	0.04			
			Q					4		>			0	>		<	1			

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

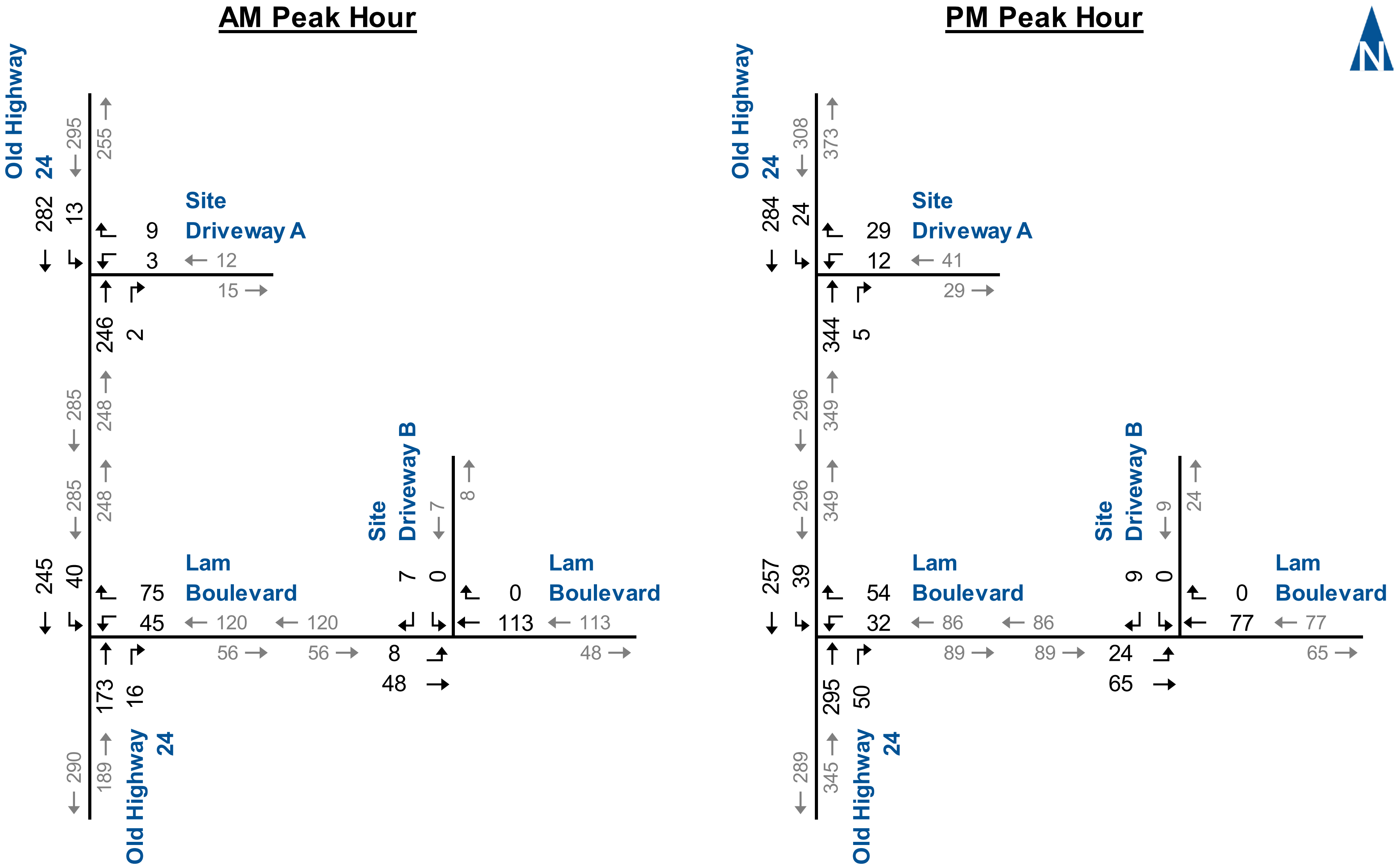
4.3 2024 Total Traffic Operations

Figure 4.3 illustrates the 2024 total traffic volumes, including trips generated by the proposed development.

The 2024 total traffic volumes have been analyzed using the same methodology as under existing and background traffic conditions.

Table 4.2 summarizes the results of the 2024 total traffic operations. The results indicate that the intersection of Old Highway 24 and Lam Boulevard and the access intersections to Old Highway 24 and Lam Boulevard are forecast to operate at acceptable levels of service during the AM and PM peak hours.

Appendix G contains the supporting detailed Synchro 11 reports.



2024 Total Traffic Volumes

Figure 4.3

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

TABLE 4.2: 2024 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Old Highway 24 & Site Driveway A	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					11		>	**11**		0	>	**0**	<	8		**0**	
			V/C					0.02		>			0.00	>		<	0.01			
			Q					1		>			0	>		<	0			
	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.26		>			0.00	>		<	0.04			
			Q					8		>			0	>		<	1			
	Lam Boulevard & Site Driveway B	TWSC	LOS	<	A		**A**		A	>	**A**					A		>	**A**	
			Delay	<	8		**1**		0	>	**0**					9		>	**9**	
			V/C	<	0.01				0.00	>						0.01		>		
			Q	<	0				0	>						0		>		
PM Peak Hour	Old Highway 24 & Site Driveway A	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					12		>	**12**		0	>	**0**	<	8		**1**	
			V/C					0.08		>			0.00	>		<	0.02			
			Q					2		>			0	>		<	1			
	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					14		>	**14**		0	>	**0**	<	8		**1**	
			V/C					0.20		>			0.00	>		<	0.04			
			Q					6		>			0	>		<	1			
	Lam Boulevard & Site Driveway B	TWSC	LOS	<	A		**A**		A	>	**A**					A		>	**A**	
			Delay	<	7		**2**		0	>	**0**					9		>	**9**	
			V/C	<	0.02				0.00	>						0.01		>		
			Q	<	1				0	>						0		>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

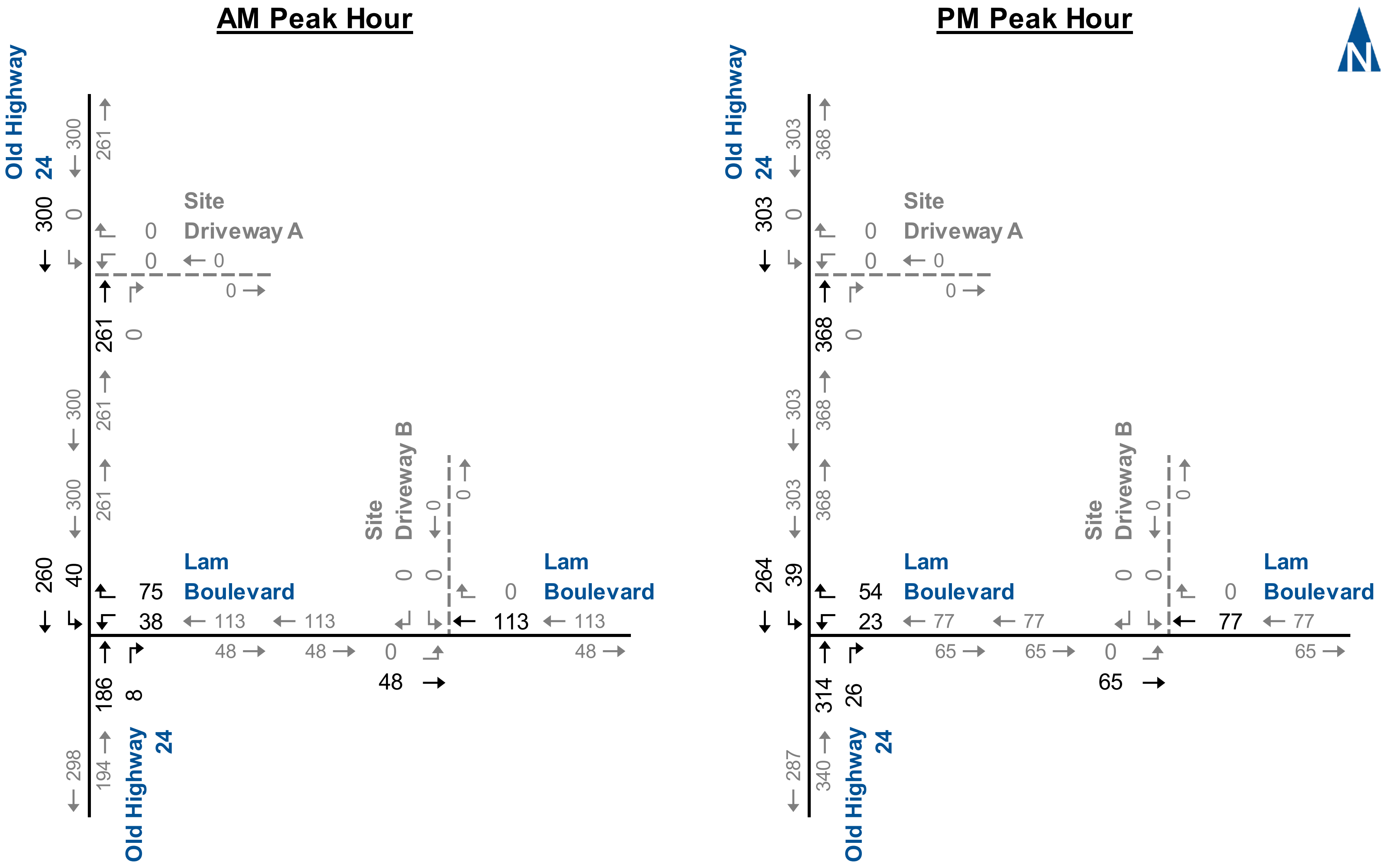
4.4 2029 Background Traffic Operations

Figure 4.4 illustrates the 2029 background traffic volumes, including road traffic growth and other area development traffic.

The 2029 background traffic volumes have been analyzed using the same methodology as under existing traffic conditions.

Table 4.3 summarizes the results of the 2029 background traffic operations. The results indicate that the intersection of Old Highway 24 and Lam Boulevard is forecast to operate at acceptable levels of service and within capacity during the AM and PM peak hours.

Appendix H contains the supporting detailed Synchro 11 reports.



2029 Background Traffic Volumes

Figure 4.4

TABLE 4.3: 2029 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.24		>			0.00	>		<	0.04			
			Q					7		>			0	>		<	1			
PM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					14		>	**14**		0	>	**0**	<	8		**1**	
			V/C					0.18		>			0.00	>		<	0.04			
			Q					4		>			0	>		<	1			

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

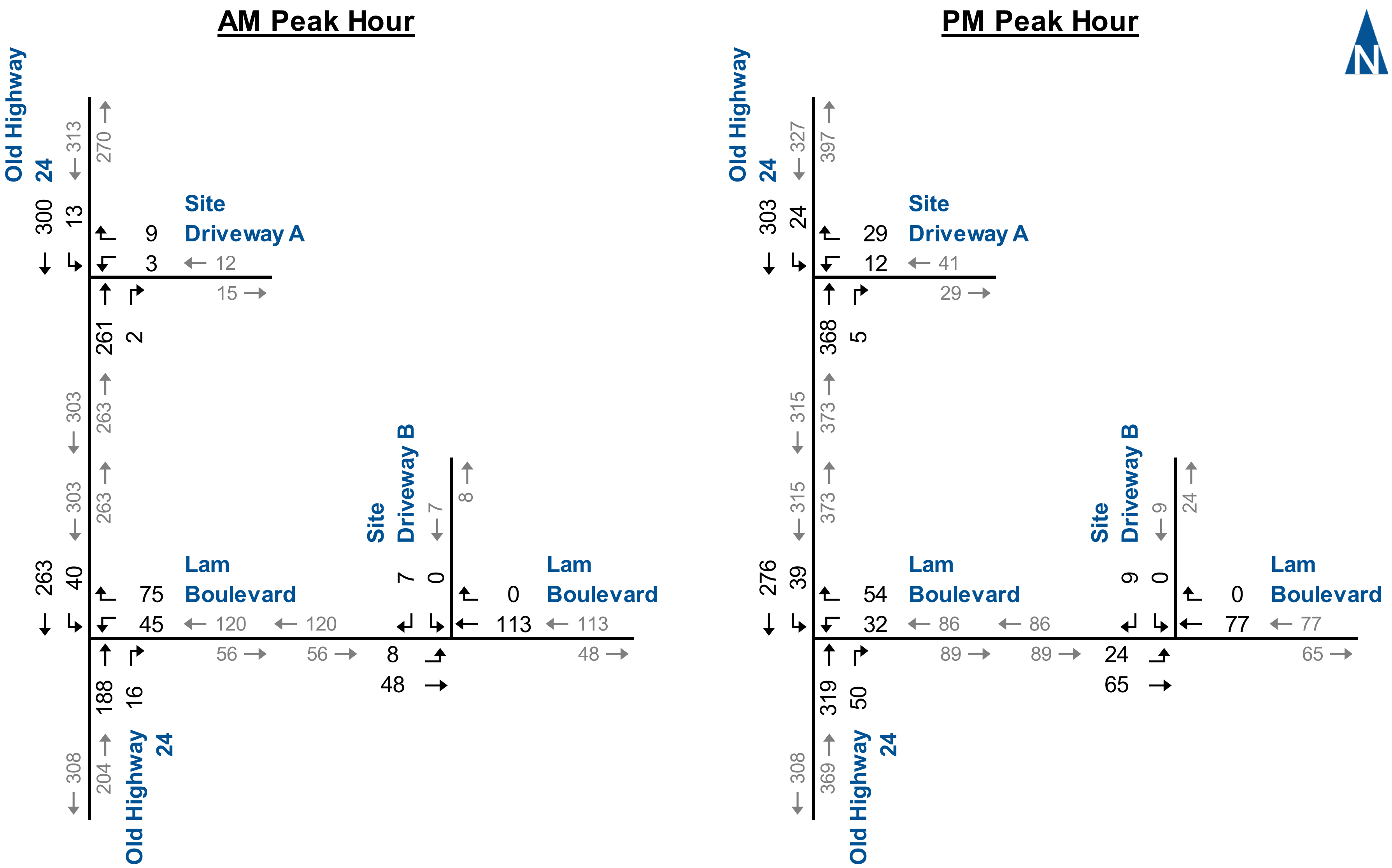
4.5 2029 Total Traffic Operations

Figure 4.5 illustrates the 2029 total traffic volumes, including trips generated by the proposed development.

The 2029 total traffic volumes have been analyzed using the same methodology as under existing and background traffic conditions.

Table 4.4 summarizes the results of the 2029 total traffic operations. The results indicate that the intersection of Old Highway 24 and Lam Boulevard and the access intersections to Old Highway 24 and Lam Boulevard are forecast to operate at acceptable levels of service during the AM and PM peak hours.

Appendix I contains the supporting detailed Synchro 11 reports.



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2029 Total Traffic Volumes

Figure 4.5

TABLE 4.4: 2029 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
AM Peak Hour	Old Highway 24 & Site Driveway A	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					11		>	**11**		0	>	**0**	<	8		**0**	
			V/C					0.02		>			0.00	>		<	0.01			
			Q					1		>			0	>		<	0			
	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					14		>	**14**		0	>	**0**	<	8		**1**	
			V/C					0.27		>			0.00	>		<	0.04			
			Q					8		>			0	>		<	1			
	Lam Boulevard & Site Driveway B	TWSC	LOS	<	A		**A**		A	>	**A**					A		>	**A**	
			Delay	<	8		**1**		0	>	**0**					9		>	**9**	
			V/C	<	0.01				0.00	>						0.01		>		
			Q	<	0				0	>						0		>		
PM Peak Hour	Old Highway 24 & Site Driveway A	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.09		>			0.00	>		<	0.02			
			Q					2		>			0	>		<	1			
	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					15		>	**15**		0	>	**0**	<	8		**1**	
			V/C					0.22		>			0.00	>		<	0.04			
			Q					6		>			0	>		<	1			
	Lam Boulevard & Site Driveway B	TWSC	LOS	<	A		**A**		A	>	**A**					A		>	**A**	
			Delay	<	7		**2**		0	>	**0**					9		>	**9**	
			V/C	<	0.02				0.00	>						0.01		>		
			Q	<	1				0	>						0		>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

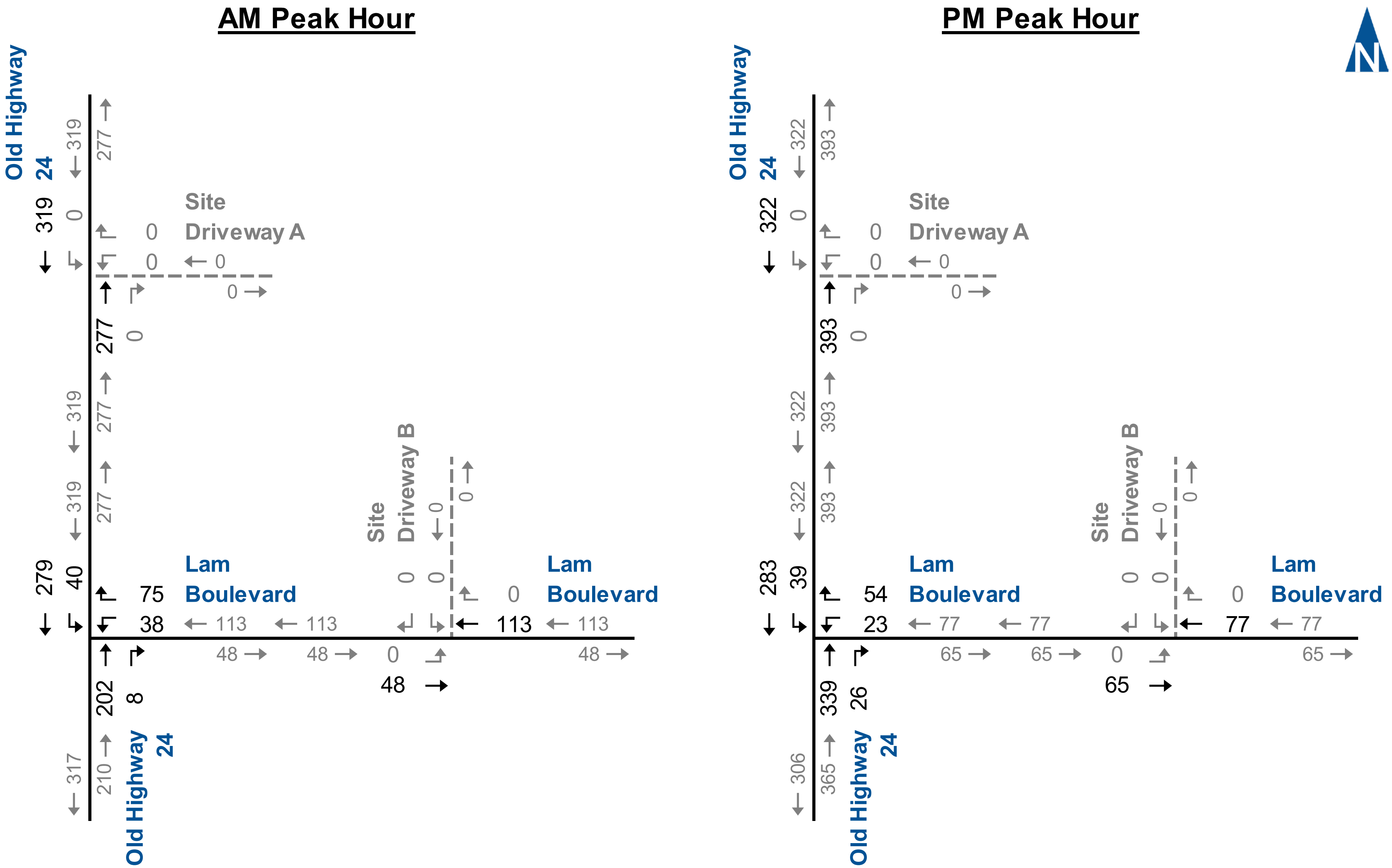
4.6 2034 Background Traffic Operations

Figure 4.6 illustrates the 2034 background traffic volumes, including road traffic growth and other area development traffic.

The 2034 background traffic volumes have been analyzed using the same methodology as under existing traffic conditions.

Table 4.5 summarizes the results of the 2034 background traffic operations. The results indicate that the intersection of Old Highway 24 and Lam Boulevard is forecast to operate at acceptable levels of service and within capacity during the AM and PM peak hours.

Appendix J contains the supporting detailed Synchro 11 reports.



2034 Background Traffic Volumes

Figure 4.6

TABLE 4.5: 2034 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.25		>			0.00	>		<	0.04			
			Q					8		>			0	>		<	1			
PM Peak Hour	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					14		>	**14**		0	>	**0**	<	8		**1**	
			V/C					0.19		>			0.00	>		<	0.04			
			Q					5		>			0	>		<	1			

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

4.7 2034 Total Traffic Operations

Figure 4.7 illustrates the 2034 total traffic volumes, including trips generated by the proposed development.

The 2034 total traffic volumes have been analyzed using the same methodology as under existing and background traffic conditions.

Table 4.6 summarizes the results of the 2034 total traffic operations. The results indicate that the intersection of Old Highway 24 and Lam Boulevard and the access intersections on Old Highway 24 and Lam Boulevard are forecast to operate at acceptable levels of service during the AM and PM peak hours.

Appendix K contains the supporting detailed Synchro 11 reports.

4.8 Roadway Traffic Volumes

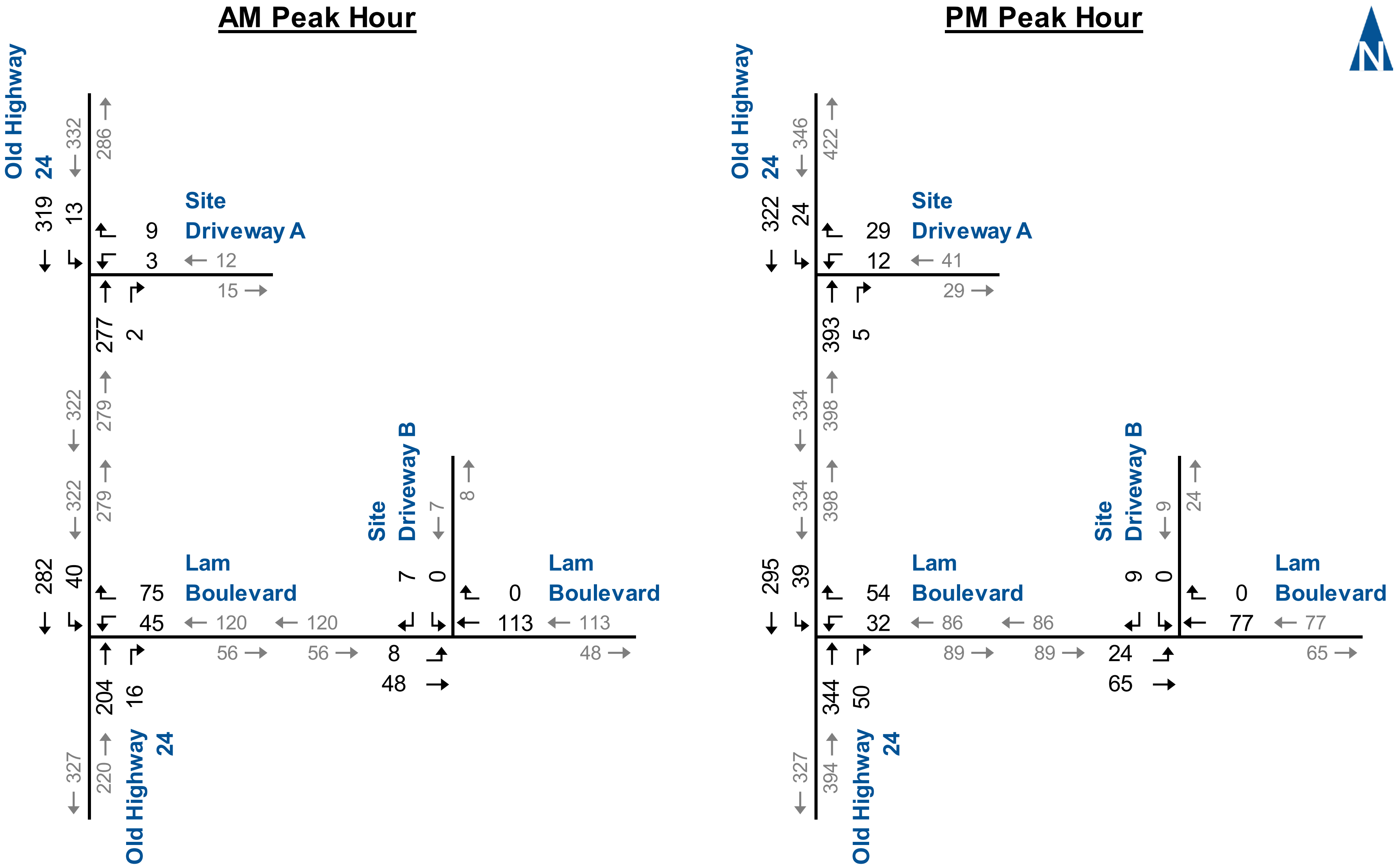
As stated in **Section 2.3**, the peak hour, peak direction traffic volume on Old Highway 24 is less than 350 vph and well within the lane capacity of 900 vph. The 2034 background peak hour, peak direction traffic volume on Old Highway 24 will be less than 400 vph.

The additional traffic volumes generated by the subject development will be minimal. The peak hour, peak direction traffic volume on Old Highway 24 is expected to be less than 450 vph. As under existing conditions, the directional peak will be well within capacity of Old Highway 24.

Similarly, the peak hour, peak directional volume on Lam Boulevard will be less than 100 vph and well within capacity under the 2034 total traffic scenario.

The Average Daily Traffic (ADT) volume is a measurement of the two-way, daily traffic volumes along a road segment. When 24-hour traffic count data are not available, the ADT is typically estimated by assuming the daily PM peak hour traffic volume to be 10% of the ADT.

The current ADT volume along Old Highway 24 in vicinity of the subject site is 5770 vehicles and is estimated to increase to 7690 vehicles by 2034. Over a 11-year period, this is an average increase of approximately 175 vehicles per year. The increase will have minimal impacts on Old Highway 24 traffic flows.



2034 Total Traffic Volumes

Figure 4.7

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

TABLE 4.6: 2034 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Old Highway 24 & Site Driveway A	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					11		>	**11**		0	>	**0**	<	8		**0**	
			V/C					0.02		>			0.00	>		<	0.01			
			Q					1		>			0	>		<	0			
	Old Highway 24 & Lam Boulevard	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					14		>	**14**		0	>	**0**	<	8		**1**	
			V/C					0.28		>			0.00	>		<	0.04			
			Q					8		>			0	>		<	1			
	Lam Boulevard & Site Driveway B	TWSC	LOS	<	A		**A**		A	>	**A**					A		>	**A**	
			Delay	<	8		**1**		0	>	**0**					9		>	**9**	
			V/C	<	0.01				0.00	>						0.01		>		
			Q	<	0				0	>						0		>		
PM Peak Hour	Old Highway 24 & Site Driveway A	TWSC	LOS					B		>	**B**		A	>	**A**	<	A		**A**	
			Delay					13		>	**13**		0	>	**0**	<	8		**1**	
			V/C					0.09		>			0.00	>		<	0.02			
			Q					2		>			0	>		<	1			
	Old Highway 24 & Lam Boulevard	TWSC	LOS					C		>	**C**		A	>	**A**	<	A		**A**	
			Delay					16		>	**16**		0	>	**0**	<	8		**1**	
			V/C					0.23		>			0.00	>		<	0.04			
			Q					7		>			0	>		<	1			
	Lam Boulevard & Site Driveway B	TWSC	LOS	<	A		**A**		A	>	**A**					A		>	**A**	
			Delay	<	7		**2**		0	>	**0**					9		>	**9**	
			V/C	<	0.02				0.00	>						0.01		>		
			Q	<	1				0	>						0		>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

4.9 Left-Turn Lanes

The need for an auxiliary left-turn turning lane on Old Highway 24 at the proposed site access was assessed based on the requirements and procedures detailed in the Ministry of Transportation Design Supplement for the Transportation Association of Canada Geometric Design Guide for Canadian Roads[8] (TAC-GDGCR). The warrant requirements were assessed using the nomographs for left-turn lanes on a two-lane undivided highway at an unsignalized intersection with a design speed of 10 kilometres per hour over the posted speed limit (70 km/h).

Based on these criteria, a southbound left-turn lane is not warranted on Old Highway 24 at Site Driveway A; or on Lam Boulevard at Site Driveway B under 2034 total traffic conditions.

Figure 4.8a contains the warrant nomographs for Old Highway 24 and Driveway A, and **Figure 4.8b** contains the warrant nomographs for Lam Boulevard and Driveway B.

<u>Old Highway 24 & Lam Boulevard Intersection</u>

It is noted that the access to the development on Old Highway 24 is located to the north of the intersection at Lam Boulevard. As such, and also based on the site design, southbound left-turn movements from Old Highway 24 to the development are more likely to use the access (Driveway A) on Old Highway 24 than turn left at Lam Boulevard. This is reflected in the assignment of development traffic in **Figure 3.2c**, and future background and total traffic volumes, for the three horizon years, illustrated in **Section 4**.

As shown in **Section 4**, the southbound left-turn movement at Old Highway 24 and Lam Boulevard is the same under background and total traffic conditions for all three horizon years.

Based on the TAC/MTO methodology, an auxiliary southbound left-turn lane is identified as not warranted under background or total traffic conditions, as illustrated in **Figure 4.8c**.

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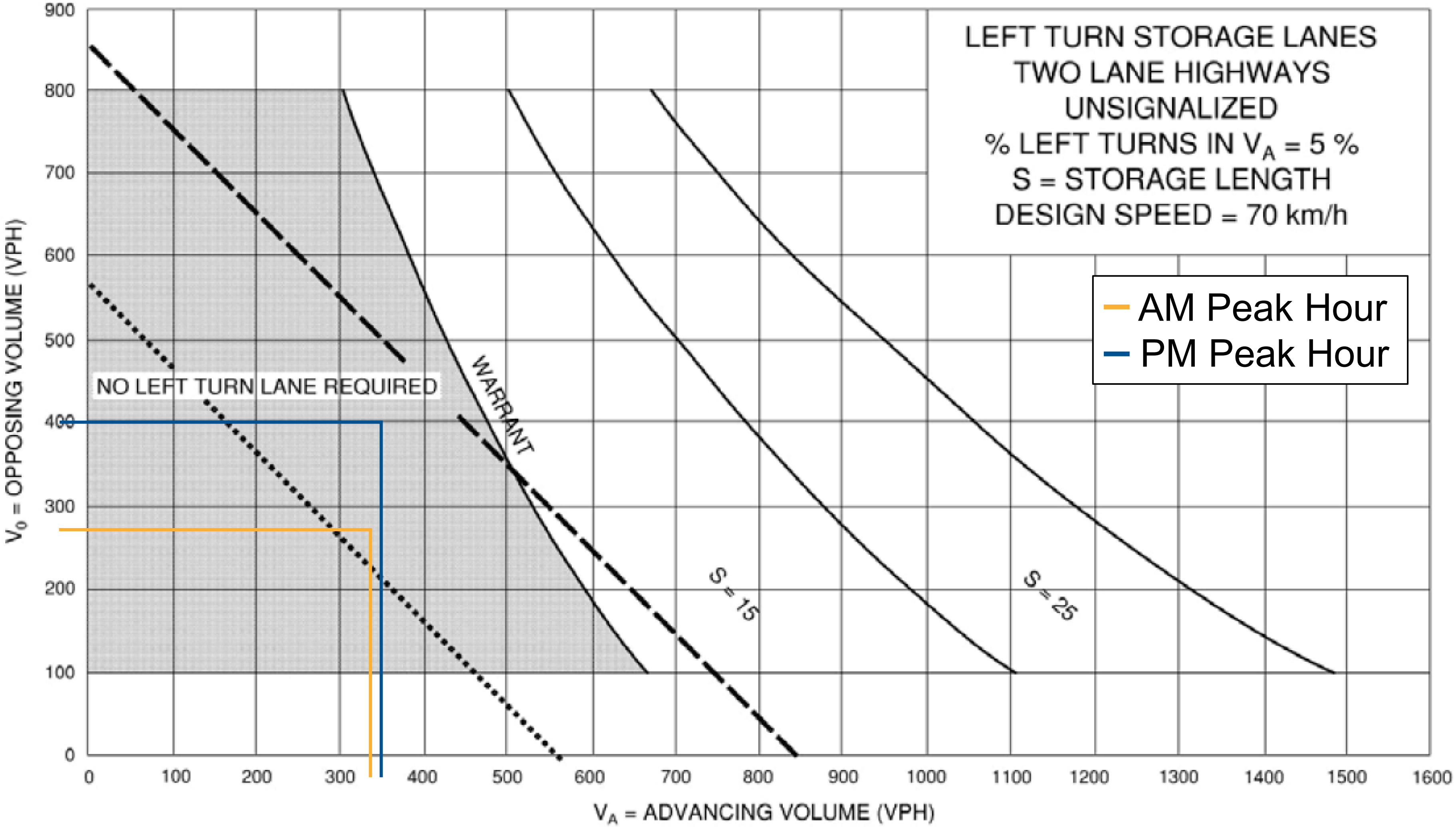
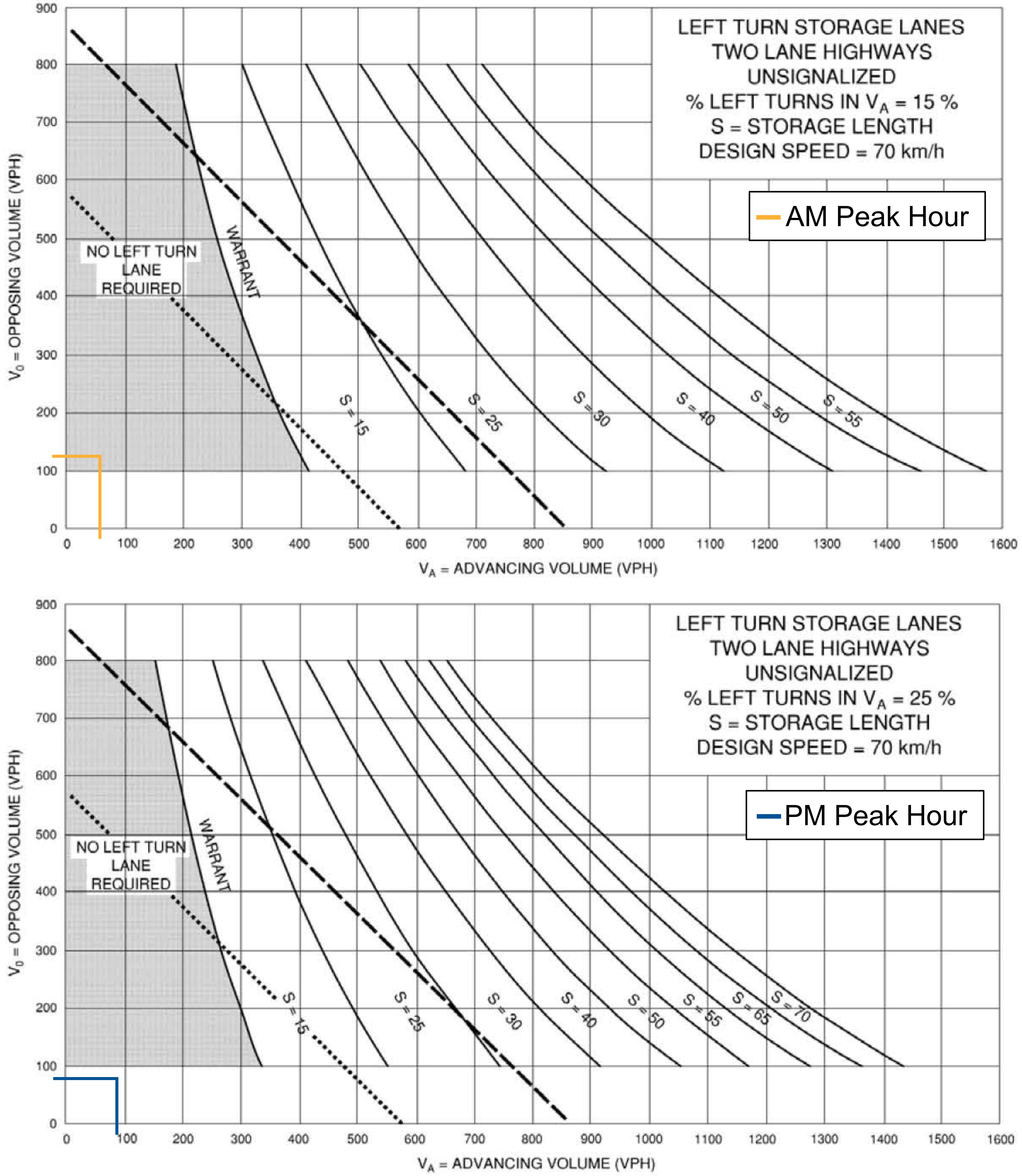
[8] *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, June 2017.



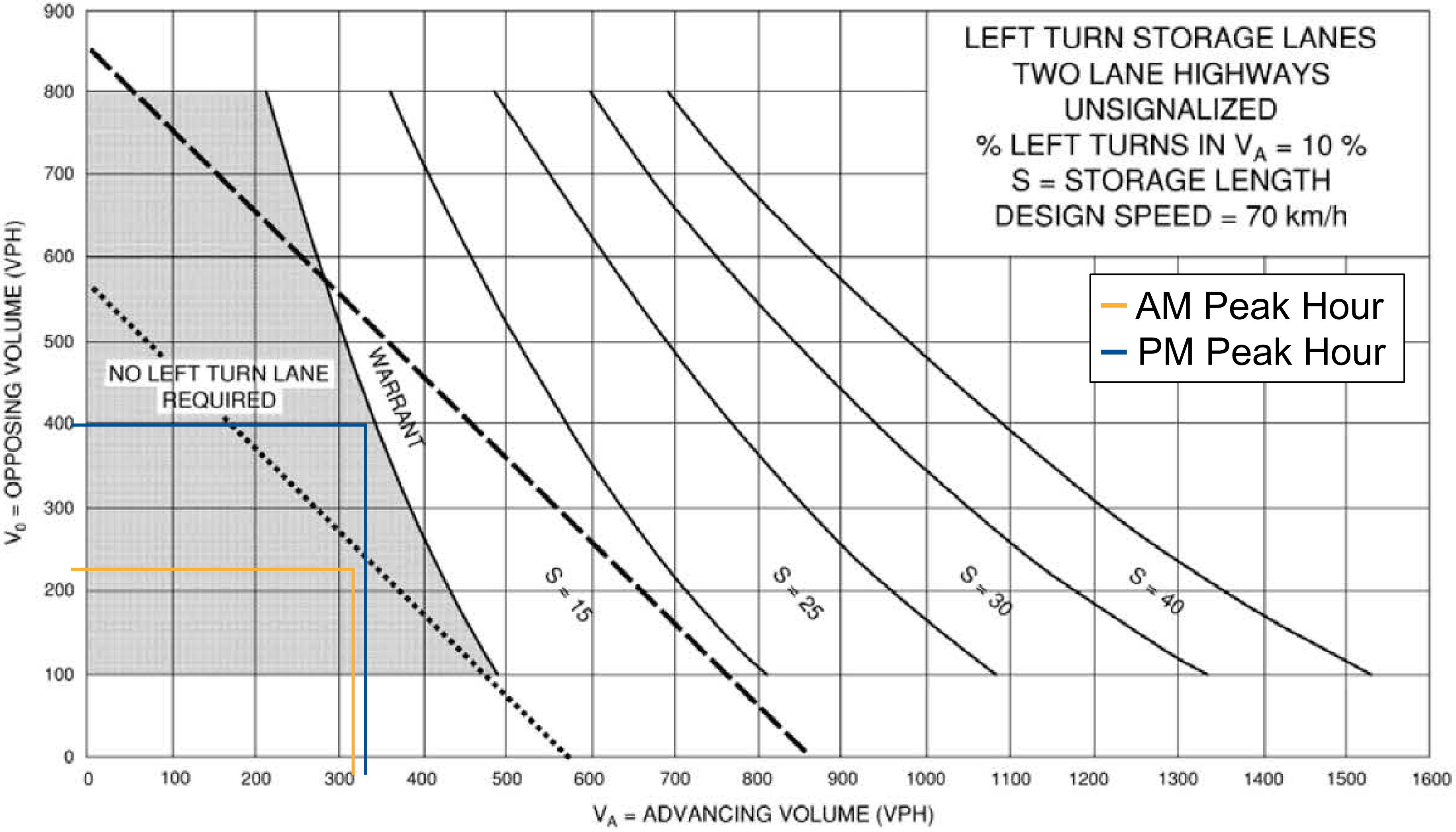
Old Highway 24 & Site Driveway A Southbound Left-Turn Lane 2034 Total Traffic Conditions

Figure 4.8a



Lam Boulevard & Site Driveway B
Eastbound Left-Turn Lane
2034 Total Traffic Conditions

Figure 4.8b



Old Highway 24 & Lam Boulevard
Southbound Left-Turn Lane
2034 Total Traffic Conditions

Figure 4.8c

4.10 Access Review

The sight distance and corner clearance of the proposed access connection to Old Highway 24 has been assessed to determine whether there are operational and/or safety-related concerns that may be affected by the location of the proposed access.

4.10.1 Sight Distance

A sight distance assessment was completed based on the methodology in the Transportation Association of Canada's Geometric Design Guide for Canadian Roads[9] (TAC-GDGCR). Sight distance measurements were made using Google Maps imagery dated 2021.

Based on TAC guidelines, the required sight distances corresponding to a design speed of 70 km/h (10 km/h over the posted speed limit of 60 km/h on Old Highway 24) are as follows:

- minimum stopping sight distance[10]: 105 metres;
- decision sight distance – left turn from stop control[11]: 150 metres; and
- decision sight distance – right turn from stop control[12]: 130 metres.

For the site access, the left-turn from stop distance is measured to be at least 300 metres, satisfying the required distance of 150 metres. Similarly, the right-turn from stop sight distance is measured to be greater than 300 metres, satisfying the required distance of 130 metres. The stopping sight distances for vehicles travelling along Old Highway 24 are estimated to be the same as the left-turn and right-turn from stop, respectively, satisfying both stopping sight distance requirements.

The site access point on Old Highway 24 satisfies the corresponding sight distance requirements.

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[9] Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, June 2017.

[10] TAC-GDGCR, Table 2.5.2: Stopping Sight Distance on Level Roadways for Automobiles.

[11] TAC-GDGCR, Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop.

[12] TAC-GDGCR, Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop.

4.10.2 Corner Clearance

The TAC-GDGCR[13] also provides spacing requirements for access management including corner clearance requirements at Major Intersections.

The recommended corner clearances for an arterial roadway with an operating speed of 50 km/h are:

- 35 metres downstream and upstream of a stop-controlled intersection; and
- 70 metres downstream and upstream of a signalized intersection.

The proposed access is located 75 metres from the unsignalized intersection of Old Highway 24 and Lam Boulevard, satisfying the TAC recommendation.

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[13] TAC-GDGCR Chapter 8.8, Corner Clearance at Major Intersections.

5 Conclusions and Recommendations

5.1 Conclusions

Based on the investigations carried out, it is concluded that:

- **Existing Traffic Conditions:** The intersection of Old Highway 24 and Lam Boulevard is currently operating at satisfactory levels of service (LOS A/B).
- **Development Trip Generation:** The development is forecast to generate 42 and 103 net new trips during the AM and PM peak hours, respectively.
- **Background Traffic Conditions:** The intersection of Old Highway 24 and Lam Boulevard is forecast to operate at acceptable levels of service under 2024, 2029, and 2034 background horizon years.
- **Total Traffic Conditions:** The intersection of Old Highway 24 and Lam Boulevard and the access intersections on Old Highway 24 and Lam Boulevard are forecast to operate at acceptable levels of service under 2024, 2029, and 2034 total horizon years.
- **Roadway Traffic Volumes:** The peak hour, peak direction traffic volume on Old Highway 24 is currently less than 350 vph, well within the lane capacity of 900 vph. Under the 2034 total traffic conditions, the peak hour, peak direction traffic volume will increase to less than 450 vph and will be within the lane capacity of 900 vph. The projected increase will have minimal impacts on Old Highway 24 traffic flows.
- **Old Highway 24 and Lam Boulevard:** An auxiliary southbound left-turn lane is not warranted under 2034 total traffic conditions.
- **Site Driveways:** Operational analysis and review of driveway geometry indicates the following:
  - The driveway traffic movements register acceptable levels of service.
  - A southbound auxiliary left-turn lane is not warranted on Old Highway 24 at the site driveway.
  - An eastbound auxiliary left-turn lane is not warranted on Lam Boulevard at the site driveway.
  - The location of the driveway on Old Highway 24 is 66 metres from the Old Highway 24/Lam Boulevard intersection, which

satisfies the corner clearance requirement of 35 metres recommended by TAC design guidelines.

5.2 Recommendations

Based on the findings of this study, it is recommended that the subject development be considered for approval as proposed.

Appendix A

Pre-Study Consultation

From: Patrick Neal
To: Stephen Gradish
Cc: Eldon Darbyson; Rajan Philips
Subject: (210680) Lam Boulevard Townhouses TIS Pre-Study Consultation
Date: November 16, 2021 11:02:00 AM

Hi Stephen,

Paradigm has been retained to undertake a Traffic Impact Study (TIS) for the proposed residential development at the northeast corner of Old Highway 24 and Lam Boulevard in the Town of Waterford, Norfolk County. The proposed development will include 50 townhouse dwelling units, with a single all-movement access on Old Highway 24. The preliminary site concept plan is attached.

Based on Pre-consultation Comments and Norfolk County's (Appendix J) TIS Guidelines, we are proposing the following TIS scope of work, for your review and approval:

- Weekday AM and PM peak hour analysis of adjacent roadways.
- Study area intersections:
    - Old Highway 24 and Lam Boulevard; and
    - Access intersection on Old Highway 24.
- Traffic Data: we will use a TMC collected by Paradigm in September 2021 at the Old Highway 24 and Lam Boulevard intersection.
- Horizon Years: (1) Year of development opening, (2) five years after development opening, and (3) 10 years after development opening.
- Background Growth Rate: 1.5% per annum.
- Trip Generation: ITE Trip Generation Manual 11th Edition.
- Site traffic distribution will be based on the existing traffic volumes on Old Highway 24.
- If necessary, recommendations will be provided to mitigate the impact of the proposed development on the surrounding road network.
- Access Review: review the access location for conformance with separation spacing from Lam Boulevard.

Please let us know if you have any comments or questions.

Regards,

Patrick Neal, BCE
Transportation Consultant

Paradigm Transportation Solutions Limited
5A-150 Pinebush Road, Cambridge ON N1R 8J8

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e: pneal@ptsl.com
w: www.ptsl.com

Appendix B

Existing Traffic Data

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 09/14/2021
Page No: 1

Turning Movement Data

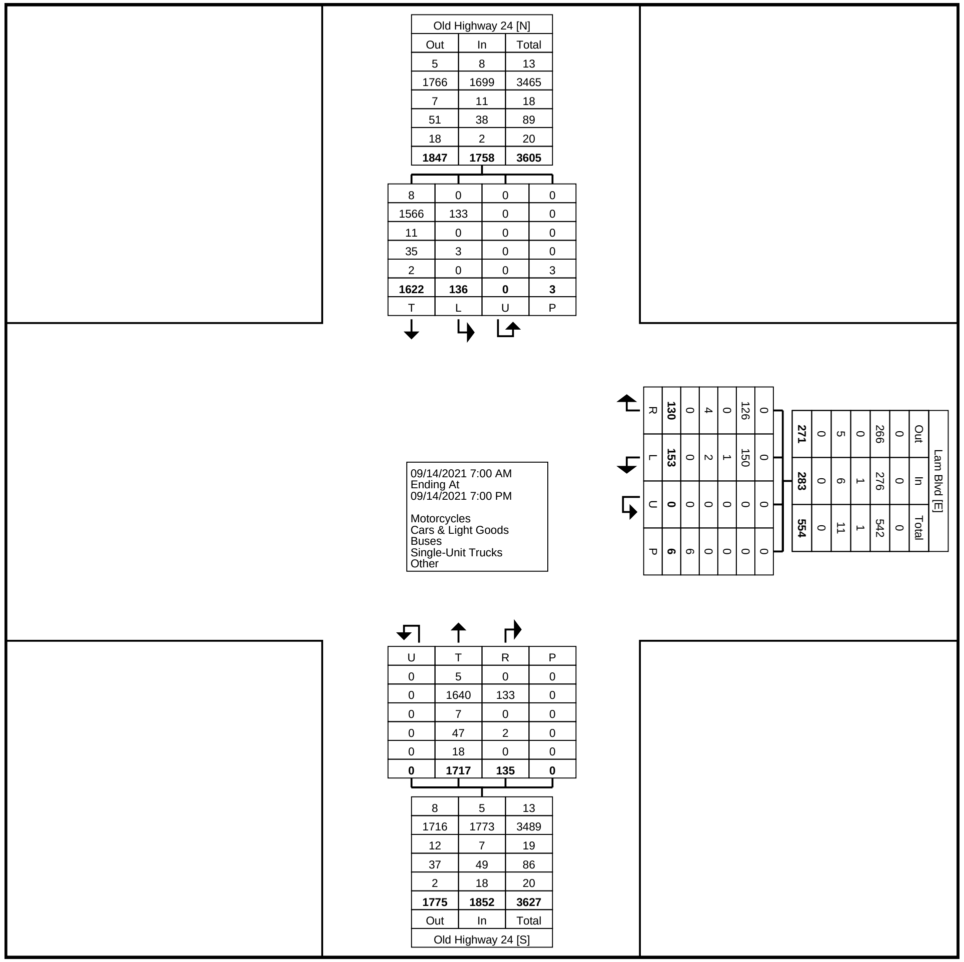
	Lam Blvd Westbound					Old Highway 24 Northbound					Old Highway 24 Southbound					
Start Time	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Int. Total
7:00 AM	4	6	0	0	10	31	0	0	0	31	1	46	0	0	47	88
7:15 AM	5	6	0	0	11	39	1	0	0	40	4	35	0	0	39	90
7:30 AM	4	3	0	0	7	43	2	0	0	45	2	51	0	0	53	105
7:45 AM	4	5	0	0	9	51	2	0	0	53	3	47	0	3	50	112
Hourly Total	17	20	0	0	37	164	5	0	0	169	10	179	0	3	189	395
8:00 AM	8	3	0	0	11	35	3	0	0	38	5	38	0	0	43	92
8:15 AM	5	5	0	0	10	58	4	0	0	62	3	44	0	0	47	119
8:30 AM	8	12	0	0	20	50	3	0	0	53	5	73	0	0	78	151
8:45 AM	5	2	0	0	7	36	0	0	0	36	4	61	0	0	65	108
Hourly Total	26	22	0	0	48	179	10	0	0	189	17	216	0	0	233	470
9:00 AM	5	3	0	0	8	43	1	0	0	44	3	42	0	0	45	97
9:15 AM	4	3	0	0	7	38	4	0	0	42	5	37	0	0	42	91
9:30 AM	10	2	0	0	12	37	2	0	0	39	3	39	0	0	42	93
9:45 AM	4	5	0	0	9	52	4	0	0	56	3	64	0	0	67	132
Hourly Total	23	13	0	0	36	170	11	0	0	181	14	182	0	0	196	413
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	12	4	0	0	16	55	2	0	0	57	4	63	0	0	67	140
11:45 AM	5	6	0	0	11	56	7	0	0	63	5	48	0	0	53	127
Hourly Total	17	10	0	0	27	111	9	0	0	120	9	111	0	0	120	267
12:00 PM	7	9	0	1	16	63	2	0	0	65	4	56	0	0	60	141
12:15 PM	7	3	0	1	10	64	0	0	0	64	5	51	0	0	56	130
12:30 PM	6	1	0	2	7	60	6	0	0	66	1	46	0	0	47	120
12:45 PM	3	4	0	1	7	61	9	0	0	70	6	47	0	0	53	130
Hourly Total	23	17	0	5	40	248	17	0	0	265	16	200	0	0	216	521
1:00 PM	4	8	0	0	12	66	6	0	0	72	1	49	0	0	50	134
1:15 PM	2	2	0	0	4	48	9	0	0	57	4	48	0	0	52	113
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	6	10	0	0	16	114	15	0	0	129	5	97	0	0	102	247
4:00 PM	2	7	0	0	9	96	5	0	0	101	6	63	0	0	69	179
4:15 PM	3	1	0	0	4	60	8	0	0	68	10	49	0	0	59	131
4:30 PM	5	2	0	1	7	68	8	0	0	76	5	70	0	0	75	158
4:45 PM	5	1	0	0	6	72	5	0	0	77	6	42	0	0	48	131
Hourly Total	15	11	0	1	26	296	26	0	0	322	27	224	0	0	251	599
5:00 PM	4	5	0	0	9	71	8	0	0	79	5	60	0	0	65	153
5:15 PM	3	8	0	0	11	60	9	0	0	69	5	59	0	0	64	144
5:30 PM	2	4	0	0	6	55	2	0	0	57	5	51	0	0	56	119

5:45 PM	7	3	0	0	10	51	5	0	0	56	4	52	0	0	56	122
Hourly Total	16	20	0	0	36	237	24	0	0	261	19	222	0	0	241	538
6:00 PM	3	3	0	0	6	53	6	0	0	59	9	60	0	0	69	134
6:15 PM	1	1	0	0	2	48	5	0	0	53	5	59	0	0	64	119
6:30 PM	3	1	0	0	4	54	5	0	0	59	1	34	0	0	35	98
6:45 PM	3	2	0	0	5	43	2	0	0	45	4	38	0	0	42	92
Hourly Total	10	7	0	0	17	198	18	0	0	216	19	191	0	0	210	443
Grand Total	153	130	0	6	283	1717	135	0	0	1852	136	1622	0	3	1758	3893
Approach %	54.1	45.9	0.0	-	-	92.7	7.3	0.0	-	-	7.7	92.3	0.0	-	-	-
Total %	3.9	3.3	0.0	-	7.3	44.1	3.5	0.0	-	47.6	3.5	41.7	0.0	-	45.2	-
Motorcycles	0	0	0	-	0	5	0	0	-	5	0	8	0	-	8	13
% Motorcycles	0.0	0.0	-	-	0.0	0.3	0.0	-	-	0.3	0.0	0.5	-	-	0.5	0.3
Cars & Light Goods	150	126	0	-	276	1640	133	0	-	1773	133	1566	0	-	1699	3748
% Cars & Light Goods	98.0	96.9	-	-	97.5	95.5	98.5	-	-	95.7	97.8	96.5	-	-	96.6	96.3
Buses	1	0	0	-	1	7	0	0	-	7	0	11	0	-	11	19
% Buses	0.7	0.0	-	-	0.4	0.4	0.0	-	-	0.4	0.0	0.7	-	-	0.6	0.5
Single-Unit Trucks	2	4	0	-	6	47	2	0	-	49	3	35	0	-	38	93
% Single-Unit Trucks	1.3	3.1	-	-	2.1	2.7	1.5	-	-	2.6	2.2	2.2	-	-	2.2	2.4
Articulated Trucks	0	0	0	-	0	18	0	0	-	18	0	0	0	-	0	18
% Articulated Trucks	0.0	0.0	-	-	0.0	1.0	0.0	-	-	1.0	0.0	0.0	-	-	0.0	0.5
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	2	0	-	2	2
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.1	-	-	0.1	0.1
Bicycles on Crosswalk	-	-	-	2	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	33.3	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	4	-	-	-	-	0	-	-	-	-	3	-	-
% Pedestrians	-	-	-	66.7	-	-	-	-	-	-	-	-	-	100.0	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 09/14/2021



Old Highway 24 [N]

Out	In	Total
5	8	13
1766	1699	3465
7	11	18
51	38	89
18	2	20
1847	**1758**	**3605**

T	L	U	P
8	0	0	0
1566	133	0	0
11	0	0	0
35	3	0	0
2	0	0	3
1622	**136**	**0**	**3**

Lam Blvd [E]

Out	In	Total
0	0	0
266	276	542
0	1	1
5	6	11
0	0	0
271	**283**	**554**

R	L	U	P
0	0	0	0
126	150	0	0
0	1	0	0
4	2	0	0
0	0	0	6
130	**153**	**0**	**6**

09/14/2021 7:00 AM
Ending At
09/14/2021 7:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

U	T	R	P
0	5	0	0
0	1640	133	0
0	7	0	0
0	47	2	0
0	18	0	0
0	**1717**	**135**	**0**

Out	In	Total
8	5	13
1716	1773	3489
12	7	19
37	49	86
2	18	20
1775	**1852**	**3627**

Old Highway 24 [S]

Turning Movement Data Plot

Turning Movement Peak Hour Data (8:15 AM)

Start Time	Lam Blvd Westbound					Old Highway 24 Northbound					Old Highway 24 Southbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
8:15 AM	5	5	0	0	10	58	4	0	0	62	3	44	0	0	47	119
8:30 AM	8	12	0	0	20	50	3	0	0	53	5	73	0	0	78	151
8:45 AM	5	2	0	0	7	36	0	0	0	36	4	61	0	0	65	108
9:00 AM	5	3	0	0	8	43	1	0	0	44	3	42	0	0	45	97
Total	23	22	0	0	45	187	8	0	0	195	15	220	0	0	235	475
Approach %	51.1	48.9	0.0	-	-	95.9	4.1	0.0	-	-	6.4	93.6	0.0	-	-	-
Total %	4.8	4.6	0.0	-	9.5	39.4	1.7	0.0	-	41.1	3.2	46.3	0.0	-	49.5	-
PHF	0.719	0.458	0.000	-	0.563	0.806	0.500	0.000	-	0.786	0.750	0.753	0.000	-	0.753	0.786
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	1
% Motorcycles	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.5	-	-	0.4	0.2
Cars & Light Goods	23	20	0	-	43	176	8	0	-	184	14	208	0	-	222	449
% Cars & Light Goods	100.0	90.9	-	-	95.6	94.1	100.0	-	-	94.4	93.3	94.5	-	-	94.5	94.5
Buses	0	0	0	-	0	4	0	0	-	4	0	6	0	-	6	10
% Buses	0.0	0.0	-	-	0.0	2.1	0.0	-	-	2.1	0.0	2.7	-	-	2.6	2.1
Single-Unit Trucks	0	2	0	-	2	5	0	0	-	5	1	5	0	-	6	13
% Single-Unit Trucks	0.0	9.1	-	-	4.4	2.7	0.0	-	-	2.6	6.7	2.3	-	-	2.6	2.7
Articulated Trucks	0	0	0	-	0	2	0	0	-	2	0	0	0	-	0	2
% Articulated Trucks	0.0	0.0	-	-	0.0	1.1	0.0	-	-	1.0	0.0	0.0	-	-	0.0	0.4
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 09/14/2021
Page No: 5

Old Highway 24 [N]

Out	In	Total
0	1	1
196	222	418
4	6	10
7	6	13
2	0	2
209	**235**	**444**

1	0	0	0
208	14	0	0
6	0	0	0
5	1	0	0
0	0	0	0
220	**15**	**0**	**0**
T	L	U	P

Peak Hour Data

09/14/2021 8:15 AM
Ending At
09/14/2021 9:15 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

R	L	U	P
22	**23**	**0**	**0**
0	0	0	0
2	0	0	0
0	0	0	0
20	23	0	0
0	0	0	0

Lam Blvd [E]

Out	In	Total
0	0	0
22	43	65
0	0	0
1	2	3
0	0	0
23	**45**	**68**

U	T	R	P
0	0	0	0
0	176	8	0
0	4	0	0
0	5	0	0
0	2	0	0
0	**187**	**8**	**0**

1	0	1
231	184	415
6	4	10
5	5	10
0	2	2
243	**195**	**438**
Out	In	Total

Old Highway 24 [S]

Turning Movement Peak Hour Data Plot (8:15 AM)

Turning Movement Peak Hour Data (11:30 AM)

	Lam Blvd Westbound					Old Highway 24 Northbound					Old Highway 24 Southbound					
Start Time	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Int. Total
11:30 AM	12	4	0	0	16	55	2	0	0	57	4	63	0	0	67	140
11:45 AM	5	6	0	0	11	56	7	0	0	63	5	48	0	0	53	127
12:00 PM	7	9	0	1	16	63	2	0	0	65	4	56	0	0	60	141
12:15 PM	7	3	0	1	10	64	0	0	0	64	5	51	0	0	56	130
Total	31	22	0	2	53	238	11	0	0	249	18	218	0	0	236	538
Approach %	58.5	41.5	0.0	-	-	95.6	4.4	0.0	-	-	7.6	92.4	0.0	-	-	-
Total %	5.8	4.1	0.0	-	9.9	44.2	2.0	0.0	-	46.3	3.3	40.5	0.0	-	43.9	-
PHF	0.646	0.611	0.000	-	0.828	0.930	0.393	0.000	-	0.958	0.900	0.865	0.000	-	0.881	0.954
Motorcycles	0	0	0	-	0	2	0	0	-	2	0	0	0	-	0	2
% Motorcycles	0.0	0.0	-	-	0.0	0.8	0.0	-	-	0.8	0.0	0.0	-	-	0.0	0.4
Cars & Light Goods	30	22	0	-	52	229	11	0	-	240	18	211	0	-	229	521
% Cars & Light Goods	96.8	100.0	-	-	98.1	96.2	100.0	-	-	96.4	100.0	96.8	-	-	97.0	96.8
Buses	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Single-Unit Trucks	1	0	0	-	1	4	0	0	-	4	0	7	0	-	7	12
% Single-Unit Trucks	3.2	0.0	-	-	1.9	1.7	0.0	-	-	1.6	0.0	3.2	-	-	3.0	2.2
Articulated Trucks	0	0	0	-	0	3	0	0	-	3	0	0	0	-	0	3
% Articulated Trucks	0.0	0.0	-	-	0.0	1.3	0.0	-	-	1.2	0.0	0.0	-	-	0.0	0.6
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	50.0	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	50.0	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 09/14/2021

Old Highway 24 [N]		
Out	In	Total
2	0	2
251	229	480
0	0	0
4	7	11
3	0	3
260	**236**	**496**

0	0	0	0
211	18	0	0
0	0	0	0
7	0	0	0
0	0	0	0
218	**18**	**0**	**0**
T	L	U	P

Peak Hour Data

09/14/2021 11:30 AM
Ending At
09/14/2021 12:30 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

R	L	U	P
22	**31**	**0**	**2**
0	0	0	2
0	1	0	0
0	0	0	0
22	30	0	0
0	0	0	0

Lam Blvd [E]		
Out	In	Total
0	0	0
29	52	81
0	0	0
0	1	1
0	0	0
29	**53**	**82**

U	T	R	P
0	2	0	0
0	229	11	0
0	0	0	0
0	4	0	0
0	3	0	0
0	**238**	**11**	**0**

0	2	2
241	240	481
0	0	0
8	4	12
0	3	3
249	**249**	**498**
Out	In	Total
Old Highway 24 [S]		

Turning Movement Peak Hour Data Plot (11:30 AM)

Turning Movement Peak Hour Data (4:00 PM)

	Lam Blvd Westbound					Old Highway 24 Northbound					Old Highway 24 Southbound					
Start Time	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Int. Total
4:00 PM	2	7	0	0	9	96	5	0	0	101	6	63	0	0	69	179
4:15 PM	3	1	0	0	4	60	8	0	0	68	10	49	0	0	59	131
4:30 PM	5	2	0	1	7	68	8	0	0	76	5	70	0	0	75	158
4:45 PM	5	1	0	0	6	72	5	0	0	77	6	42	0	0	48	131
Total	15	11	0	1	26	296	26	0	0	322	27	224	0	0	251	599
Approach %	57.7	42.3	0.0	-	-	91.9	8.1	0.0	-	-	10.8	89.2	0.0	-	-	-
Total %	2.5	1.8	0.0	-	4.3	49.4	4.3	0.0	-	53.8	4.5	37.4	0.0	-	41.9	-
PHF	0.750	0.393	0.000	-	0.722	0.771	0.813	0.000	-	0.797	0.675	0.800	0.000	-	0.837	0.837
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	2	0	-	2	2
% Motorcycles	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.9	-	-	0.8	0.3
Cars & Light Goods	15	11	0	-	26	273	25	0	-	298	27	216	0	-	243	567
% Cars & Light Goods	100.0	100.0	-	-	100.0	92.2	96.2	-	-	92.5	100.0	96.4	-	-	96.8	94.7
Buses	0	0	0	-	0	1	0	0	-	1	0	1	0	-	1	2
% Buses	0.0	0.0	-	-	0.0	0.3	0.0	-	-	0.3	0.0	0.4	-	-	0.4	0.3
Single-Unit Trucks	0	0	0	-	0	18	1	0	-	19	0	5	0	-	5	24
% Single-Unit Trucks	0.0	0.0	-	-	0.0	6.1	3.8	-	-	5.9	0.0	2.2	-	-	2.0	4.0
Articulated Trucks	0	0	0	-	0	4	0	0	-	4	0	0	0	-	0	4
% Articulated Trucks	0.0	0.0	-	-	0.0	1.4	0.0	-	-	1.2	0.0	0.0	-	-	0.0	0.7
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

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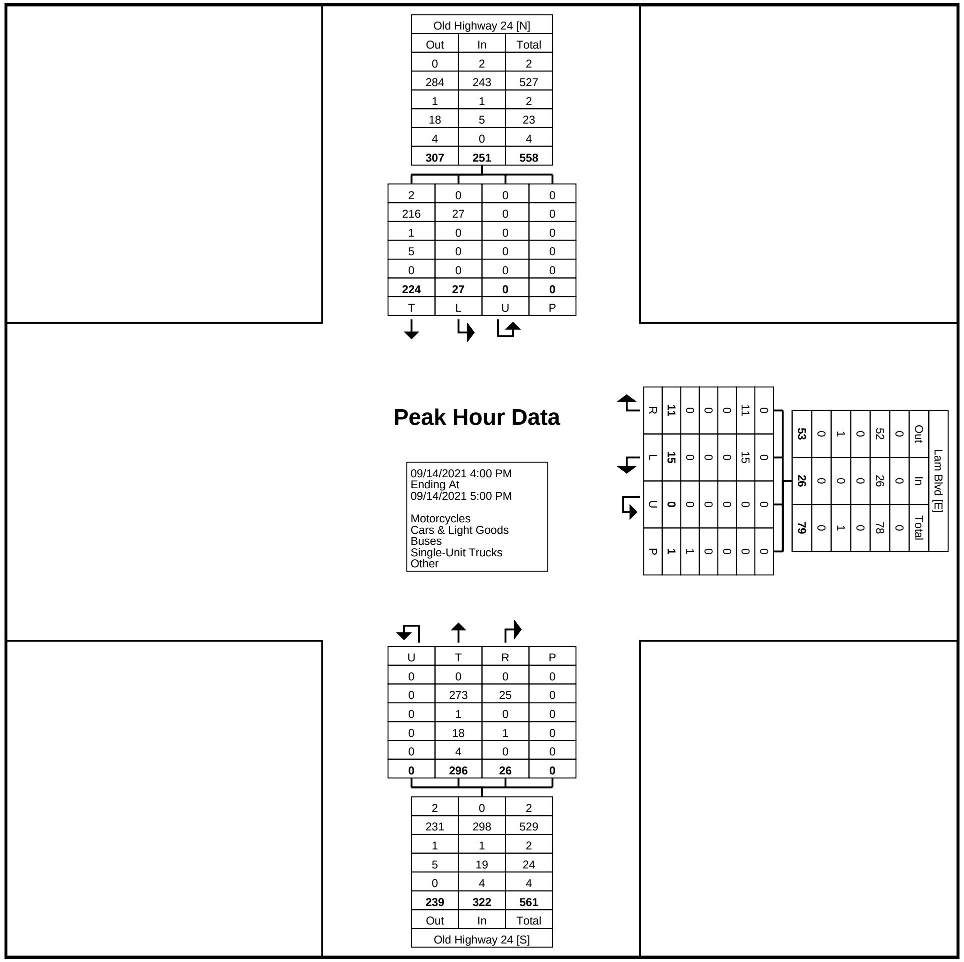
Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 09/14/2021
Page No: 9



Old Highway 24 [N]

Out	In	Total
0	2	2
284	243	527
1	1	2
18	5	23
4	0	4
307	**251**	**558**

T	L	U	P
2	0	0	0
216	27	0	0
1	0	0	0
5	0	0	0
0	0	0	0
224	**27**	**0**	**0**

Peak Hour Data

09/14/2021 4:00 PM
Ending At
09/14/2021 5:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

R	L	U	P
0	0	0	0
11	15	0	0
0	0	0	0
0	0	0	0
0	0	0	1
11	**15**	**0**	**1**

Lam Blvd [E]

Out	In	Total
0	0	0
52	26	78
0	0	0
1	0	1
0	0	0
53	**26**	**79**

U	T	R	P
0	0	0	0
0	273	25	0
0	1	0	0
0	18	1	0
0	4	0	0
0	**296**	**26**	**0**

Out	In	Total
2	0	2
231	298	529
1	1	2
5	19	24
0	4	4
239	**322**	**561**

Old Highway 24 [S]

Turning Movement Peak Hour Data Plot (4:00 PM)

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 05/17/2022
Page No: 1

Turning Movement Data

	Lam Blvd					Old Highway 24					Old Highway 24					
	Westbound					Northbound					Southbound					
Start Time	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Int. Total
7:00 AM	3	1	0	0	4	30	3	0	0	33	1	32	0	0	33	70
7:15 AM	3	2	0	0	5	46	1	0	0	47	1	28	0	0	29	81
7:30 AM	4	3	0	0	7	28	4	0	0	32	0	59	0	0	59	98
7:45 AM	10	1	0	1	11	54	3	0	0	57	0	55	0	3	55	123
Hourly Total	20	7	0	1	27	158	11	0	0	169	2	174	0	3	176	372
8:00 AM	7	4	0	1	11	30	1	0	0	31	2	43	0	0	45	87
8:15 AM	8	1	0	0	9	40	4	0	0	44	1	45	0	0	46	99
8:30 AM	7	3	0	0	10	45	1	0	0	46	1	68	0	0	69	125
8:45 AM	10	5	0	0	15	48	5	0	0	53	2	57	0	0	59	127
Hourly Total	32	13	0	1	45	163	11	0	0	174	6	213	0	0	219	438
9:00 AM	5	6	0	0	11	32	3	0	0	35	4	43	0	0	47	93
9:15 AM	4	4	0	0	8	31	0	0	0	31	3	50	0	0	53	92
9:30 AM	5	1	0	0	6	37	1	0	0	38	2	57	0	0	59	103
9:45 AM	3	4	0	0	7	44	1	0	0	45	3	45	0	0	48	100
Hourly Total	17	15	0	0	32	144	5	0	0	149	12	195	0	0	207	388
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	8	3	0	0	11	55	6	0	0	61	2	45	0	0	47	119
11:45 AM	2	1	0	0	3	57	5	0	0	62	2	43	0	0	45	110
Hourly Total	10	4	0	0	14	112	11	0	0	123	4	88	0	0	92	229
12:00 PM	5	1	0	0	6	52	4	0	0	56	6	52	0	0	58	120
12:15 PM	2	2	0	0	4	48	4	0	0	52	5	38	0	0	43	99
12:30 PM	4	2	0	0	6	51	3	0	0	54	5	47	0	0	52	112
12:45 PM	5	5	0	0	10	48	6	0	0	54	8	45	0	0	53	117
Hourly Total	16	10	0	0	26	199	17	0	0	216	24	182	0	0	206	448
1:00 PM	3	2	0	0	5	53	4	0	0	57	2	42	0	0	44	106
1:15 PM	5	4	0	0	9	56	0	0	0	56	3	45	0	0	48	113
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	8	6	0	0	14	109	4	0	0	113	5	87	0	0	92	219
4:00 PM	4	8	0	0	12	59	6	0	0	65	8	56	0	0	64	141
4:15 PM	2	4	0	0	6	65	2	0	0	67	4	49	0	0	53	126
4:30 PM	4	2	0	0	6	73	7	0	0	80	6	55	0	0	61	147
4:45 PM	7	3	0	1	10	85	9	0	0	94	4	50	0	0	54	158
Hourly Total	17	17	0	1	34	282	24	0	0	306	22	210	0	0	232	572
5:00 PM	6	0	0	0	6	51	4	0	0	55	4	69	0	0	73	134
5:15 PM	4	5	0	0	9	74	9	0	0	83	8	53	0	0	61	153
5:30 PM	2	2	0	0	4	39	5	0	0	44	5	53	0	0	58	106

5:45 PM	3	3	0	0	6	54	1	0	0	55	8	57	0	0	65	126
Hourly Total	15	10	0	0	25	218	19	0	0	237	25	232	0	0	257	519
6:00 PM	5	2	0	0	7	46	4	0	0	50	2	51	0	0	53	110
6:15 PM	2	5	0	0	7	48	3	0	0	51	3	44	0	0	47	105
6:30 PM	1	1	0	0	2	35	0	0	0	35	6	31	0	0	37	74
6:45 PM	5	1	0	0	6	26	0	0	0	26	3	30	0	0	33	65
Hourly Total	13	9	0	0	22	155	7	0	0	162	14	156	0	0	170	354
Grand Total	148	91	0	3	239	1540	109	0	0	1649	114	1537	0	3	1651	3539
Approach %	61.9	38.1	0.0	-	-	93.4	6.6	0.0	-	-	6.9	93.1	0.0	-	-	-
Total %	4.2	2.6	0.0	-	6.8	43.5	3.1	0.0	-	46.6	3.2	43.4	0.0	-	46.7	-
Motorcycles	1	0	0	-	1	2	1	0	-	3	0	8	0	-	8	12
% Motorcycles	0.7	0.0	-	-	0.4	0.1	0.9	-	-	0.2	0.0	0.5	-	-	0.5	0.3
Cars & Light Goods	143	90	0	-	233	1477	107	0	-	1584	112	1487	0	-	1599	3416
% Cars & Light Goods	96.6	98.9	-	-	97.5	95.9	98.2	-	-	96.1	98.2	96.7	-	-	96.9	96.5
Buses	1	0	0	-	1	11	0	0	-	11	0	10	0	-	10	22
% Buses	0.7	0.0	-	-	0.4	0.7	0.0	-	-	0.7	0.0	0.7	-	-	0.6	0.6
Single-Unit Trucks	3	1	0	-	4	45	1	0	-	46	2	27	0	-	29	79
% Single-Unit Trucks	2.0	1.1	-	-	1.7	2.9	0.9	-	-	2.8	1.8	1.8	-	-	1.8	2.2
Articulated Trucks	0	0	0	-	0	5	0	0	-	5	0	5	0	-	5	10
% Articulated Trucks	0.0	0.0	-	-	0.0	0.3	0.0	-	-	0.3	0.0	0.3	-	-	0.3	0.3
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	3	-	-	-	-	0	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	100.0	-	-

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Count Name: Old Highway 24 & Lam Blvd
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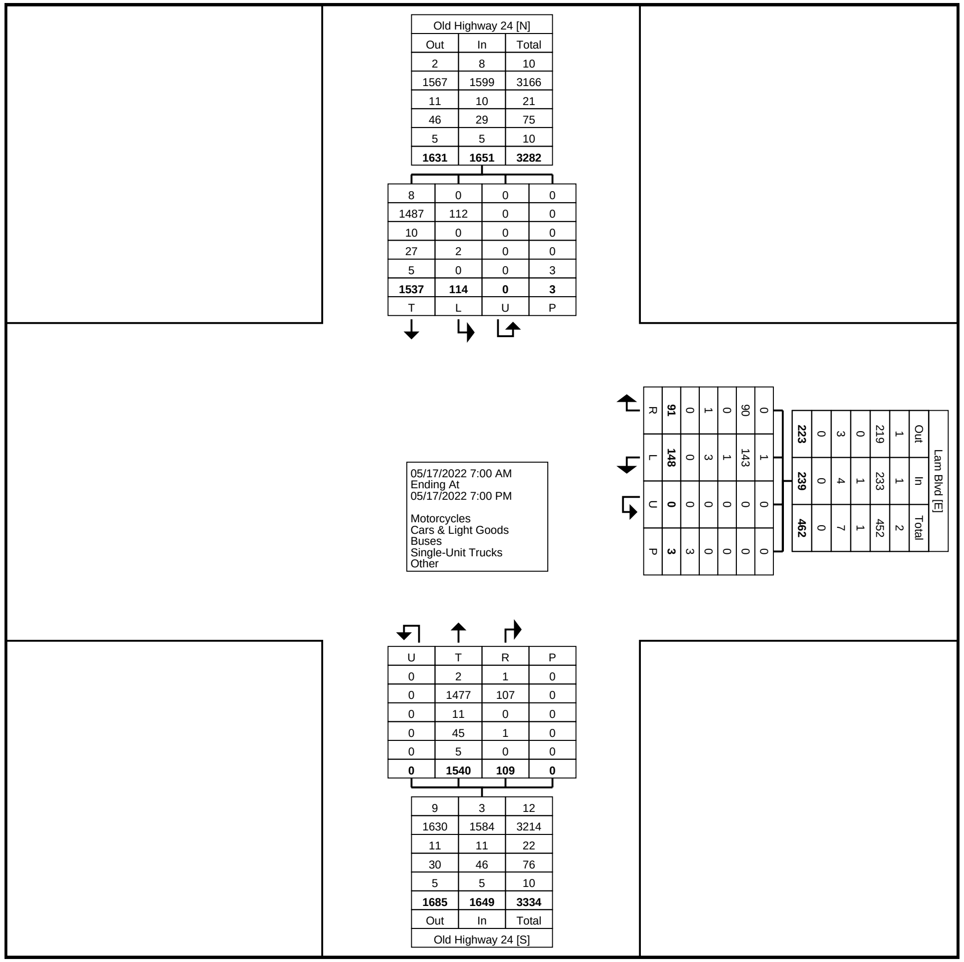
Start Date: 05/17/2022
Page No: 3



Old Highway 24 [N]

Out	In	Total
2	8	10
1567	1599	3166
11	10	21
46	29	75
5	5	10
1631	**1651**	**3282**

T	L	U	P
8	0	0	0
1487	112	0	0
10	0	0	0
27	2	0	0
5	0	0	3
1537	**114**	**0**	**3**

Lam Blvd [E]

Out	In	Total
1	1	2
219	233	452
0	1	1
3	4	7
0	0	0
223	**239**	**462**

R	L	U	P
0	1	0	0
90	143	0	0
0	1	0	0
1	3	0	0
0	0	0	3
91	**148**	**0**	**3**

05/17/2022 7:00 AM
Ending At
05/17/2022 7:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

U	T	R	P
0	2	1	0
0	1477	107	0
0	11	0	0
0	45	1	0
0	5	0	0
0	**1540**	**109**	**0**

Out	In	Total
9	3	12
1630	1584	3214
11	11	22
30	46	76
5	5	10
1685	**1649**	**3334**

Old Highway 24 [S]

Turning Movement Data Plot

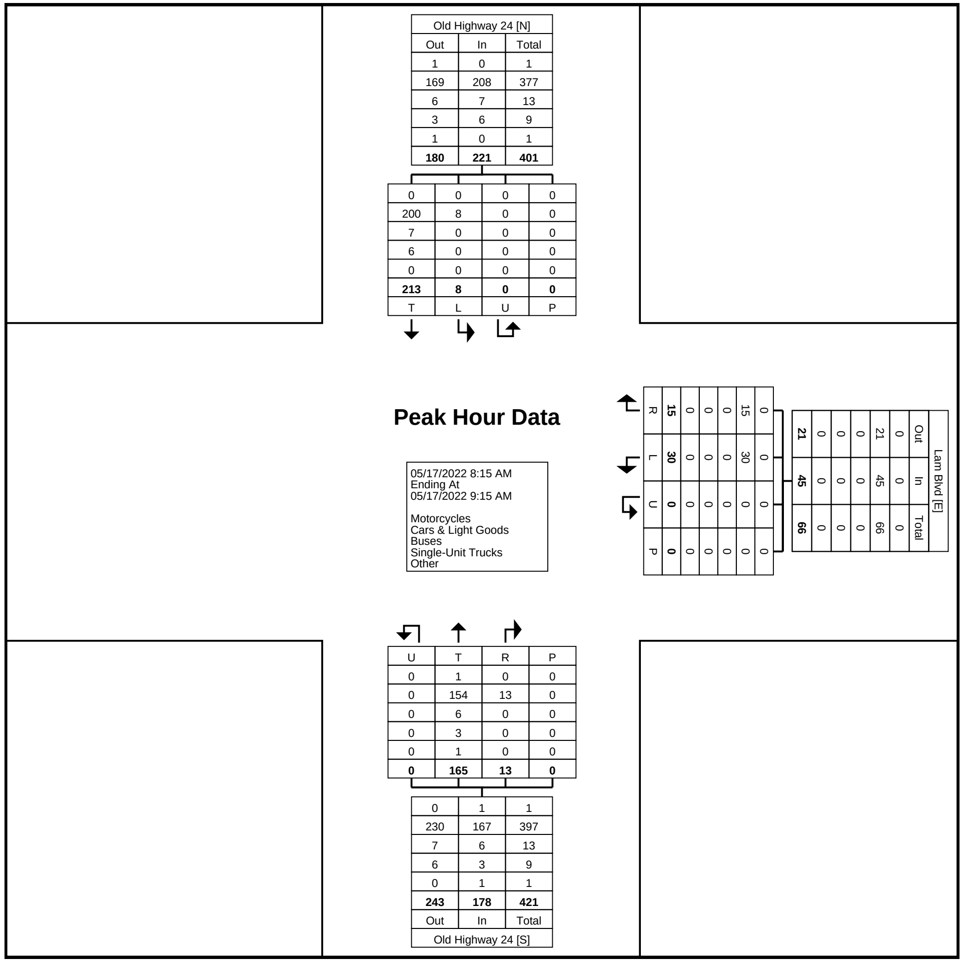
Turning Movement Peak Hour Data (8:15 AM)

	Lam Blvd					Old Highway 24					Old Highway 24					
	Westbound					Northbound					Southbound					
Start Time	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Int. Total
8:15 AM	8	1	0	0	9	40	4	0	0	44	1	45	0	0	46	99
8:30 AM	7	3	0	0	10	45	1	0	0	46	1	68	0	0	69	125
8:45 AM	10	5	0	0	15	48	5	0	0	53	2	57	0	0	59	127
9:00 AM	5	6	0	0	11	32	3	0	0	35	4	43	0	0	47	93
Total	30	15	0	0	45	165	13	0	0	178	8	213	0	0	221	444
Approach %	66.7	33.3	0.0	-	-	92.7	7.3	0.0	-	-	3.6	96.4	0.0	-	-	-
Total %	6.8	3.4	0.0	-	10.1	37.2	2.9	0.0	-	40.1	1.8	48.0	0.0	-	49.8	-
PHF	0.750	0.625	0.000	-	0.750	0.859	0.650	0.000	-	0.840	0.500	0.783	0.000	-	0.801	0.874
Motorcycles	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	1
% Motorcycles	0.0	0.0	-	-	0.0	0.6	0.0	-	-	0.6	0.0	0.0	-	-	0.0	0.2
Cars & Light Goods	30	15	0	-	45	154	13	0	-	167	8	200	0	-	208	420
% Cars & Light Goods	100.0	100.0	-	-	100.0	93.3	100.0	-	-	93.8	100.0	93.9	-	-	94.1	94.6
Buses	0	0	0	-	0	6	0	0	-	6	0	7	0	-	7	13
% Buses	0.0	0.0	-	-	0.0	3.6	0.0	-	-	3.4	0.0	3.3	-	-	3.2	2.9
Single-Unit Trucks	0	0	0	-	0	3	0	0	-	3	0	6	0	-	6	9
% Single-Unit Trucks	0.0	0.0	-	-	0.0	1.8	0.0	-	-	1.7	0.0	2.8	-	-	2.7	2.0
Articulated Trucks	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	-	-	0.0	0.6	0.0	-	-	0.6	0.0	0.0	-	-	0.0	0.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 05/17/2022



Peak Hour Data

05/17/2022 8:15 AM
Ending At
05/17/2022 9:15 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Old Highway 24 [N]

Out	In	Total
1	0	1
169	208	377
6	7	13
3	6	9
1	0	1
180	**221**	**401**

T	L	U	P
0	0	0	0
200	8	0	0
7	0	0	0
6	0	0	0
0	0	0	0
213	**8**	**0**	**0**

Lam Blvd [E]

Out	In	Total
0	0	0
21	45	66
0	0	0
0	0	0
0	0	0
21	**45**	**66**

R	L	U	P
0	0	0	0
15	30	0	0
0	0	0	0
0	0	0	0
0	0	0	0
15	**30**	**0**	**0**

U	T	R	P
0	1	0	0
0	154	13	0
0	6	0	0
0	3	0	0
0	1	0	0
0	**165**	**13**	**0**

Out	In	Total
0	1	1
230	167	397
7	6	13
6	3	9
0	1	1
243	**178**	**421**

Old Highway 24 [S]

Turning Movement Peak Hour Data Plot (8:15 AM)

Turning Movement Peak Hour Data (11:30 AM)

	Lam Blvd					Old Highway 24					Old Highway 24					
	Westbound					Northbound					Southbound					
Start Time	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Int. Total
11:30 AM	8	3	0	0	11	55	6	0	0	61	2	45	0	0	47	119
11:45 AM	2	1	0	0	3	57	5	0	0	62	2	43	0	0	45	110
12:00 PM	5	1	0	0	6	52	4	0	0	56	6	52	0	0	58	120
12:15 PM	2	2	0	0	4	48	4	0	0	52	5	38	0	0	43	99
Total	17	7	0	0	24	212	19	0	0	231	15	178	0	0	193	448
Approach %	70.8	29.2	0.0	-	-	91.8	8.2	0.0	-	-	7.8	92.2	0.0	-	-	-
Total %	3.8	1.6	0.0	-	5.4	47.3	4.2	0.0	-	51.6	3.3	39.7	0.0	-	43.1	-
PHF	0.531	0.583	0.000	-	0.545	0.930	0.792	0.000	-	0.931	0.625	0.856	0.000	-	0.832	0.933
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	17	6	0	-	23	204	19	0	-	223	14	173	0	-	187	433
% Cars & Light Goods	100.0	85.7	-	-	95.8	96.2	100.0	-	-	96.5	93.3	97.2	-	-	96.9	96.7
Buses	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	1
% Buses	0.0	0.0	-	-	0.0	0.5	0.0	-	-	0.4	0.0	0.0	-	-	0.0	0.2
Single-Unit Trucks	0	1	0	-	1	5	0	0	-	5	1	3	0	-	4	10
% Single-Unit Trucks	0.0	14.3	-	-	4.2	2.4	0.0	-	-	2.2	6.7	1.7	-	-	2.1	2.2
Articulated Trucks	0	0	0	-	0	2	0	0	-	2	0	2	0	-	2	4
% Articulated Trucks	0.0	0.0	-	-	0.0	0.9	0.0	-	-	0.9	0.0	1.1	-	-	1.0	0.9
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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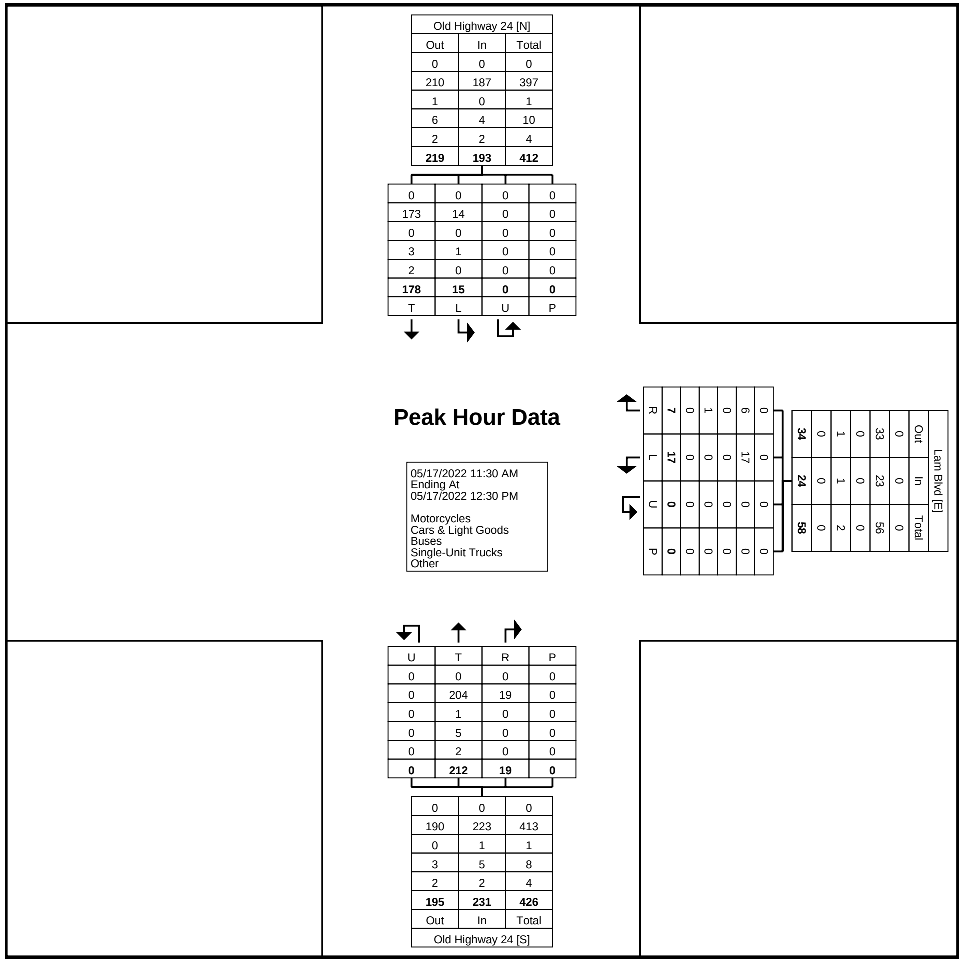
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 05/17/2022



Old Highway 24 [N]

Out	In	Total
0	0	0
210	187	397
1	0	1
6	4	10
2	2	4
219	**193**	**412**

T	L	U	P
0	0	0	0
173	14	0	0
0	0	0	0
3	1	0	0
2	0	0	0
178	**15**	**0**	**0**

Peak Hour Data

05/17/2022 11:30 AM
Ending At
05/17/2022 12:30 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Lam Blvd [E]

Out	In	Total
0	0	0
33	23	56
0	0	0
1	1	2
0	0	0
34	**24**	**58**

R	L	U	P
0	0	0	0
6	17	0	0
0	0	0	0
1	0	0	0
0	0	0	0
7	**17**	**0**	**0**

U	T	R	P
0	0	0	0
0	204	19	0
0	1	0	0
0	5	0	0
0	2	0	0
0	**212**	**19**	**0**

Out	In	Total
0	0	0
190	223	413
0	1	1
3	5	8
2	2	4
195	**231**	**426**

Old Highway 24 [S]

Turning Movement Peak Hour Data Plot (11:30 AM)

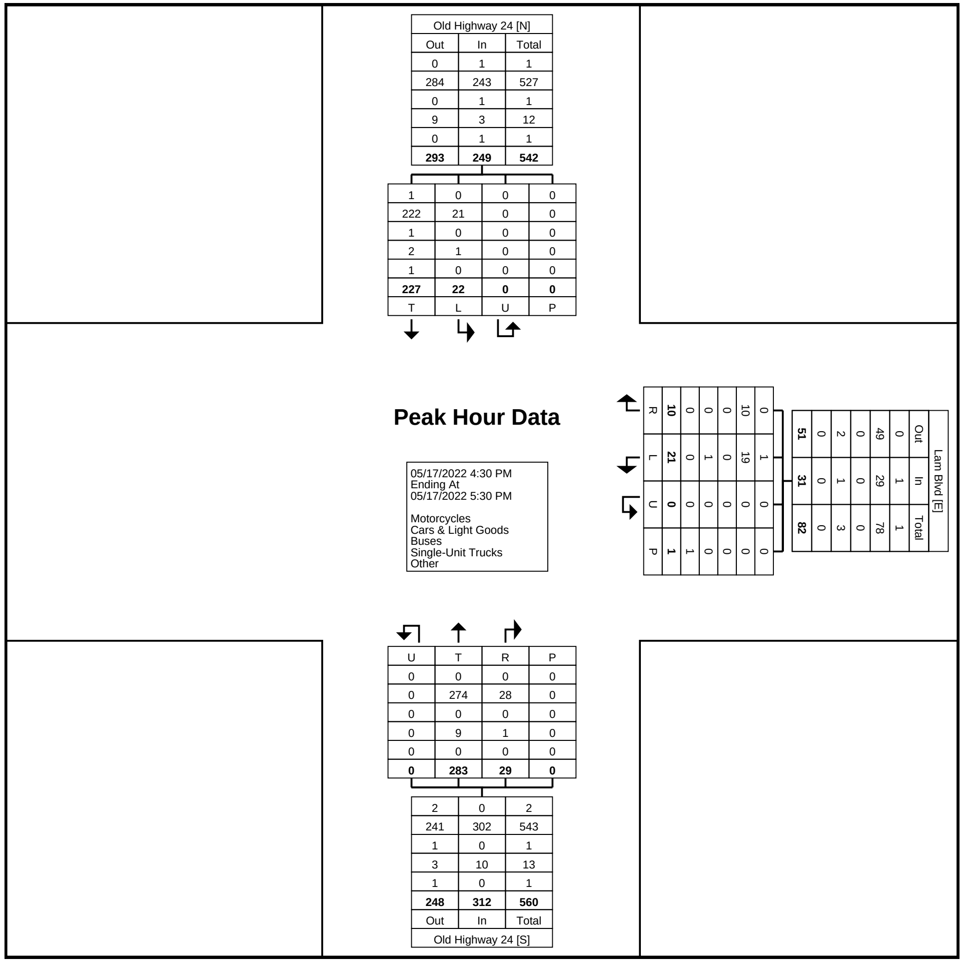
Turning Movement Peak Hour Data (4:30 PM)

Start Time	Lam Blvd Westbound					Old Highway 24 Northbound					Old Highway 24 Southbound					
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Int. Total
4:30 PM	4	2	0	0	6	73	7	0	0	80	6	55	0	0	61	147
4:45 PM	7	3	0	1	10	85	9	0	0	94	4	50	0	0	54	158
5:00 PM	6	0	0	0	6	51	4	0	0	55	4	69	0	0	73	134
5:15 PM	4	5	0	0	9	74	9	0	0	83	8	53	0	0	61	153
Total	21	10	0	1	31	283	29	0	0	312	22	227	0	0	249	592
Approach %	67.7	32.3	0.0	-	-	90.7	9.3	0.0	-	-	8.8	91.2	0.0	-	-	-
Total %	3.5	1.7	0.0	-	5.2	47.8	4.9	0.0	-	52.7	3.7	38.3	0.0	-	42.1	-
PHF	0.750	0.500	0.000	-	0.775	0.832	0.806	0.000	-	0.830	0.688	0.822	0.000	-	0.853	0.937
Motorcycles	1	0	0	-	1	0	0	0	-	0	0	1	0	-	1	2
% Motorcycles	4.8	0.0	-	-	3.2	0.0	0.0	-	-	0.0	0.0	0.4	-	-	0.4	0.3
Cars & Light Goods	19	10	0	-	29	274	28	0	-	302	21	222	0	-	243	574
% Cars & Light Goods	90.5	100.0	-	-	93.5	96.8	96.6	-	-	96.8	95.5	97.8	-	-	97.6	97.0
Buses	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	1
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.4	-	-	0.4	0.2
Single-Unit Trucks	1	0	0	-	1	9	1	0	-	10	1	2	0	-	3	14
% Single-Unit Trucks	4.8	0.0	-	-	3.2	3.2	3.4	-	-	3.2	4.5	0.9	-	-	1.2	2.4
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	1
% Articulated Trucks	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.4	-	-	0.4	0.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Old Highway 24 & Lam Blvd
Site Code: 210475
Start Date: 05/17/2022
Page No: 9



Peak Hour Data

05/17/2022 4:30 PM
Ending At
05/17/2022 5:30 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Old Highway 24 [N]

Out	In	Total
0	1	1
284	243	527
0	1	1
9	3	12
0	1	1
293	**249**	**542**

T	L	U	P
1	0	0	0
222	21	0	0
1	0	0	0
2	1	0	0
1	0	0	0
227	**22**	**0**	**0**

Lam Blvd [E]

Out	In	Total
0	1	1
49	29	78
0	0	0
2	1	3
0	0	0
51	**31**	**82**

R	L	U	P
0	1	0	0
10	19	0	0
0	0	0	0
0	1	0	0
0	0	0	1
10	**21**	**0**	**1**

U	T	R	P
0	0	0	0
0	274	28	0
0	0	0	0
0	9	1	0
0	0	0	0
0	**283**	**29**	**0**

Out	In	Total
2	0	2
241	302	543
1	0	1
3	10	13
1	0	1
248	**312**	**560**

Old Highway 24 [S]

Turning Movement Peak Hour Data Plot (4:30 PM)

Appendix C

Base Year (2023) Traffic Operations Reports

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	23	22	193	8	15	227
Future Volume (vph)	23	22	193	8	15	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.934		0.995			
Flt Protected	0.975					0.997
Satd. Flow (prot)	1657	0	1821	0	0	1852
Flt Permitted	0.975					0.997
Satd. Flow (perm)	1657	0	1821	0	0	1852
Link Speed (k/h)	50		60			60
Link Distance (m)	46.4		221.5			75.3
Travel Time (s)	3.3		13.3			4.5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	9%	4%	0%	7%	2%
Adj. Flow (vph)	29	28	244	10	19	287
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	0	254	0	0	306
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 34.3% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	23	22	193	8	15	227
Future Vol, veh/h	23	22	193	8	15	227
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	0	9	4	0	7	2
Mvmt Flow	29	28	244	10	19	287

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	574	249	0	0	254	0
Stage 1	249	-	-	-	-	-
Stage 2	325	-	-	-	-	-
Critical Hdwy	6.4	6.29	-	-	4.17	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.381	-	-	2.263	-
Pot Cap-1 Maneuver	484	773	-	-	1282	-
Stage 1	797	-	-	-	-	-
Stage 2	737	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	475	773	-	-	1282	-
Mov Cap-2 Maneuver	475	-	-	-	-	-
Stage 1	797	-	-	-	-	-
Stage 2	724	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.8	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	585	1282	-
HCM Lane V/C Ratio	-	-	0.097	0.015	-
HCM Control Delay (s)	-	-	11.8	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0	-

2: Old Highway 24 & Lam Boulevard

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
	↙	↖	↑	↗	↘	↓
Lane Configurations	↖↗		↱			↰
Traffic Volume (vph)	15	11	305	26	27	231
Future Volume (vph)	15	11	305	26	27	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.943		0.989			
Flt Protected	0.972					0.995
Satd. Flow (prot)	1742	0	1745	0	0	1857
Flt Permitted	0.972					0.995
Satd. Flow (perm)	1742	0	1745	0	0	1857
Link Speed (k/h)	50		60			60
Link Distance (m)	51.0		221.5			78.4
Travel Time (s)	3.7		13.3			4.7
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	8%	4%	0%	2%
Adj. Flow (vph)	18	13	363	31	32	275
Shared Lane Traffic (%)						
Lane Group Flow (vph)	31	0	394	0	0	307
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 44.6% ICU Level of Service A

Analysis Period (min) 15

2: Old Highway 24 & Lam Boulevard

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖↗		↱			↰
Traffic Vol, veh/h	15	11	305	26	27	231
Future Vol, veh/h	15	11	305	26	27	231
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	0	8	4	0	2
Mvmt Flow	18	13	363	31	32	275

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	719	380	0	0	395	0
Stage 1	380	-	-	-	-	-
Stage 2	339	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	398	671	-	-	1175	-
Stage 1	696	-	-	-	-	-
Stage 2	726	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	385	670	-	-	1174	-
Mov Cap-2 Maneuver	385	-	-	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	703	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	469	1174	-
HCM Lane V/C Ratio	-	-	0.066	0.027	-
HCM Control Delay (s)	-	-	13.2	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Appendix D

Internal Trip Capture

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:	230332 (Lam Blvd Townhouses)	**Organization:**	Paradigm
Project Location:	Waterford	**Performed By:**	
Scenario Description:	Total Traffic	**Date:**	07-Jun-23
Analysis Year:	2034	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822	14,766		35	21	14
Restaurant				0		
Cinema/Entertainment				0		
Residential	215		24	7	2	5
Hotel				0		
All Other Land Uses[2]				0		
Total				42	23	19

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant						
Cinema/Entertainment						
Residential	1.00			1.00		
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	42	23	19
Internal Capture Percentage	0%	0%	0%
External Vehicle-Trips[3]	42	23	19
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	0%	0%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	0%
Hotel	N/A	N/A

[1] Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2] Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[4] Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	230332 (Lam Blvd Townhouses)
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	21	21	1.00	14	14
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	2	2	1.00	5	5
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	4		2	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	1	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		7	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	2		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	4	0	0		0
Hotel	0	1	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	0	21	21	21	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	2	2	2	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	0	14	14	14	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	5	5	5	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2] Person-Trips

[3] Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:	230332 (Lam Blvd Townhouses)	**Organization:**	Paradigm
Project Location:	Waterford	**Performed By:**	
Scenario Description:	Total Traffic	**Date:**	07-Jun-23
Analysis Year:	2034	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822	14,766		103	52	51
Restaurant				0		
Cinema/Entertainment				0		
Residential	215		24	10	6	4
Hotel				0		
All Other Land Uses[2]				0		
Total				113	58	55

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant						
Cinema/Entertainment						
Residential	1.00			1.00		
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail					0	
Restaurant						
Cinema/Entertainment						
Residential		0				
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	3	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	2	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	113	58	55
Internal Capture Percentage	9%	9%	9%
External Vehicle-Trips[3]	103	53	50
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	4%	6%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	50%	50%
Hotel	N/A	N/A

[1] Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2] Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[4] Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	230332 (Lam Blvd Townhouses)
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	52	52	1.00	51	51
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	6	6	1.00	4	4
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	1		15	2	13	3
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	2	1	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		4	0	0	0	0
Retail	0		0	0	3	0
Restaurant	0	26		0	1	0
Cinema/Entertainment	0	2	0		0	0
Residential	0	5	0	0		0
Hotel	0	1	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	2	50	52	50	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	3	3	6	3	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	3	48	51	48	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	2	2	4	2	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

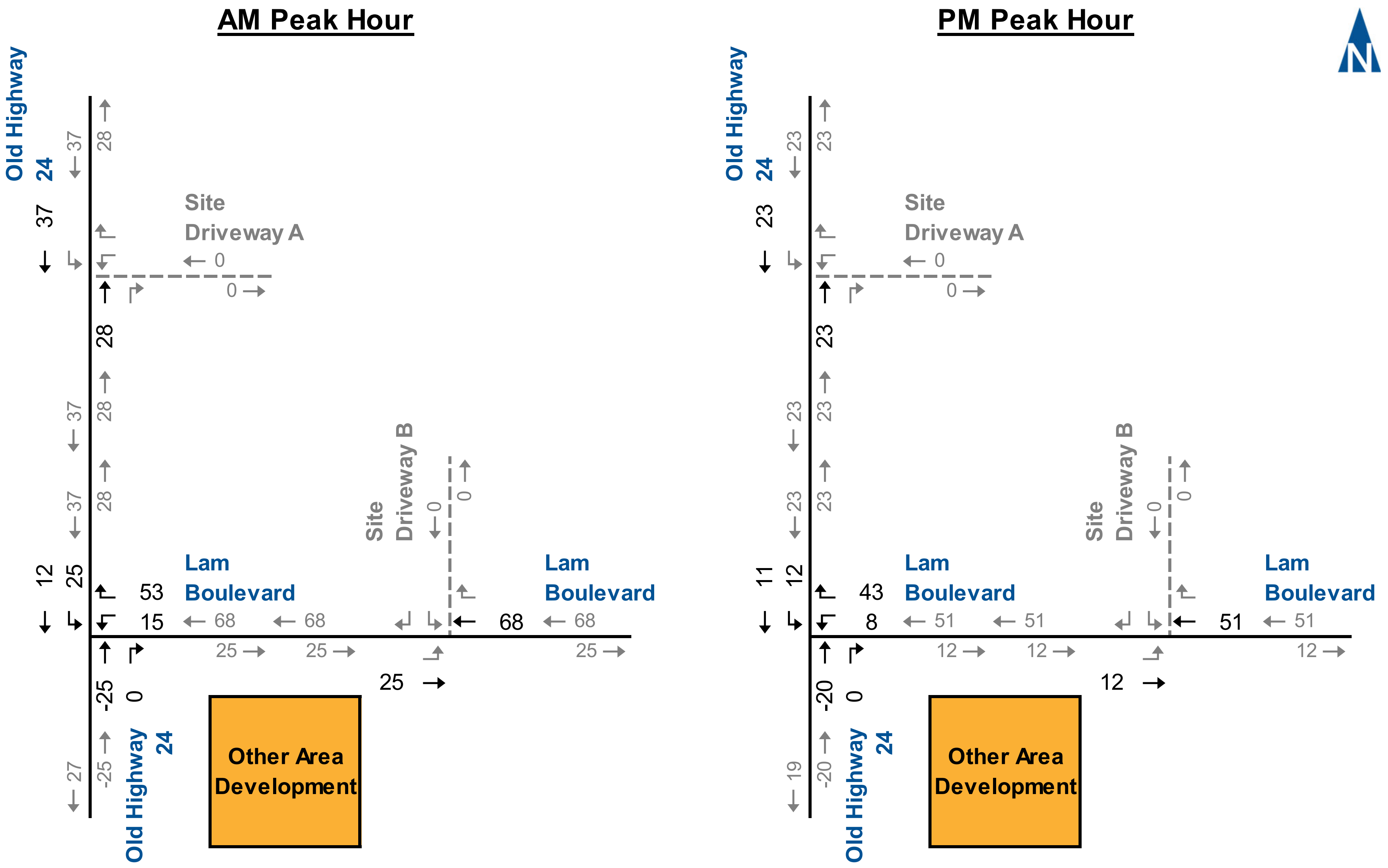
[2] Person-Trips

[3] Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Appendix E

Background Development Traffic Volumes



Background Development Traffic Volumes

Old Highway 24 & Lam Boulevard Townhouse Development TIS
230332 (210680)

Appendix E

Appendix F

2024 Background Traffic Operations Reports

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↲↳		↱			↰
Traffic Volume (vph)	38	75	171	8	40	242
Future Volume (vph)	38	75	171	8	40	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.910		0.994			
Flt Protected	0.983					0.993
Satd. Flow (prot)	1604	0	1819	0	0	1837
Flt Permitted	0.983					0.993
Satd. Flow (perm)	1604	0	1819	0	0	1837
Link Speed (k/h)	50		60			60
Link Distance (m)	46.4		221.5			75.3
Travel Time (s)	3.3		13.3			4.5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	9%	4%	0%	7%	2%
Adj. Flow (vph)	48	95	216	10	51	306
Shared Lane Traffic (%)						
Lane Group Flow (vph)	143	0	226	0	0	357
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 41.2% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↲↳		↱			↰
Traffic Vol, veh/h	38	75	171	8	40	242
Future Vol, veh/h	38	75	171	8	40	242
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	0	9	4	0	7	2
Mvmt Flow	48	95	216	10	51	306

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	629	221	0	0	226	0
Stage 1	221	-	-	-	-	-
Stage 2	408	-	-	-	-	-
Critical Hdwy	6.4	6.29	-	-	4.17	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.381	-	-	2.263	-
Pot Cap-1 Maneuver	449	801	-	-	1313	-
Stage 1	821	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	428	801	-	-	1313	-
Mov Cap-2 Maneuver	428	-	-	-	-	-
Stage 1	821	-	-	-	-	-
Stage 2	644	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	619	1313	-
HCM Lane V/C Ratio	-	-	0.231	0.039	-
HCM Control Delay (s)	-	-	12.6	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0.1	-

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	23	54	290	26	39	245
Future Volume (vph)	23	54	290	26	39	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.905		0.989			
Flt Protected	0.985					0.993
Satd. Flow (prot)	1694	0	1745	0	0	1855
Flt Permitted	0.985					0.993
Satd. Flow (perm)	1694	0	1745	0	0	1855
Link Speed (k/h)	50		60			60
Link Distance (m)	51.0		221.5			78.4
Travel Time (s)	3.7		13.3			4.7
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	8%	4%	0%	2%
Adj. Flow (vph)	27	64	345	31	46	292
Shared Lane Traffic (%)						
Lane Group Flow (vph)	91	0	376	0	0	338
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 46.5% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	23	54	290	26	39	245
Future Vol, veh/h	23	54	290	26	39	245
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	0	8	4	0	2
Mvmt Flow	27	64	345	31	46	292

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	746	362	0	0	377	0
Stage 1	362	-	-	-	-	-
Stage 2	384	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	384	687	-	-	1193	-
Stage 1	709	-	-	-	-	-
Stage 2	693	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	366	686	-	-	1192	-
Mov Cap-2 Maneuver	366	-	-	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	661	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	544	1192	-
HCM Lane V/C Ratio	-	-	0.169	0.039	-
HCM Control Delay (s)	-	-	13	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.1	-

Appendix G

2024 Total Traffic Operations Reports

Lanes, Volumes, Timings
1: Old Highway 24 & Site Driveway A

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	⅄		↱			↰
Traffic Volume (vph)	4	9	246	2	13	282
Future Volume (vph)	4	9	246	2	13	282
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.999			
Flt Protected	0.986					0.998
Satd. Flow (prot)	1660	0	1861	0	0	1859
Flt Permitted	0.986					0.998
Satd. Flow (perm)	1660	0	1861	0	0	1859
Link Speed (k/h)	50		60			60
Link Distance (m)	83.3		75.3			97.3
Travel Time (s)	6.0		4.5			5.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	10	267	2	14	307
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	269	0	0	321
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 35.4% ICU Level of Service A
Analysis Period (min) 15

HCM 6th TWSC
1: Old Highway 24 & Site Driveway A

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	⅄		↱			↰
Traffic Vol, veh/h	4	9	246	2	13	282
Future Vol, veh/h	4	9	246	2	13	282
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	4	10	267	2	14	307

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	603	268	0	0	269	0
Stage 1	268	-	-	-	-	-
Stage 2	335	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	462	771	-	-	1295	-
Stage 1	777	-	-	-	-	-
Stage 2	725	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	456	771	-	-	1295	-
Mov Cap-2 Maneuver	456	-	-	-	-	-
Stage 1	777	-	-	-	-	-
Stage 2	716	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	636	1295	-
HCM Lane V/C Ratio	-	-	0.022	0.011	-
HCM Control Delay (s)	-	-	10.8	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	45	75	173	16	40	246
Future Volume (vph)	45	75	173	16	40	246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916		0.989			
Flt Protected	0.982					0.993
Satd. Flow (prot)	1618	0	1813	0	0	1837
Flt Permitted	0.982					0.993
Satd. Flow (perm)	1618	0	1813	0	0	1837
Link Speed (k/h)	50		60			60
Link Distance (m)	46.4		221.5			75.3
Travel Time (s)	3.3		13.3			4.5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	9%	4%	0%	7%	2%
Adj. Flow (vph)	57	95	219	20	51	311
Shared Lane Traffic (%)						
Lane Group Flow (vph)	152	0	239	0	0	362
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 42.3% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	75	173	16	40	246
Future Vol, veh/h	45	75	173	16	40	246
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	0	9	4	0	7	2
Mvmt Flow	57	95	219	20	51	311

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	642	229	0	0	239	0
Stage 1	229	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Critical Hdwy	6.4	6.29	-	-	4.17	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.381	-	-	2.263	-
Pot Cap-1 Maneuver	442	793	-	-	1299	-
Stage 1	814	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	421	793	-	-	1299	-
Mov Cap-2 Maneuver	421	-	-	-	-	-
Stage 1	814	-	-	-	-	-
Stage 2	640	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.1	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	596	1299	-
HCM Lane V/C Ratio	-	-	0.255	0.039	-
HCM Control Delay (s)	-	-	13.1	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1	0.1	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Volume (vph)	8	48	113	0	0	7
Future Volume (vph)	8	48	113	0	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected		0.993				
Satd. Flow (prot)	0	1850	1863	0	1611	0
Flt Permitted		0.993				
Satd. Flow (perm)	0	1850	1863	0	1611	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		46.4	130.2		61.7	
Travel Time (s)		3.3	9.4		4.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	52	123	0	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	61	123	0	8	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 19.3% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	8	48	113	0	0	7
Future Vol, veh/h	8	48	113	0	0	7
Conflicting Peds, #/hr	0	0	0	0	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, %	2	2	2	2	2	2
Mvmt Flow	9	52	123	0	0	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	123	0	-	0	193	123
Stage 1	-	-	-	-	123	-
Stage 2	-	-	-	-	70	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1464	-	-	-	796	928
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	953	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1464	-	-	-	791	928
Mov Cap-2 Maneuver	-	-	-	-	791	-
Stage 1	-	-	-	-	897	-
Stage 2	-	-	-	-	953	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1464	-	-	-	928
HCM Lane V/C Ratio	0.006	-	-	-	0.008
HCM Control Delay (s)	7.5	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings
1: Old Highway 24 & Site Driveway A

2024 Total PM Peak Hour
Old Highway 24 & Lam Boulevard TIS

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	12	29	344	5	24	284
Future Volume (vph)	12	29	344	5	24	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.998			
Flt Protected	0.986					0.996
Satd. Flow (prot)	1660	0	1859	0	0	1855
Flt Permitted	0.986					0.996
Satd. Flow (perm)	1660	0	1859	0	0	1855
Link Speed (k/h)	50		60			60
Link Distance (m)	81.8		78.4			87.0
Travel Time (s)	5.9		4.7			5.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	32	374	5	26	309
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	0	379	0	0	335
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 44.8% ICU Level of Service A
Analysis Period (min) 15

HCM 6th TWSC
1: Old Highway 24 & Site Driveway A

2024 Total PM Peak Hour
Old Highway 24 & Lam Boulevard TIS

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	12	29	344	5	24	284
Future Vol, veh/h	12	29	344	5	24	284
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	13	32	374	5	26	309

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	738	377	0	0	379	0
Stage 1	377	-	-	-	-	-
Stage 2	361	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	385	670	-	-	1179	-
Stage 1	694	-	-	-	-	-
Stage 2	705	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	375	670	-	-	1179	-
Mov Cap-2 Maneuver	375	-	-	-	-	-
Stage 1	694	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	545	1179	-
HCM Lane V/C Ratio	-	-	0.082	0.022	-
HCM Control Delay (s)	-	-	12.2	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	32	54	295	50	39	257
Future Volume (vph)	32	54	295	50	39	257
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.915		0.980			
Flt Protected	0.982					0.994
Satd. Flow (prot)	1707	0	1733	0	0	1856
Flt Permitted	0.982					0.994
Satd. Flow (perm)	1707	0	1733	0	0	1856
Link Speed (k/h)	50		60			60
Link Distance (m)	51.0		221.5			78.4
Travel Time (s)	3.7		13.3			4.7
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	8%	4%	0%	2%
Adj. Flow (vph)	38	64	351	60	46	306
Shared Lane Traffic (%)						
Lane Group Flow (vph)	102	0	411	0	0	352
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 49.4% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	32	54	295	50	39	257
Future Vol, veh/h	32	54	295	50	39	257
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	0	8	4	0	2
Mvmt Flow	38	64	351	60	46	306

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	780	382	0	0	412	0
Stage 1	382	-	-	-	-	-
Stage 2	398	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	367	670	-	-	1158	-
Stage 1	694	-	-	-	-	-
Stage 2	683	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	349	669	-	-	1157	-
Mov Cap-2 Maneuver	349	-	-	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	650	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	499	1157	-
HCM Lane V/C Ratio	-	-	0.205	0.04	-
HCM Control Delay (s)	-	-	14.1	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

Lanes, Volumes, Timings
3: Lam Boulevard & Site Driveway B

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↙↘	
Traffic Volume (vph)	24	65	77	0	0	9
Future Volume (vph)	24	65	77	0	0	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected		0.987				
Satd. Flow (prot)	0	1839	1863	0	1611	0
Flt Permitted		0.987				
Satd. Flow (perm)	0	1839	1863	0	1611	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		51.0	125.6		57.1	
Travel Time (s)		3.7	9.0		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	71	84	0	0	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	97	84	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.4% ICU Level of Service A

Analysis Period (min) 15

HCM 6th TWSC
3: Lam Boulevard & Site Driveway B

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↙↘	
Traffic Vol, veh/h	24	65	77	0	0	9
Future Vol, veh/h	24	65	77	0	0	9
Conflicting Peds, #/hr	0	0	0	0	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, %	2	2	2	2	2	2
Mvmt Flow	26	71	84	0	0	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	84	0	-	0	207	84
Stage 1	-	-	-	-	84	-
Stage 2	-	-	-	-	123	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1513	-	-	-	781	975
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	902	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1513	-	-	-	767	975
Mov Cap-2 Maneuver	-	-	-	-	767	-
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1513	-	-	-	975
HCM Lane V/C Ratio	0.017	-	-	-	0.01
HCM Control Delay (s)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0

Appendix H

2029 Background Traffic Operations Reports

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	38	75	186	8	40	260
Future Volume (vph)	38	75	186	8	40	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.910		0.994			
Flt Protected	0.983					0.993
Satd. Flow (prot)	1604	0	1819	0	0	1838
Flt Permitted	0.983					0.993
Satd. Flow (perm)	1604	0	1819	0	0	1838
Link Speed (k/h)	50		60			60
Link Distance (m)	46.4		221.5			75.3
Travel Time (s)	3.3		13.3			4.5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	9%	4%	0%	7%	2%
Adj. Flow (vph)	48	95	235	10	51	329
Shared Lane Traffic (%)						
Lane Group Flow (vph)	143	0	245	0	0	380
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 42.9% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	38	75	186	8	40	260
Future Vol, veh/h	38	75	186	8	40	260
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	0	9	4	0	7	2
Mvmt Flow	48	95	235	10	51	329

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	671	240	0	0	245	0
Stage 1	240	-	-	-	-	-
Stage 2	431	-	-	-	-	-
Critical Hdwy	6.4	6.29	-	-	4.17	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.381	-	-	2.263	-
Pot Cap-1 Maneuver	425	782	-	-	1292	-
Stage 1	805	-	-	-	-	-
Stage 2	660	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	405	782	-	-	1292	-
Mov Cap-2 Maneuver	405	-	-	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	628	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	596	1292	-
HCM Lane V/C Ratio	-	-	0.24	0.039	-
HCM Control Delay (s)	-	-	12.9	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0.1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	⅄		↱			↰
Traffic Volume (vph)	23	54	314	26	39	264
Future Volume (vph)	23	54	314	26	39	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.905		0.990			
Flt Protected	0.985					0.994
Satd. Flow (prot)	1694	0	1747	0	0	1856
Flt Permitted	0.985					0.994
Satd. Flow (perm)	1694	0	1747	0	0	1856
Link Speed (k/h)	50		60			60
Link Distance (m)	51.0		221.5			78.4
Travel Time (s)	3.7		13.3			4.7
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	8%	4%	0%	2%
Adj. Flow (vph)	27	64	374	31	46	314
Shared Lane Traffic (%)						
Lane Group Flow (vph)	91	0	405	0	0	360
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 48.8% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	⅄		↱			↰
Traffic Vol, veh/h	23	54	314	26	39	264
Future Vol, veh/h	23	54	314	26	39	264
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	0	8	4	0	2
Mvmt Flow	27	64	374	31	46	314

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	797	391	0	0	406	0
Stage 1	391	-	-	-	-	-
Stage 2	406	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	358	662	-	-	1164	-
Stage 1	688	-	-	-	-	-
Stage 2	677	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	340	661	-	-	1163	-
Mov Cap-2 Maneuver	340	-	-	-	-	-
Stage 1	687	-	-	-	-	-
Stage 2	645	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	13.5		0		1.1	
HCM LOS	B					

Minor Lane/Major Mvmt		NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)		-	-	516	1163	-
HCM Lane V/C Ratio		-	-	0.178	0.04	-
HCM Control Delay (s)		-	-	13.5	8.2	0
HCM Lane LOS		-	-	B	A	A
HCM 95th %tile Q(veh)		-	-	0.6	0.1	-

Appendix I

2029 Total Traffic Operations Reports

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	4	9	261	2	13	300
Future Volume (vph)	4	9	261	2	13	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.999			
Flt Protected	0.986					0.998
Satd. Flow (prot)	1660	0	1861	0	0	1859
Flt Permitted	0.986					0.998
Satd. Flow (perm)	1660	0	1861	0	0	1859
Link Speed (k/h)	50		60			60
Link Distance (m)	83.3		75.3			97.3
Travel Time (s)	6.0		4.5			5.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	10	284	2	14	326
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	286	0	0	340
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 36.3% ICU Level of Service A
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	4	9	261	2	13	300
Future Vol, veh/h	4	9	261	2	13	300
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	4	10	284	2	14	326

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	639	285	0	0	286	0
Stage 1	285	-	-	-	-	-
Stage 2	354	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	440	754	-	-	1276	-
Stage 1	763	-	-	-	-	-
Stage 2	710	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	434	754	-	-	1276	-
Mov Cap-2 Maneuver	434	-	-	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	701	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	615	1276	-
HCM Lane V/C Ratio	-	-	0.023	0.011	-
HCM Control Delay (s)	-	-	11	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	45	75	188	16	40	264
Future Volume (vph)	45	75	188	16	40	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916		0.990			
Flt Protected	0.982					0.993
Satd. Flow (prot)	1618	0	1814	0	0	1838
Flt Permitted	0.982					0.993
Satd. Flow (perm)	1618	0	1814	0	0	1838
Link Speed (k/h)	50		60			60
Link Distance (m)	46.4		221.5			75.3
Travel Time (s)	3.3		13.3			4.5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	9%	4%	0%	7%	2%
Adj. Flow (vph)	57	95	238	20	51	334
Shared Lane Traffic (%)						
Lane Group Flow (vph)	152	0	258	0	0	385
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 44.1% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	45	75	188	16	40	264
Future Vol, veh/h	45	75	188	16	40	264
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	0	9	4	0	7	2
Mvmt Flow	57	95	238	20	51	334

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	684	248	0	0	258	0
Stage 1	248	-	-	-	-	-
Stage 2	436	-	-	-	-	-
Critical Hdwy	6.4	6.29	-	-	4.17	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.381	-	-	2.263	-
Pot Cap-1 Maneuver	417	774	-	-	1278	-
Stage 1	798	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	397	774	-	-	1278	-
Mov Cap-2 Maneuver	397	-	-	-	-	-
Stage 1	798	-	-	-	-	-
Stage 2	624	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.6	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	571	1278	-
HCM Lane V/C Ratio	-	-	0.266	0.04	-
HCM Control Delay (s)	-	-	13.6	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.1	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⅄	
Traffic Volume (vph)	8	48	113	0	0	7
Future Volume (vph)	8	48	113	0	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected		0.993				
Satd. Flow (prot)	0	1850	1863	0	1611	0
Flt Permitted		0.993				
Satd. Flow (perm)	0	1850	1863	0	1611	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		46.4	130.2		61.7	
Travel Time (s)		3.3	9.4		4.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	52	123	0	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	61	123	0	8	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 19.3% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⅄	
Traffic Vol, veh/h	8	48	113	0	0	7
Future Vol, veh/h	8	48	113	0	0	7
Conflicting Peds, #/hr	0	0	0	0	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, %	2	2	2	2	2	2
Mvmt Flow	9	52	123	0	0	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	123	0	-	0	193	123
Stage 1	-	-	-	-	123	-
Stage 2	-	-	-	-	70	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1464	-	-	-	796	928
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	953	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1464	-	-	-	791	928
Mov Cap-2 Maneuver	-	-	-	-	791	-
Stage 1	-	-	-	-	897	-
Stage 2	-	-	-	-	953	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1464	-	-	-	928
HCM Lane V/C Ratio	0.006	-	-	-	0.008
HCM Control Delay (s)	7.5	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	12	29	368	5	24	303
Future Volume (vph)	12	29	368	5	24	303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.998			
Flt Protected	0.986					0.996
Satd. Flow (prot)	1660	0	1859	0	0	1855
Flt Permitted	0.986					0.996
Satd. Flow (perm)	1660	0	1859	0	0	1855
Link Speed (k/h)	50		60			60
Link Distance (m)	81.8		78.4			87.0
Travel Time (s)	5.9		4.7			5.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	32	400	5	26	329
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	0	405	0	0	355
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 45.7% ICU Level of Service A

Analysis Period (min) 15

Intersection

Int Delay, s/veh 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	12	29	368	5	24	303
Future Vol, veh/h	12	29	368	5	24	303
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	13	32	400	5	26	329

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	784	403	0	0	405	0
Stage 1	403	-	-	-	-	-
Stage 2	381	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	362	647	-	-	1154	-
Stage 1	675	-	-	-	-	-
Stage 2	691	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	352	647	-	-	1154	-
Mov Cap-2 Maneuver	352	-	-	-	-	-
Stage 1	675	-	-	-	-	-
Stage 2	672	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	520	1154	-
HCM Lane V/C Ratio	-	-	0.086	0.023	-
HCM Control Delay (s)	-	-	12.6	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	32	54	319	50	39	276
Future Volume (vph)	32	54	319	50	39	276
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.915		0.982			
Flt Protected	0.982					0.994
Satd. Flow (prot)	1707	0	1736	0	0	1856
Flt Permitted	0.982					0.994
Satd. Flow (perm)	1707	0	1736	0	0	1856
Link Speed (k/h)	50		60			60
Link Distance (m)	51.0		221.5			78.4
Travel Time (s)	3.7		13.3			4.7
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	8%	4%	0%	2%
Adj. Flow (vph)	38	64	380	60	46	329
Shared Lane Traffic (%)						
Lane Group Flow (vph)	102	0	440	0	0	375
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 51.6% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	32	54	319	50	39	276
Future Vol, veh/h	32	54	319	50	39	276
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	0	8	4	0	2
Mvmt Flow	38	64	380	60	46	329

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	832	411	0	0	441	0
Stage 1	411	-	-	-	-	-
Stage 2	421	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	342	645	-	-	1130	-
Stage 1	674	-	-	-	-	-
Stage 2	667	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	325	644	-	-	1129	-
Mov Cap-2 Maneuver	325	-	-	-	-	-
Stage 1	673	-	-	-	-	-
Stage 2	634	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.7	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	472	1129	-
HCM Lane V/C Ratio	-	-	0.217	0.041	-
HCM Control Delay (s)	-	-	14.7	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

	↗	→	←	↖	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Traffic Volume (vph)	24	65	77	0	0	9
Future Volume (vph)	24	65	77	0	0	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected		0.987				
Satd. Flow (prot)	0	1839	1863	0	1611	0
Flt Permitted		0.987				
Satd. Flow (perm)	0	1839	1863	0	1611	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		51.0	125.6		57.1	
Travel Time (s)		3.7	9.0		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	71	84	0	0	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	97	84	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.4% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Traffic Vol, veh/h	24	65	77	0	0	9
Future Vol, veh/h	24	65	77	0	0	9
Conflicting Peds, #/hr	0	0	0	0	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, %	2	2	2	2	2	2
Mvmt Flow	26	71	84	0	0	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	84	0	-	0	207	84
Stage 1	-	-	-	-	84	-
Stage 2	-	-	-	-	123	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1513	-	-	-	781	975
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	902	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1513	-	-	-	767	975
Mov Cap-2 Maneuver	-	-	-	-	767	-
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1513	-	-	-	975
HCM Lane V/C Ratio	0.017	-	-	-	0.01
HCM Control Delay (s)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0

Appendix J

2034 Background Traffic Operations Reports

Lanes, Volumes, Timings
2: Old Highway 24 & Lam Boulevard

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	38	75	202	8	40	279
Future Volume (vph)	38	75	202	8	40	279
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.910		0.995			
Flt Protected	0.983					0.994
Satd. Flow (prot)	1604	0	1820	0	0	1840
Flt Permitted	0.983					0.994
Satd. Flow (perm)	1604	0	1820	0	0	1840
Link Speed (k/h)	50		60			60
Link Distance (m)	46.4		221.5			75.3
Travel Time (s)	3.3		13.3			4.5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	9%	4%	0%	7%	2%
Adj. Flow (vph)	48	95	256	10	51	353
Shared Lane Traffic (%)						
Lane Group Flow (vph)	143	0	266	0	0	404
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 44.7% ICU Level of Service A

Analysis Period (min) 15

HCM 6th TWSC
2: Old Highway 24 & Lam Boulevard

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	38	75	202	8	40	279
Future Vol, veh/h	38	75	202	8	40	279
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	0	9	4	0	7	2
Mvmt Flow	48	95	256	10	51	353

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	716	261	0	0	266	0
Stage 1	261	-	-	-	-	-
Stage 2	455	-	-	-	-	-
Critical Hdwy	6.4	6.29	-	-	4.17	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.381	-	-	2.263	-
Pot Cap-1 Maneuver	400	761	-	-	1269	-
Stage 1	787	-	-	-	-	-
Stage 2	643	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	380	761	-	-	1269	-
Mov Cap-2 Maneuver	380	-	-	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	611	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	569	1269	-
HCM Lane V/C Ratio	-	-	0.251	0.04	-
HCM Control Delay (s)	-	-	13.4	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1	0.1	-

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Volume (vph)	23	54	339	26	39	283
Future Volume (vph)	23	54	339	26	39	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.905		0.990			
Flt Protected	0.985					0.994
Satd. Flow (prot)	1694	0	1746	0	0	1856
Flt Permitted	0.985					0.994
Satd. Flow (perm)	1694	0	1746	0	0	1856
Link Speed (k/h)	50		60			60
Link Distance (m)	51.0		221.5			78.4
Travel Time (s)	3.7		13.3			4.7
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	8%	4%	0%	2%
Adj. Flow (vph)	27	64	404	31	46	337
Shared Lane Traffic (%)						
Lane Group Flow (vph)	91	0	435	0	0	383
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 51.1% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	23	54	339	26	39	283
Future Vol, veh/h	23	54	339	26	39	283
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	0	8	4	0	2
Mvmt Flow	27	64	404	31	46	337

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	850	421	0	0	436	0
Stage 1	421	-	-	-	-	-
Stage 2	429	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	334	637	-	-	1134	-
Stage 1	667	-	-	-	-	-
Stage 2	661	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	317	636	-	-	1133	-
Mov Cap-2 Maneuver	317	-	-	-	-	-
Stage 1	666	-	-	-	-	-
Stage 2	628	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	489	1133	-
HCM Lane V/C Ratio	-	-	0.187	0.041	-
HCM Control Delay (s)	-	-	14.1	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.1	-

Appendix K

2034 Total Traffic Operations Reports

Lanes, Volumes, Timings
1: Old Highway 24 & Site Driveway A

2034 Total AM Peak Hour
Old Highway 24 & Lam Boulevard TIS

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Volume (vph)	4	9	277	2	13	319
Future Volume (vph)	4	9	277	2	13	319
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.999			
Flt Protected	0.986					0.998
Satd. Flow (prot)	1660	0	1861	0	0	1859
Flt Permitted	0.986					0.998
Satd. Flow (perm)	1660	0	1861	0	0	1859
Link Speed (k/h)	50		60			60
Link Distance (m)	83.3		75.3			97.3
Travel Time (s)	6.0		4.5			5.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	10	301	2	14	347
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	303	0	0	361
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 37.3% ICU Level of Service A
Analysis Period (min) 15

HCM 6th TWSC
1: Old Highway 24 & Site Driveway A

2034 Total AM Peak Hour
Old Highway 24 & Lam Boulevard TIS

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Vol, veh/h	4	9	277	2	13	319
Future Vol, veh/h	4	9	277	2	13	319
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	4	10	301	2	14	347

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	677	302	0	0	303	0
Stage 1	302	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	418	738	-	-	1258	-
Stage 1	750	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	412	738	-	-	1258	-
Mov Cap-2 Maneuver	412	-	-	-	-	-
Stage 1	750	-	-	-	-	-
Stage 2	685	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	594	1258	-
HCM Lane V/C Ratio	-	-	0.024	0.011	-
HCM Control Delay (s)	-	-	11.2	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Lanes, Volumes, Timings
2: Old Highway 24 & Lam Boulevard

2034 Total AM Peak Hour
Old Highway 24 & Lam Boulevard TIS

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↲
Traffic Volume (vph)	45	75	204	16	40	283
Future Volume (vph)	45	75	204	16	40	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916		0.990			
Flt Protected	0.982					0.994
Satd. Flow (prot)	1618	0	1814	0	0	1840
Flt Permitted	0.982					0.994
Satd. Flow (perm)	1618	0	1814	0	0	1840
Link Speed (k/h)	50		60			60
Link Distance (m)	46.4		221.5			75.3
Travel Time (s)	3.3		13.3			4.5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	9%	4%	0%	7%	2%
Adj. Flow (vph)	57	95	258	20	51	358
Shared Lane Traffic (%)						
Lane Group Flow (vph)	152	0	278	0	0	409
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 45.9% ICU Level of Service A
Analysis Period (min) 15

HCM 6th TWSC
2: Old Highway 24 & Lam Boulevard

2034 Total AM Peak Hour
Old Highway 24 & Lam Boulevard TIS

Intersection	
Int Delay, s/veh	3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↲
Traffic Vol, veh/h	45	75	204	16	40	283
Future Vol, veh/h	45	75	204	16	40	283
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	0	9	4	0	7	2
Mvmt Flow	57	95	258	20	51	358

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	728	268	0	0	278	0
Stage 1	268	-	-	-	-	-
Stage 2	460	-	-	-	-	-
Critical Hdwy	6.4	6.29	-	-	4.17	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.381	-	-	2.263	-
Pot Cap-1 Maneuver	393	754	-	-	1257	-
Stage 1	782	-	-	-	-	-
Stage 2	640	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	373	754	-	-	1257	-
Mov Cap-2 Maneuver	373	-	-	-	-	-
Stage 1	782	-	-	-	-	-
Stage 2	607	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	545	1257	-
HCM Lane V/C Ratio	-	-	0.279	0.04	-
HCM Control Delay (s)	-	-	14.1	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.1	-

Lanes, Volumes, Timings
3: Lam Boulevard & Site Driveway B

	↗	→	←	↖	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Volume (vph)	8	48	113	0	0	7
Future Volume (vph)	8	48	113	0	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected		0.993				
Satd. Flow (prot)	0	1850	1863	0	1611	0
Flt Permitted		0.993				
Satd. Flow (perm)	0	1850	1863	0	1611	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		46.4	130.2		61.7	
Travel Time (s)		3.3	9.4		4.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	52	123	0	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	61	123	0	8	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 19.3% ICU Level of Service A

Analysis Period (min) 15

HCM 6th TWSC
3: Lam Boulevard & Site Driveway B

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	8	48	113	0	0	7
Future Vol, veh/h	8	48	113	0	0	7
Conflicting Peds, #/hr	0	0	0	0	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, %	2	2	2	2	2	2
Mvmt Flow	9	52	123	0	0	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	123	0	-	0	193	123
Stage 1	-	-	-	-	123	-
Stage 2	-	-	-	-	70	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1464	-	-	-	796	928
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	953	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1464	-	-	-	791	928
Mov Cap-2 Maneuver	-	-	-	-	791	-
Stage 1	-	-	-	-	897	-
Stage 2	-	-	-	-	953	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1464	-	-	-	928
HCM Lane V/C Ratio	0.006	-	-	-	0.008
HCM Control Delay (s)	7.5	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings
1: Old Highway 24 & Site Driveway A

2034 Total PM Peak Hour
Old Highway 24 & Lam Boulevard TIS

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Volume (vph)	12	29	393	5	24	322
Future Volume (vph)	12	29	393	5	24	322
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.904		0.998			
Flt Protected	0.986					0.997
Satd. Flow (prot)	1660	0	1859	0	0	1857
Flt Permitted	0.986					0.997
Satd. Flow (perm)	1660	0	1859	0	0	1857
Link Speed (k/h)	50		60			60
Link Distance (m)	81.8		78.4			87.0
Travel Time (s)	5.9		4.7			5.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	32	427	5	26	350
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	0	432	0	0	376
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 46.7% ICU Level of Service A
Analysis Period (min) 15

HCM 6th TWSC
1: Old Highway 24 & Site Driveway A

2034 Total PM Peak Hour
Old Highway 24 & Lam Boulevard TIS

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Vol, veh/h	12	29	393	5	24	322
Future Vol, veh/h	12	29	393	5	24	322
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	13	32	427	5	26	350

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	832	430	0	0	432	0
Stage 1	430	-	-	-	-	-
Stage 2	402	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	339	625	-	-	1128	-
Stage 1	656	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	329	625	-	-	1128	-
Mov Cap-2 Maneuver	329	-	-	-	-	-
Stage 1	656	-	-	-	-	-
Stage 2	656	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	495	1128	-
HCM Lane V/C Ratio	-	-	0.09	0.023	-
HCM Control Delay (s)	-	-	13	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱			↰↑
Traffic Volume (vph)	32	54	344	50	39	295
Future Volume (vph)	32	54	344	50	39	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.915		0.983			
Flt Protected	0.982					0.994
Satd. Flow (prot)	1707	0	1738	0	0	1856
Flt Permitted	0.982					0.994
Satd. Flow (perm)	1707	0	1738	0	0	1856
Link Speed (k/h)	50		60			60
Link Distance (m)	51.0		221.5			78.4
Travel Time (s)	3.7		13.3			4.7
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	8%	4%	0%	2%
Adj. Flow (vph)	38	64	410	60	46	351
Shared Lane Traffic (%)						
Lane Group Flow (vph)	102	0	470	0	0	397
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 53.9% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱			↰↑
Traffic Vol, veh/h	32	54	344	50	39	295
Future Vol, veh/h	32	54	344	50	39	295
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	0	8	4	0	2
Mvmt Flow	38	64	410	60	46	351

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	884	441	0	0	471	0
Stage 1	441	-	-	-	-	-
Stage 2	443	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	318	621	-	-	1101	-
Stage 1	653	-	-	-	-	-
Stage 2	651	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	301	620	-	-	1100	-
Mov Cap-2 Maneuver	301	-	-	-	-	-
Stage 1	652	-	-	-	-	-
Stage 2	617	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.5	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	445	1100	-
HCM Lane V/C Ratio	-	-	0.23	0.042	-
HCM Control Delay (s)	-	-	15.5	8.4	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0.1	-

	↗	→	←	↖	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Traffic Volume (vph)	24	65	77	0	0	9
Future Volume (vph)	24	65	77	0	0	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected		0.987				
Satd. Flow (prot)	0	1839	1863	0	1611	0
Flt Permitted		0.987				
Satd. Flow (perm)	0	1839	1863	0	1611	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		51.0	125.6		57.1	
Travel Time (s)		3.7	9.0		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	71	84	0	0	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	97	84	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.4% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Traffic Vol, veh/h	24	65	77	0	0	9
Future Vol, veh/h	24	65	77	0	0	9
Conflicting Peds, #/hr	0	0	0	0	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, %	2	2	2	2	2	2
Mvmt Flow	26	71	84	0	0	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	84	0	-	0	207	84
Stage 1	-	-	-	-	84	-
Stage 2	-	-	-	-	123	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1513	-	-	-	781	975
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	902	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1513	-	-	-	767	975
Mov Cap-2 Maneuver	-	-	-	-	767	-
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1513	-	-	-	975
HCM Lane V/C Ratio	0.017	-	-	-	0.01
HCM Control Delay (s)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0

John Iezzi

From: Natalie Biesinger
Sent: Friday, October 20, 2023 8:05 AM
To: Stephen Gradish
Cc: John Iezzi
Subject: RE: RVA Water & Sanitary Modelling (OPNPL2022039 / ZNPL2022040 & OPNPL2022043 / ZNPL2022053)

Hi Stephen,

Could you please send us the RVA sanitary and water modelling reports for the below developments in Waterford?

- **OPNPL2022039 / ZNPL2022040** - Southeast corner of Lam Boulevard and Old Highway 24, Waterford , Roll # 33605062868 - Orchard Square Townhouse Development, Waterford
- **OPNPL2022043 / ZNPL2022053** – Northeast corner of Lam Boulevard and Old Highway 24, Waterford, Roll# 33605062848

We are planning on submitting **OPNPL2022043 / ZNPL2022053** very soon, so if you could send that one as soon as possible that would be greatly appreciated!

Thank you,

Natalie Biesinger, BASc., EIT
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planner
2 Talbot Street North Simcoe Ontario N3Y 3W4
Office: 519-426-6270 x137 Cell: 519-501-6278
www.gdvallee.ca

From: Natalie Biesinger
Sent: Friday, September 22, 2023 9:31 AM
To: Stephen Gradish <Stephen.Gradish@norfolkcounty.ca>
Cc: John Iezzi <johniezzi@gdvallee.ca>
Subject: RVA Water & Sanitary Modelling (OPNPL2022039 / ZNPL2022040 & OPNPL2022043 / ZNPL2022053)

Hi Stephen,

Just following up again regarding RVA modelling, could you please send us the sanitary and water modelling reports for the following developments in Waterford:

- **OPNPL2022039 / ZNPL2022040** - Southeast corner of Lam Boulevard and Old Highway 24, Waterford , Roll # 33605062868 - Orchard Square Townhouse Development, Waterford
- **OPNPL2022043 / ZNPL2022053** – Northeast corner of Lam Boulevard and Old Highway 24, Waterford, Roll# 33605062848

If you could send these reports as soon as possible it would be greatly appreciated.

Thank you in advance,

Natalie Biesinger, BASc., EIT
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LAM BOULEVARD DEVELOPMENT

WATERFORD - NORFOLK COUNTY

Estimated Cost and Securities

Rev1 - Feb 23 2023
Rev2 - Sept 22 2023

Project# 21-059

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
	A. SANITARY SEWERS						
1	Supply and install sanitary sewer:						
	a) SAMH1 to SAMH2	metre	10	$250.00	$2,500	100%	$2,500
	b) SAMH2 to SAMH3	metre	28.9	$250.00	$7,225	10%	$723
	c) SAMH3 to SAMH4	metre	59.2	$250.00	$14,800	10%	$1,480
2	Construct 1200mm dia. precast concrete maintenance holes:						
	a) SAMH1	L.S.	1	$6,000	$6,000	100%	$6,000
	b) SAMH2	L.S.	1	$6,000	$6,000	100%	$6,000
	c) SAMH3	L.S.	1	$6,000	$6,000	10%	$600
	d) SAMH4	L.S.	1	$6,000	$6,000	10%	$600
3	Supply and install sanitary service including all fittings.	each	25	$750.00	$18,750	10%	$1,875
4	Connect existing sanitary on Lam Blvd to SAMH1.	L.S.	1	$3,000.00	$3,000	100%	$3,000
5	Flush and CCTV Video Sanitary System.	L.S.	1	$2,000.00	$2,000	10%	$200
	TOTAL SANITARY SEWERS				**$72,275**		**$22,978**
	B. WATERMAINS						
1	Connect new 150mm water service to existing 200mm watermain on Lam Blvd.	L.S.	1	$3,000	$3,000	100%	$3,000
2	Supply and install 150mm dia. watermain including all fittings and anodes on development property.	metre	80	$100.00	$8,000	10%	$800
2	Supply and install 150mm dia. watermain including all fittings and anodes in ROW.	metre	8	$100.00	$800	100%	$800
3	Supply and install water service including all fittings and anodes.	each	25	$750.00	$18,750	10%	$1,875
4	Supply and install backflow preventer complete with chamber.	each	1	$55,000.00	$55,000	10%	$5,500
5	Supply and install hydrant set complete with valve.	each	1	$5,000.00	$5,000	10%	$500
	TOTAL WATERMAIN				**$90,550**		**$12,475**

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
	C. STORM SEWERS						
1	Supply and install storm sewers:						
	a) EX STMH1 to STMH2 (450mm)	metre	4.6	$300.00	$1,380	10%	$138
	b) STMH2 to CBMH3 (450mm)	metre	3.0	$300.00	$900	10%	$90
	d) CBMH3 to DCBMH4 (375mm)	metre	33	$250.00	$8,250	10%	$825
	e) DCBMH4 to CB13 (300mm)	metre	29.1	$200.00	$5,820	10%	$582
	f) CBMH3 to STMH5 (375mm)	metre	38.0	$250.00	$9,500	10%	$950
	g) STMH5 to CBMH6 (375mm)	metre	19.9	$250.00	$4,975	10%	$498
	h) CBMH6 to CB2 (300mm)	metre	25.3	$200.00	$5,060	10%	$506
	i) STMH5 to CB3 (300mm)	metre	22.9	$200.00	$4,580	10%	$458
2	Supply and install precast concrete maintenance holes complete with benching:						
	a) STMH2 - 1200mm	L.S.	1	$6,000	$6,000	10%	$600
	b) STMH5 - 1200mm	L.S.	1	$6,000	$6,000	10%	$600
2	Supply and install precast concrete maintenance holes complete with grate and sump.						
	a) CBMH1 - 1200mm	L.S.	1	$7,000	$7,000	10%	$700
	b) CBMH3 - 1200mm	L.S.	1	$7,000	$7,000	10%	$700
	c) DCBMH4 - 1500mm	L.S.	1	$8,500	$8,500	10%	$850
	d) CBMH6 - 1200mm	L.S.	1	$7,000	$7,000	10%	$700
3	Construct 600x600 precast concrete catch basins complete with grate, connections, and subdrains.						
	a) CB1	L.S.	1	$2,000	$2,000	10%	$200
	b) CB2	L.S.	1	$2,000	$2,000	10%	$200
	c) CB3	L.S.	1	$2,000	$2,000	10%	$200
	d) CB4	L.S.	1	$2,000	$2,000	10%	$200
	e) CB5	L.S.	1	$2,000	$2,000	10%	$200
4	Construct proposed Stormtech Stormwater Management Facility	L.S.	1	$150,000.00	$150,000	10%	$15,000
5	Flush and CCTV Video Storm System	L.S.	1	$4,000.00	$4,000	10%	$400
	TOTAL STORM SEWER				**$245,965**		**$24,597**

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
	D. ROAD CONSTRUCTION						
1	Sub-excavation to a depth of 540mm below finish grade for proposed driveway/parking areas.	L.S.	1	$26,700	$26,700	10%	$2,670
2	Supply, place and compact 300mm Granular 'B' Type 2 100% crushed limestone for proposed driveway/parking areas.	tonne	2290	$20.00	$45,800	10%	$4,580
3	Supply, place and compact 150mm Granular 'A' 100% crushed limestone for proposed driveway/parking areas.	tonne	1060	$25.00	$26,500	10%	$2,650
4	Supply, place and compact 50mm of HL8 base asphalt pavement for proposed driveway/parking areas.	tonne	370	$110.00	$40,700	10%	$4,070
5	Supply, place and compact 40mm of HL3 surface asphalt pavement for proposed driveway/parking areas.	tonne	290	$120.00	$34,800	10%	$3,480
6	Sub-excavation to a depth of 540mm below finish grade for proposed driveway entrances.	L.S.	1	$1,900	$1,900	100%	$1,900
7	Supply, place and compact 300mm Granular 'B' Type 2 100% crushed limestone for proposed driveway entrances.	tonne	160	$20.00	$3,200	100%	$3,200
8	Supply, place and compact 150mm Granular 'A' 100% crushed limestone for proposed driveway entrances.	tonne	80	$25.00	$2,000	100%	$2,000
9	Supply, place and compact 50mm of HL8 base asphalt pavement for proposed driveway entrances.	tonne	30	$110.00	$3,300	100%	$3,300
10	Supply, place and compact 40mm of HL3 surface asphalt pavement for proposed driveway entrances.	tonne	20	$120.00	$2,400	100%	$2,400
11	Supply, place, and compact 150mm Granular 'A' 100% crushed limestone for proposed internal concrete sidewalks.	tonne	170	$30.00	$5,100	10%	$510
12	Supply and construct proposed internal 32 MPa concrete sidewalks	sq. m	420	$55.00	$23,100	10%	$2,310
13	Supply, place, and compact 150mm Granular 'A' 100% crushed limestone for proposed external concrete sidewalks.	tonne	150	$30.00	$4,500	100%	$4,500
14	Supply and construct proposed external 32 MPa concrete sidewalks	sq. m	380	$55.00	$20,900	100%	$20,900
15	Supply and construct proposed internal 32 MPa concrete barrier curb as per OPSD 600.110.	m	330	$45.00	$14,850	10%	$1,485
16	Supply and construct proposed external 32 MPa concrete barrier curb as per OPSD 600.110.	m	55	$45.00	$2,475	100%	$2,475
17	Supply and install light duty silt fence as per OPSD 219.110.	metre	340	$10.00	$3,400	10%	$340
	TOTAL ROAD CONSTRUCTION				**$261,625**		**$62,770**

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
	SECURITY SUMMARY						
A.	SANITARY SEWERS						$22,978
B.	WATERMAIN						$12,475
C.	STORM SEWERS						$24,597
D.	ROAD CONSTRUCTION						$62,770
E.	LANDSCAPING ALLOWANCE ($50,000 @ 10%)						$5,000
	TOTAL SECURITIES NORFOLK COUNTY						$127,819
	GRAND TOTAL						**$127,819**