

April 5, 2023

Mohammad Alam | MPL, MUD, RPP, MCIP
Principal Planner
Planning - Community Development Division
185 Robinson Street
Simcoe, ON N3Y 5L6

Dear Mr. Alam:

**APPLICATION FOR SITE PLAN APPROVAL
811 OLD HIGHWAY 24, WATERFORD**

On behalf of Norfolk Disposal Services Ltd. c/o Bernie Debono ("client" or "owner"), Arcadis IBI Group are please to submit the enclosed application for Site Plan Approval for the lands located at 811 Old Highway 24 Waterford, ON ("subject lands"). The proposal is for to expand the existing disposal services on-site to accommodate a new transfer building (GFA $\pm 1,800\text{m}^2$) for recyclable materials along with a public recyclable drop-off area. The facility is proposed to also provide 20 standard parking spaces and 1 accessible parking space to accommodate employees and users of the facility. A landscape berm at the north-east corner of the property along with a landscaped area between the entire frontage of Old Highway 24 is also proposed to provide an appropriate buffer between the proposal and existing uses. The current access onto Old Highway 24 from the subject lands is proposed to be closed and access to the new facility will be direct through the existing entrance off of Thompson Road West. Five scissor docks for public drop-off are proposed along the rear lot line.

In support of the Site Plan Approval Application, please find enclosed the following:

- Completed Application form;
- Topographical Survey, as prepared by Jewitt and Dixon Ltd., dated July 15, 2021;
- Site Plan, as prepared by Arcadis IBI Group, dated April 3, 2023;
- Land Use Compatibility Study, as prepared by WSP; dated September 23, 2022;
- Landscape Plan, as prepared by Arcadis IBI Group, dated March 31, 2023;
- Building Floor Plans, Elevations and Sections, as prepared by PK Construction Inc., dated December 9, 2022;
- Photometric (Lighting) Plan, as prepared by PK Construction Inc., dated March 23, 2023;
- Engineering package, as prepared by, J.H. Cohoon Engineering Limited, dated April 4, 2023; and includes the following items:
 - Lot Grading, Siltation and Erosion Control Plan
 - Servicing Plan
 - Storm Water Drainage Plan (pre & post development)
 - Functional Servicing Report; includes Storm Water Management Design Report

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- Construction Estimates & Securities
- Transportation Impact Study, as prepared by Arcadis IBI Group, dated March 31, 2023;
 - Vehicle Maneuvering Diagram & Analysis

The application fee of \$4,000.00, will be submitted via cheque by the client in-person.

We trust that the enclosed is in order. However, should you have any questions or require further information, please do not hesitate to contact the undersigned.

Regards,
Arcadis IBI Group



Tracy Tucker, BAA, CPT
Sr. Project Manager

Cc: *Norfolk Disposal Services Ltd. c/o Bernie Debono, client*

Planning Department Development Application Form

Complete Application

A complete development application consists of the following:

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

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

Pre-Submission Consultation “Pre-consultation”:

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

Development Application Process

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

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

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

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

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

Notification Sign Requirements

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

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

Contact Us

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

For Office Use Only:

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

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

- ☐ Official Plan Amendment
- ☐ Zoning By-Law Amendment
- ☐ Temporary Use By-law
- ☐ Draft Plan of Subdivision/Vacant Land Condominium
- ☐ Condominium Exemption
- ☒ Site Plan Application
- ☐ Extension of a Temporary Use By-law
- ☐ Part Lot Control
- ☐ Cash-in-Lieu of Parking
- ☐ Renewable Energy Project or Radio Communication Tower

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

Property Assessment Roll Number: _____

A. Applicant Information

Name of Owner _____

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

Address _____

Town and Postal Code _____

Phone Number _____

Cell Number _____

Email _____

Name of Applicant _____

Address _____

Town and Postal Code _____

Phone Number _____

Cell Number _____

Email _____

Name of Agent _____

Address _____

Town and Postal Code _____

Phone Number _____

Cell Number _____

Email _____

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

☐ Owner

☐ Agent

☐ Applicant

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

B. Location, Legal Description and Property Information

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

Municipal Civic Address: _____

Present Official Plan Designation(s): _____

Present Zoning: _____

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

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

3. Present use of the subject lands:

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

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

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

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

If yes, identify and provide details of the building:

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

9. Existing use of abutting properties:

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

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

C. Purpose of Development Application

Note: Please complete all that apply.

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

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

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

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

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

- N/A 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: _____

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

Frontage: _____

Depth: _____

Width: _____

Area: _____

Proposed use: _____

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

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

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

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

10. Building Size

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

11. Off Street Parking and Loading Facilities

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

N/A 12. Residential (if applicable)

Number of buildings existing: _____

Number of buildings proposed: _____

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

If yes, describe: _____

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

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

N/A 13. Commercial/Industrial Uses (if applicable)

Number of buildings existing: _____

Number of buildings proposed: _____

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

If yes, describe:

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

Seating Capacity (for assembly halls or similar): _____

Total number of fixed seats: _____

Describe the type of business(es) proposed: _____

Total number of staff proposed initially: _____

Total number of staff proposed in five years: _____

Maximum number of staff on the largest shift: _____

Is open storage required: ☐ Yes ☐ No

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

☐ Yes ☐ No If yes please describe:

N/A 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):

N/A 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:

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

E. Provincial Policy

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

If no, please explain:

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

If no, please explain:

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

If no, please explain:

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

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

Livestock facility or stockyard (submit MDS Calculation with application)

☐ On the subject lands or ☐ within 500 meters – distance _____

Wooded area

☐ On the subject lands or ☐ within 500 meters – distance _____

Municipal Landfill

☐ On the subject lands or ☐ within 500 meters – distance _____

Sewage treatment plant or waste stabilization plant

☐ On the subject lands or ☐ within 500 meters – distance _____

Provincially significant wetland (class 1, 2 or 3) or other environmental feature

☐ On the subject lands or ☐ within 500 meters – distance _____

Floodplain

☐ On the subject lands or ☐ within 500 meters – distance _____

Rehabilitated mine site

☐ On the subject lands or ☐ within 500 meters – distance _____

Non-operating mine site within one kilometre

☐ On the subject lands or ☐ within 500 meters – distance _____

Active mine site within one kilometre

☐ On the subject lands or ☐ within 500 meters – distance _____

Industrial or commercial use (specify the use(s))

☐ On the subject lands or ☐ within 500 meters – distance _____

Active railway line

☐ On the subject lands or ☐ within 500 meters – distance _____

Seasonal wetness of lands

☐ On the subject lands or ☐ within 500 meters – distance _____

Erosion

☐ On the subject lands or ☐ within 500 meters – distance _____

Abandoned gas wells

☐ On the subject lands or ☐ within 500 meters – distance _____

F. Servicing and Access

1. Indicate what services are available or proposed:

Water Supply

- | | |
|--|---|
| <input type="checkbox"/> Municipal piped water | <input type="checkbox"/> Communal wells |
| <input type="checkbox"/> Individual wells | <input type="checkbox"/> Other (describe below) |
-

Sewage Treatment

- | | |
|---|---|
| <input type="checkbox"/> Municipal sewers | <input type="checkbox"/> Communal system |
| <input type="checkbox"/> Septic tank and tile bed in good working order | <input type="checkbox"/> Other (describe below) |
-

Storm Drainage

- | | |
|---|---------------------------------------|
| <input type="checkbox"/> Storm sewers | <input type="checkbox"/> Open ditches |
| <input type="checkbox"/> Other (describe below) | |
-

2. Existing or proposed access to subject lands:

- | | |
|---|---|
| <input type="checkbox"/> Municipal road | <input type="checkbox"/> Provincial highway |
| <input type="checkbox"/> Unopened road | <input type="checkbox"/> Other (describe below) |

Name of road/street: _____

G. Other Information

1. Does the application involve a local business? ☐ Yes ☐ No

If yes, how many people are employed on the subject lands?

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

H. Supporting Material to be submitted by Applicant

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

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

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

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

- ☐ Zoning Deficiency Form
- ☐ On-Site Sewage Disposal System Evaluation Form (to verify location and condition)
- ☐ Architectural Plan
- ☐ Buildings Elevation Plan
- ☐ Cut and Fill Plan
- ☐ Erosion and Sediment Control Plan
- ☐ Grading and Drainage Control Plan (around perimeter and within site) (existing and proposed)
- ☐ Landscape Plan
- ☐ Photometric (Lighting) Plan
- ☐ Plan and Profile Drawings
- ☐ Site Servicing Plan
- ☐ Storm water Management Plan
- ☐ Street Sign and Traffic Plan
- ☐ Street Tree Planting Plan
- ☐ Tree Preservation Plan
- ☐ Archaeological Assessment
- ☐ Environmental Impact Study

- ☐ Functional Servicing Report
- ☐ Geotechnical Study / Hydrogeological Review
- ☐ Minimum Distance Separation Schedule
- ☐ Noise or Vibration Study
- ☐ Record of Site Condition
- ☐ Storm water Management Report
- ☐ Traffic Impact Study – please contact the Planner to verify the scope required

Site Plan applications will require the following supporting materials:

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

Standard condominium exemptions will require the following supporting materials:

- ☐ Plan of standard condominium (2 paper copies and 1 electronic copy)
- ☐ Draft condominium declaration
- ☐ Property Identification Number (PIN) printout

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

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

I. Development Agreements

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

J. Transfers, Easements and Postponement of Interest

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

K. Permission to Enter Subject Lands

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

L. Freedom of Information

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

Bernard Debono

Owner/Applicant Signature

MARCH 31, 2023

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 Norfolk Disposal Services Ltd. c/o Bernie Debono am/are the registered owner(s) of the lands that is the subject of this application.

I/We authorize ARCADIS 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.

Bernard Debono

Owner

MARCH 31, 2023

Date

Owner

Date

N. Declaration

I, Tracy Tucker of the City of Hamilton

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:

City of Hamilton

[Signature]

Owner/Applicant Signature

In Province of Ontario

This 31st day of March

A.D., 20 23

[Signature]

A Commissioner, etc.

Jared Vail Marcus, a Commissioner, etc.
Province of Ontario,
for IBI Group.
Expires December 5, 2023.

Project Title: PROPOSED SORTING FACILITY FOR NORFOLK DISPOSAL SERVICES LIMITED

Client: PK CONSTRUCTION INC.

Date: April 4, 2023

Address: 106 THOMPSON ROAD WEST

User: Michael Feiden

Municipality: WATERFORD

Job No.: 15888

Revisions:

Item	Description	unit	Quantity	Unit Price	Total Cost	On-Site	
						Securities	
						10% Maint.	50% Perf.

A. SANITARY

1	Santiary						
	150mm Diam.	I.m.	29.9	\$70.00	\$2,093.00	\$0	\$1,046.50
2	1200mm Diam. Manhole	EACH	1	\$4,200.00	\$4,200.00	\$0	\$2,100.00
3	Connection to Existing	L.S.	1	\$4,000.00	\$4,000.00	\$0	\$2,000.00

TOTAL SANITARY SEWERS					\$10,293.00	\$0.00	\$5,146.50
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B. WATERMAIN

1	Connection to Existing	L.S.	1	\$4,000.00	\$4,000.00	\$0.00	\$2,000.00
2	Watermain						
	a) 150mm Diam.	I.m.	77.6	\$180.00	\$13,968.00	\$0	\$6,984.00
	b) 25mm Dia. Cu. servicing	EACH	51.7	\$72.00	\$3,722.40		\$1,861.20
3	Water Valves						
	a) 150mm Diam.	EACH	1	\$2,500.00	\$2,500.00	\$0	\$1,250.00
4	Hydrant Sets	EACH	1	\$5,500.00	\$5,500.00	\$0	\$2,750.00
5	Curbstops	Each	1	\$1,000.00	\$1,000.00	\$0	\$500.00
6	Testing	L.S.	1	\$3,500.00	\$3,500.00	\$0	\$1,750.00

TOTAL WATERMAIN					\$34,190.40	\$0.00	\$17,095.20
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C. STORM SEWERS

1	Storm Sewer						
	a) 250mm Diam.	M	88.3	\$120.00	\$10,596.00	\$0	\$5,298.00
	b) 300mm Diam.	M	68.2	\$130.00	\$8,866.00	\$0	\$4,433.00
	c) 375mm Diam.	M	52.9	\$140.00	\$7,406.00	\$0	\$3,703.00
	d) 450mm Diam.	M	127.2	\$150.00	\$19,080.00	\$0	\$9,540.00
2	1200mm Diam. Manhole	EACH	5	\$6,000.00	\$30,000.00	\$0	\$15,000.00
3	Stormceptor System						
	a) EF8	EACH	1	\$40,000.00	\$40,000.00	\$0	\$20,000.00
4	Catchbasin / Ditch Inlets	EACH	4	\$2,000.00	\$8,000.00	\$0	\$4,000.00
5	Cultec System	L.S.	1	\$20,000.00	\$20,000.00	\$0	\$10,000.00
6	Connection to Existing	L.S.	1	\$4,000.00	\$4,000.00	\$0	\$2,000.00
7	Video Inspection and Report	L.S.	1	\$2,500.00	\$2,500.00	\$0	\$1,250.00

TOTAL STORM SEWERS					\$150,448.00	\$0.00	\$75,224.00
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D. ROAD CONSTRUCTION

1	Fine Grading	L.S.	1	\$3,000.00	\$3,000.00	\$0	\$1,500.00
2	Granular 'A'	Tonne	2690	\$25.00	\$67,250.00	\$0	\$33,625.00
3	Granular 'B'	Tonne	7740	\$25.00	\$193,500.00	\$0	\$96,750.00
4	Retaining Wall Guardrail	L.S.	2	\$2,500.00	\$5,000.00	\$0	\$2,500.00
5	Stone Retaining Wall	sq.m.	150.7	\$300.00	\$45,210.00	\$0	\$22,605.00
6	Misc. Signage	L.S.	1	\$2,000.00	\$2,000.00	\$0	\$1,000.00

TOTAL ROAD CONSTRUCTION					\$315,960.00	\$0.00	\$157,980.00
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SUMMARY

A. SANITARY SEWERS					\$10,293.00	\$0.00	\$5,146.50
B. WATERMAIN					\$34,190.40	\$0.00	\$17,095.20
C. STORM SEWERS					\$150,448.00	\$0.00	\$75,224.00
D. ROAD CONSTRUCTION					\$315,960.00	\$0.00	\$157,980.00
TOTAL WATERFORD	ITEMS				\$510,891.40	\$0.00	\$255,445.70

TOTAL SECURITIES REQUIRED						\$255,445.70	
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TOTAL SECURITIES						\$255,445.70	
5% CONTINGENCY						\$12,772.29	

SUBTOTAL						\$268,217.99	
HST						\$3,486.83	

GRAND TOTAL						\$271,704.82	
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DOOR SCHEDULE															
MARK	LOC.	DOOR			FRAMES		HARDWARE								COMMENTS
		SIZE	MATERIAL	FINISH	MATERIAL	FINISH	ELECT STRIKE	POWER OPERATOR	CLOSER	GLAZING	LATCH DEVICE	EXIT DEVICE	KICK PLATES	WEATHER STRIP	
DR.01	NORTH ELEVATION	3'2" x 7'-0"	HM	PT*	HM	PT*			●			●	●	●	
DR.02	EAST ELEVATION	3'2" x 7'-0"	HM	PT*	HM	PT*			●			●	●	●	
DR.03	SOUTH ELEVATION	18'-0" x 18'-0"	ALUM.	FF	ALUM.	FF									OVERHEAD DOOR
DR.04	SOUTH ELEVATION	3'2" x 7'-0"	HM	PT*	HM	PT*			●			●	●	●	
DR.05	WEST ELEVATION	18'-0" x 28'-0"	ALUM.	FF	ALUM.	FF									FOLDING FIN-DOOR
DR.06	WEST ELEVATION	18'-0" x 28'-0"	ALUM.	FF	ALUM.	FF									FOLDING FIN-DOOR
DR.07	WEST ELEVATION	18'-0" x 28'-0"	ALUM.	FF	ALUM.	FF									FOLDING FIN-DOOR
DR.08	WEST ELEVATION	18'-0" x 28'-0"	ALUM.	FF	ALUM.	FF									FOLDING FIN-DOOR
DR.09	WEST ELEVATION	18'-0" x 28'-0"	ALUM.	FF	ALUM.	FF									FOLDING FIN-DOOR
DR.10	WEST ELEVATION	3'2" x 7'-0"	HM	PT*	HM	PT*			●			●	●	●	

*PAINT FINISH TO BE WHITE WHITE - QC-28317

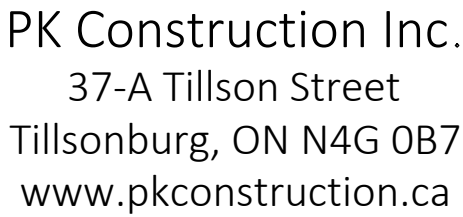
ALUM - ALUMINUM
 ANO - ANODIZED
 EX - EXISTING
 FF - FACTORY FINISH - WHITE
 HM - HOLLOW METAL
 PT - PAINT FINISH
 STN - STAINED AND FINISHED
 SWD - SOLID WOOD

FIRM NAME: CONTACT INFORMATION:		PK CONSTRUCTION 37-A TILSON ST TILLSONBURG, ON, N4G 0B7 (519) 842-8001					
PROJECT INFORMATION		NORFOLK DISPOSAL NEW TRANSFER STATION 118 OLD HIGHWAY 24 WATERFORD, ON, NOE 1Y0					
ITEM							

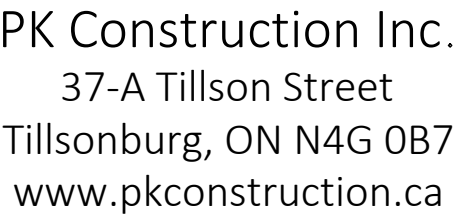
A101	OBC MATRIX AND SCHEDULES
A201	FLOOR PLAN
A301	BUILDING ELEVATIONS
A302	BUILDING SECTIONS

WALL - W1 - 1 HOUR FIRE RESISTANCE RATING - ULC W605
26 GAUGE EXTERIOR CLADDING
U CHANNEL BASE (PRE ENGINEERED BUILDING STRUCTURE)
MINERAL WOOL BATT INSULATION
Z-GIRT (PRE ENGINEERED BUILDING STRUCTURE)
CERAMIC FIBRE STRIP STEEL
24 GAUGE SHEET STEEL LINER PANEL

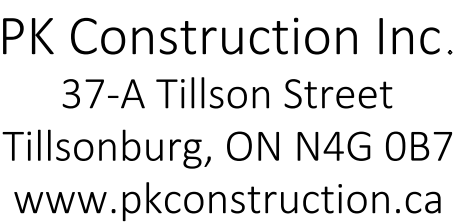
WALL - W2
24 GAUGE EXTERIOR CLADDING
PRE-ENGINEERED BUILDING STRUCTURE



PROJECT INFORMATION		REVISIONS	
PROJECT NO.	DATE	1. ISSUED FOR COSTING	DATE
22029	2022-12-09		
ISSUED BY			
TH			
811 OLD HWY. 24 WATERFORD, ON, N0E 1Y0			
PROJECT NO. A			
DATE 2022-12-09			
DRAWING DESCRIPTION OBC MATRIX AND SCHEDULES			
A101			



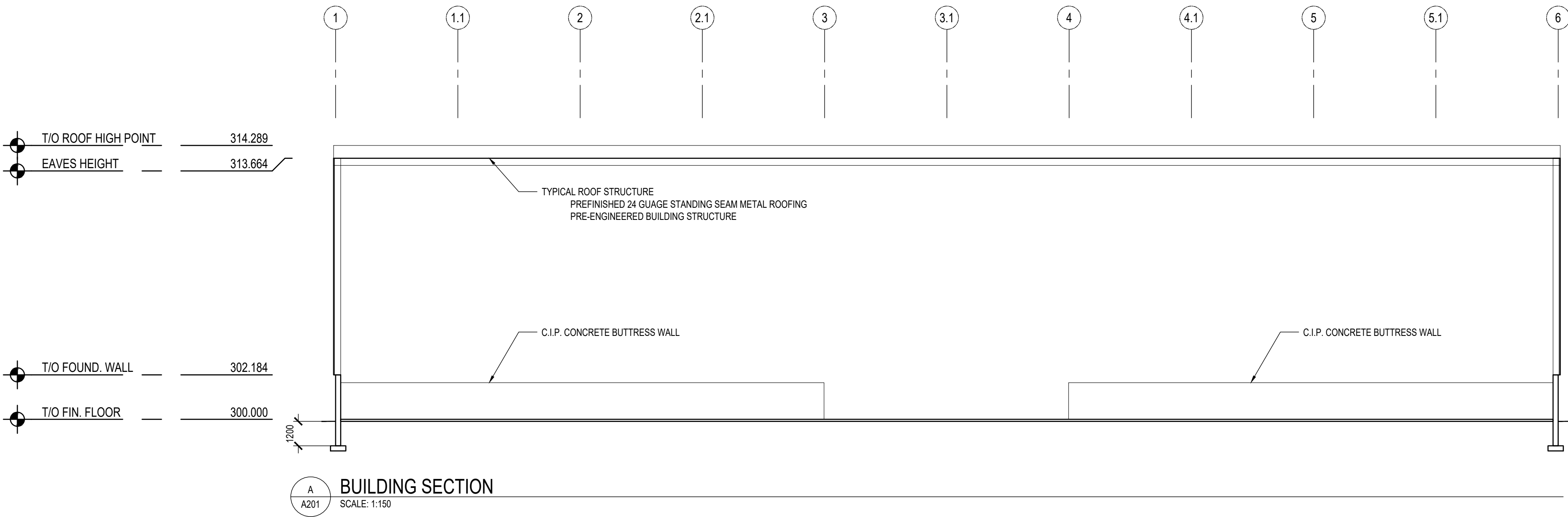
<p>PROJECT DESCRIPTION</p> <p>NORFOLK DISPOSAL NEW TRANSFER STATION</p>	<p>811 OLD HWY. 24 WATERFORD, ON, N0E 1Y0</p>	<p>DATE</p> <p>2022-12-09</p>	<p>PROJECT NUMBER</p> <p>FLOOR PLAN</p>
<p>DRAWN BY</p> <p>TH</p>	<p>ISSUE NO.</p> <p>A</p>		
<p>DATE</p> <p>2022-12-09</p>			<p>A201</p>



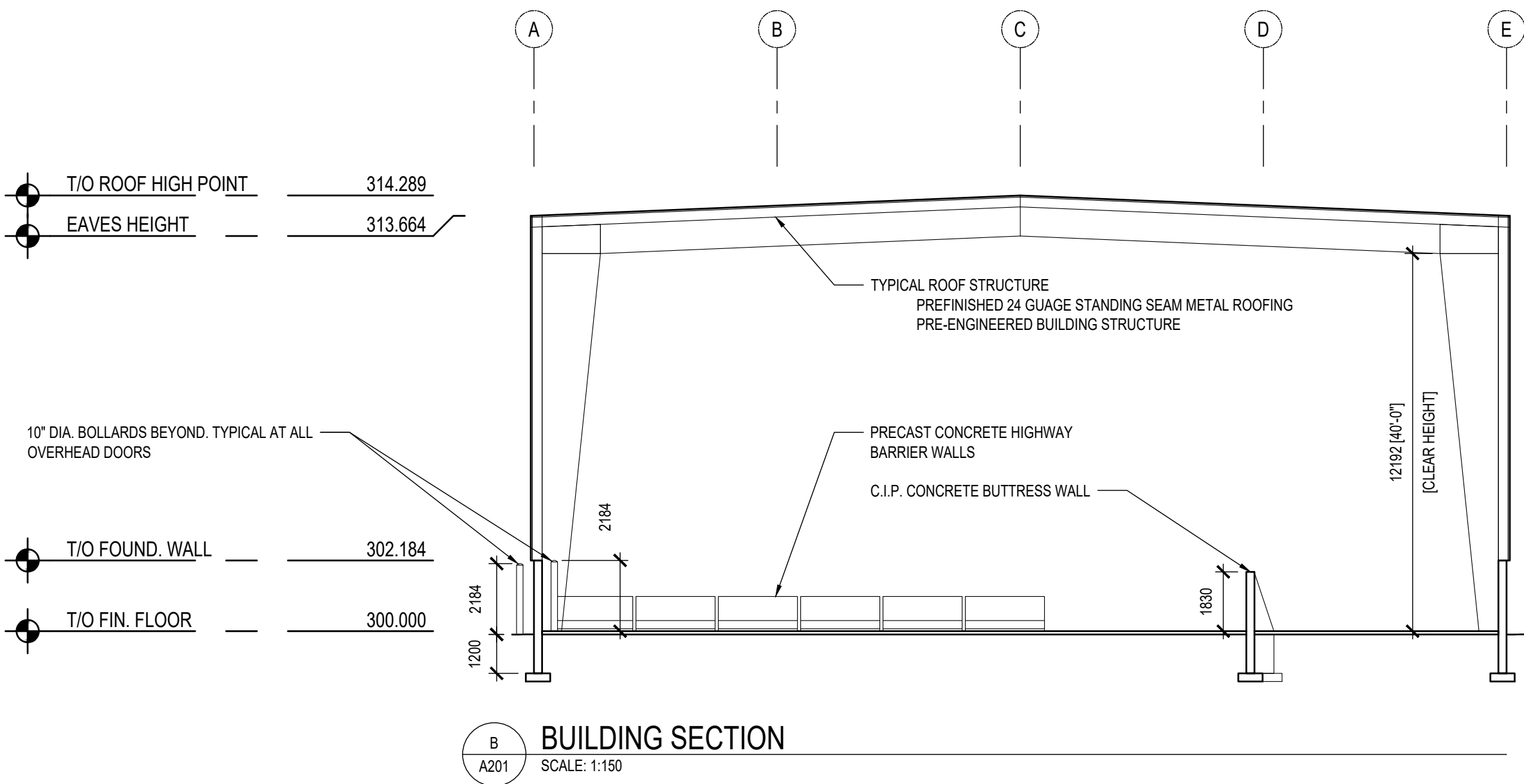
BUILDING ELEVATIONS 22029	NORFOLK DISPOSAL NEW TRANSFER STATION
DRAWN BY DATE	811 OLD HWY. 24 WATERFORD, ON, N0E 1Y0
202-72-10-09	BUILDING ELEVATIONS A301



PK Construction Inc.
37-A Tillson Street
Tillsonburg, ON N4G 0B7
www.pkconstruction.ca



A
A201
BUILDING SECTION
SCALE: 1:150



B
A201
BUILDING SECTION
SCALE: 1:150

NORFOLK DISPOSAL
NEW TRANSFER STATION
811 OLD HWY. 24
WATERFORD, ON, NOE 1Y0
BUILDING SECTIONS
A302

REVISIONS	DATE	ISSUED FOR COSTING
1. ISSUED FOR COSTING	2022-12-09	

FUNCTIONAL SERVICING REPORT
PROPOSED INDUSTRIAL DEVELOPMENT
MN 106 Thompson Road West
Waterford, Ontario
Norfolk County

Prepared By:

J.H. Cohoon Engineering Limited
440 Hardy Road, Unit 1
Brantford, Ontario
N3T 5L8
Phone (519) 753-2656
Fax (519) 753-4263

INTRODUCTION

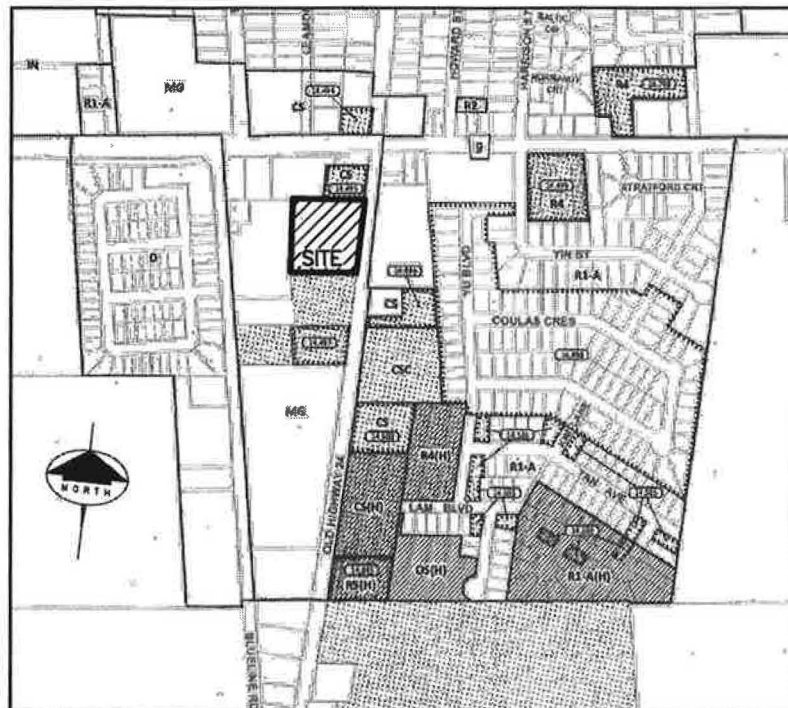
The following Functional Servicing Report was prepared by J.H. Cohoon Engineering Limited for Norfolk Disposal in support of a proposed industrial development to be located on the southwest corner of the intersection of Thompson Road West and Old Highway No. 24 in the Village of Waterford, Norfolk County. The site is located at MN 106 Thompson Road West. The proposal is to construct an 1,800 sq.m., single story industrial building to be utilized for the transfer building for recyclable materials. The proposal includes the provision of some off-street parking on the property to be located adjacent to the building with a future public drop off area to be located in the rear of the building. The subject area is some 1.525 ha. in size. The preliminary layout of the development is illustrated within Appendix 'A' of this report on drawings prepared by J H Cohoon Engineering Limited being drawing 15888-1 (which illustrates the proposed grading and servicing of this site).

The objective of this report is to document the servicing strategy to be utilized for the site. The property is currently serviced with all municipal services including sanitary and water services. The owner will assume full responsibility for the installation and maintenance of the services on the property and any associated upgrades.

PROPOSED DEVELOPMENT CONCEPT

As noted above, the proposed development is to be constructed on the on the subject lands which is located on the southwest corner of Thompson Road West and Old Highway No. 24 in Waterford, Ontario in Norfolk County. The site is located at the south end of the Village of Waterford. The site proposed for the development as industrial building on 1.525 hectares in size. A key map illustrating the site location is provided in Figure 1.

The development is intended to construct an 1,800 sq.m. industrial building including the associated servicing, and improvements to the presently developed site. The overall development is illustrated on the plans prepared by the J H Cohoon Engineering Limited being drawing 1588-1 which has been included within Appendix 'A' of this report



KEY PLAN

**Site Location – Key Plan
Figure No. 1**

SANITARY SEWERS & APPURTENANCES

3.1 Design Flows

This site is proposed to be fully connected to the municipal sanitary sewer system located on Old Highway 24 and an easement located directly south of the development on the abutting lands. The proposed development is illustrated on the attached site plan being drawing that is located within Appendix 'A' of this report (being J H Cohoon Engineering Limited 1588-1) which indicates the location of the proposed sanitary servicing into this site.

In accordance with the current Norfolk County design criteria, the design flows are being submitted to the County for the review of the conveyance systems within the Town of Delhi, Norfolk County. The following information is being provided to the Norfolk County for their use and consideration.

Sanitary Design Flows

Industrial Component

15 maximum anticipated occupant load

As per the requirements of the Ontario Building Code, the average daily flow is based upon 75 litres per person per day

$$\begin{aligned} 15 \times 75 &= 1,125 \text{ liters per day} \\ &= 0.013 \text{ liters per second} \end{aligned}$$

$$\begin{aligned} \text{Total Average Design Residential Flow} &= 0.013 \text{ liters per second.} \end{aligned}$$

Therefore, the total sanitary effluent from this site results in the following estimation of the sanitary flows:

Summary of Results

Average Flow Rate

$$\begin{aligned} \text{Industrial Component} &= 0.013 \text{ liters per sec} \\ \text{Total} &= 0.013 \text{ litres per sec} \end{aligned}$$

Infiltration Allowance

$$\begin{aligned} \text{Site Area} &= 1.525 \text{ hectares} \\ \text{Infiltration Rate} &= 0.28 \text{ liters per second per hectare} \\ \text{Infiltration Allowance} &= 0.427 \text{ liters per second} \end{aligned}$$

$$\begin{aligned} \text{Total Average Flow Rate including Infiltration} &= 0.440 \text{ litres per second} \end{aligned}$$

On the basis of the Modified Harmon Peaking Factor, and a total population for this site being 15 (industrial), the peaking factor of 3.517 (Max 4) was applied resulting in a peak design flow for this building being 0.046 liters per second.

Therefore, the resulting flows from this development are as follows:

$$\begin{aligned} \text{Average Day Flow Route (including infiltration)} &= 0.440 \text{ lps} \\ \text{Peak Flow Rate (including infiltration)} &= 0.473 \text{ lps} \end{aligned}$$

The proposed sanitary connection is proposed to be located into the existing sanitary main adjacent to the property.

Sanitary Outlet

The sanitary sewer system for the subject development will be connected into the existing sanitary sewer that are located on the abutting easement directly south of

the side in Waterford, Ontario, Norfolk County. The analysis relating to the overall impact of this development on the receiving sanitary sewer system will be reviewed by the Norfolk County as part of this submission.

WATERMAINS & APPURTENANCES

Design Flows

The peak design flow rate from the proposed development using current Norfolk County Standards. As with the wastewater, the estimated average flows have been detailed with the Sanitary Sewer Section of this report. (Section 3.1 above). However, in this case the peaking factor of 2 has been utilized and a demand of 450 liters per person per day.

The summary of the water system demands can be summarized as follows:

	Average Daily Flow Rate (Liters per second)	Peak Daily Flow Rate* (Litres per second)
Industrial Component	0.013	0.026

The proposed fire protection to this development will be handled by the existing fire hydrants located adjacent to the property.

Utilizing the requirements of the Fire Underwriters Survey 2020, the following outlines the water demand for the overall building area:

This building is approximately 1,800 +/- sq. m. in size (single storey industrial). Utilizing the Fire Underwriters Survey Document, our estimation of the required fire demand is as follows:

$$\begin{aligned} \text{Estimate of Fire Flow Required} &= 220 * C * \text{SQRT}(A) \\ \text{Where } C &= \text{Coefficient related to type of Construction} \\ &\text{In this case, ordinary construction is proposed.} \\ &\text{Non-Combustible Construction} = 0.8 \end{aligned}$$

$$\begin{aligned} A &= \text{Total Area of the Building (As outlined above)} \\ &1,800.0 \text{ sq. m.} \end{aligned}$$

$$\begin{aligned} &= 220 \times 0.8 \times \text{SQRT}(1,800) \\ &= 7,467.0 \text{ litres per min} \\ &\text{Rounded} \end{aligned}$$

	=	7,000 litres per min
Modifications		
Occupancy	=	Medium Hazard Occupancy = +15%
Increase	=	1,050 litres per min
Net Fire Demand	=	8,050 litres per min
Further Modifications		
Automatic Sprinkler System	=	50%
Reduction	=	4,025 litres per min
Spatial Exposure (Estimated)		
North	> 30 m	+ 0 %
East	> 60 m	+ 0 %
West	Street	+ 0 %
South	> 30 m	+ 0 %
Total		+ 0 %
Increase	=	0.0 litres per min
Total Fire Demand		4,025.0 litres per min
		4,000 litres per min (Rounded)
		66.7 litres per sec.

STORM SEWERS & APPURTENANCES

Storm Sewers

The site is intended to be serviced with municipal storm sewers which are to be designed to handle the 5-year storm event where possible. The overall stormwater management system is to be consistent with the current policies of the County of Norfolk which require reduction in the post development flows to below the pre-development rates for all storm events up to and including the 100-year event. In this case, the municipal owned storm sewer system is located on Thompson Road West adjacent to the site. This sewer would be considered the outlet for the property (legal outlet). In fact, the site presently drains in a southerly direction towards the abutting property to the south. The site is presently un-developed with only approximately 16.2% impervious surfaces consisting of existing driveways through the site.

The proposed development is of a significantly larger impervious areas and as such, conventional stormwater management techniques are required to be implemented.

Pre-Development Hydrologic Modeling Parameters

MIDUSS modeling software was used to establish pre-development runoff rates for the site. The site is approximately 1.525 hectares in size with the flow direction being extremely flat but is directed towards the southerly property. The existing topography slope is approximately 1.0+/-% and directs the runoff to the rear of the site.

Post Development Conditions

The proposed concept plan includes the following:

- A proposed 1,800 sq.m. industrial building, with the required parking, resulting in an overall % impervious on the site being increased from the 16.2% impervious surfaces in the pre-development condition to a 61.1% impervious condition.

For the purposes of this report, 61.1% has been utilized in the hydrologic modeling for the overall development to represent the proposed development.

Modelling Results – Quantity Control

Stormwater flows were calculated using MIDUSS modeling software. Norfolk County IDF parameters were used to generate rainfall for sizing of the SWM facilities in accordance with Norfolk County Development Engineering Standards.

Peak flow reduction will be achieved through on-site detention in an effort minimize the potential for downstream flooding and erosion. Post development surface water runoff will be controlled to existing pre-development levels for the 2, 5, 10, 25, 50- and 100-year storm events (as possible). The results of the Miduss modeling have been included within Appendix 'B' of this report and can be summarized as follows:

Table 1 – Peak Flow Rates

Storm Event	Pre-Development Peak Flow (m³/sec)	Post Development Peak Flow No SWM (m³/sec)	Post Development Peak Flow with SWM
2 Year	0.054	0.193	0.057
5 Year	0.097	0.271	0.081

10 Year	0.131	0.366	0.105
25 Year	0.180	0.458	0.111
50 Year	0.225	0.537	0.117
100 Year	0.254	0.598	0.126

The proposed flow reductions are the result of the introduction of orifice plates within the storm sewer system which results in surface ponding and or underground storage within the proposed culvert system.

The pre-development runoff computer simulations results have been included within Appendix 'B' of this report. The post-development runoff computer simulations results have been included within Appendix 'C' of this report.

The proposed stormwater management system includes the provision for a minor system designed to accommodate the 5-year storm event. The storm sewer design calculations are included in Appendix 'D' of this report

March 2023

GRADING

Preliminary site grades are illustrated on the attached grading plan prepared by J H Cohoon Engineering Limited being drawing 16025-1 included with this report.

UTILITIES

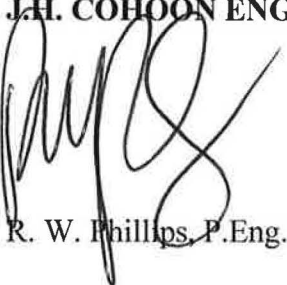
Gas, hydro, Bell, and cable utilities are available to service the proposed development. Coordination of these services will be required with Union Gas, Hydro One, Bell, and Cable TV.

CONCLUSIONS

The preceding sections of this report outline the preliminary servicing and grading requirements for the proposed residential development on this site. Based on the work completed to date, it may be concluded that the proposed development may be developed with full municipal services.

Report Prepared By:

J.H. COHOON ENGINEERING LIMITED

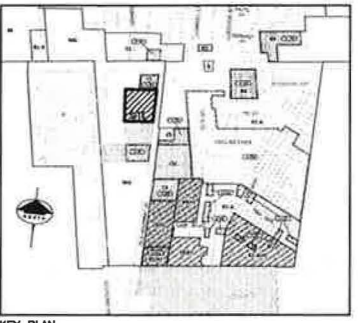
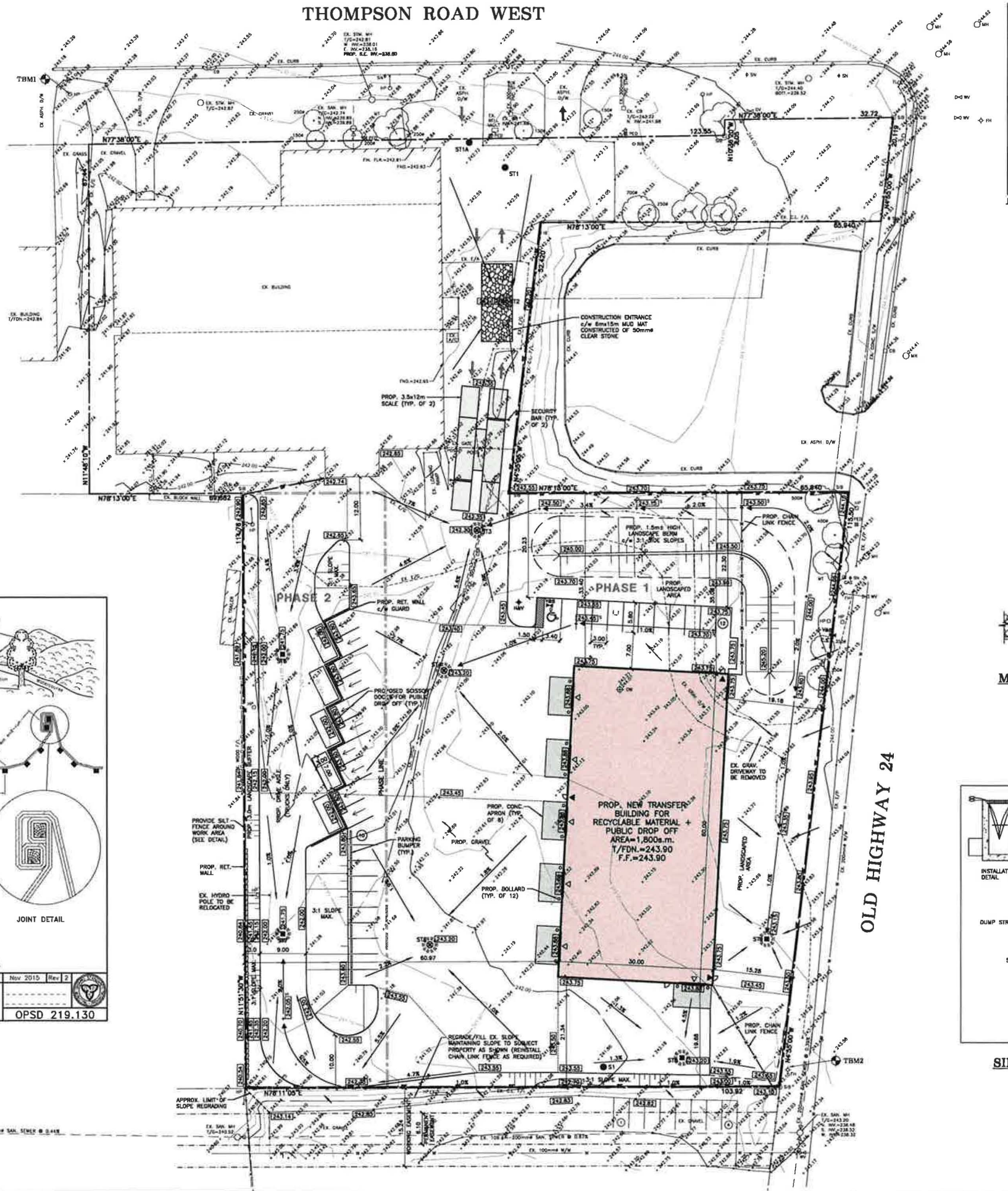


R. W. Phillips, P.Eng.



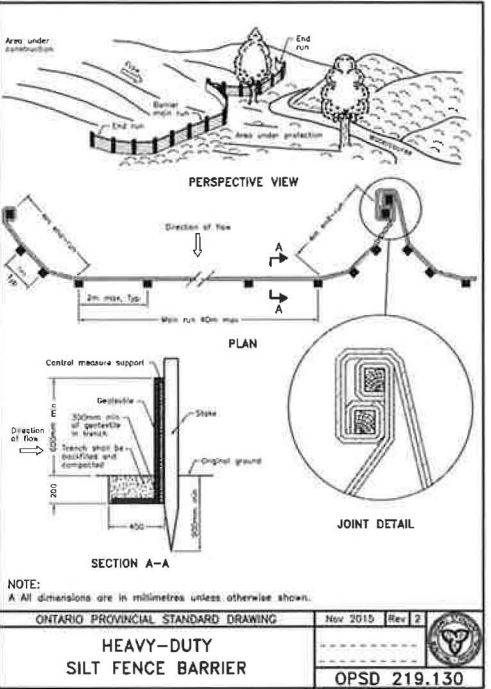
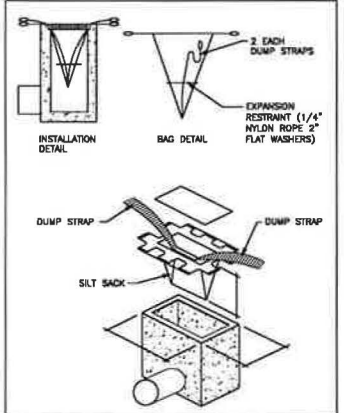
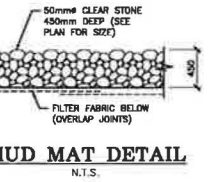
Appendix 'A'
Development Proposal as prepared by
J H Cohoon Engineering Drawing 15888-1

THOMPSON ROAD WEST



- LEGEND:**
- EXISTING ELEVATIONS
 - PROPOSED ELEVATIONS
 - PROPOSED SWALE ELEVATIONS
 - PROPOSED SWALE
 - GENERAL DRAINAGE
 - SILTATION FENCE
 - SILT SACK AS SHOWN

- NOTES:**
- ALL ELEVATIONS SHOWN ARE METRIC.
 - BUILDER/OWNER TO VERIFY COMPLIANCE WITH ZONING BYLAW (w. SIDEYARDS, SETBACKS, REARWARDS ETC.).
 - THE SILTATION & EROSION CONTROL (SEC) MEASURES ILLUSTRATED ON THIS PLAN ARE CONSIDERED TO BE THE MINIMUM REQUIREMENT. SITE CONDITIONS MAY REQUIRE ADDITIONAL MEASURES WHICH WILL BE IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION.
 - ALL SEC MEASURES ARE TO BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
 - OWNER/CONTRACTOR TO MAINTAIN EROSION CONTROL MEASURES THROUGHOUT SITE UNTIL A COMPLETE GRASS/VEGETATION COVER IS ACHIEVED.
 - ONLY AT THE DISCRETION OF THE ENGINEER ARE THE SEC MEASURES TO BE REMOVED.
 - SITE WORKS ARE TO BE STAGED IN SUCH A MANNER THAT EROSION WILL BE MINIMIZED, AND THE CONSULTANT MUST PROVIDE CONFIRMATION THAT ALL APPROVED SILTATION AND EROSION CONTROL FACILITIES HAVE BEEN INSTALLED PRIOR TO THE COMMENCEMENT OF ANY GRADING, EXCAVATION OR DEMOLITION.
 - CLEARING AND GRUBBING OF THE SITE SHOULD BE KEPT TO A MINIMUM AND VEGETATION REMOVED ONLY IN ADVANCE OF IMMEDIATE CONSTRUCTION.
 - STOCKPILES OF EARTH OR TOPSOIL ARE TO BE LOCATED AND PROTECTED TO MINIMIZE ENVIRONMENTAL INTERFERENCE. EROSION CONTROL FENCING IS TO BE INSTALLED AROUND THE BASE OF ALL STOCKPILES.
 - THE OWNER IS RESPONSIBLE TO ENSURE THE MUNICIPAL ROADS ARE KEPT CLEAR OF ALL SEDIMENTS FROM VEHICULAR TRACKING ETC. TO AND FROM THE SITE, AT THE END OF EACH WORKDAY.
 - ALL DISTURBED AREAS, NOT INCLUDED IN THE CONSTRUCTION ZONE, ARE TO BE TOPSOILED AND SEEDED IMMEDIATELY AFTER COMPLETION OF AREA GRADING.
 - ALL EXISTING AND PROPOSED CATCHBASINS ON THE SUBJECT PROPERTY, PLUS ANY CATCHBASINS WITHIN THE INFLUENCE OF RUNOFF FROM THE SITE, ARE TO BE PROTECTED WITH FILTER CLOTH OR APPROVED EQUIVALENT.
 - ADDITIONAL SILT CONTROLS MAY BE REQUIRED AS DETERMINED BY THE COUNTY AND/OR THE ENGINEER.



NOTE:
A. All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING Nov 2015 Rev 2
HEAVY-DUTY SILT FENCE BARRIER
OPSD 219.130

T.B.M. No. 1 ELEV. = 243.30m (GEO)
NAIL ON SIDE OF HYDRO POLE WEST OF EXISTING BUILDING

T.B.M. No. 2 ELEV. = 244.14m (GEO)
TOP NUT OF HYDRANT, SOUTH EAST CORNER OF PROPERTY

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
440 HARDY ROAD, UNIT #1, BRANTFORD - ONTARIO, N3T 5L8
TEL: (519) 753-2856 FAX: (519) 753-4283 www.cohooneering.com

PROJECT:
**PROPOSED SORTING FACILITY
NORFOLK DISPOSAL
SERVICES LIMITED**
106 THOMPSON ROAD WEST
WATERFORD, ONTARIO

CLIENT:
PK CONSTRUCTION INC.

**GRADING AND
SILTATION & EROSION
CONTROL PLAN**

DESIGN: R.W.P. SCALE: 1:400
DRAWN: K.P.B. JOB No: 15888
CHECKED: R.W.P. DWG. No: 15888-1
SHEET: 1 of 3
DATE: APR. 4/23



BLUELINE RD.
77.0m - 250mm SAN. SINK @ 0.1%
77.0m - 250mm SAN. SINK @ 0.1%
77.0m - 250mm SAN. SINK @ 0.1%

GENERAL NOTES:

- CONSTRUCTION OF SEWERS, WATERMAINS AND RELATED APPURTENANCES SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CURRENT STANDARD DRAWINGS OF THE COUNTY OF NORFOLK AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD). THE COUNTY OF NORFOLK DRAWINGS SHALL TAKE PRECEDENCE OVER THE OPSD DRAWINGS.
- INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THE APPROVED SET OF CONSTRUCTION DRAWINGS IS PROVIDED AS A GENERAL GUIDE ONLY. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS THEY SEE FIT WITH THE UNDERSTANDING THAT THE OWNER AND HIS AGENTS DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND/OR SUFFICIENCY.
- ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION AND HE SHALL REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
- RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
- THE CONTRACTOR SHALL OBTAIN ALL PERMITS FOR CONSTRUCTION.
- FOR ALL SEWERS AND WATERMAIN IN FULL SECTIONS, THE COMPACTION SHALL BE VERIFIED PRIOR TO LAYING OF PIPE.
- NO SUBSTITUTIONS WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE COUNTY OF NORFOLK OR THE ENGINEER.
- ALL EXCAVATIONS TO BE BACKFILLED WITH SELECT NATIVE MATERIAL, APPROVED BY THE ENGINEER, TO 95% S.P.D.
- THE DEVELOPER AND/OR CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING CURB, ROAD CONSTRUCTION IS FINISHED, BUT CONTROL DEVICES AS SHOWN ON THE DRAWINGS AND AS DIRECTED BY THE ENGINEER.
- TREE PROTECTION PROCEDURES TO BE IMPLEMENTED IN ACCORDANCE WITH COUNTY OF NORFOLK STANDARDS.
- ALL TRENCH BACKFILL UNDER EXISTING ROADWAYS SHALL BE COMPACTED IN MINIMUM 250mm LIFTS TO 95% STANDARD PROCTOR DENSITY. A GEOTECHNICAL ENGINEER'S REPRESENTATIVE SHALL BE ON SITE DURING THE WORK TO VERIFY THE COMPACTION OF EACH LIFT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS OF TESTING.
- AN ENGINEER IS REQUIRED TO BE ON SITE FOR INSPECTION OF ALL UNDERGROUND SERVICES.

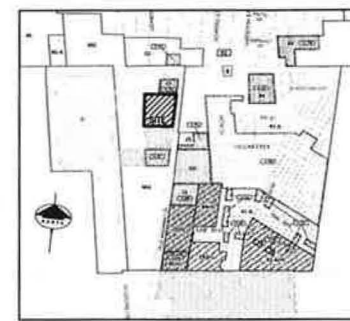
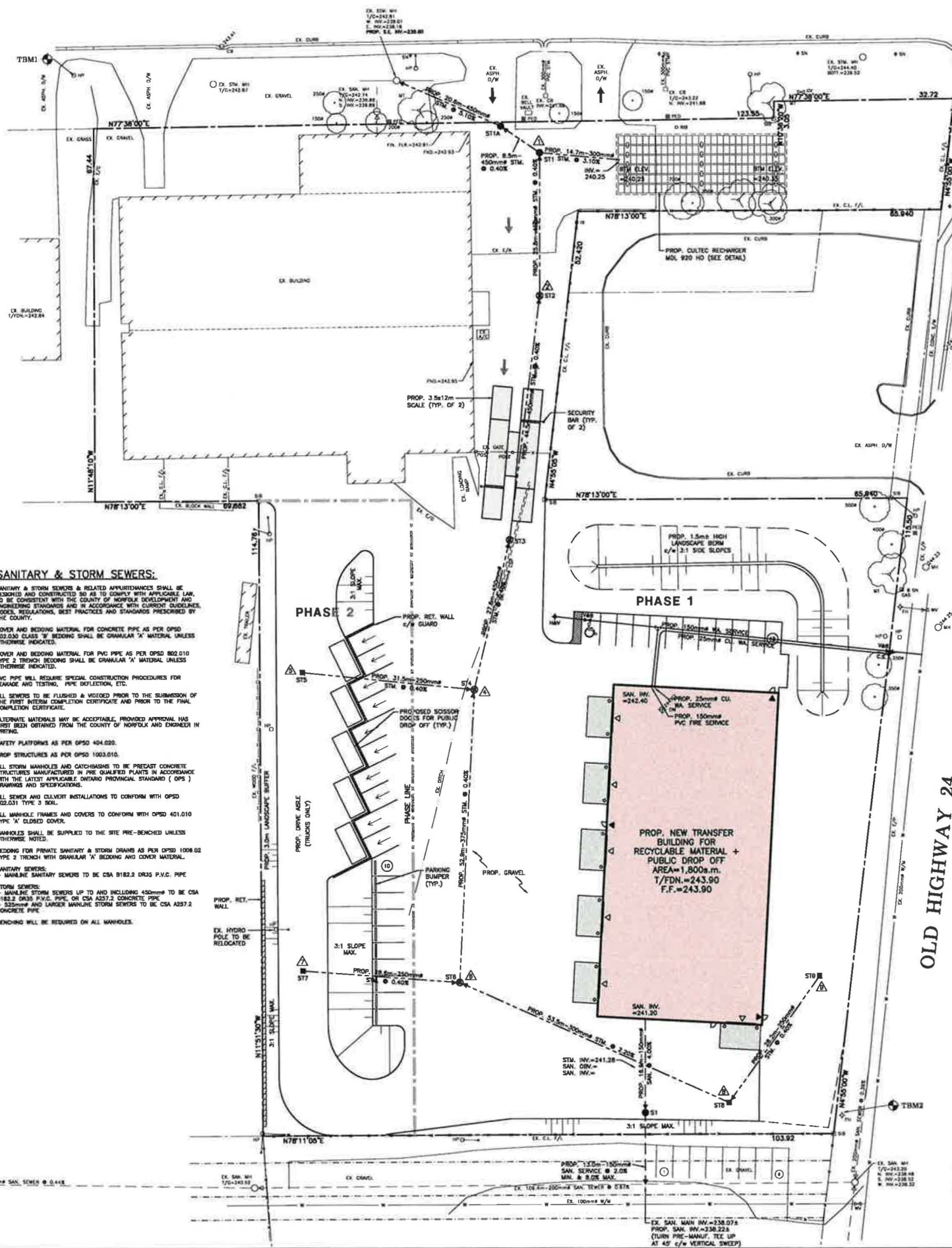
ROADWORKS:

- ROADWAYS & RELATED WORKS SHALL BE DESIGNED AND CONSTRUCTED SO AS TO COMPLY WITH APPLICABLE LAW, TO BE CONSISTENT WITH THE COUNTY OF NORFOLK DEVELOPMENT AND ENGINEERING STANDARDS AND IN ACCORDANCE WITH CURRENT GUIDELINES, CODES, REGULATIONS, BEST PRACTICES AND STANDARDS PRESCRIBED BY THE COUNTY.
- CATCH BASIN CONNECTIONS TO BE PVC PIPE CSA B182.4, SDR 35 OR "ULTRA RIB". SINGLE CATCH BASIN LEADS TO BE MIN. 250mm DIA. DOUBLE CATCH BASIN LEADS TO BE MIN. 300mm DIA. REAR LOT CATCH BASIN LEADS AND DITCH INLET LEADS TO BE CSA A257.1 EXTRA STRENGTH CL3 CONC. 300mm DIA. AT 1.0% MIN.
- SINGLE CATCH BASIN AS PER OPSD 100.010 FRAME AND COVER AS PER OPSD 400.110.
- DOUBLE CATCH BASIN AS PER OPSD 700.030 FRAME AND COVER AS PER OPSD 400.110.
- FOR MANHOLE AND CATCH BASIN TOP ADJUSTMENTS, ALL PERMANENT ADJUSTMENTS ARE TO BE POWDER IN PLACE OR APPROVED EQUIVALENT (e.g. MODULOC).
- ALL BEDDING AND BACKFILL MATERIAL, ROAD SUB-GRADES AND GRANULAR ROAD BASES SHALL BE COMPACTED TO MIN 100% S.P.D. UNLESS OTHERWISE SPECIFIED.

WATERMAINS:

- WATERMAINS AND RELATED APPURTENANCES SHALL BE DESIGNED AND CONSTRUCTED SO AS TO COMPLY WITH APPLICABLE LAW, TO BE CONSISTENT WITH THE COUNTY OF NORFOLK DEVELOPMENT AND ENGINEERING STANDARDS AND IN ACCORDANCE WITH CURRENT GUIDELINES, CODES, REGULATIONS, BEST PRACTICES AND STANDARDS PRESCRIBED BY THE COUNTY.
- WATERMAINS TO BE INSTALLED WITH A MINIMUM DEPTH OF COVER OF 1.70m BELOW FINISHED GRADE.
- WATERMAINS TO BE INSTALLED IN ACCORDANCE WITH OPSD 802.010 TYPE 2 TRENCH BEDDING TO BE GRANULAR "A" UNLESS OTHERWISE NOTED.
- WATERMAINS TO BE PVC DR-18 IN ACCORDANCE WITH ANMA C900 & CSA B137.3. THE PIPE SHALL BE SHIPPED TO THE SITE WITH THE ENDS FACTORY CAPPED.
- FOR PVC WATERMAIN DEFLECTION: - MAXIMUM ALLOWABLE DEFLECTION OF 1 DEGREE PER JOINT SHALL NOT BE EXCEEDED. - EACH JOINT SHALL BE DEFLECTED AN EQUAL AMOUNT.
- ALL WATER MAINS TO BE SHOWN, TESTED, DISINFECTED AND FLUSHED UNDER THE SUPERVISION OF THE ENGINEER PRIOR TO CONNECTION TO THE EXISTING MUNICIPAL SYSTEM. REFER TO OPSD 701.02.23, ANMA C900 & COUNTY OF NORFOLK GENERAL WATERMAIN DISINFECTION PROCEDURES.
- A REDUCED PRESSURE DOUBLE BACKFLOW PREVENTER IS REQUIRED ON THE TEMPORARY SUPPLY LINES USED FOR FLUSHING AND DISINFECTION OF WATERMAINS AND TO BE TESTED AND CERTIFIED ON SITE.
- UPON COMPLETION OF INSTALLATION, THE CONTRACTOR SHALL PERFORM A PRESSURE TEST ON THE WATERMAINS AS PER OPSD 701.02.23 AND COUNTY OF NORFOLK SPECIFICATIONS. WATERMAIN IS TO BE TESTED UNDER THE SUPERVISION OF THE ENGINEER PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS.
- PIPE CLOSURES WHERE REQUIRED, ARE TO BE SUPPLIED BY THE CONTRACTOR. THE CONTRACTOR SHALL ALSO SUPPLY AND INSTALL ALL ADAPTOR PIECES IN ORDER TO CONNECT EXISTING WATERMAINS.
- ALL WATER SERVICE CONNECTIONS 25mm DIA. ASTM B88 TYPE "C" SOFT COPPER AS PER OPSD 110.010 & COUNTY OF NORFOLK ENGINEERING STANDARDS WITH SANE BEDDING.
- CURB STOPS TO BE MAXIMUM 4-750 OR EQUIVALENT APPROVED BY THE COUNTY OF NORFOLK.
- ALL VALVE BOXES TO BE SET TO PROPOSED ASPHALT INDOOR COURSE (H/L) ELEVATION. VALVE BOXES ARE TO BE ADJUSTED TO FINAL SURFACE ASPHALT ELEVATION WHEN FINAL ASPHALT COURSE IS PLACED (NO RISERS WILL BE PERMITTED).
- GATE VALVES TO BE MUELLER 2380 OR EQUIVALENT APPROVED BY THE COUNTY OF NORFOLK.
- JOINT RESTRAINTS WITH A MINIMUM LENGTH OF 1.5m ON EACH SIDE OF 45° BENDS PERMITTED. JOINT RESTRAINTS TO BE REGULAR FOR PVC SERIES 300P OR APPROVED EQUAL. JOINT RESTRAINT LENGTHS SHOWN TO BE VERIFIED BY SUPPLIER BASED ON INSTALLATION CONDITIONS.
- 3-WAY HYDRANTS TO BE INSTALLED AS PER OPSD 110.010 (SHALL OPEN LEFT - COUNTER CLOCKWISE) & PAINTED RED. HYDRANTS TO BE CANADA VALVE CENTURY HYDRANT OR EQUIVALENT APPROVED BY THE COUNTY OF NORFOLK.
- ALL FIRE HYDRANTS SHALL CONFORM TO THE AREA MUNICIPALITY FIRE DEPARTMENT'S REQUIREMENTS. ALL HYDRANTS WITHIN CONDOMINIUM SHALL BE OF LUG MANUFACTURE.
- TRACING WIRES THREE GAUGE TO BE TERMINATED / ACCESSIBLE AT A TEST BOX AT ALL HYDRANTS AND PLACED ALONG TOP OF WATERMAIN AND FASTENED WITH STRAPS AT 8.0m CENTRES. TRACING WIRE SHALL NOT BE LOOSED TO THE SURFACE AT MANHOLE VALVE BOXES.
- ALL WATERMAIN VALVES, BENDS AND FITTINGS TO HAVE MECHANICAL JOINTS.
- CATHODIC PROTECTION TO BE PROVIDED AT ALL VALVES, BENDS AND FITTINGS WITH 11.0 KG ZINC ANODES AND ON ALL WATER SERVICE CONNECTIONS WITH 5.0 KG ZINC ANODES.
- WATERMAIN INSULATION TO BE PROVIDED AT ALL LOCATIONS WHERE THE WATERMAIN IS LOCATED CLOSE TO CATCH BASINS (LESS THAN 0.5m) AND AT CONNECTIONS TO EXISTING WATERMAINS WHERE DEPTH OF COVER IS INSUFFICIENT (LESS THAN 1.70m).
- THE WATERMAIN AND HYDRANT LEADS AT THE HIGH POINTS SHOULD BE CONSTRUCTED SO THAT THE HYDRANT LEAD SLOPE SUFFICIENTLY UPWARD FROM THE WATERMAIN TO THE HYDRANT TO OPTIMIZE THE HYDRANTS AS AIR RELIEF POINTS.
- SHOULD AIR IN THE WATERMAIN BE DEMONSTRATED TO BE A PROBLEM, THE CONTRACTOR WILL BE REQUIRED TO INSTALL AN AIR RELIEF VALVE(S) TO THE SATISFACTION OF THE COUNTY OF NORFOLK.

THOMPSON ROAD WEST



LEGEND:

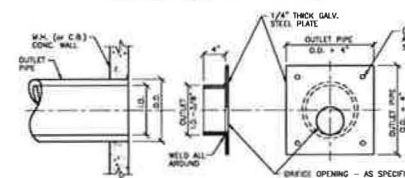
- EXISTING ELEVATIONS
- PROPOSED ELEVATIONS
- PROPOSED SHALE ELEVATIONS
- PROPOSED SHALE
- GENERAL DRAINAGE

NOTES:

- ALL ELEVATIONS SHOWN ARE METRIC.
- BUILDER/OWNER TO VERIFY COMPLIANCE WITH ZONING BYLAWS (e.g. SIDEYARDS, SETBACKS, REARWARDS ETC.)

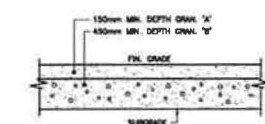
C.B. ORIFICE PLATE SIZING

ORIFICE PLATE CONFIGURATION NUMBER	DIAMETER OF ORIFICE PLATE OPENING
1	220mm
2	300mm
3	215mm
4	75mm
5	170mm
6	110mm
7	110mm
8	110mm



FLOW CONTROL DEVICE ORIFICE PLATE

N.T.S.



TYP. GRAVEL AREAS

N.T.S.

SANITARY SYSTEM

M/H No.	DESCRIPTION	T/D	INVERTS
S1	1.2m P/C MH	243.50	N 240.52 S 240.40

STORM SYSTEM

M/H No.	DESCRIPTION	T/D	INVERTS
ST1A	STORMCEPTOR MODEL EF08	242.75	SE 239.70 NW 239.65
ST1	1.2m P/C MH	242.70	S 239.70 NW 239.74
ST2	1.2m P/C CB/MH	242.10	S 239.91 N 239.88
ST3	1.2m P/C CB/MH	242.30	S 240.11 N 240.09
ST4	1.2m P/C CB/MH	243.20	N 240.22 W 240.52 S 240.24
ST5	0.6x0.6x1.22m P/C CB	241.75	E 240.65
ST6	1.2m P/C CB/MH	243.20	E 240.47 W 240.54 N 240.45
ST7	0.6x0.6x1.22m P/C CB	241.75	E 240.65
ST8	0.6x0.6x1.67m P/C CB	243.20	N 241.67 W 241.65
ST9	0.6x0.6x1.52m P/C CB	243.15	S 241.78



J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD, UNIT #1, BRANTFORD - ONTARIO, N3T 6L8
TEL: (519) 753-2858 FAX: (519) 753-4283 www.cohooneng.com

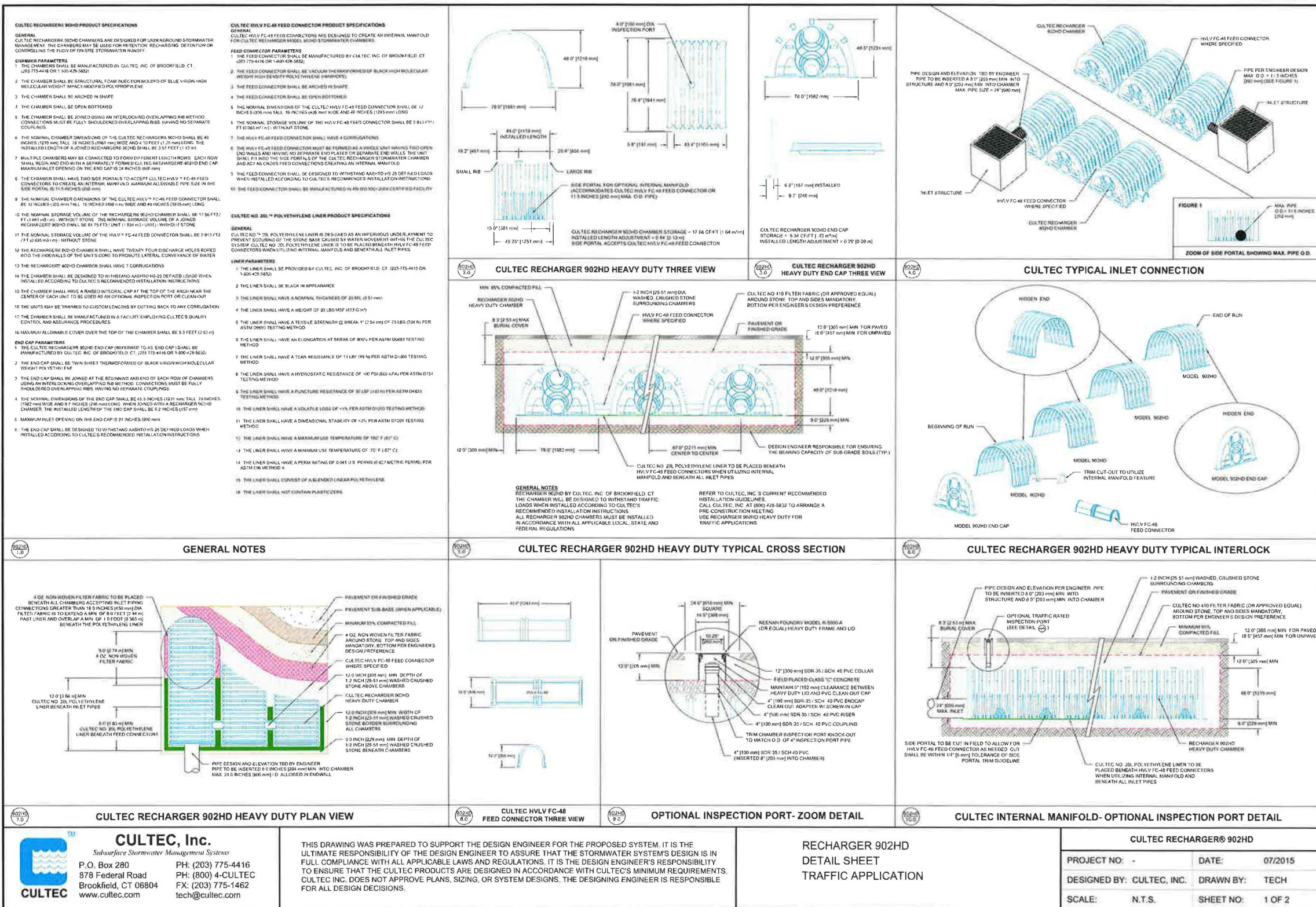
PROJECT: PROPOSED SORTING FACILITY NORFOLK DISPOSAL SERVICES LIMITED

106 THOMPSON ROAD WEST
WATERFORD, ONTARIO

CLIENT: PK CONSTRUCTION INC.

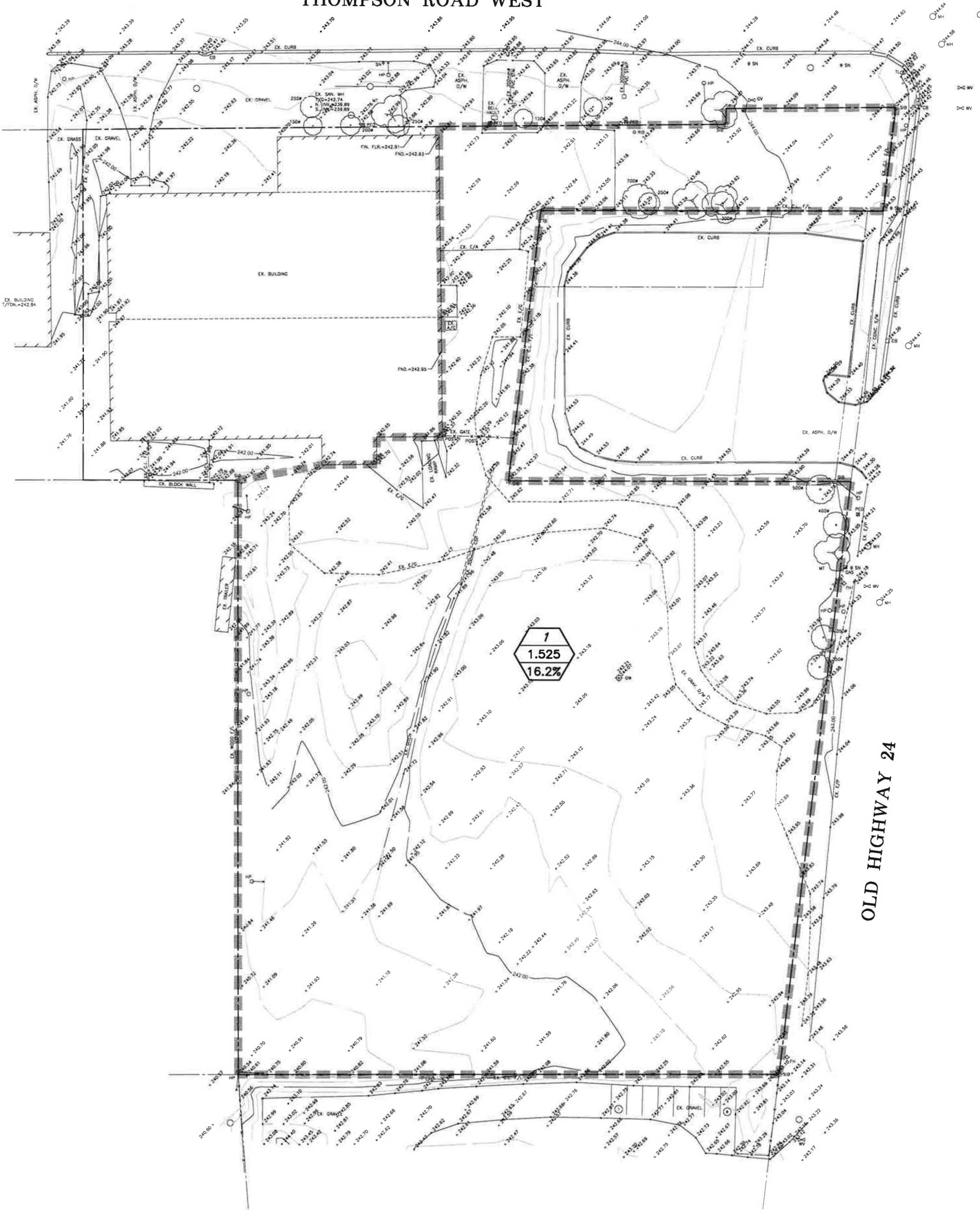
SERVICING PLAN

DESIGN: R.W.P.	SCALE: 1:400
DRAWN: K.P.B.	JOB No: 15888
CHECKED: R.W.P.	
SHEET: 2 of 3	DWG. No: 15888-2
DATE: APR. 4/23	



Appendix 'B'
MIDUSS Stormwater Management Simulation Results
Pre-development Conditions

THOMPSON ROAD WEST



PRE DEVELOPMENT
STORM DRAINAGE AREAS



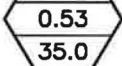

PROPOSED SORTING FACILITY
106 THOMPSON ROAD WEST-NORFOLK



J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
BRANTFORD

CLIENT: PK CONSTRUCTION INC. JOB: 15888
SCALE: 1:750

LEGEND

-  STORM DRAINAGE BOUNDARY
-  STORM DRAINAGE NUMBER
-  STORM AREA IN HECTARES
-  % IMPERVIOUS

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25 rev. 473"
"          MIDUSS created                      February-07-10"
"          10 Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pre2.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 7:27:24 AM"
" 31      TIME PARAMETERS"
"          10.000 Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1 Chicago storm"
"          529.711 Coefficient A"
"          4.501 Constant B"
"          0.745 Exponent C"
"          0.400 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity                    69.337 mm/hr"
"          Total depth                          32.583 mm"
"          6 005hyd Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          2 Rectangular"
"          1 Equal length"
"          2 Horton equation"
"          101 No description"
"          16.200 % Impervious"
"          1.525 Total Area"
"          146.747 Flow length"
"          1.000 Overland Slope"
"          1.278 Pervious Area"
"          146.747 Pervious length"
"          1.000 Pervious slope"
"          0.247 Impervious Area"
"          146.747 Impervious length"
"          1.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          35.000 Pervious Max.infiltration"
"          5.000 Pervious Min.infiltration"
"          0.500 Pervious Lag constant (hours)"
"          7.500 Pervious Depression storage"
"          0.015 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.500 Impervious Lag constant (hours)"
"          2.000 Impervious Depression storage"
"          0.054 0.000 0.000 0.000 c.m/sec"
"          Catchment 101 Pervious Impervious Total Area "
"          Surface Area 1.278 0.247 1.525 hectare"
"          Time of concentration 98.221 8.196 33.679 minutes"
"          Time to Centroid 132.884 92.712 104.083 minutes"
"          Rainfall depth 32.583 32.583 32.583 mm"
"          Rainfall volume 416.39 80.50 496.89 c.m"
"          Rainfall losses 30.249 2.000 25.672 mm"
"          Runoff depth 2.334 30.583 6.911 mm"
"          Runoff volume 29.83 75.56 105.39 c.m"
"          Runoff coefficient 0.072 0.939 0.212 "

```

"	Maximum flow	0.005	0.051	0.054	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.054 0.054 0.000 0.000"				
" 38	START/RE-START TOTALS 101"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		1.525	hectare"	
"	Total Impervious area		0.247	hectare"	
"	Total % impervious		16.200"		
" 19	EXIT"				


```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25 rev. 473"
"          MIDUSS created                      February-07-10"
"          10 Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                   pre5.out"
"          Licensee name:                     Bob"
"          Company                           "
"          Date & Time last used:             09/08/2022 at 7:30:17 AM"
" 31      TIME PARAMETERS"
"          10.000 Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1 Chicago storm"
"          583.017 Coefficient A"
"          3.007 Constant B"
"          0.703 Exponent C"
"          0.400 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity          92.454 mm/hr"
"          Total depth                44.904 mm"
"          6 005hyd Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          2 Rectangular"
"          1 Equal length"
"          2 Horton equation"
"          101 No description"
"          16.200 % Impervious"
"          1.525 Total Area"
"          146.747 Flow length"
"          1.000 Overland Slope"
"          1.278 Pervious Area"
"          146.747 Pervious length"
"          1.000 Pervious slope"
"          0.247 Impervious Area"
"          146.747 Impervious length"
"          1.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          35.000 Pervious Max.infiltration"
"          5.000 Pervious Min.infiltration"
"          0.500 Pervious Lag constant (hours)"
"          7.500 Pervious Depression storage"
"          0.015 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.500 Impervious Lag constant (hours)"
"          2.000 Impervious Depression storage"
"          0.097 0.000 0.000 0.000 c.m/sec"
"          Catchment 101 Pervious Impervious Total Area "
"          Surface Area 1.278 0.247 1.525 hectare"
"          Time of concentration 52.404 7.305 33.315 minutes"
"          Time to Centroid 120.241 91.830 108.215 minutes"
"          Rainfall depth 44.904 44.904 44.904 mm"
"          Rainfall volume 573.85 110.94 684.79 c.m"
"          Rainfall losses 33.604 2.000 28.484 mm"
"          Runoff depth 11.301 42.904 16.420 mm"
"          Runoff volume 144.42 106.00 250.41 c.m"
"          Runoff coefficient 0.252 0.955 0.366 "

```

"	Maximum flow	0.038	0.066	0.097	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.097 0.097 0.000 0.000"				
" 38	START/RE-START TOTALS 101"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		1.525	hectare"	
"	Total Impervious area		0.247	hectare"	
"	Total % impervious		16.200"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      February-07-10"
"          10  Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pre10.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 7:31:42 AM"
" 31      TIME PARAMETERS"
"          10.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          670.324  Coefficient A"
"          3.007  Constant B"
"          0.698  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          107.682  mm/hr"
"          Total depth                52.991  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          2  Rectangular"
"          1  Equal length"
"          2  Horton equation"
"          101  No description"
"          16.200  % Impervious"
"          1.525  Total Area"
"          146.747  Flow length"
"          1.000  Overland Slope"
"          1.278  Pervious Area"
"          146.747  Pervious length"
"          1.000  Pervious slope"
"          0.247  Impervious Area"
"          146.747  Impervious length"
"          1.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          35.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.500  Pervious Lag constant (hours)"
"          7.500  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.500  Impervious Lag constant (hours)"
"          2.000  Impervious Depression storage"
"          0.131  0.000  0.000  0.000 c.m/sec"
"          Catchment 101  Pervious  Impervious Total Area "
"          Surface Area  1.278  0.247  1.525  hectare"
"          Time of concentration  44.143  6.873  31.331  minutes"
"          Time to Centroid  121.929  91.169  111.356  minutes"
"          Rainfall depth  52.991  52.991  52.991  mm"
"          Rainfall volume  677.20  130.91  808.12  c.m"
"          Rainfall losses  34.172  2.000  28.960  mm"
"          Runoff depth  18.819  50.991  24.031  mm"
"          Runoff volume  240.50  125.97  366.47  c.m"
"          Runoff coefficient  0.355  0.962  0.453  "

```

"	Maximum flow	0.069	0.075	0.131	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.131 0.131 0.000 0.000"				
" 38	START/RE-START TOTALS 101"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		1.525	hectare"	
"	Total Impervious area		0.247	hectare"	
"	Total % impervious		16.200"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      February-07-10"
"          10  Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pre25.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 7:33:08 AM"
" 31      TIME PARAMETERS"
"          10.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          721.533  Coefficient A"
"          2.253  Constant B"
"          0.679  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          127.011  mm/hr"
"          Total depth                63.151  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          2  Rectangular"
"          1  Equal length"
"          2  Horton equation"
"          101  No description"
"          16.200  % Impervious"
"          1.525  Total Area"
"          146.747  Flow length"
"          1.000  Overland Slope"
"          1.278  Pervious Area"
"          146.747  Pervious length"
"          1.000  Pervious slope"
"          0.247  Impervious Area"
"          146.747  Impervious length"
"          1.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          35.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.500  Pervious Lag constant (hours)"
"          7.500  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.500  Impervious Lag constant (hours)"
"          2.000  Impervious Depression storage"
"          0.180  0.000  0.000  0.000 c.m/sec"
"          Catchment 101      Pervious  Impervious Total Area  "
"          Surface Area      1.278      0.247      1.525      hectare"
"          Time of concentration 38.292      6.434      28.932      minutes"
"          Time to Centroid    121.493      90.744      112.459      minutes"
"          Rainfall depth      63.151      63.151      63.151      mm"
"          Rainfall volume     807.04      156.01      963.05      c.m"
"          Rainfall losses     34.738      2.000      29.434      mm"
"          Runoff depth        28.413      61.151      33.717      mm"
"          Runoff volume       363.11      151.07      514.18      c.m"
"          Runoff coefficient   0.450      0.968      0.534      "

```

"	Maximum flow	0.110	0.087	0.180	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.180 0.180 0.000 0.000"				
" 38	START/RE-START TOTALS 101"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		1.525	hectare"	
"	Total Impervious area		0.247	hectare"	
"	Total % impervious		16.200"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      February-07-10"
"          10  Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pre50.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 7:34:33 AM"
" 31      TIME PARAMETERS"
"          10.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          766.038  Coefficient A"
"          1.838  Constant B"
"          0.668  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          142.054  mm/hr"
"          Total depth                71.105  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          2  Rectangular"
"          1  Equal length"
"          2  Horton equation"
"          101  No description"
"          16.200  % Impervious"
"          1.525  Total Area"
"          146.747  Flow length"
"          1.000  Overland Slope"
"          1.278  Pervious Area"
"          146.747  Pervious length"
"          1.000  Pervious slope"
"          0.247  Impervious Area"
"          146.747  Impervious length"
"          1.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          35.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.500  Pervious Lag constant (hours)"
"          7.500  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.500  Impervious Lag constant (hours)"
"          2.000  Impervious Depression storage"
"          0.225  0.000  0.000  0.000 c.m/sec"
"          Catchment 101          Pervious  Impervious Total Area "
"          Surface Area          1.278  0.247  1.525  hectare"
"          Time of concentration  34.972  6.152  27.180  minutes"
"          Time to Centroid      120.202  90.488  112.169  minutes"
"          Rainfall depth        71.105  71.105  71.105  mm"
"          Rainfall volume        908.69  175.67  1084.36  c.m"
"          Rainfall losses        35.049  2.000  29.695  mm"
"          Runoff depth           36.056  69.105  41.410  mm"
"          Runoff volume          460.78  170.72  631.50  c.m"
"          Runoff coefficient      0.507  0.972  0.582  "

```

"	Maximum flow	0.149	0.097	0.225	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.225 0.225 0.000 0.000"				
" 38	START/RE-START TOTALS 101"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		1.525	hectare"	
"	Total Impervious area		0.247	hectare"	
"	Total % impervious		16.200"		
" 19	EXIT"				


```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25 rev. 473"
"          MIDUSS created                      February-07-10"
"          10 Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    prel00.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 7:35:46 AM"
" 31      TIME PARAMETERS"
"          10.000 Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1 Chicago storm"
"          801.041 Coefficient A"
"          1.501 Constant B"
"          0.657 Exponent C"
"          0.400 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity          155.782 mm/hr"
"          Total depth                78.830 mm"
"          6 005hyd Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          2 Rectangular"
"          1 Equal length"
"          2 Horton equation"
"          101 No description"
"          16.200 % Impervious"
"          1.525 Total Area"
"          146.747 Flow length"
"          1.000 Overland Slope"
"          1.278 Pervious Area"
"          146.747 Pervious length"
"          1.000 Pervious slope"
"          0.247 Impervious Area"
"          146.747 Impervious length"
"          1.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          35.000 Pervious Max.infiltration"
"          5.000 Pervious Min.infiltration"
"          0.500 Pervious Lag constant (hours)"
"          7.500 Pervious Depression storage"
"          0.015 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.500 Impervious Lag constant (hours)"
"          2.000 Impervious Depression storage"
"          0.264 0.000 0.000 0.000 c.m/sec"
"          Catchment 101 Pervious Impervious Total Area "
"          Surface Area 1.278 0.247 1.525 hectare"
"          Time of concentration 32.983 5.929 26.089 minutes"
"          Time to Centroid 119.953 90.304 112.398 minutes"
"          Rainfall depth 78.830 78.830 78.830 mm"
"          Rainfall volume 1007.41 194.75 1202.16 c.m"
"          Rainfall losses 35.397 2.000 29.987 mm"
"          Runoff depth 43.433 76.830 48.844 mm"
"          Runoff volume 555.06 189.81 744.86 c.m"
"          Runoff coefficient 0.551 0.975 0.620 "

```

"	Maximum flow	0.185	0.107	0.264	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.264 0.264 0.000 0.000"				
" 38	START/RE-START TOTALS 101"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		1.525	hectare"	
"	Total Impervious area		0.247	hectare"	
"	Total % impervious		16.200"		
" 19	EXIT"				

Stormceptor[®] EF Sizing Report

STORMCEPTOR[®]

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

04/04/2023

Province:	Ontario	Project Name:	Thompson Rd
City:	Simcoe	Project Number:	15888
Nearest Rainfall Station:	BRANTFORD MOE	Designer Name:	Robert Phillips
Climate Station Id:	6140954	Designer Company:	J H Cohoon Engineering Limited
Years of Rainfall Data:	41	Designer Email:	rphillips@cohooneng.com
Site Name:		Designer Phone:	519-753-2656
Drainage Area (ha):	1.525	EOR Name:	
% Imperviousness:	61.10	EOR Company:	
Runoff Coefficient 'c': 0.66		EOR Email:	
Particle Size Distribution:	CA ETV	EOR Phone:	
Target TSS Removal (%):	60.0		

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	36.99
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary	
Stormceptor Model	TSS Removal Provided (%)
EFO4	46
EFO6	55
EFO8	60
EFO10	63
EFO12	65

Recommended Stormceptor EFO Model: **EFO8**
 Estimated Net Annual Sediment (TSS) Load Reduction (%): **60**
 Water Quality Runoff Volume Capture (%): **> 90**

Stormceptor® EF Sizing Report

THIRD-PARTY TESTING AND VERIFICATION

► **Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

► **Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

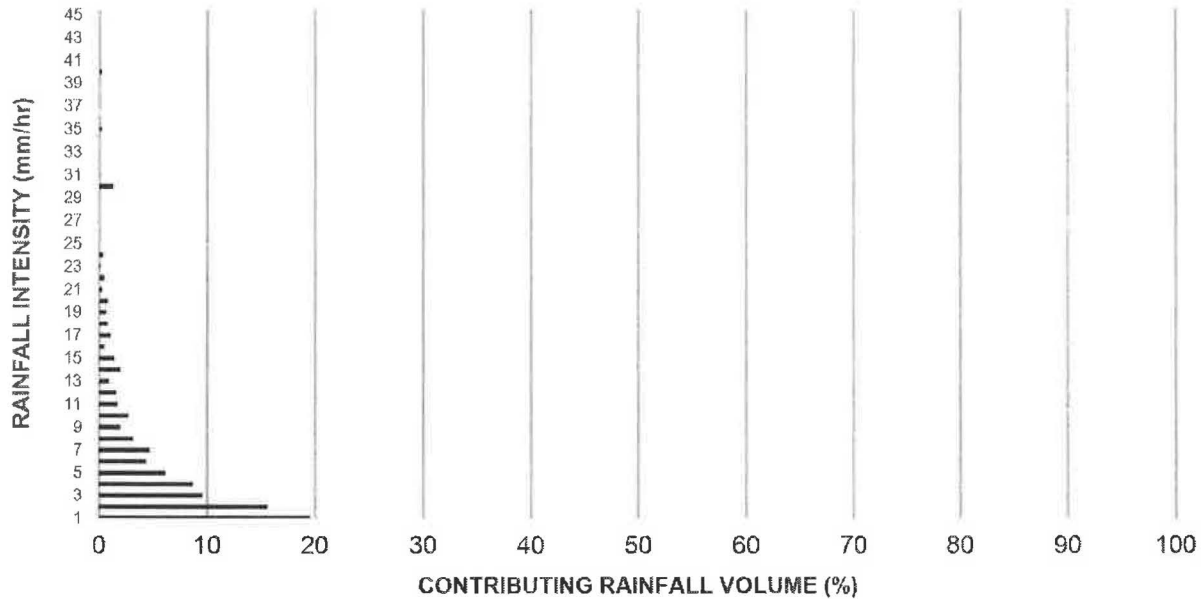
Stormceptor®**EF** Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	9.1	9.1	1.41	85.0	18.0	70	6.4	6.4
1	19.6	28.8	2.83	170.0	36.0	70	13.8	20.3
2	15.6	44.4	5.65	339.0	72.0	66	10.2	30.5
3	9.6	54.0	8.48	509.0	108.0	62	6.0	36.5
4	8.7	62.7	11.30	678.0	144.0	59	5.1	41.6
5	6.2	68.9	14.13	848.0	180.0	56	3.4	45.0
6	4.4	73.3	16.96	1017.0	216.0	54	2.4	47.4
7	4.7	77.9	19.78	1187.0	253.0	53	2.5	49.9
8	3.2	81.1	22.61	1357.0	289.0	52	1.6	51.5
9	2.0	83.1	25.43	1526.0	325.0	50	1.0	52.5
10	2.7	85.7	28.26	1696.0	361.0	49	1.3	53.8
11	1.7	87.4	31.09	1865.0	397.0	48	0.8	54.6
12	1.6	89.0	33.91	2035.0	433.0	47	0.7	55.3
13	0.9	89.8	36.74	2204.0	469.0	46	0.4	55.7
14	2.0	91.8	39.56	2374.0	505.0	45	0.9	56.6
15	1.4	93.2	42.39	2543.0	541.0	44	0.6	57.2
16	0.5	93.7	45.22	2713.0	577.0	43	0.2	57.5
17	1.1	94.8	48.04	2883.0	613.0	42	0.4	57.9
18	0.8	95.5	50.87	3052.0	649.0	42	0.3	58.2
19	0.7	96.2	53.69	3222.0	685.0	42	0.3	58.5
20	0.8	97.0	56.52	3391.0	722.0	41	0.3	58.9
21	0.3	97.4	59.35	3561.0	758.0	41	0.1	59.0
22	0.5	97.8	62.17	3730.0	794.0	41	0.2	59.2
23	0.1	97.9	65.00	3900.0	830.0	41	0.0	59.2
24	0.4	98.3	67.83	4070.0	866.0	41	0.2	59.4
25	0.0	98.3	70.65	4239.0	902.0	41	0.0	59.4
30	1.3	99.6	84.78	5087.0	1082.0	39	0.5	59.9
35	0.2	99.8	98.91	5935.0	1263.0	36	0.1	59.9
40	0.2	100.0	113.04	6783.0	1443.0	33	0.1	60.0
45	0.0	100.0	127.17	7630.0	1623.0	29	0.0	60.0
Estimated Net Annual Sediment (TSS) Load Reduction =								60 %

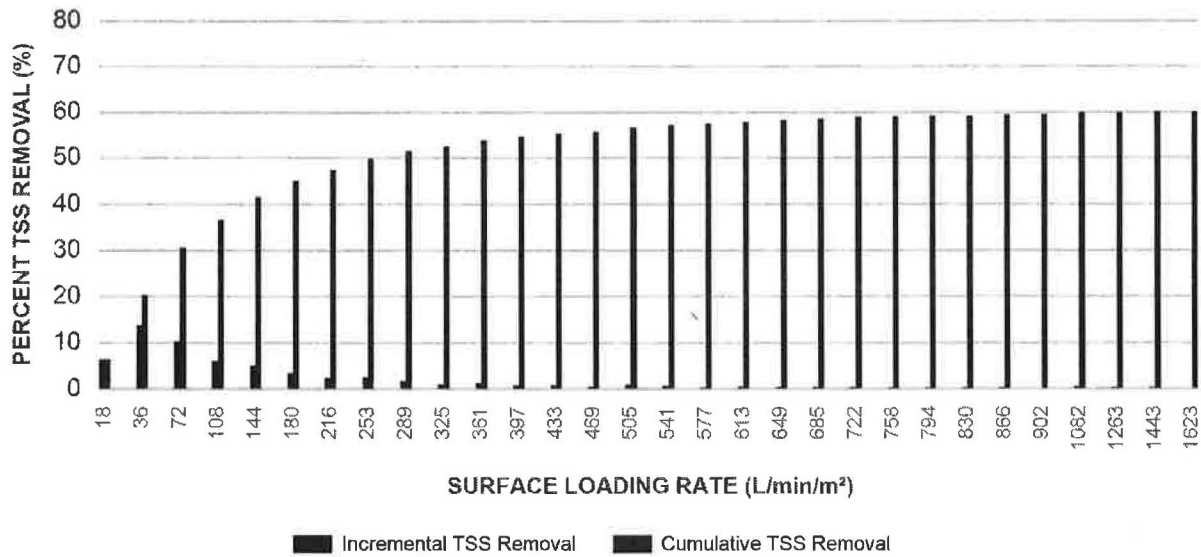
Climate Station ID: 6140954 Years of Rainfall Data: 41

Stormceptor®EF Sizing Report

RAINFALL DATA FROM BRANTFORD MOE RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

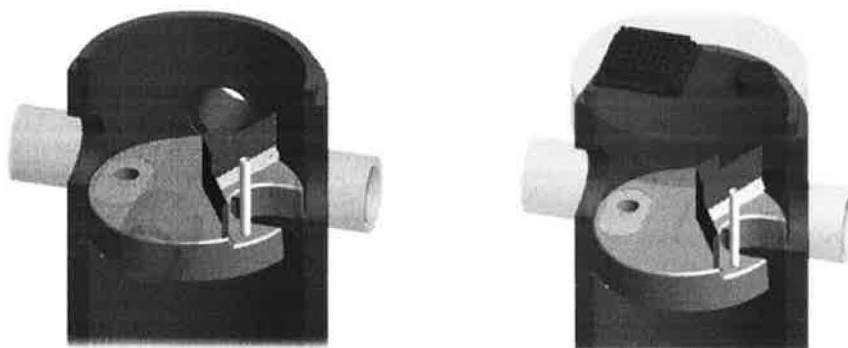
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

DESIGN FLEXIBILITY

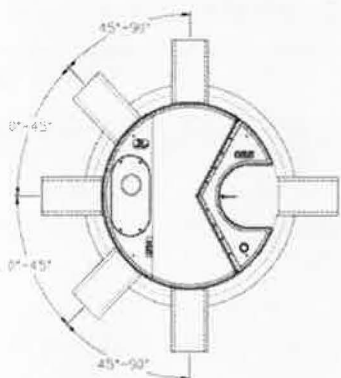
► **Stormceptor® EF and EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

► While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



Stormceptor® EF Sizing Report



INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>

Stormceptor® EF Sizing Report

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24		

Stormceptor® **EF** Sizing Report

**STANDARD PERFORMANCE SPECIFICATION FOR
“OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE**

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall



Stormceptor®EF Sizing Report

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

Stormceptor®EF Sizing Report

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Appendix 'C'
MIDUSS Stormwater Management Simulation Results
Post-development Conditions

Orifice Plate Calculations
Proposed Industrial Expansion
Norfolk Disposal

Norfolk

Ontario

Job 15888

"April 2023

Pond Area 2

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	= $(2gh)^{0.5}$	C
242.10	0.00	2.50	0.00	0.2831	2.06	40.4172	6.3575	0.63
242.25	0.15	7.00	4.50	0.2932	2.21	43.3602	6.5848	0.63
242.35	0.25	23.32	20.82	0.2998	2.31	45.3222	6.7322	0.63

Invert of Outlet/Orifice Plate

239.89

Orifice Plate Diameter

300 mm

Area of Orifice

0.0707 sq.m.

Centreline of Orifice Plate

240.04

Structure Storage

2.50287804 cu.m.

Pond Area No. 1 - Cultec

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	= $(2gh)^{0.5}$	C
240.25	0.00	0.57	0.00	0.0750	0.5	9.81	3.1321	0.63
240.70	0.45	231.77	231.20	0.1034	0.95	18.639	4.3173	0.63
241.25	1.00	462.97	462.40	0.1299	1.5	29.43	5.4249	0.63

Invert of Outlet/Orifice Plate

239.75

Orifice Plate Diameter

220

Area of Orifice

0.0380 sq.m.

Centreline of Orifice Plate

239.75

Structure Storage

0.566262 cu.m.

Pond Area 4

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	= $(2gh)^{0.5}$	C
243.20	0.00	3.37	0.00	0.1717	2.87	56.35845	7.5072	0.63
243.30	0.10	15.09	11.72	0.1747	2.9725	58.32045	7.6368	0.63
243.40	0.20	50.25	46.88	0.1776	3.0725	60.28245	7.7642	0.63

Invert of Outlet/Orifice Plate

240.22

Orifice Plate Diameter

215 mm

Area of Orifice

0.0363 sq.m.

Centreline of Orifice Plate

240.33

Structure Storage

3.37492152 cu.m.

Pond Area 5

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	$=(2gh)^{**0.5}$	C
241.75	0.00	0.40	0.00	0.0127	1.06	20.84625	4.5658	0.63
241.90	0.15	8.34	7.94	0.0136	1.21	23.78925	4.8774	0.63
242.00	0.25	37.17	36.77	0.0141	1.31	25.75125	5.0746	0.63
Invert of Outlet/Orifice Plate				240.65				
Orifice Plate Diameter				75 mm	Area of Orifice	0.0044 sq.m.		
Centreline of Orifice Plate				240.69	Structure Storage	0.396 cu.m.		

Pond Area 6

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	$=(2gh)^{**0.5}$	C
243.20	0.00	3.11	0.00	0.1034	2.66	52.2873	7.2310	0.63
243.35	0.15	15.44	12.33	0.1063	2.82	55.2303	7.4317	0.63
243.45	0.25	60.21	57.10	0.1081	2.91	57.1923	7.5626	0.63
Invert of Outlet/Orifice Plate				240.45				
Orifice Plate Diameter				170 mm	Area of Orifice	0.0227 sq.m.		
Centreline of Orifice Plate				240.54	Structure Storage	3.114441 cu.m.		

Pond Area 7

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	$=(2gh)^{**0.5}$	C
241.75	0.00	0.40	0.00	0.0271	1.04	20.5029	4.5280	0.63
241.90	0.15	6.94	6.54	0.0290	1.19	23.4459	4.8421	0.63
242.00	0.25	31.84	31.44	0.0302	1.29	25.4079	5.0406	0.63
Invert of Outlet/Orifice Plate				240.65				
Orifice Plate Diameter				110 mm	Area of Orifice	0.0095 sq.m.		
Centreline of Orifice Plate				240.71	Structure Storage	0.396 cu.m.		

Pond Area 8

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	=(2gh)**0.5	C
243.20	0.00	0.56	0.00	0.0324	1.49	29.3319	5.4159	0.63
243.35	0.15	3.81	3.25	0.0340	1.64	32.2749	5.6811	0.63
243.50	0.30	26.54	25.98	0.0355	1.79	35.2179	5.9345	0.63
Invert of Outlet/Orifice Plate				241.65				
Orifice Plate Diameter				110 mm	Area of Orifice	0.0095 sq.m.		
Centreline of Orifice Plate				241.71	Structure Storage	0.558 cu.m.		

Pond Area 9

Stage (m)	Depth (m)	Storage (cu.m.)		Discharge (cms)	h (m)	2gh	=(2gh)**0.5	C
243.15	0.00	0.49	0.00	0.0304	1.32	25.8003	5.0794	0.63
243.30	0.15	3.82	3.33	0.0321	1.47	28.7433	5.3613	0.63
243.45	0.30	27.12	26.63	0.0337	1.61	31.6863	5.6291	0.63
Invert of Outlet/Orifice Plate				241.78				
Orifice Plate Diameter				110 mm	Area of Orifice	0.0095 sq.m.		
Centreline of Orifice Plate				241.84	Structure Storage	0.4932 cu.m.		

EX. STM. NH
T/G=242.81
W INV.=238.01
E. INV.=238.16
PROP. S.E. INV.=238.60

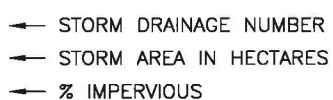


PROPOSED SORTING FACILITY
106 THOMPSON ROAD WEST-NORFOLK



JOB: 15888

 STORM DRAINAGE BOUNDARY



```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      February-07-10"
"          10  Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pst2.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 11:31:17 AM"
" 31      TIME PARAMETERS"
"          10.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          529.711  Coefficient A"
"          4.501  Constant B"
"          0.745  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    69.337  mm/hr"
"          Total depth                        32.583  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 2"
"          2  Rectangular"
"          1  Equal length"
"          2  Horton equation"
"          2  No description"
"          54.500  % Impervious"
"          0.226  Total Area"
"          38.966  Flow length"
"          1.500  Overland Slope"
"          0.103  Pervious Area"
"          38.966  Pervious length"
"          1.500  Pervious slope"
"          0.123  Impervious Area"
"          38.966  Impervious length"
"          1.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          35.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.500  Pervious Lag constant (hours)"
"          7.500  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.500  Impervious Lag constant (hours)"
"          2.000  Impervious Depression storage"
"          0.024  0.000  0.000  0.000 c.m/sec"
"          Catchment 2  Pervious  Impervious Total Area "
"          Surface Area  0.103  0.123  0.226  hectare"
"          Time of concentration  39.251  3.275  5.430  minutes"
"          Time to Centroid  100.160  89.873  90.489  minutes"
"          Rainfall depth  32.583  32.583  32.583  mm"
"          Rainfall volume  33.51  40.13  73.64  c.m"
"          Rainfall losses  30.249  2.000  14.853  mm"
"          Runoff depth  2.334  30.583  17.730  mm"
"          Runoff volume  2.40  37.67  40.07  c.m"
"          Runoff coefficient  0.072  0.939  0.544  "

```

"	Maximum flow	0.001	0.024	0.024	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.024 0.024 0.000 0.000"				
" 51	PIPE DESIGN"				
"	0.024 Current peak flow c.m/sec"				
"	0.013 Manning 'n' "				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.071 metre"				
"	Velocity 0.986 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.085 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre) "				
"	0.024 0.024 0.024 0.000 c.m/sec"				
" 40	HYDROGRAPH Combine 2"				
"	6 Combine "				
"	2 Node #"				
"	"				
"	Maximum flow 0.024 c.m/sec"				
"	Hydrograph volume 40.069 c.m"				
"	0.024 0.024 0.024 0.024"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.024 0.000 0.024 0.024"				
" 33	CATCHMENT 3"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	3 No description"				
"	46.000 % Impervious"				
"	0.200 Total Area"				
"	10.638 Flow length"				
"	1.500 Overland Slope"				
"	0.108 Pervious Area"				
"	10.638 Pervious length"				
"	1.500 Pervious slope"				
"	0.092 Impervious Area"				
"	10.638 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n' "				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours) "				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n' "				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours) "				
"	2.000 Impervious Depression storage"				
"	0.019 0.000 0.024 0.024 c.m/sec"				
"	Catchment 3 Pervious Impervious Total Area "				
"	Surface Area 0.108 0.092 0.200 hectare"				
"	Time of concentration 18.012 1.503 2.861 minutes"				
"	Time to Centroid 88.696 89.815 89.723 minutes"				
"	Rainfall depth 32.583 32.583 32.583 mm"				
"	Rainfall volume 35.19 29.98 65.17 c.m"				
"	Rainfall losses 30.249 2.000 17.254 mm"				
"	Runoff depth 2.334 30.583 15.329 mm"				

"	Runoff volume	2.52	28.14	30.66	c.m"
"	Runoff coefficient	0.072	0.939	0.470	"
"	Maximum flow	0.002	0.018	0.019	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.019	0.019	0.024	0.024"	
" 51	PIPE DESIGN"				
"	0.019 Current peak flow	c.m/sec"			
"	0.013 Manning 'n'"				
"	1.000 Diameter	metre"			
"	1.000 Gradient	%"			
"	Depth of flow	0.064	metre"		
"	Velocity	0.918	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.076	metre"		
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length	(metre)"			
"	0.019	0.019	0.019	0.024 c.m/sec"	
" 40	HYDROGRAPH Combine	3"			
"	6 Combine "				
"	3 Node #"				
"	"				
"	Maximum flow	0.019	c.m/sec"		
"	Hydrograph volume	30.657	c.m"		
"	0.019	0.019	0.019	0.019"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.019	0.000	0.019	0.019"	
" 33	CATCHMENT 4"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	4 No description"				
"	69.700 % Impervious"				
"	0.288 Total Area"				
"	23.607 Flow length"				
"	1.500 Overland Slope"				
"	0.087 Pervious Area"				
"	23.607 Pervious length"				
"	1.500 Pervious slope"				
"	0.201 Impervious Area"				
"	23.607 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"	0.039	0.000	0.019	0.019 c.m/sec"	
"	Catchment 4	Pervious	Impervious	Total Area	"
"	Surface Area	0.087	0.201	0.288	hectare"
"	Time of concentration	29.058	2.425	3.280	minutes"
"	Time to Centroid	94.506	89.815	89.966	minutes"
"	Rainfall depth	32.583	32.583	32.583	mm"
"	Rainfall volume	28.43	65.41	93.84	c.m"

"	Rainfall losses	30.249	2.000	10.559	mm"
"	Runoff depth	2.334	30.583	22.024	mm"
"	Runoff volume	2.04	61.39	63.43	c.m"
"	Runoff coefficient	0.072	0.939	0.676	"
"	Maximum flow	0.001	0.039	0.039	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.039	0.039	0.019	0.019"
" 51	PIPE DESIGN"				
"	0.039 Current peak flow	c.m/sec"			
"	0.013 Manning 'n'"				
"	1.000 Diameter	metre"			
"	1.000 Gradient	%"			
"	Depth of flow	0.089	metre"		
"	Velocity	1.140	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.109	metre"		
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length	(metre)"			
"		0.039	0.039	0.039	0.019 c.m/sec"
" 40	HYDROGRAPH Combine 4"				
"	6 Combine "				
"	4 Node #"				
"	"				
"	Maximum flow	0.039	c.m/sec"		
"	Hydrograph volume	63.428	c.m"		
"		0.039	0.039	0.039	0.039"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.039	0.000	0.039	0.039"
" 33	CATCHMENT 5"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	5 No description"				
"	77.200 % Impervious"				
"	0.112 Total Area"				
"	31.111 Flow length"				
"	1.500 Overland Slope"				
"	0.026 Pervious Area"				
"	31.111 Pervious length"				
"	1.500 Pervious slope"				
"	0.086 Impervious Area"				
"	31.111 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"		0.017	0.000	0.039	0.039 c.m/sec"
"	Catchment 5	Pervious	Impervious	Total Area	"
"	Surface Area	0.026	0.086	0.112	hectare"
"	Time of concentration	34.291	2.862	3.554	minutes"
"	Time to Centroid	97.607	89.815	89.987	minutes"

"	Rainfall depth	32.583	32.583	32.583	mm"
"	Rainfall volume	8.32	28.17	36.49	c.m"
"	Rainfall losses	30.249	2.000	8.441	mm"
"	Runoff depth	2.334	30.583	24.142	mm"
"	Runoff volume	0.60	26.44	27.04	c.m"
"	Runoff coefficient	0.072	0.939	0.741	"
"	Maximum flow	0.000	0.017	0.017	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.017 0.017 0.039 0.039"				
" 51	PIPE DESIGN"				
"	0.017 Current peak flow c.m/sec"				
"	0.013 Manning 'n' "				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.060 metre"				
"	Velocity 0.881 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.071 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre)"				
"	0.017 0.017 0.017 0.039 c.m/sec"				
" 40	HYDROGRAPH Combine 5"				
"	6 Combine "				
"	5 Node #"				
"	"				
"	Maximum flow 0.017 c.m/sec"				
"	Hydrograph volume 27.039 c.m"				
"	0.017 0.017 0.017 0.017"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.017 0.000 0.017 0.017"				
" 33	CATCHMENT 6"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	6 No description"				
"	100.000 % Impervious"				
"	0.242 Total Area"				
"	55.000 Flow length"				
"	1.500 Overland Slope"				
"	0.000 Pervious Area"				
"	55.000 Pervious length"				
"	1.500 Pervious slope"				
"	0.242 Impervious Area"				
"	55.000 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n' "				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n' "				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"	0.047 0.000 0.017 0.017 c.m/sec"				
"	Catchment 6 Pervious Impervious Total Area "				
"	Surface Area 0.000 0.242 0.242 hectare"				

"	Time of concentration	48.267	4.028	4.028	minutes"
"	Time to Centroid	105.212	90.147	90.147	minutes"
"	Rainfall depth	32.583	32.583	32.583	mm"
"	Rainfall volume	0.00	78.85	78.85	c.m"
"	Rainfall losses	30.249	2.000	2.000	mm"
"	Runoff depth	2.334	30.583	30.583	mm"
"	Runoff volume	0.00	74.01	74.01	c.m"
"	Runoff coefficient	0.000	0.939	0.939	"
"	Maximum flow	0.000	0.047	0.047	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.047	0.047	0.017	0.017"
" 51	PIPE DESIGN"				
"	0.047 Current peak flow	c.m/sec"			
"	0.013 Manning 'n'"				
"	1.000 Diameter	metre"			
"	1.000 Gradient	%"			
"	Depth of flow	0.097	metre"		
"	Velocity	1.199	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.118	metre"		
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length	(metre)"			
"		0.047	0.047	0.047	0.017 c.m/sec"
" 40	HYDROGRAPH Combine 6"				
"	6 Combine "				
"	6 Node #"				
"	"				
"	Maximum flow	0.047	c.m/sec"		
"	Hydrograph volume	74.011	c.m"		
"		0.047	0.047	0.047	0.047"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.047	0.000	0.047	0.047"
" 33	CATCHMENT 7"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	7 No description"				
"	63.300 % Impervious"				
"	0.146 Total Area"				
"	36.500 Flow length"				
"	1.500 Overland Slope"				
"	0.054 Pervious Area"				
"	36.500 Pervious length"				
"	1.500 Pervious slope"				
"	0.092 Impervious Area"				
"	36.500 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"		0.018	0.000	0.047	0.047 c.m/sec"

	Catchment 7	Pervious	Impervious	Total Area	
"	Surface Area	0.054	0.092	0.146	hectare"
"	Time of concentration	37.741	3.149	4.615	minutes"
"	Time to Centroid	99.379	89.844	90.248	minutes"
"	Rainfall depth	32.583	32.583	32.583	mm"
"	Rainfall volume	17.46	30.11	47.57	c.m"
"	Rainfall losses	30.249	2.000	12.367	mm"
"	Runoff depth	2.334	30.583	20.216	mm"
"	Runoff volume	1.25	28.26	29.51	c.m"
"	Runoff coefficient	0.072	0.939	0.620	"
"	Maximum flow	0.001	0.018	0.018	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.018	0.018	0.047	0.047"	
" 51	PIPE DESIGN"				
"	0.018	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.062	metre"	
"		Velocity	0.901	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.074	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.018	0.018	0.018	0.047 c.m/sec"	
" 40	HYDROGRAPH Combine 7"				
"	6	Combine "			
"	7	Node #"			
"					
"		Maximum flow	0.018	c.m/sec"	
"		Hydrograph volume	29.515	c.m"	
"	0.018	0.018	0.018	0.018"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.018	0.000	0.018	0.018"	
" 33	CATCHMENT 8"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	8	No description"			
"	69.100	% Impervious"			
"	0.078	Total Area"			
"	9.070	Flow length"			
"	1.500	Overland Slope"			
"	0.024	Pervious Area"			
"	9.070	Pervious length"			
"	1.500	Pervious slope"			
"	0.054	Impervious Area"			
"	9.070	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			

"	2.000	Impervious Depression storage"			
"		0.011	0.000	0.018	0.018 c.m/sec"
"		Catchment 8	Pervious	Impervious	Total Area "
"		Surface Area	0.024	0.054	0.078 hectare"
"		Time of concentration	16.368	1.366	1.861 minutes"
"		Time to Centroid	87.918	89.815	89.752 minutes"
"		Rainfall depth	32.583	32.583	32.583 mm"
"		Rainfall volume	7.85	17.56	25.41 c.m"
"		Rainfall losses	30.249	2.000	10.729 mm"
"		Runoff depth	2.334	30.583	21.854 mm"
"		Runoff volume	0.56	16.48	17.05 c.m"
"		Runoff coefficient	0.072	0.939	0.671 "
"		Maximum flow	0.000	0.010	0.011 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.011	0.011	0.018	0.018"
" 51		PIPE DESIGN"			
"	0.011	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.048	metre"	
"		Velocity	0.768	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.057	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.011	0.011	0.011	0.018 c.m/sec"
" 40		HYDROGRAPH Combine 8"			
"	6	Combine "			
"	8	Node #"			
"		"			
"		Maximum flow	0.011	c.m/sec"	
"		Hydrograph volume	17.046	c.m"	
"		0.011	0.011	0.011	0.011"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.011	0.000	0.011	0.011"
" 33		CATCHMENT 9"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	9	No description"			
"	42.100	% Impervious"			
"	0.214	Total Area"			
"	71.333	Flow length"			
"	1.500	Overland Slope"			
"	0.124	Pervious Area"			
"	71.333	Pervious length"			
"	1.500	Pervious slope"			
"	0.090	Impervious Area"			
"	71.333	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			

"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.018	0.000	0.011	0.011 c.m/sec"
"		Catchment 9	Pervious	Impervious	Total Area "
"		Surface Area	0.124	0.090	0.214 hectare"
"		Time of concentration	56.417	4.708	9.620 minutes"
"		Time to Centroid	109.768	90.479	92.311 minutes"
"		Rainfall depth	32.583	32.583	32.583 mm"
"		Rainfall volume	40.37	29.36	69.73 c.m"
"		Rainfall losses	30.249	2.000	18.356 mm"
"		Runoff depth	2.334	30.583	14.227 mm"
"		Runoff volume	2.89	27.55	30.45 c.m"
"		Runoff coefficient	0.072	0.939	0.437 "
"		Maximum flow	0.001	0.017	0.018 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.018	0.018	0.011	0.011"
" 51		PIPE DESIGN"			
"	0.018	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.062	metre"	
"		Velocity	0.897	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.073	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.018	0.018	0.018	0.011 c.m/sec"
" 40		HYDROGRAPH Combine 9"			
"	6	Combine "			
"	9	Node #"			
"		"			
"		Maximum flow	0.018	c.m/sec"	
"		Hydrograph volume	30.446	c.m"	
"		0.018	0.018	0.018	0.018"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.018	0.000	0.018	0.018"
" 33		CATCHMENT 10"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	10	No description"			
"	0.000	% Impervious"			
"	0.019	Total Area"			
"	2.317	Flow length"			
"	1.500	Overland Slope"			
"	0.019	Pervious Area"			
"	2.317	Pervious length"			
"	1.500	Pervious slope"			
"	0.000	Impervious Area"			
"	2.317	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			

"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours) "			
"	2.000	Impervious Depression storage"			
"		0.001	0.000	0.018	0.018 c.m/sec"
"		Catchment 10	Pervious	Impervious	Total Area "
"		Surface Area	0.019	0.000	0.019 hectare"
"		Time of concentration	7.218	0.602	7.217 minutes"
"		Time to Centroid	83.224	89.815	83.224 minutes"
"		Rainfall depth	32.583	32.583	32.583 mm"
"		Rainfall volume	6.19	0.00	6.19 c.m"
"		Rainfall losses	30.249	2.000	30.249 mm"
"		Runoff depth	2.334	30.583	2.334 mm"
"		Runoff volume	0.44	0.00	0.44 c.m"
"		Runoff coefficient	0.072	0.000	0.072 "
"		Maximum flow	0.001	0.000	0.001 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.001	0.001	0.018	0.018"
" 51		PIPE DESIGN"			
"	0.001	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.012	metre"	
"		Velocity	0.300	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.012	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre) "		
"		0.001	0.001	0.001	0.018 c.m/sec"
" 40		HYDROGRAPH Combine	10"		
"	6	Combine "			
"	10	Node #"			
"		"			
"		Maximum flow	0.001	c.m/sec"	
"		Hydrograph volume	0.444	c.m"	
"		0.001	0.001	0.001	0.001"
" 40		HYDROGRAPH Confluence	10"		
"	7	Confluence "			
"	10	Node #"			
"		"			
"		Maximum flow	0.001	c.m/sec"	
"		Hydrograph volume	0.444	c.m"	
"		0.001	0.001	0.001	0.000"
" 51		PIPE DESIGN"			
"	0.001	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.012	metre"	
"		Velocity	0.300	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.012	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre) "		
"		0.001	0.001	0.001	0.000 c.m/sec"
" 40		HYDROGRAPH Combine	999"		
"	6	Combine "			

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"      999  Node #"
"
"      Maximum flow                0.001    c.m/sec"
"      Hydrograph volume           0.444    c.m"
"      0.001    0.001    0.001    0.001"
" 40      HYDROGRAPH Confluence  9"
"      7  Confluence "
"      9  Node #"
"
"      Maximum flow                0.018    c.m/sec"
"      Hydrograph volume           30.446    c.m"
"      0.001    0.018    0.001    0.000"
" 54      POND DESIGN"
"      0.018  Current peak flow    c.m/sec"
"      0.025  Target outflow      c.m/sec"
"      30.4   Hydrograph volume    c.m"
"      3.     Number of stages"
"      243.150 Minimum water level  metre"
"      243.300 Maximum water level  metre"
"      243.150 Starting water level  metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge Volume"
"      243.150 0.03040 0.4900"
"      243.225 0.03210 3.820"
"      243.300 0.03370 27.120"
"      Peak outflow                0.016    c.m/sec"
"      Maximum level                243.181  metre"
"      Maximum storage              1.866    c.m"
"      Centroidal lag              1.572    hours"
"      0.001    0.018    0.016    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.001    0.016    0.016    0.000"
" 51      PIPE DESIGN"
"      0.016  Current peak flow    c.m/sec"
"      0.013  Manning 'n'"
"      0.250  Diameter    metre"
"      0.400  Gradient    %"
"      Depth of flow                0.113    metre"
"      Velocity                    0.731    m/sec"
"      Pipe capacity                0.038    c.m/sec"
"      Critical depth              0.100    metre"
" 53      ROUTE Pipe Route 28"
"      28.20   Pipe Route 28 Reach length ( metre)"
"      0.215   X-factor <= 0.5"
"      28.918   K-lag ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag ( seconds)"
"      0.500   Beta weighting factor"
"      42.857   Routing time step ( seconds)"
"      1       No. of sub-reaches"
"      Peak outflow                0.015    c.m/sec"
"      0.001    0.016    0.015    0.000 c.m/sec"
" 40      HYDROGRAPH Combine  8"
"      6  Combine "
"      8  Node #"
"
"      Maximum flow                0.026    c.m/sec"
"      Hydrograph volume           47.491    c.m"

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"          0.001      0.016      0.015      0.026"
" 40      HYDROGRAPH Confluence 8"
"          7 Confluence "
"          8 Node #"
"          "
"          Maximum flow          0.026      c.m/sec"
"          Hydrograph volume      47.491      c.m"
"          0.001      0.026      0.015      0.000"
" 54      POND DESIGN"
"          0.026 Current peak flow      c.m/sec"
"          0.035 Target outflow      c.m/sec"
"          47.5 Hydrograph volume      c.m"
"          3. Number of stages"
"          243.200 Minimum water level      metre"
"          243.500 Maximum water level      metre"
"          243.200 Starting water level      metre"
"          0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200 0.03240      1.830"
"          243.350 0.03400      5.080"
"          243.500 0.03550      27.810"
"          Peak outflow          0.022      c.m/sec"
"          Maximum level          243.270      metre"
"          Maximum storage          3.336      c.m"
"          Centroidal lag          1.591      hours"
"          0.001      0.026      0.022      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5 Next link "
"          0.001      0.022      0.022      0.000"
" 51      PIPE DESIGN"
"          0.022 Current peak flow      c.m/sec"
"          0.013 Manning 'n'"
"          0.250 Diameter      metre"
"          2.200 Gradient      %"
"          Depth of flow          0.085      metre"
"          Velocity          1.490      m/sec"
"          Pipe capacity          0.088      c.m/sec"
"          Critical depth          0.119      metre"
" 53      ROUTE Pipe Route 54"
"          53.50 Pipe Route 54 Reach length      ( metre)"
"          0.480 X-factor <= 0.5"
"          26.933 K-lag      ( seconds)"
"          0.000 Default(0) or user spec.(1) values used"
"          0.500 X-factor <= 0.5"
"          30.000 K-lag      ( seconds)"
"          0.500 Beta weighting factor"
"          27.273 Routing time step      ( seconds)"
"          1 No. of sub-reaches"
"          Peak outflow          0.021      c.m/sec"
"          0.001      0.022      0.021      0.000 c.m/sec"
" 40      HYDROGRAPH Combine 6"
"          6 Combine "
"          6 Node #"
"          "
"          Maximum flow          0.068      c.m/sec"
"          Hydrograph volume      121.502      c.m"
"          0.001      0.022      0.021      0.068"
" 40      HYDROGRAPH Confluence 7"
"          7 Confluence "
"          7 Node #"

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"
"
"      Maximum flow              0.018      c.m/sec"
"      Hydrograph volume         29.515      c.m"
"      0.001      0.018      0.021      0.000"
" 54      POND DESIGN"
"      0.018      Current peak flow      c.m/sec"
"      0.035      Target outflow      c.m/sec"
"      29.5      Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200      Minimum water level      metre"
"      243.500      Maximum water level      metre"
"      243.200      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.02710      0.4000"
"      243.350      0.02900      6.940"
"      243.500      0.03020      31.840"
"      Peak outflow              0.014      c.m/sec"
"      Maximum level              243.271      metre"
"      Maximum storage              3.510      c.m"
"      Centroidal lag              1.571      hours"
"      0.001      0.018      0.014      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.001      0.014      0.014      0.000"
" 51      PIPE DESIGN"
"      0.014      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.250      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow              0.104      metre"
"      Velocity              0.706      m/sec"
"      Pipe capacity              0.038      c.m/sec"
"      Critical depth              0.093      metre"
" 53      ROUTE      Pipe Route 29"
"      28.60      Pipe Route 29 Reach length      ( metre)"
"      0.242      X-factor <= 0.5"
"      30.382      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.500      Beta weighting factor"
"      42.857      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow              0.013      c.m/sec"
"      0.001      0.014      0.013      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      6"
"      6      Combine "
"      6      Node #"
"      "
"      Maximum flow              0.081      c.m/sec"
"      Hydrograph volume              151.017      c.m"
"      0.001      0.014      0.013      0.081"
" 40      HYDROGRAPH      Confluence      6"
"      7      Confluence "
"      6      Node #"
"      "
"      Maximum flow              0.081      c.m/sec"
"      Hydrograph volume              151.017      c.m"
"      0.001      0.081      0.013      0.000"

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" 54      POND DESIGN"
"      0.081 Current peak flow      c.m/sec"
"      0.100 Target outflow      c.m/sec"
"      151.0 Hydrograph volume      c.m"
"      3. Number of stages"
"      243.200 Minimum water level      metre"
"      243.450 Maximum water level      metre"
"      243.200 Starting water level      metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.1034      3.110"
"      243.325      0.1063      15.440"
"      243.450      0.1081      60.240"
"      Peak outflow      0.069      c.m/sec"
"      Maximum level      243.272      metre"
"      Maximum storage      10.220      c.m"
"      Centroidal lag      1.588      hours"
"      0.001      0.081      0.069      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5 Next link "
"      0.001      0.069      0.069      0.000"
" 51      PIPE DESIGN"
"      0.069 Current peak flow      c.m/sec"
"      0.013 Manning 'n'"
"      0.375 Diameter      metre"
"      0.400 Gradient      %"
"      Depth of flow      0.214      metre"
"      Velocity      1.057      m/sec"
"      Pipe capacity      0.111      c.m/sec"
"      Critical depth      0.191      metre"
" 53      ROUTE Pipe Route 53"
"      52.90 Pipe Route 53 Reach length (metre)"
"      0.183 X-factor <= 0.5"
"      37.520 K-lag (seconds)"
"      0.000 Default(0) or user spec.(1) values used"
"      0.500 X-factor <= 0.5"
"      30.000 K-lag (seconds)"
"      0.500 Beta weighting factor"
"      60.000 Routing time step (seconds)"
"      1 No. of sub-reaches"
"      Peak outflow      0.066      c.m/sec"
"      0.001      0.069      0.066      0.000 c.m/sec"
" 40      HYDROGRAPH Combine 4"
"      6 Combine "
"      4 Node #"
"      "
"      Maximum flow      0.106      c.m/sec"
"      Hydrograph volume      214.445      c.m"
"      0.001      0.069      0.066      0.106"
" 40      HYDROGRAPH Confluence 5"
"      7 Confluence "
"      5 Node #"
"      "
"      Maximum flow      0.017      c.m/sec"
"      Hydrograph volume      27.039      c.m"
"      0.001      0.017      0.066      0.000"
" 54      POND DESIGN"
"      0.017 Current peak flow      c.m/sec"
"      0.025 Target outflow      c.m/sec"
"      27.0 Hydrograph volume      c.m"

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"          3.  Number of stages"
"      241.750  Minimum water level      metre"
"      242.000  Maximum water level      metre"
"      241.750  Starting water level      metre"
"          0    Keep Design Data: 1 = True; 0 = False"
"              Level Discharge      Volume"
"              241.750  0.01270      0.4000"
"              241.875  0.01360      8.340"
"              242.000  0.01410      37.170"
"              Peak outflow              0.010      c.m/sec"
"              Maximum level              241.849      metre"
"              Maximum storage              6.665      c.m"
"              Centroidal lag              1.670      hours"
"              0.001      0.017      0.010      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5    Next link "
"              0.001      0.010      0.010      0.000"
" 51      PIPE DESIGN"
"          0.010  Current peak flow      c.m/sec"
"          0.013  Manning 'n'"
"          0.250  Diameter      metre"
"          0.400  Gradient      %"
"              Depth of flow              0.086      metre"
"              Velocity              0.642      m/sec"
"              Pipe capacity              0.038      c.m/sec"
"              Critical depth              0.078      metre"
" 53      ROUTE      Pipe Route 32"
"          31.50      Pipe Route 32 Reach length      ( metre)"
"          0.311  X-factor <= 0.5"
"          36.827  K-lag      ( seconds)"
"          0.000  Default(0) or user spec.(1) values used"
"          0.500  X-factor <= 0.5"
"          30.000  K-lag      ( seconds)"
"          0.500  Beta weighting factor"
"          50.000  Routing time step      ( seconds)"
"          1    No. of sub-reaches"
"              Peak outflow              0.010      c.m/sec"
"              0.001      0.010      0.010      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      4"
"          6    Combine "
"          4    Node #"
"          "
"              Maximum flow              0.114      c.m/sec"
"              Hydrograph volume              241.484      c.m"
"              0.001      0.010      0.010      0.114"
" 40      HYDROGRAPH      Confluence      4"
"          7    Confluence "
"          4    Node #"
"          "
"              Maximum flow              0.114      c.m/sec"
"              Hydrograph volume              241.485      c.m"
"              0.001      0.114      0.010      0.000"
" 54      POND DESIGN"
"          0.114  Current peak flow      c.m/sec"
"          0.100  Target outflow      c.m/sec"
"          241.5  Hydrograph volume      c.m"
"          3.    Number of stages"
"          243.200  Minimum water level      metre"
"          244.000  Maximum water level      metre"
"          243.200  Starting water level      metre"

```



```

"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.1717      3.370"
"      243.600      0.1747      15.090"
"      244.000      0.1776      50.250"
"      Peak outflow      0.104      c.m/sec"
"      Maximum level      243.393      metre"
"      Maximum storage      9.013      c.m"
"      Centroidal lag      1.606      hours"
"      0.001      0.114      0.104      0.000 c.m/sec"
40      HYDROGRAPH Next link "
"      5      Next link "
"      0.001      0.104      0.104      0.000"
51      PIPE DESIGN"
"      0.104      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.246      metre"
"      Velocity      1.175      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.225      metre"
53      ROUTE      Pipe Route 28"
"      27.80      Pipe Route 28 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      17.745      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.578      Beta weighting factor"
"      40.000      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.102      c.m/sec"
"      0.001      0.104      0.102      0.000 c.m/sec"
40      HYDROGRAPH Combine      3"
"      6      Combine "
"      3      Node #"
"      "
"      Maximum flow      0.122      c.m/sec"
"      Hydrograph volume      272.142      c.m"
"      0.001      0.104      0.102      0.122"
40      HYDROGRAPH Confluence      3"
"      7      Confluence "
"      3      Node #"
"      "
"      Maximum flow      0.122      c.m/sec"
"      Hydrograph volume      272.142      c.m"
"      0.001      0.122      0.102      0.000"
51      PIPE DESIGN"
"      0.122      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.271      metre"
"      Velocity      1.217      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.243      metre"
53      ROUTE      Pipe Route 45"
"      44.50      Pipe Route 45 Reach length      ( metre)"
"      0.001      X-factor <= 0.5"

```

```

"      27.421   K-lag   ( seconds) "
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds) "
"      0.500   Beta weighting factor"
"      54.545   Routing time step   ( seconds) "
"      1       No. of sub-reaches"
"      Peak outflow                0.118      c.m/sec"
"      0.001      0.122      0.118      0.000 c.m/sec"
" 40      HYDROGRAPH   Combine      2"
"      6       Combine "
"      2       Node #"
"      "
"      Maximum flow                0.143      c.m/sec"
"      Hydrograph volume            312.211      c.m"
"      0.001      0.122      0.118      0.143"
" 40      HYDROGRAPH   Confluence    2"
"      7       Confluence "
"      2       Node #"
"      "
"      Maximum flow                0.143      c.m/sec"
"      Hydrograph volume            312.211      c.m"
"      0.001      0.143      0.118      0.000"
" 54      POND DESIGN"
"      0.143   Current peak flow    c.m/sec"
"      0.091   Target outflow      c.m/sec"
"      312.2   Hydrograph volume    c.m"
"      3.      Number of stages"
"      242.100 Minimum water level   metre"
"      242.350 Maximum water level   metre"
"      242.100 Starting water level   metre"
"      0       Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      242.100      0.2831      2.500"
"      242.225      0.2932      7.000"
"      242.350      0.2998      23.820"
"      Peak outflow                0.141      c.m/sec"
"      Maximum level                242.124      metre"
"      Maximum storage              3.356      c.m"
"      Centroidal lag              1.599      hours"
"      0.001      0.143      0.141      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5       Next link "
"      0.001      0.141      0.141      0.000"
" 51      PIPE DESIGN"
"      0.141   Current peak flow    c.m/sec"
"      0.013   Manning 'n'"
"      0.450   Diameter      metre"
"      0.400   Gradient      %"
"      Depth of flow                0.299      metre"
"      Velocity                    1.254      m/sec"
"      Pipe capacity                0.180      c.m/sec"
"      Critical depth              0.263      metre"
" 53      ROUTE      Pipe Route 30"
"      30.00      Pipe Route 30 Reach length   ( metre) "
"      0.000   X-factor <= 0.5"
"      17.948   K-lag   ( seconds) "
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds) "

```

```

"      0.645  Beta weighting factor"
"      50.000 Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.138  c.m/sec"
"      0.001  0.141  0.138  0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.001  0.138  0.138  0.000"
" 54      POND DESIGN"
"      0.138  Current peak flow  c.m/sec"
"      0.091  Target outflow  c.m/sec"
"      312.2  Hydrograph volume  c.m"
"      3.  Number of stages"
"      239.750 Minimum water level  metre"
"      240.650 Maximum water level  metre"
"      239.750 Starting water level  metre"
"      0  Keep Design Data: 1 = True; 0 = False"
"      Level Discharge  Volume"
"      239.750  0.07500  0.5700"
"      240.200  0.1034  231.770"
"      240.650  0.1299  462.970"
"      Peak outflow          0.057  c.m/sec"
"      Maximum level          240.000  metre"
"      Maximum storage        128.847  c.m"
"      Centroidal lag         2.227  hours"
"      0.001  0.138  0.057  0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.001  0.057  0.057  0.000"
" 51      PIPE DESIGN"
"      0.057  Current peak flow  c.m/sec"
"      0.013  Manning 'n'"
"      0.450  Diameter  metre"
"      0.400  Gradient  %"
"      Depth of flow          0.175  metre"
"      Velocity                1.008  m/sec"
"      Pipe capacity          0.180  c.m/sec"
"      Critical depth          0.165  metre"
" 53      ROUTE  Pipe Route 25"
"      24.50  Pipe Route 25 Reach length  ( metre)"
"      0.002  X-factor <= 0.5"
"      18.236  K-lag  ( seconds)"
"      0.000  Default(0) or user spec.(1) values used"
"      0.500  X-factor <= 0.5"
"      30.000  K-lag  ( seconds)"
"      0.500  Beta weighting factor"
"      35.294 Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.057  c.m/sec"
"      0.001  0.057  0.057  0.000 c.m/sec"
" 40      HYDROGRAPH  Combine  999"
"      6  Combine "
"      999  Node #"
"      "
"      Maximum flow          0.057  c.m/sec"
"      Hydrograph volume      312.636  c.m"
"      0.001  0.057  0.057  0.057"
" 40      HYDROGRAPH  Confluence  999"
"      7  Confluence "
"      999  Node #"

```

"	"				
"	Maximum flow	0.057	c.m/sec"		
"	Hydrograph volume	312.636	c.m"		
"	0.001 0.057	0.057	0.000"		
" 38	START/RE-START TOTALS 999"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area	1.525	hectare"		
"	Total Impervious area	0.981	hectare"		
"	Total % impervious	64.313"			
" 19	EXIT"				

```

"      MIDUSS Output ----->"
"      MIDUSS version                      Version 2.25 rev. 473"
"      MIDUSS created                      February-07-10"
"      10 Units used:                      ie METRIC"
"      Job folder:                        C:\swm\MIDUSS\15888"
"      Output filename:                    pst5.out"
"      Licensee name:                      Bob"
"      Company                            "
"      Date & Time last used:              09/08/2022 at 11:23:37 AM"
" 31      TIME PARAMETERS"
"      10.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"      1 Chicago storm"
"      553.017 Coefficient A"
"      3.007 Constant B"
"      0.703 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity                    87.696 mm/hr"
"      Total depth                        42.594 mm"
"      6 005hyd Hydrograph extension used in this file"
" 33      CATCHMENT 2"
"      2 Rectangular"
"      1 Equal length"
"      2 Horton equation"
"      2 No description"
"      54.500 % Impervious"
"      0.226 Total Area"
"      38.966 Flow length"
"      1.500 Overland Slope"
"      0.103 Pervious Area"
"      38.966 Pervious length"
"      1.500 Pervious slope"
"      0.123 Impervious Area"
"      38.966 Impervious length"
"      1.500 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      35.000 Pervious Max.infiltration"
"      5.000 Pervious Min.infiltration"
"      0.500 Pervious Lag constant (hours)"
"      7.500 Pervious Depression storage"
"      0.015 Impervious Manning 'n'"
"      0.000 Impervious Max.infiltration"
"      0.000 Impervious Min.infiltration"
"      0.500 Impervious Lag constant (hours)"
"      2.000 Impervious Depression storage"
"      0.035 0.000 0.000 0.000 c.m/sec"
"      Catchment 2 Pervious Impervious Total Area "
"      Surface Area 0.103 0.123 0.226 hectare"
"      Time of concentration 22.472 2.982 6.101 minutes"
"      Time to Centroid 96.510 89.631 90.732 minutes"
"      Rainfall depth 42.594 42.594 42.594 mm"
"      Rainfall volume 43.80 52.46 96.26 c.m"
"      Rainfall losses 33.330 2.000 16.255 mm"
"      Runoff depth 9.264 40.594 26.338 mm"
"      Runoff volume 9.53 50.00 59.52 c.m"
"      Runoff coefficient 0.217 0.953 0.618 "

```

"	Maximum flow	0.006	0.030	0.035	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.035 0.035 0.000 0.000"				
" 51	PIPE DESIGN"				
"	0.035 Current peak flow c.m/sec"				
"	0.013 Manning 'n' "				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.084 metre"				
"	Velocity 1.098 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.102 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre) "				
"	0.035 0.035 0.035 0.000 c.m/sec"				
" 40	HYDROGRAPH Combine 2"				
"	6 Combine "				
"	2 Node #"				
"	"				
"	Maximum flow 0.035 c.m/sec"				
"	Hydrograph volume 59.525 c.m"				
"	0.035 0.035 0.035 0.035"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.035 0.000 0.035 0.035"				
" 33	CATCHMENT 3"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	3 No description"				
"	46.000 % Impervious"				
"	0.200 Total Area"				
"	10.638 Flow length"				
"	1.500 Overland Slope"				
"	0.108 Pervious Area"				
"	10.638 Pervious length"				
"	1.500 Pervious slope"				
"	0.092 Impervious Area"				
"	10.638 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n' "				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours) "				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n' "				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours) "				
"	2.000 Impervious Depression storage"				
"	0.034 0.000 0.035 0.035 c.m/sec"				
"	Catchment 3 Pervious Impervious Total Area "				
"	Surface Area 0.108 0.092 0.200 hectare"				
"	Time of concentration 10.312 1.368 3.258 minutes"				
"	Time to Centroid 87.808 89.624 89.241 minutes"				
"	Rainfall depth 42.594 42.594 42.594 mm"				
"	Rainfall volume 46.00 39.19 85.19 c.m"				
"	Rainfall losses 33.330 2.000 18.918 mm"				
"	Runoff depth 9.264 40.594 23.675 mm"				

"	Runoff volume	10.00	37.35	47.35	c.m"
"	Runoff coefficient	0.217	0.953	0.556	"
"	Maximum flow	0.011	0.022	0.034	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.034	0.034	0.035	0.035"	
" 51	PIPE DESIGN"				
"	0.034	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"	Depth of flow	0.083	metre"		
"	Velocity	1.085	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.100	metre"		
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.034	0.034	0.034	0.035 c.m/sec"	
" 40	HYDROGRAPH Combine 3"				
"	6	Combine "			
"	3	Node #"			
"					
"	Maximum flow	0.034	c.m/sec"		
"	Hydrograph volume	47.351	c.m"		
"	0.034	0.034	0.034	0.034"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.034	0.000	0.034	0.034"	
" 33	CATCHMENT 4"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	4	No description"			
"	69.700	% Impervious"			
"	0.288	Total Area"			
"	23.607	Flow length"			
"	1.500	Overland Slope"			
"	0.087	Pervious Area"			
"	23.607	Pervious length"			
"	1.500	Pervious slope"			
"	0.201	Impervious Area"			
"	23.607	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"	0.054	0.000	0.034	0.034 c.m/sec"	
"	Catchment 4	Pervious	Impervious	Total Area	"
"	Surface Area	0.087	0.201	0.288	hectare"
"	Time of concentration	16.636	2.207	3.510	minutes"
"	Time to Centroid	92.571	89.624	89.890	minutes"
"	Rainfall depth	42.594	42.594	42.594	mm"
"	Rainfall volume	37.17	85.50	122.67	c.m"

"	Rainfall losses	33.330	2.000	11.493	mm"
"	Runoff depth	9.264	40.594	31.101	mm"
"	Runoff volume	8.08	81.49	89.57	c.m"
"	Runoff coefficient	0.217	0.953	0.730	"
"	Maximum flow	0.006	0.049	0.054	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.054	0.054	0.034	0.034"
" 51	PIPE DESIGN"				
"	0.054	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.104	metre"	
"		Velocity	1.256	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.128	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"		0.054	0.054	0.054	0.034 c.m/sec"
" 40	HYDROGRAPH Combine 4"				
"	6	Combine "			
"	4	Node #"			
"	"				
"		Maximum flow	0.054	c.m/sec"	
"		Hydrograph volume	89.570	c.m"	
"		0.054	0.054	0.054	0.054"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.054	0.000	0.054	0.054"
" 33	CATCHMENT 5"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	5	No description"			
"	77.200	% Impervious"			
"	0.112	Total Area"			
"	31.111	Flow length"			
"	1.500	Overland Slope"			
"	0.026	Pervious Area"			
"	31.111	Pervious length"			
"	1.500	Pervious slope"			
"	0.086	Impervious Area"			
"	31.111	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.022	0.000	0.054	0.054 c.m/sec"
"	Catchment 5	Pervious	Impervious	Total Area	"
"	Surface Area	0.026	0.086	0.112	hectare"
"	Time of concentration	19.633	2.605	3.680	minutes"
"	Time to Centroid	94.282	89.624	89.919	minutes"

"	Rainfall depth	42.594	42.594	42.594	mm"
"	Rainfall volume	10.88	36.83	47.70	c.m"
"	Rainfall losses	33.330	2.000	9.143	mm"
"	Runoff depth	9.264	40.594	33.450	mm"
"	Runoff volume	2.37	35.10	37.46	c.m"
"	Runoff coefficient	0.217	0.953	0.785	"
"	Maximum flow	0.002	0.021	0.022	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.022	0.022	0.054	0.054"
" 51	PIPE DESIGN"				
"	0.022 Current peak flow	c.m/sec"			
"	0.013 Manning 'n' "				
"	1.000 Diameter	metre"			
"	1.000 Gradient	%"			
"	Depth of flow	0.068	metre"		
"	Velocity	0.961	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.082	metre"		
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length	(metre)"			
"		0.022	0.022	0.022	0.054 c.m/sec"
" 40	HYDROGRAPH Combine 5"				
"	6 Combine "				
"	5 Node #"				
"	"				
"	Maximum flow	0.022	c.m/sec"		
"	Hydrograph volume	37.464	c.m"		
"		0.022	0.022	0.022	0.022"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.022	0.000	0.022	0.022"
" 33	CATCHMENT 6"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	6 No description"				
"	100.000 % Impervious"				
"	0.242 Total Area"				
"	55.000 Flow length"				
"	1.500 Overland Slope"				
"	0.000 Pervious Area"				
"	55.000 Pervious length"				
"	1.500 Pervious slope"				
"	0.242 Impervious Area"				
"	55.000 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n' "				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours) "				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n' "				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours) "				
"	2.000 Impervious Depression storage"				
"		0.059	0.000	0.022	0.022 c.m/sec"
"	Catchment 6	Pervious	Impervious	Total Area	"
"	Surface Area	0.000	0.242	0.242	hectare"

"	Time of concentration	27.634	3.667	3.667	minutes"
"	Time to Centroid	100.097	89.771	89.771	minutes"
"	Rainfall depth	42.594	42.594	42.594	mm"
"	Rainfall volume	0.00	103.08	103.08	c.m"
"	Rainfall losses	33.330	2.000	2.000	mm"
"	Runoff depth	9.264	40.594	40.594	mm"
"	Runoff volume	0.00	98.24	98.24	c.m"
"	Runoff coefficient	0.000	0.953	0.953	"
"	Maximum flow	0.000	0.059	0.059	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.059	0.059	0.022	0.022"
" 51	PIPE DESIGN"				
"	0.059	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.108	metre"	
"		Velocity	1.286	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.133	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"		0.059	0.059	0.059	0.022 c.m/sec"
" 40	HYDROGRAPH Combine 6"				
"	6	Combine "			
"	6	Node #"			
"					
"		Maximum flow	0.059	c.m/sec"	
"		Hydrograph volume	98.237	c.m"	
"		0.059	0.059	0.059	0.059"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.059	0.000	0.059	0.059"
" 33	CATCHMENT 7"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	7	No description"			
"	63.300	% Impervious"			
"	0.146	Total Area"			
"	36.500	Flow length"			
"	1.500	Overland Slope"			
"	0.054	Pervious Area"			
"	36.500	Pervious length"			
"	1.500	Pervious slope"			
"	0.092	Impervious Area"			
"	36.500	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.025	0.000	0.059	0.059 c.m/sec"

	Catchment 7	Pervious	Impervious	Total Area	
"	Surface Area	0.054	0.092	0.146	hectare"
"	Time of concentration	21.607	2.867	5.057	minutes"
"	Time to Centroid	95.850	89.625	90.352	minutes"
"	Rainfall depth	42.594	42.594	42.594	mm"
"	Rainfall volume	22.82	39.36	62.19	c.m"
"	Rainfall losses	33.330	2.000	13.498	mm"
"	Runoff depth	9.264	40.594	29.096	mm"
"	Runoff volume	4.96	37.52	42.48	c.m"
"	Runoff coefficient	0.217	0.953	0.683	"
"	Maximum flow	0.003	0.023	0.025	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.025	0.025	0.059	0.059"	
" 51	PIPE DESIGN"				
"	0.025	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.072	metre"	
"		Velocity	0.994	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.087	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre) "		
"	0.025	0.025	0.025	0.059 c.m/sec"	
" 40	HYDROGRAPH Combine 7"				
"	6	Combine "			
"	7	Node #"			
"					
"		Maximum flow	0.025	c.m/sec"	
"		Hydrograph volume	42.479	c.m"	
"	0.025	0.025	0.025	0.025"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.025	0.000	0.025	0.025"	
" 33	CATCHMENT 8"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	8	No description"			
"	69.100	% Impervious"			
"	0.078	Total Area"			
"	9.070	Flow length"			
"	1.500	Overland Slope"			
"	0.024	Pervious Area"			
"	9.070	Pervious length"			
"	1.500	Pervious slope"			
"	0.054	Impervious Area"			
"	9.070	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours) "			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours) "			

"	2.000	Impervious Depression storage"			
"		0.016	0.000	0.025	0.025 c.m/sec"
"		Catchment 8	Pervious	Impervious	Total Area "
"		Surface Area	0.024	0.054	0.078 hectare"
"		Time of concentration	9.371	1.243	1.996 minutes"
"		Time to Centroid	87.296	89.624	89.409 minutes"
"		Rainfall depth	42.594	42.594	42.594 mm"
"		Rainfall volume	10.27	22.96	33.22 c.m"
"		Rainfall losses	33.330	2.000	11.681 mm"
"		Runoff depth	9.264	40.594	30.913 mm"
"		Runoff volume	2.23	21.88	24.11 c.m"
"		Runoff coefficient	0.217	0.953	0.726 "
"		Maximum flow	0.003	0.013	0.016 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.016	0.016	0.025	0.025"
" 51		PIPE DESIGN"			
"	0.016	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.058	metre"	
"		Velocity	0.862	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.068	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.016	0.016	0.016	0.025 c.m/sec"
" 40		HYDROGRAPH Combine 8"			
"	6	Combine "			
"	8	Node #"			
"		"			
"		Maximum flow	0.016	c.m/sec"	
"		Hydrograph volume	24.112	c.m"	
"		0.016	0.016	0.016	0.016"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.016	0.000	0.016	0.016"
" 33		CATCHMENT 9"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	9	No description"			
"	42.100	% Impervious"			
"	0.214	Total Area"			
"	71.333	Flow length"			
"	1.500	Overland Slope"			
"	0.124	Pervious Area"			
"	71.333	Pervious length"			
"	1.500	Pervious slope"			
"	0.090	Impervious Area"			
"	71.333	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			

"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.026	0.000	0.016	0.016 c.m/sec"
"		Catchment 9	Pervious	Impervious	Total Area "
"		Surface Area	0.124	0.090	0.214 hectare"
"		Time of concentration	32.300	4.286	10.978 minutes"
"		Time to Centroid	103.364	90.062	93.239 minutes"
"		Rainfall depth	42.594	42.594	42.594 mm"
"		Rainfall volume	52.78	38.37	91.15 c.m"
"		Rainfall losses	33.330	2.000	20.140 mm"
"		Runoff depth	9.264	40.594	22.454 mm"
"		Runoff volume	11.48	36.57	48.05 c.m"
"		Runoff coefficient	0.217	0.953	"
"		Maximum flow	0.005	0.022	0.026 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.026	0.026	0.016	0.016"
" 51		PIPE DESIGN"			
"	0.026	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.073	metre"	
"		Velocity	1.005	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.088	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.026	0.026	0.026	0.016 c.m/sec"
" 40		HYDROGRAPH Combine	9"		
"	6	Combine "			
"	9	Node #"			
"		"			
"		Maximum flow	0.026	c.m/sec"	
"		Hydrograph volume	48.051	c.m"	
"		0.026	0.026	0.026	0.026"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.026	0.000	0.026	0.026"
" 33		CATCHMENT 10"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	10	No description"			
"	0.000	% Impervious"			
"	0.019	Total Area"			
"	2.317	Flow length"			
"	1.500	Overland Slope"			
"	0.019	Pervious Area"			
"	2.317	Pervious length"			
"	1.500	Pervious slope"			
"	0.000	Impervious Area"			
"	2.317	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			

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"      0.015  Impervious Manning 'n'"
"      0.000  Impervious Max.infiltration"
"      0.000  Impervious Min.infiltration"
"      0.500  Impervious Lag constant (hours)"
"      2.000  Impervious Depression storage"
"          0.002      0.000      0.026      0.026 c.m/sec"
"      Catchment 10      Pervious      Impervious Total Area "
"      Surface Area      0.019      0.000      0.019      hectare"
"      Time of concentration      4.132      0.548      4.132      minutes"
"      Time to Centroid      85.535      89.624      85.535      minutes"
"      Rainfall depth      42.594      42.594      42.594      mm"
"      Rainfall volume      8.09      0.00      8.09      c.m"
"      Rainfall losses      33.330      2.000      33.330      mm"
"      Runoff depth      9.264      40.594      9.264      mm"
"      Runoff volume      1.76      0.00      1.76      c.m"
"      Runoff coefficient      0.217      0.000      0.217      "
"      Maximum flow      0.002      0.000      0.002      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.002      0.002      0.026      0.026"
" 51      PIPE DESIGN"
"      0.002  Current peak flow      c.m/sec"
"      0.013  Manning 'n'"
"      1.000  Diameter      metre"
"      1.000  Gradient      %"
"      Depth of flow      0.022      metre"
"      Velocity      0.461      m/sec"
"      Pipe capacity      2.398      c.m/sec"
"      Critical depth      0.024      metre"
" 53      ROUTE Zero Route"
"      0.00  Zero Route Reach length      ( metre)"
"          0.002      0.002      0.002      0.026 c.m/sec"
" 40      HYDROGRAPH Combine      10"
"      6      Combine "
"      10     Node #"
"      "
"      Maximum flow      0.002      c.m/sec"
"      Hydrograph volume      1.760      c.m"
"          0.002      0.002      0.002      0.002"
" 40      HYDROGRAPH Confluence      10"
"      7      Confluence "
"      10     Node #"
"      "
"      Maximum flow      0.002      c.m/sec"
"      Hydrograph volume      1.760      c.m"
"          0.002      0.002      0.002      0.000"
" 51      PIPE DESIGN"
"      0.002  Current peak flow      c.m/sec"
"      0.013  Manning 'n'"
"      1.000  Diameter      metre"
"      1.000  Gradient      %"
"      Depth of flow      0.022      metre"
"      Velocity      0.461      m/sec"
"      Pipe capacity      2.398      c.m/sec"
"      Critical depth      0.024      metre"
" 53      ROUTE Zero Route"
"      0.00  Zero Route Reach length      ( metre)"
"          0.002      0.002      0.002      0.000 c.m/sec"
" 40      HYDROGRAPH Combine      999"
"      6      Combine "

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"          999   Node #"
"
"          Maximum flow          0.002   c.m/sec"
"          Hydrograph volume     1.760   c.m"
"          0.002   0.002   0.002   0.002"
" 40   HYDROGRAPH   Confluence   9"
"          7   Confluence "
"          9   Node #"
"          "
"          Maximum flow          0.026   c.m/sec"
"          Hydrograph volume     48.051   c.m"
"          0.002   0.026   0.002   0.000"
" 54   POND DESIGN"
"          0.026   Current peak flow   c.m/sec"
"          0.025   Target outflow   c.m/sec"
"          48.1   Hydrograph volume   c.m"
"          3.   Number of stages"
"          243.150   Minimum water level   metre"
"          243.300   Maximum water level   metre"
"          243.150   Starting water level   metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"          Level Discharge   Volume"
"          243.150   0.03040   0.4900"
"          243.225   0.03210   3.820"
"          243.300   0.03370   27.120"
"          Peak outflow          0.022   c.m/sec"
"          Maximum level          243.199   metre"
"          Maximum storage          2.671   c.m"
"          Centroidal lag          1.587   hours"
"          0.002   0.026   0.022   0.000 c.m/sec"
" 40   HYDROGRAPH Next link "
"          5   Next link "
"          0.002   0.022   0.022   0.000"
" 51   PIPE DESIGN"
"          0.022   Current peak flow   c.m/sec"
"          0.013   Manning 'n'"
"          0.250   Diameter   metre"
"          0.400   Gradient   %"
"          Depth of flow          0.139   metre"
"          Velocity          0.800   m/sec"
"          Pipe capacity          0.038   c.m/sec"
"          Critical depth          0.120   metre"
" 53   ROUTE   Pipe Route 28"
"          28.20   Pipe Route 28 Reach length   ( metre)"
"          0.118   X-factor <= 0.5"
"          26.442   K-lag   ( seconds)"
"          0.000   Default(0) or user spec.(1) values used"
"          0.500   X-factor <= 0.5"
"          30.000   K-lag   ( seconds)"
"          0.500   Beta weighting factor"
"          46.154   Routing time step   ( seconds)"
"          1   No. of sub-reaches"
"          Peak outflow          0.022   c.m/sec"
"          0.002   0.022   0.022   0.000 c.m/sec"
" 40   HYDROGRAPH   Combine   8"
"          6   Combine "
"          8   Node #"
"          "
"          Maximum flow          0.037   c.m/sec"
"          Hydrograph volume     72.162   c.m"

```

```

"          0.002      0.022      0.022      0.037"
" 40      HYDROGRAPH Confluence      8"
"          7 Confluence "
"          8 Node #"
"          "
"          Maximum flow          0.037      c.m/sec"
"          Hydrograph volume      72.162      c.m"
"          0.002      0.037      0.022      0.000"
" 54      POND DESIGN"
"          0.037 Current peak flow      c.m/sec"
"          0.035 Target outflow      c.m/sec"
"          72.2 Hydrograph volume      c.m"
"          3. Number of stages"
"          243.200 Minimum water level      metre"
"          243.500 Maximum water level      metre"
"          243.200 Starting water level      metre"
"          0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200 0.03240      1.830"
"          243.350 0.03400      5.080"
"          243.500 0.03550      27.810"
"          Peak outflow          0.031      c.m/sec"
"          Maximum level          243.340      metre"
"          Maximum storage          4.863      c.m"
"          Centroidal lag          1.601      hours"
"          0.002      0.037      0.031      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5 Next link "
"          0.002      0.031      0.031      0.000"
" 51      PIPE DESIGN"
"          0.031 Current peak flow      c.m/sec"
"          0.013 Manning 'n'"
"          0.250 Diameter      metre"
"          2.200 Gradient      %"
"          Depth of flow          0.102      metre"
"          Velocity          1.639      m/sec"
"          Pipe capacity          0.088      c.m/sec"
"          Critical depth          0.143      metre"
" 53      ROUTE Pipe Route 54"
"          53.50 Pipe Route 54 Reach length ( metre)"
"          0.476 X-factor <= 0.5"
"          24.478 K-lag ( seconds)"
"          0.000 Default(0) or user spec.(1) values used"
"          0.500 X-factor <= 0.5"
"          30.000 K-lag ( seconds)"
"          0.500 Beta weighting factor"
"          25.000 Routing time step ( seconds)"
"          1 No. of sub-reaches"
"          Peak outflow          0.030      c.m/sec"
"          0.002      0.031      0.030      0.000 c.m/sec"
" 40      HYDROGRAPH Combine      6"
"          6 Combine "
"          6 Node #"
"          "
"          Maximum flow          0.089      c.m/sec"
"          Hydrograph volume      170.399      c.m"
"          0.002      0.031      0.030      0.089"
" 40      HYDROGRAPH Confluence      7"
"          7 Confluence "
"          7 Node #"

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"
"
"      Maximum flow      0.025      c.m/sec"
"      Hydrograph volume 42.479      c.m"
"      0.002      0.025      0.030      0.000"
" 54      POND DESIGN".
"      0.025      Current peak flow      c.m/sec"
"      0.035      Target outflow      c.m/sec"
"      42.5      Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200      Minimum water level      metre"
"      243.500      Maximum water level      metre"
"      243.200      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.02710      0.4000"
"      243.350      0.02900      6.940"
"      243.500      0.03020      31.840"
"      Peak outflow      0.019      c.m/sec"
"      Maximum level      243.304      metre"
"      Maximum storage      4.913      c.m"
"      Centroidal lag      1.572      hours"
"      0.002      0.025      0.019      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.002      0.019      0.019      0.000"
" 51      PIPE DESIGN"
"      0.019      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.250      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.124      metre"
"      Velocity      0.764      m/sec"
"      Pipe capacity      0.038      c.m/sec"
"      Critical depth      0.109      metre"
" 53      ROUTE      Pipe Route 29"
"      28.60      Pipe Route 29 Reach length      ( metre)"
"      0.182      X-factor <= 0.5"
"      28.081      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.500      Beta weighting factor"
"      42.857      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.018      c.m/sec"
"      0.002      0.019      0.018      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      6"
"      6      Combine "
"      6      Node #"
"      "
"      Maximum flow      0.107      c.m/sec"
"      Hydrograph volume      212.879      c.m"
"      0.002      0.019      0.018      0.107"
" 40      HYDROGRAPH      Confluence      6"
"      7      Confluence "
"      6      Node #"
"      "
"      Maximum flow      0.107      c.m/sec"
"      Hydrograph volume      212.879      c.m"
"      0.002      0.107      0.018      0.000"

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" 54      POND DESIGN"
"          0.107    Current peak flow      c.m/sec"
"          0.100    Target outflow        c.m/sec"
"          212.9    Hydrograph volume      c.m"
"          3.       Number of stages"
"          243.200  Minimum water level    metre"
"          243.450  Maximum water level    metre"
"          243.200  Starting water level   metre"
"          0        Keep Design Data: 1 = True; 0 = False"
"              Level Discharge      Volume"
"              243.200    0.1034      3.110"
"              243.325    0.1063      15.440"
"              243.450    0.1081      60.240"
"              Peak outflow          0.090    c.m/sec"
"              Maximum level          243.307  metre"
"              Maximum storage        13.616   c.m"
"              Centroidal lag          1.591   hours"
"              0.002    0.107    0.090    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5      Next link "
"              0.002    0.090    0.090    0.000"
" 51      PIPE DESIGN"
"          0.090    Current peak flow      c.m/sec"
"          0.013    Manning 'n'"
"          0.375    Diameter      metre"
"          0.400    Gradient      %"
"              Depth of flow          0.257   metre"
"              Velocity              1.118   m/sec"
"              Pipe capacity          0.111   c.m/sec"
"              Critical depth         0.220   metre"
" 53      ROUTE      Pipe Route 53"
"          52.90    Pipe Route 53 Reach length  ( metre)"
"          0.044    X-factor <= 0.5"
"          35.474    K-lag  ( seconds)"
"          0.000    Default(0) or user spec.(1) values used"
"          0.500    X-factor <= 0.5"
"          30.000    K-lag  ( seconds)"
"          0.500    Beta weighting factor"
"          66.667    Routing time step  ( seconds)"
"              1      No. of sub-reaches"
"              Peak outflow          0.087    c.m/sec"
"              0.002    0.090    0.087    0.000 c.m/sec"
" 40      HYDROGRAPH Combine 4"
"          6      Combine "
"          4      Node #"
"              "
"              Maximum flow          0.141    c.m/sec"
"              Hydrograph volume      302.448  c.m"
"              0.002    0.090    0.087    0.141"
" 40      HYDROGRAPH Confluence 5"
"          7      Confluence "
"          5      Node #"
"              "
"              Maximum flow          0.022    c.m/sec"
"              Hydrograph volume      37.464  c.m"
"              0.002    0.022    0.087    0.000"
" 54      POND DESIGN"
"          0.022    Current peak flow      c.m/sec"
"          0.025    Target outflow        c.m/sec"
"          37.5    Hydrograph volume      c.m"

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"      3.  Number of stages"
"      241.750  Minimum water level  metre"
"      242.000  Maximum water level  metre"
"      241.750  Starting water level  metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge  Volume"
"      241.750  0.01270  0.4000"
"      241.875  0.01360  8.340"
"      242.000  0.01410  37.170"
"      Peak outflow  0.013  c.m/sec"
"      Maximum level  241.878  metre"
"      Maximum storage  8.939  c.m"
"      Centroidal lag  1.668  hours"
"      0.002  0.022  0.013  0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.002  0.013  0.013  0.000"
" 51      PIPE DESIGN"
"      0.013  Current peak flow  c.m/sec"
"      0.013  Manning 'n'"
"      0.250  Diameter  metre"
"      0.400  Gradient  %"
"      Depth of flow  0.103  metre"
"      Velocity  0.701  m/sec"
"      Pipe capacity  0.038  c.m/sec"
"      Critical depth  0.092  metre"
" 53      ROUTE  Pipe Route 32"
"      31.50  Pipe Route 32 Reach length  ( metre)"
"      0.270  X-factor <= 0.5"
"      33.712  K-lag  ( seconds)"
"      0.000  Default(0) or user spec.(1) values used"
"      0.500  X-factor <= 0.5"
"      30.000  K-lag  ( seconds)"
"      0.500  Beta weighting factor"
"      46.154  Routing time step  ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow  0.013  c.m/sec"
"      0.002  0.013  0.013  0.000 c.m/sec"
" 40      HYDROGRAPH  Combine  4"
"      6      Combine "
"      4      Node #"
"      "
"      Maximum flow  0.152  c.m/sec"
"      Hydrograph volume  340.203  c.m"
"      0.002  0.013  0.013  0.152"
" 40      HYDROGRAPH  Confluence  4"
"      7      Confluence "
"      4      Node #"
"      "
"      Maximum flow  0.152  c.m/sec"
"      Hydrograph volume  340.203  c.m"
"      0.002  0.152  0.013  0.000"
" 54      POND DESIGN"
"      0.152  Current peak flow  c.m/sec"
"      0.100  Target outflow  c.m/sec"
"      340.2  Hydrograph volume  c.m"
"      3.      Number of stages"
"      243.200  Minimum water level  metre"
"      244.000  Maximum water level  metre"
"      243.200  Starting water level  metre"

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"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.1717      3.370"
"      243.600      0.1747      15.090"
"      244.000      0.1776      50.250"
"      Peak outflow      0.139      c.m/sec"
"      Maximum level      243.495      metre"
"      Maximum storage      12.001      c.m"
"      Centroidal lag      1.606      hours"
"      0.002      0.152      0.139      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.002      0.139      0.139      0.000"
" 51      PIPE DESIGN"
"      0.139      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.296      metre"
"      Velocity      1.250      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.261      metre"
" 53      ROUTE      Pipe Route 28"
"      27.80      Pipe Route 28 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      16.674      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.665      Beta weighting factor"
"      46.154      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.136      c.m/sec"
"      0.002      0.139      0.136      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      3"
"      6      Combine "
"      3      Node #"
"      "
"      Maximum flow      0.170      c.m/sec"
"      Hydrograph volume      387.553      c.m"
"      0.002      0.139      0.136      0.170"
" 40      HYDROGRAPH      Confluence      3"
"      7      Confluence "
"      3      Node #"
"      "
"      Maximum flow      0.170      c.m/sec"
"      Hydrograph volume      387.554      c.m"
"      0.002      0.170      0.136      0.000"
" 51      PIPE DESIGN"
"      0.170      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.347      metre"
"      Velocity      1.289      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.290      metre"
" 53      ROUTE      Pipe Route 45"
"      44.50      Pipe Route 45 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"

```

```

"      25.887   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"      0.638   Beta weighting factor"
"      66.667   Routing time step   ( seconds)"
"      1       No. of sub-reaches"
"      Peak outflow                0.165      c.m/sec"
"      0.002      0.170      0.165      0.000 c.m/sec"
" 40      HYDROGRAPH   Combine      2"
"      6       Combine "
"      2       Node #"
"      "
"      Maximum flow                0.200      c.m/sec"
"      Hydrograph volume            447.079      c.m"
"      0.002      0.170      0.165      0.200"
" 40      HYDROGRAPH   Confluence    2"
"      7       Confluence "
"      2       Node #"
"      "
"      Maximum flow                0.200      c.m/sec"
"      Hydrograph volume            447.078      c.m"
"      0.002      0.200      0.165      0.000"
" 54      POND DESIGN"
"      0.200   Current peak flow    c.m/sec"
"      0.091   Target outflow      c.m/sec"
"      447.1   Hydrograph volume    c.m"
"      3.      Number of stages"
"      242.100 Minimum water level    metre"
"      242.350 Maximum water level    metre"
"      242.100 Starting water level    metre"
"      0       Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      242.100      0.2831      2.500"
"      242.225      0.2932      7.000"
"      242.350      0.2998      23.820"
"      Peak outflow                0.197      c.m/sec"
"      Maximum level                242.161      metre"
"      Maximum storage              4.698      c.m"
"      Centroidal lag              1.598      hours"
"      0.002      0.200      0.197      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5       Next link "
"      0.002      0.197      0.197      0.000"
" 51      PIPE DESIGN"
"      0.197   Current peak flow    c.m/sec"
"      0.013   Manning 'n'"
"      0.450   Diameter      metre"
"      0.400   Gradient      %"
"      Surcharged HGL                0.476      %"
"      Velocity                      1.237      m/sec"
"      Pipe capacity                  0.180      c.m/sec"
"      Critical depth                 0.000      metre"
" 53      ROUTE      Pipe Route 30"
"      30.00   Pipe Route 30 Reach length   ( metre)"
"      0.000   X-factor <= 0.5"
"      16.135   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"

```

```

"      0.638  Beta weighting factor"
"      66.667 Routing time step  ( seconds)"
"      1    No. of sub-reaches"
"      Peak outflow                0.197    c.m/sec"
"      0.002    0.197    0.197    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5    Next link "
"      0.002    0.197    0.197    0.000"
" 54      POND DESIGN"
"      0.197  Current peak flow    c.m/sec"
"      0.091  Target outflow      c.m/sec"
"      447.1  Hydrograph volume    c.m"
"      3.     Number of stages"
"      239.750 Minimum water level  metre"
"      240.650 Maximum water level  metre"
"      239.750 Starting water level  metre"
"      0     Keep Design Data: 1 = True; 0 = False"
"      Level Discharge    Volume"
"      239.750  0.07500    0.5700"
"      240.200  0.1034    231.770"
"      240.650  0.1299    462.970"
"      Peak outflow                0.081    c.m/sec"
"      Maximum level                240.100  metre"
"      Maximum storage              180.566  c.m"
"      Centroidal lag               2.220    hours"
"      0.002    0.197    0.081    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5    Next link "
"      0.002    0.081    0.081    0.000"
" 51      PIPE DESIGN"
"      0.081  Current peak flow    c.m/sec"
"      0.013  Manning 'n'"
"      0.450  Diameter            metre"
"      0.400  Gradient            %"
"      Depth of flow                0.211    metre"
"      Velocity                    1.102    m/sec"
"      Pipe capacity                0.180    c.m/sec"
"      Critical depth               0.196    metre"
" 53      ROUTE    Pipe Route 25"
"      24.50  Pipe Route 25 Reach length  ( metre)"
"      0.000  X-factor <= 0.5"
"      16.677 K-lag  ( seconds)"
"      0.000  Default(0) or user spec.(1) values used"
"      0.500  X-factor <= 0.5"
"      30.000 K-lag  ( seconds)"
"      0.557  Beta weighting factor"
"      35.294 Routing time step  ( seconds)"
"      1    No. of sub-reaches"
"      Peak outflow                0.080    c.m/sec"
"      0.002    0.081    0.080    0.000 c.m/sec"
" 40      HYDROGRAPH Combine 999"
"      6    Combine "
"      999  Node #"
"      "
"      Maximum flow                0.081    c.m/sec"
"      Hydrograph volume            448.839  c.m"
"      0.002    0.081    0.080    0.081"
" 40      HYDROGRAPH Confluence 999"
"      7    Confluence "
"      999  Node #"

```

"	"				
"	Maximum flow	0.081	c.m/sec"		
"	Hydrograph volume	448.839	c.m"		
"	0.002 0.081	0.080	0.000"		
" 38	START/RE-START TOTALS 999"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area	1.525	hectare"		
"	Total Impervious area	0.981	hectare"		
"	Total % impervious	64.313"			
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25 rev. 473"
"          MIDUSS created                      February-07-10"
"          10 Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pst10.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 11:32:53 AM"
" 31          TIME PARAMETERS"
"          10.000 Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1 Chicago storm"
"          670.324 Coefficient A"
"          3.007 Constant B"
"          0.698 Exponent C"
"          0.400 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity          107.682 mm/hr"
"          Total depth                52.991 mm"
"          6 005hyd Hydrograph extension used in this file"
" 33          CATCHMENT 2"
"          2 Rectangular"
"          1 Equal length"
"          2 Horton equation"
"          2 No description"
"          54.500 % Impervious"
"          0.226 Total Area"
"          38.966 Flow length"
"          1.500 Overland Slope"
"          0.103 Pervious Area"
"          38.966 Pervious length"
"          1.500 Pervious slope"
"          0.123 Impervious Area"
"          38.966 Impervious length"
"          1.500 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          35.000 Pervious Max.infiltration"
"          5.000 Pervious Min.infiltration"
"          0.500 Pervious Lag constant (hours)"
"          7.500 Pervious Depression storage"
"          0.015 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.500 Impervious Lag constant (hours)"
"          2.000 Impervious Depression storage"
"          0.048 0.000 0.000 0.000 c.m/sec"
"          Catchment 2 Pervious Impervious Total Area "
"          Surface Area 0.103 0.123 0.226 hectare"
"          Time of concentration 17.640 2.747 6.255 minutes"
"          Time to Centroid 100.366 89.150 91.792 minutes"
"          Rainfall depth 52.991 52.991 52.991 mm"
"          Rainfall volume 54.49 65.27 119.76 c.m"
"          Rainfall losses 34.172 2.000 16.638 mm"
"          Runoff depth 18.819 50.991 36.353 mm"
"          Runoff volume 19.35 62.81 82.16 c.m"
"          Runoff coefficient 0.355 0.962 0.686 "

```


"		Maximum flow	0.011	0.037	0.048	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.048	0.048	0.000	0.000"	
" 51		PIPE DESIGN"				
"	0.048	Current peak flow	c.m/sec"			
"	0.013	Manning 'n'"				
"	1.000	Diameter	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.098	metre"		
"		Velocity	1.211	m/sec"		
"		Pipe capacity	2.398	c.m/sec"		
"		Critical depth	0.120	metre"		
" 53		ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"			
"		0.048	0.048	0.048	0.000 c.m/sec"	
" 40		HYDROGRAPH Combine	2"			
"	6	Combine "				
"	2	Node #"				
"		"				
"		Maximum flow	0.048	c.m/sec"		
"		Hydrograph volume	82.158	c.m"		
"		0.048	0.048	0.048	0.048"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.048	0.000	0.048	0.048"	
" 33		CATCHMENT 3"				
"	2	Rectangular"				
"	1	Equal length"				
"	2	Horton equation"				
"	3	No description"				
"	46.000	% Impervious"				
"	0.200	Total Area"				
"	10.638	Flow length"				
"	1.500	Overland Slope"				
"	0.108	Pervious Area"				
"	10.638	Pervious length"				
"	1.500	Pervious slope"				
"	0.092	Impervious Area"				
"	10.638	Impervious length"				
"	1.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	35.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.500	Pervious Lag constant (hours)"				
"	7.500	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.500	Impervious Lag constant (hours)"				
"	2.000	Impervious Depression storage"				
"		0.049	0.000	0.048	0.048 c.m/sec"	
"		Catchment 3	Pervious	Impervious	Total Area	"
"		Surface Area	0.108	0.092	0.200	hectare"
"		Time of concentration	8.095	1.260	3.326	minutes"
"		Time to Centroid	92.970	89.141	90.299	minutes"
"		Rainfall depth	52.991	52.991	52.991	mm"
"		Rainfall volume	57.23	48.75	105.98	c.m"
"		Rainfall losses	34.172	2.000	19.373	mm"
"		Runoff depth	18.819	50.991	33.618	mm"

"	Runoff volume	20.32	46.91	67.24	c.m"
"	Runoff coefficient	0.355	0.962	0.634	"
"	Maximum flow	0.021	0.028	0.049	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.049	0.049	0.048	0.048"
" 51	PIPE DESIGN"				
"	0.049 Current peak flow	c.m/sec"			
"	0.013 Manning 'n'"				
"	1.000 Diameter	metre"			
"	1.000 Gradient	%"			
"	Depth of flow	0.099	metre"		
"	Velocity	1.213	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.121	metre"		
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length	(metre)"			
"		0.049	0.049	0.049	0.048 c.m/sec"
" 40	HYDROGRAPH Combine 3"				
"	6 Combine "				
"	3 Node #"				
"	"				
"	Maximum flow	0.049	c.m/sec"		
"	Hydrograph volume	67.237	c.m"		
"		0.049	0.049	0.049	0.049"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.049	0.000	0.049	0.049"
" 33	CATCHMENT 4"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	4 No description"				
"	69.700 % Impervious"				
"	0.288 Total Area"				
"	23.607 Flow length"				
"	1.500 Overland Slope"				
"	0.087 Pervious Area"				
"	23.607 Pervious length"				
"	1.500 Pervious slope"				
"	0.201 Impervious Area"				
"	23.607 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"		0.073	0.000	0.049	0.049 c.m/sec"
"	Catchment 4	Pervious	Impervious	Total Area	"
"	Surface Area	0.087	0.201	0.288	hectare"
"	Time of concentration	13.059	2.033	3.558	minutes"
"	Time to Centroid	96.860	89.146	90.212	minutes"
"	Rainfall depth	52.991	52.991	52.991	mm"
"	Rainfall volume	46.24	106.37	152.61	c.m"

"	Rainfall losses	34.172	2.000	11.748	mm"
"	Runoff depth	18.819	50.991	41.243	mm"
"	Runoff volume	16.42	102.36	118.78	c.m"
"	Runoff coefficient	0.355	0.962	0.778	"
"	Maximum flow	0.013	0.060	0.073	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.073	0.073	0.049	0.049"
" 51	PIPE DESIGN"				
"	0.073 Current peak flow	c.m/sec"			
"	0.013 Manning 'n'"				
"	1.000 Diameter	metre"			
"	1.000 Gradient	%"			
"	Depth of flow	0.120	metre"		
"	Velocity	1.372	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.149	metre"		
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length	(metre)"			
"		0.073	0.073	0.073	0.049 c.m/sec"
" 40	HYDROGRAPH Combine 4"				
"	6 Combine "				
"	4 Node #"				
"	"				
"	Maximum flow	0.073	c.m/sec"		
"	Hydrograph volume	118.780	c.m"		
"		0.073	0.073	0.073	0.073"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.073	0.000	0.073	0.073"
" 33	CATCHMENT 5"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	5 No description"				
"	77.200 % Impervious"				
"	0.112 Total Area"				
"	31.111 Flow length"				
"	1.500 Overland Slope"				
"	0.026 Pervious Area"				
"	31.111 Pervious length"				
"	1.500 Pervious slope"				
"	0.086 Impervious Area"				
"	31.111 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"		0.029	0.000	0.073	0.073 c.m/sec"
"	Catchment 5	Pervious	Impervious	Total Area "	
"	Surface Area	0.026	0.086	0.112	hectare"
"	Time of concentration	15.411	2.400	3.678	minutes"
"	Time to Centroid	98.787	89.148	90.096	minutes"

"	Rainfall depth	52.991	52.991	52.991	mm"
"	Rainfall volume	13.53	45.82	59.35	c.m"
"	Rainfall losses	34.172	2.000	9.335	mm"
"	Runoff depth	18.819	50.991	43.656	mm"
"	Runoff volume	4.81	44.09	48.89	c.m"
"	Runoff coefficient	0.355	0.962	0.824	"
"	Maximum flow	0.003	0.026	0.029	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.029	0.029	0.073	0.073"
" 51	PIPE DESIGN"				
"	0.029	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.077	metre"	
"		Velocity	1.039	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.093	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"		0.029	0.029	0.029	0.073 c.m/sec"
" 40	HYDROGRAPH Combine 5"				
"	6	Combine "			
"	5	Node #"			
"					
"		Maximum flow	0.029	c.m/sec"	
"		Hydrograph volume	48.895	c.m"	
"		0.029	0.029	0.029	0.029"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.029	0.000	0.029	0.029"
" 33	CATCHMENT 6"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	6	No description"			
"	100.000	% Impervious"			
"	0.242	Total Area"			
"	55.000	Flow length"			
"	1.500	Overland Slope"			
"	0.000	Pervious Area"			
"	55.000	Pervious length"			
"	1.500	Pervious slope"			
"	0.242	Impervious Area"			
"	55.000	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.072	0.000	0.029	0.029 c.m/sec"
"	Catchment 6	Pervious	Impervious	Total Area	"
"	Surface Area	0.000	0.242	0.242	hectare"

"	Time of concentration	21.692	3.378	3.378	minutes"
"	Time to Centroid	103.577	89.187	89.187	minutes"
"	Rainfall depth	52.991	52.991	52.991	mm"
"	Rainfall volume	0.00	128.24	128.24	c.m"
"	Rainfall losses	34.172	2.000	2.000	mm"
"	Runoff depth	18.819	50.991	50.991	mm"
"	Runoff volume	0.00	123.40	123.40	c.m"
"	Runoff coefficient	0.000	0.962	0.962	"
"	Maximum flow	0.000	0.072	0.072	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.072	0.072	0.029	0.029"
" 51	PIPE DESIGN"				
"	0.072	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.119	metre"	
"		Velocity	1.368	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.148	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"		0.072	0.072	0.072	0.029 c.m/sec"
" 40	HYDROGRAPH Combine 6"				
"	6	Combine "			
"	6	Node #"			
"					
"		Maximum flow	0.072	c.m/sec"	
"		Hydrograph volume	123.399	c.m"	
"		0.072	0.072	0.072	0.072"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.072	0.000	0.072	0.072"
" 33	CATCHMENT 7"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	7	No description"			
"	63.300	% Impervious"			
"	0.146	Total Area"			
"	36.500	Flow length"			
"	1.500	Overland Slope"			
"	0.054	Pervious Area"			
"	36.500	Pervious length"			
"	1.500	Pervious slope"			
"	0.092	Impervious Area"			
"	36.500	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.034	0.000	0.072	0.072 c.m/sec"

	Catchment 7	Pervious	Impervious	Total Area	
"	Surface Area	0.054	0.092	0.146	hectare"
"	Time of concentration	16.962	2.641	5.165	minutes"
"	Time to Centroid	99.865	89.150	91.039	minutes"
"	Rainfall depth	52.991	52.991	52.991	mm"
"	Rainfall volume	28.39	48.97	77.37	c.m"
"	Rainfall losses	34.172	2.000	13.807	mm"
"	Runoff depth	18.819	50.991	39.184	mm"
"	Runoff volume	10.08	47.13	57.21	c.m"
"	Runoff coefficient	0.355	0.962	0.739	"
"	Maximum flow	0.006	0.028	0.034	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.034	0.034	0.072	0.072"	
" 51	PIPE DESIGN"				
"	0.034	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.083	metre"	
"		Velocity	1.088	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.101	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.034	0.034	0.034	0.072 c.m/sec"	
" 40	HYDROGRAPH Combine 7"				
"	6	Combine "			
"	7	Node #"			
"					
"		Maximum flow	0.034	c.m/sec"	
"		Hydrograph volume	57.209	c.m"	
"	0.034	0.034	0.034	0.034"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.034	0.000	0.034	0.034"	
" 33	CATCHMENT 8"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	8	No description"			
"	69.100	% Impervious"			
"	0.078	Total Area"			
"	9.070	Flow length"			
"	1.500	Overland Slope"			
"	0.024	Pervious Area"			
"	9.070	Pervious length"			
"	1.500	Pervious slope"			
"	0.054	Impervious Area"			
"	9.070	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			

"	2.000	Impervious Depression storage"			
"		0.021	0.000	0.034	0.034 c.m/sec"
"		Catchment 8	Pervious	Impervious	Total Area "
"		Surface Area	0.024	0.054	0.078 hectare"
"		Time of concentration	7.356	1.145	2.025 minutes"
"		Time to Centroid	92.605	89.140	89.631 minutes"
"		Rainfall depth	52.991	52.991	52.991 mm"
"		Rainfall volume	12.77	28.56	41.33 c.m"
"		Rainfall losses	34.172	2.000	11.941 mm"
"		Runoff depth	18.819	50.991	41.050 mm"
"		Runoff volume	4.54	27.48	32.02 c.m"
"		Runoff coefficient	0.355	0.962	0.775 "
"		Maximum flow	0.005	0.016	0.021 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.021	0.021	0.034	0.034"
" 51		PIPE DESIGN"			
"	0.021	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.066	metre"	
"		Velocity	0.939	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.079	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre) "		
"		0.021	0.021	0.021	0.034 c.m/sec"
" 40		HYDROGRAPH Combine 8"			
"	6	Combine "			
"	8	Node #"			
"		"			
"		Maximum flow	0.021	c.m/sec"	
"		Hydrograph volume	32.019	c.m"	
"		0.021	0.021	0.021	0.021"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.021	0.000	0.021	0.021"
" 33		CATCHMENT 9"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	9	No description"			
"	42.100	% Impervious"			
"	0.214	Total Area"			
"	71.333	Flow length"			
"	1.500	Overland Slope"			
"	0.124	Pervious Area"			
"	71.333	Pervious length"			
"	1.500	Pervious slope"			
"	0.090	Impervious Area"			
"	71.333	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours) "			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			

"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.036	0.000	0.021	0.021 c.m/sec"
"		Catchment 9	Pervious	Impervious	Total Area "
"		Surface Area	0.124	0.090	0.214 hectare"
"		Time of concentration	25.355	3.948	11.155 minutes"
"		Time to Centroid	106.691	89.394	95.217 minutes"
"		Rainfall depth	52.991	52.991	52.991 mm"
"		Rainfall volume	65.66	47.74	113.40 c.m"
"		Rainfall losses	34.172	2.000	20.628 mm"
"		Runoff depth	18.819	50.991	32.364 mm"
"		Runoff volume	23.32	45.94	69.26 c.m"
"		Runoff coefficient	0.355	0.962	0.611 "
"		Maximum flow	0.011	0.027	0.036 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.036	0.036	0.021	0.021"
" 51		PIPE DESIGN"			
"	0.036	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.086	metre"	
"		Velocity	1.113	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.105	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre) "		
"		0.036	0.036	0.036	0.021 c.m/sec"
" 40		HYDROGRAPH Combine 9"			
"	6	Combine "			
"	9	Node #"			
"		"			
"		Maximum flow	0.036	c.m/sec"	
"		Hydrograph volume	69.258	c.m"	
"		0.036	0.036	0.036	0.036"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.036	0.000	0.036	0.036"
" 33		CATCHMENT 10"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	10	No description"			
"	0.000	% Impervious"			
"	0.019	Total Area"			
"	2.317	Flow length"			
"	1.500	Overland Slope"			
"	0.019	Pervious Area"			
"	2.317	Pervious length"			
"	1.500	Pervious slope"			
"	0.000	Impervious Area"			
"	2.317	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			

"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.004	0.000	0.036	0.036 c.m/sec"
"		Catchment 10	Pervious	Impervious	Total Area "
"		Surface Area	0.019	0.000	0.019 hectare"
"		Time of concentration	3.244	0.505	3.244 minutes"
"		Time to Centroid	90.802	89.139	90.802 minutes"
"		Rainfall depth	52.991	52.991	52.991 mm"
"		Rainfall volume	10.07	0.00	10.07 c.m"
"		Rainfall losses	34.172	2.000	34.172 mm"
"		Runoff depth	18.819	50.991	18.819 mm"
"		Runoff volume	3.58	0.00	3.58 c.m"
"		Runoff coefficient	0.355	0.000	0.355 "
"		Maximum flow	0.004	0.000	0.004 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.004	0.004	0.036	0.036"
" 51		PIPE DESIGN"			
"	0.004	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.029	metre"	
"		Velocity	0.554	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.033	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.004	0.004	0.004	0.036 c.m/sec"
" 40		HYDROGRAPH Combine	10"		
"	6	Combine "			
"	10	Node #"			
"		"			
"		Maximum flow	0.004	c.m/sec"	
"		Hydrograph volume	3.576	c.m"	
"		0.004	0.004	0.004	0.004"
" 40		HYDROGRAPH Confluence	10"		
"	7	Confluence "			
"	10	Node #"			
"		"			
"		Maximum flow	0.004	c.m/sec"	
"		Hydrograph volume	3.576	c.m"	
"		0.004	0.004	0.004	0.000"
" 51		PIPE DESIGN"			
"	0.004	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.029	metre"	
"		Velocity	0.554	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.033	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.004	0.004	0.004	0.000 c.m/sec"
" 40		HYDROGRAPH Combine	999"		
"	6	Combine "			

```

"          999   Node #"
"
"          Maximum flow          0.004   c.m/sec"
"          Hydrograph volume     3.576   c.m"
"          0.004   0.004   0.004   0.004"
" 40      HYDROGRAPH   Confluence   9"
"          7   Confluence "
"          9   Node #"
"
"          Maximum flow          0.036   c.m/sec"
"          Hydrograph volume     69.258   c.m"
"          0.004   0.036   0.004   0.000"
" 54      POND DESIGN"
"          0.036   Current peak flow   c.m/sec"
"          0.025   Target outflow   c.m/sec"
"          69.3   Hydrograph volume   c.m"
"          3.   Number of stages"
"          243.150   Minimum water level   metre"
"          243.300   Maximum water level   metre"
"          243.150   Starting water level   metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"          Level Discharge   Volume"
"          243.150   0.03040   0.4900"
"          243.225   0.03210   3.820"
"          243.300   0.03370   27.120"
"          Peak outflow          0.031   c.m/sec"
"          Maximum level          243.225   metre"
"          Maximum storage          3.801   c.m"
"          Centroidal lag          1.620   hours"
"          0.004   0.036   0.031   0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5   Next link "
"          0.004   0.031   0.031   0.000"
" 51      PIPE DESIGN"
"          0.031   Current peak flow   c.m/sec"
"          0.013   Manning 'n'"
"          0.250   Diameter   metre"
"          0.400   Gradient   %"
"          Depth of flow          0.174   metre"
"          Velocity          0.857   m/sec"
"          Pipe capacity          0.038   c.m/sec"
"          Critical depth          0.143   metre"
" 53      ROUTE   Pipe Route 28"
"          28.20   Pipe Route 28 Reach length   ( metre)"
"          0.000   X-factor <= 0.5"
"          24.688   K-lag   ( seconds)"
"          0.000   Default(0) or user spec.(1) values used"
"          0.500   X-factor <= 0.5"
"          30.000   K-lag   ( seconds)"
"          0.545   Beta weighting factor"
"          50.000   Routing time step   ( seconds)"
"          1   No. of sub-reaches"
"          Peak outflow          0.030   c.m/sec"
"          0.004   0.031   0.030   0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   8"
"          6   Combine "
"          8   Node #"
"
"          Maximum flow          0.051   c.m/sec"
"          Hydrograph volume     101.277   c.m"

```

"		0.004	0.031	0.030	0.051"
" 40	HYDROGRAPH	Confluence	8"		
"	7	Confluence "			
"	8	Node #"			
"					
"		Maximum flow	0.051	c.m/sec"	
"		Hydrograph volume	101.277	c.m"	
"		0.004	0.051	0.030	0.000"
" 54	POND DESIGN"				
"	0.051	Current peak flow	c.m/sec"		
"	0.035	Target outflow	c.m/sec"		
"	101.3	Hydrograph volume	c.m"		
"	3.	Number of stages"			
"	243.200	Minimum water level	metre"		
"	243.500	Maximum water level	metre"		
"	243.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	243.200	0.03240	1.830"		
"	243.350	0.03400	5.080"		
"	243.500	0.03550	27.810"		
"		Peak outflow	0.034	c.m/sec"	
"		Maximum level	243.387	metre"	
"		Maximum storage	10.681	c.m"	
"		Centroidal lag	1.641	hours"	
"		0.004	0.051	0.034	0.000 c.m/sec"
" 40	HYDROGRAPH	Next link "			
"	5	Next link "			
"		0.004	0.034	0.034	0.000"
" 51	PIPE DESIGN"				
"	0.034	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	0.250	Diameter	metre"		
"	2.200	Gradient	%"		
"		Depth of flow	0.108	metre"	
"		Velocity	1.685	m/sec"	
"		Pipe capacity	0.088	c.m/sec"	
"		Critical depth	0.151	metre"	
" 53	ROUTE	Pipe Route 54"			
"	53.50	Pipe Route 54 Reach length	(metre)"		
"	0.474	X-factor <= 0.5"			
"	23.815	K-lag (seconds)"			
"	0.000	Default(0) or user spec.(1) values used"			
"	0.500	X-factor <= 0.5"			
"	30.000	K-lag (seconds)"			
"	0.500	Beta weighting factor"			
"	25.000	Routing time step (seconds)"			
"	1	No. of sub-reaches"			
"		Peak outflow	0.034	c.m/sec"	
"		0.004	0.034	0.034	0.000 c.m/sec"
" 40	HYDROGRAPH	Combine	6"		
"	6	Combine "			
"	6	Node #"			
"					
"		Maximum flow	0.106	c.m/sec"	
"		Hydrograph volume	225.340	c.m"	
"		0.004	0.034	0.034	0.106"
" 40	HYDROGRAPH	Confluence	7"		
"	7	Confluence "			
"	7	Node #"			

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"
"
"      Maximum flow      0.034      c.m/sec"
"      Hydrograph volume  57.209      c.m"
"      0.004      0.034      0.034      0.000"
" 54      POND DESIGN"
"      0.034      Current peak flow      c.m/sec"
"      0.035      Target outflow      c.m/sec"
"      57.2      Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200      Minimum water level      metre"
"      243.500      Maximum water level      metre"
"      243.200      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.02710      0.4000"
"      243.350      0.02900      6.940"
"      243.500      0.03020      31.840"
"      Peak outflow      0.025      c.m/sec"
"      Maximum level      243.342      metre"
"      Maximum storage      6.607      c.m"
"      Centroidal lag      1.584      hours"
"      0.004      0.034      0.025      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.004      0.025      0.025      0.000"
" 51      PIPE DESIGN"
"      0.025      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.250      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.148      metre"
"      Velocity      0.817      m/sec"
"      Pipe capacity      0.038      c.m/sec"
"      Critical depth      0.127      metre"
" 53      ROUTE      Pipe Route 29"
"      28.60      Pipe Route 29 Reach length      ( metre)"
"      0.083      X-factor <= 0.5"
"      26.245      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.500      Beta weighting factor"
"      46.154      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.024      c.m/sec"
"      0.004      0.025      0.024      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      6"
"      6      Combine "
"      6      Node #"
"      "
"      Maximum flow      0.130      c.m/sec"
"      Hydrograph volume      282.548      c.m"
"      0.004      0.025      0.024      0.130"
" 40      HYDROGRAPH      Confluence      6"
"      7      Confluence "
"      6      Node #"
"      "
"      Maximum flow      0.130      c.m/sec"
"      Hydrograph volume      282.548      c.m"
"      0.004      0.130      0.024      0.000"

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" 54      POND DESIGN"
"      0.130    Current peak flow    c.m/sec"
"      0.100    Target outflow      c.m/sec"
"      282.5    Hydrograph volume    c.m"
"      3.       Number of stages"
"      243.200  Minimum water level   metre"
"      243.450  Maximum water level   metre"
"      243.200  Starting water level   metre"
"      0        Keep Design Data: 1 = True; 0 = False"
"              Level Discharge    Volume"
"              243.200    0.1034    3.110"
"              243.325    0.1063    15.440"
"              243.450    0.1081    60.240"
"              Peak outflow          0.106    c.m/sec"
"              Maximum level          243.335    metre"
"              Maximum storage          19.099    c.m"
"              Centroidal lag          1.605    hours"
"              0.004    0.130    0.106    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"              0.004    0.106    0.106    0.000"
" 51      PIPE DESIGN"
"      0.106    Current peak flow    c.m/sec"
"      0.013    Manning 'n'"
"      0.375    Diameter    metre"
"      0.400    Gradient    %"
"      Depth of flow          0.294    metre"
"      Velocity                1.143    m/sec"
"      Pipe capacity          0.111    c.m/sec"
"      Critical depth          0.240    metre"
" 53      ROUTE    Pipe Route 53"
"      52.90    Pipe Route 53 Reach length    ( metre)"
"      0.000    X-factor <= 0.5"
"      34.704    K-lag    ( seconds)"
"      0.000    Default(0) or user spec.(1) values used"
"      0.500    X-factor <= 0.5"
"      30.000    K-lag    ( seconds)"
"      0.557    Beta weighting factor"
"      75.000    Routing time step    ( seconds)"
"      1        No. of sub-reaches"
"      Peak outflow          0.102    c.m/sec"
"              0.004    0.106    0.102    0.000 c.m/sec"
" 40      HYDROGRAPH    Combine    4"
"      6      Combine "
"      4      Node #"
"      "
"      Maximum flow          0.176    c.m/sec"
"      Hydrograph volume          407.059    c.m"
"              0.004    0.106    0.102    0.176"
" 40      HYDROGRAPH    Confluence    5"
"      7      Confluence "
"      5      Node #"
"      "
"      Maximum flow          0.029    c.m/sec"
"      Hydrograph volume          48.895    c.m"
"              0.004    0.029    0.102    0.000"
" 54      POND DESIGN"
"      0.029    Current peak flow    c.m/sec"
"      0.025    Target outflow      c.m/sec"
"      48.9     Hydrograph volume    c.m"

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"          3.  Number of stages"
"    241.750  Minimum water level      metre"
"    242.000  Maximum water level      metre"
"    241.750  Starting water level      metre"
"          0  Keep Design Data: 1 = True; 0 = False"
"            Level Discharge      Volume"
"            241.750    0.01270    0.4000"
"            241.875    0.01360    8.340"
"            242.000    0.01410    37.170"
"            Peak outflow                0.014    c.m/sec"
"            Maximum level                241.893    metre"
"            Maximum storage                12.604    c.m"
"            Centroidal lag                1.690    hours"
"            0.004    0.029    0.014    0.000 c.m/sec"
" 40    HYDROGRAPH Next link "
"          5  Next link "
"            0.004    0.014    0.014    0.000"
" 51    PIPE DESIGN"
"          0.014  Current peak flow      c.m/sec"
"          0.013  Manning 'n'"
"          0.250  Diameter      metre"
"          0.400  Gradient      %"
"            Depth of flow                0.104    metre"
"            Velocity                    0.705    m/sec"
"            Pipe capacity                0.038    c.m/sec"
"            Critical depth                0.093    metre"
" 53    ROUTE    Pipe Route 32"
"          31.50  Pipe Route 32 Reach length  ( metre)"
"          0.266  X-factor <= 0.5"
"          33.489  K-lag  ( seconds)"
"          0.000  Default(0) or user spec.(1) values used"
"          0.500  X-factor <= 0.5"
"          30.000  K-lag  ( seconds)"
"          0.500  Beta weighting factor"
"          46.154  Routing time step  ( seconds)"
"          1  No. of sub-reaches"
"            Peak outflow                0.014    c.m/sec"
"            0.004    0.014    0.014    0.000 c.m/sec"
" 40    HYDROGRAPH  Combine  4"
"          6  Combine "
"          4  Node #"
"            "
"            Maximum flow                0.189    c.m/sec"
"            Hydrograph volume            456.521    c.m"
"            0.004    0.014    0.014    0.189"
" 40    HYDROGRAPH  Confluence  4"
"          7  Confluence "
"          4  Node #"
"            "
"            Maximum flow                0.189    c.m/sec"
"            Hydrograph volume            456.521    c.m"
"            0.004    0.189    0.014    0.000"
" 54    POND DESIGN"
"          0.189  Current peak flow      c.m/sec"
"          0.100  Target outflow      c.m/sec"
"          456.5  Hydrograph volume      c.m"
"          3.  Number of stages"
"          243.200  Minimum water level      metre"
"          244.000  Maximum water level      metre"
"          243.200  Starting water level      metre"

```

```

"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.1717      3.370"
"      243.600      0.1747      15.090"
"      244.000      0.1776      50.250"
"      Peak outflow      0.172      c.m/sec"
"      Maximum level      243.605      metre"
"      Maximum storage      15.498      c.m"
"      Centroidal lag      1.619      hours"
"      0.004      0.189      0.172      0.000 c.m/sec"
40      HYDROGRAPH Next link "
"      5      Next link "
"      0.004      0.172      0.172      0.000"
51      PIPE DESIGN"
"      0.172      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.351      metre"
"      Velocity      1.290      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.291      metre"
53      ROUTE      Pipe Route 28"
"      27.80      Pipe Route 28 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      16.157      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.743      Beta weighting factor"
"      60.000      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.169      c.m/sec"
"      0.004      0.172      0.169      0.000 c.m/sec"
40      HYDROGRAPH      Combine      3"
"      6      Combine "
"      3      Node #"
"      "
"      Maximum flow      0.217      c.m/sec"
"      Hydrograph volume      525.166      c.m"
"      0.004      0.172      0.169      0.217"
40      HYDROGRAPH      Confluence      3"
"      7      Confluence "
"      3      Node #"
"      "
"      Maximum flow      0.217      c.m/sec"
"      Hydrograph volume      525.166      c.m"
"      0.004      0.217      0.169      0.000"
51      PIPE DESIGN"
"      0.217      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Surcharged HGL      0.582      %"
"      Velocity      1.367      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.000      metre"
53      ROUTE      Pipe Route 45"
"      44.50      Pipe Route 45 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"

```

```

"      16.135   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"      0.743   Beta weighting factor"
"      60.000   Routing time step   ( seconds)"
"      1       No. of sub-reaches"
"      Peak outflow                                0.217   c.m/sec"
"      0.004    0.217    0.217    0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   2"
"      6       Combine "
"      2       Node #"
"      "
"      Maximum flow                                0.266   c.m/sec"
"      Hydrograph volume                          607.323   c.m"
"      0.004    0.217    0.217    0.266"
" 40      HYDROGRAPH   Confluence  2"
"      7       Confluence "
"      2       Node #"
"      "
"      Maximum flow                                0.266   c.m/sec"
"      Hydrograph volume                          607.323   c.m"
"      0.004    0.266    0.217    0.000"
" 54      POND DESIGN"
"      0.266   Current peak flow   c.m/sec"
"      0.091   Target outflow      c.m/sec"
"      607.3   Hydrograph volume   c.m"
"      3.      Number of stages"
"      242.100 Minimum water level   metre"
"      242.350 Maximum water level   metre"
"      242.100 Starting water level   metre"
"      0       Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      242.100    0.2831    2.500"
"      242.225    0.2932    7.000"
"      242.350    0.2998    23.820"
"      Peak outflow                                0.262   c.m/sec"
"      Maximum level                                242.204   metre"
"      Maximum storage                              6.247   c.m"
"      Centroidal lag                              1.604   hours"
"      0.004    0.266    0.262    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5       Next link "
"      0.004    0.262    0.262    0.000"
" 51      PIPE DESIGN"
"      0.262   Current peak flow   c.m/sec"
"      0.013   Manning 'n'"
"      0.450   Diameter   metre"
"      0.400   Gradient   %"
"      Surcharged HGL                                0.842   %"
"      Velocity                                1.645   m/sec"
"      Pipe capacity                              0.180   c.m/sec"
"      Critical depth                              0.000   metre"
" 53      ROUTE   Pipe Route 30"
"      30.00   Pipe Route 30 Reach length   ( metre)"
"      0.000   X-factor <= 0.5"
"      16.135   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"

```



```

"      0.743  Beta weighting factor"
"      60.000 Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.262      c.m/sec"
"      0.004      0.262      0.262      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.004      0.262      0.262      0.000"
" 54      POND DESIGN"
"      0.262  Current peak flow      c.m/sec"
"      0.091  Target outflow      c.m/sec"
"      607.3  Hydrograph volume      c.m"
"      3.  Number of stages"
"      239.750 Minimum water level      metre"
"      240.650 Maximum water level      metre"
"      239.750 Starting water level      metre"
"      0  Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      239.750  0.07500      0.5700"
"      240.200  0.1034      231.770"
"      240.650  0.1299      462.970"
"      Peak outflow          0.105      c.m/sec"
"      Maximum level          240.222      metre"
"      Maximum storage          243.104      c.m"
"      Centroidal lag          2.229      hours"
"      0.004      0.262      0.105      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.004      0.105      0.105      0.000"
" 51      PIPE DESIGN"
"      0.105  Current peak flow      c.m/sec"
"      0.013  Manning 'n'"
"      0.450  Diameter      metre"
"      0.400  Gradient      %"
"      Depth of flow          0.246      metre"
"      Velocity          1.176      m/sec"
"      Pipe capacity          0.180      c.m/sec"
"      Critical depth          0.225      metre"
" 53      ROUTE      Pipe Route 25"
"      24.50      Pipe Route 25 Reach length  ( metre)"
"      0.000  X-factor <= 0.5"
"      15.626  K-lag  ( seconds)"
"      0.000  Default(0) or user spec.(1) values used"
"      0.500  X-factor <= 0.5"
"      30.000  K-lag  ( seconds)"
"      0.612  Beta weighting factor"
"      37.500 Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.105      c.m/sec"
"      0.004      0.105      0.105      0.000 c.m/sec"
" 40      HYDROGRAPH  Combine      999"
"      6  Combine "
"      999  Node #"
"      "
"      Maximum flow          0.105      c.m/sec"
"      Hydrograph volume          611.003      c.m"
"      0.004      0.105      0.105      0.105"
" 40      HYDROGRAPH  Confluence      999"
"      7  Confluence "
"      999  Node #"

```

"	"				
"	Maximum flow	0.105	c.m/sec"		
"	Hydrograph volume	611.003	c.m"		
"	0.004 0.105	0.105	0.000"		
" 38	START/RE-START TOTALS 999"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area	1.525	hectare"		
"	Total Impervious area	0.981	hectare"		
"	Total % impervious	64.313"			
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      February-07-10"
"          10  Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pst25.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 11:34:34 AM"
31          TIME PARAMETERS"
"          10.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
32          STORM Chicago storm"
"          1  Chicago storm"
"          721.533  Coefficient A"
"          2.253  Constant B"
"          0.679  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          127.011  mm/hr"
"          Total depth                63.151  mm"
"          6  005hyd  Hydrograph extension used in this file"
33          CATCHMENT 2"
"          2  Rectangular"
"          1  Equal length"
"          2  Horton equation"
"          2  No description"
"          54.500  % Impervious"
"          0.226  Total Area"
"          38.966  Flow length"
"          1.500  Overland Slope"
"          0.103  Pervious Area"
"          38.966  Pervious length"
"          1.500  Pervious slope"
"          0.123  Impervious Area"
"          38.966  Impervious length"
"          1.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          35.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.500  Pervious Lag constant (hours)"
"          7.500  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.500  Impervious Lag constant (hours)"
"          2.000  Impervious Depression storage"
"          0.062  0.000  0.000  0.000 c.m/sec"
"          Catchment 2          Pervious  Impervious Total Area "
"          Surface Area          0.103  0.123  0.226  hectare"
"          Time of concentration  15.302  2.571  6.129  minutes"
"          Time to Centroid      102.447  88.980  92.744  minutes"
"          Rainfall depth        63.151  63.151  63.151  mm"
"          Rainfall volume       64.94  77.78  142.72  c.m"
"          Rainfall losses       34.738  2.000  16.896  mm"
"          Runoff depth          28.413  61.151  46.255  mm"
"          Runoff volume         29.22  75.32  104.54  c.m"
"          Runoff coefficient     0.450  0.968  0.732  "

```

"	Maximum flow	0.019	0.043	0.062	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.062 0.062 0.000 0.000"				
" 51	PIPE DESIGN"				
"	0.062 Current peak flow c.m/sec"				
"	0.013 Manning 'n'"				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.111 metre"				
"	Velocity 1.307 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.137 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre) "				
"	0.062 0.062 0.062 0.000 c.m/sec"				
" 40	HYDROGRAPH Combine 2"				
"	6 Combine "				
"	2 Node #"				
"	"				
"	Maximum flow 0.062 c.m/sec"				
"	Hydrograph volume 104.537 c.m"				
"	0.062 0.062 0.062 0.062"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.062 0.000 0.062 0.062"				
" 33	CATCHMENT 3"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	3 No description"				
"	46.000 % Impervious"				
"	0.200 Total Area"				
"	10.638 Flow length"				
"	1.500 Overland Slope"				
"	0.108 Pervious Area"				
"	10.638 Pervious length"				
"	1.500 Pervious slope"				
"	0.092 Impervious Area"				
"	10.638 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"	0.062 0.000 0.062 0.062 c.m/sec"				
"	Catchment 3 Pervious Impervious Total Area "				
"	Surface Area 0.108 0.092 0.200 hectare"				
"	Time of concentration 7.022 1.180 3.242 minutes"				
"	Time to Centroid 95.946 88.972 91.434 minutes"				
"	Rainfall depth 63.151 63.151 63.151 mm"				
"	Rainfall volume 68.20 58.10 126.30 c.m"				
"	Rainfall losses 34.738 2.000 19.678 mm"				
"	Runoff depth 28.413 61.151 43.473 mm"				

"	Runoff volume	30.69	56.26	86.95	c.m"
"	Runoff coefficient	0.450	0.968	0.688	"
"	Maximum flow	0.030	0.032	0.062	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.062 0.062 0.062 0.062"				
" 51	PIPE DESIGN"				
"	0.062 Current peak flow c.m/sec"				
"	0.013 Manning 'n'"				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.111 metre"				
"	Velocity 1.309 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.137 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre)"				
"	0.062 0.062 0.062 0.062 c.m/sec"				
" 40	HYDROGRAPH Combine 3"				
"	6 Combine "				
"	3 Node #"				
"	"				
"	Maximum flow 0.062 c.m/sec"				
"	Hydrograph volume 86.945 c.m"				
"	0.062 0.062 0.062 0.062"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.062 0.000 0.062 0.062"				
" 33	CATCHMENT 4"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	4 No description"				
"	69.700 % Impervious"				
"	0.288 Total Area"				
"	23.607 Flow length"				
"	1.500 Overland Slope"				
"	0.087 Pervious Area"				
"	23.607 Pervious length"				
"	1.500 Pervious slope"				
"	0.201 Impervious Area"				
"	23.607 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"	0.092 0.000 0.062 0.062 c.m/sec"				
"	Catchment 4 Pervious Impervious Total Area "				
"	Surface Area 0.087 0.201 0.288 hectare"				
"	Time of concentration 11.328 1.903 3.487 minutes"				
"	Time to Centroid 98.879 88.972 90.637 minutes"				
"	Rainfall depth 63.151 63.151 63.151 mm"				
"	Rainfall volume 55.11 126.77 181.87 c.m"				

"		Rainfall losses	34.738	2.000	11.919	mm"
"		Runoff depth	28.413	61.151	51.231	mm"
"		Runoff volume	24.79	122.75	147.55	c.m"
"		Runoff coefficient	0.450	0.968	0.811	"
"		Maximum flow	0.021	0.071	0.092	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.092	0.092	0.062	0.062"	
" 51		PIPE DESIGN"				
"	0.092	Current peak flow	c.m/sec"			
"	0.013	Manning 'n' "				
"	1.000	Diameter	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.134	metre"		
"		Velocity	1.471	m/sec"		
"		Pipe capacity	2.398	c.m/sec"		
"		Critical depth	0.167	metre"		
" 53		ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"			
"		0.092	0.092	0.092	0.062 c.m/sec"	
" 40		HYDROGRAPH Combine	4"			
"	6	Combine "				
"	4	Node #"				
"		"				
"		Maximum flow	0.092	c.m/sec"		
"		Hydrograph volume	147.546	c.m"		
"		0.092	0.092	0.092	0.092"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.092	0.000	0.092	0.092"	
" 33		CATCHMENT 5"				
"	2	Rectangular"				
"	1	Equal length"				
"	2	Horton equation"				
"	5	No description"				
"	77.200	% Impervious"				
"	0.112	Total Area"				
"	31.111	Flow length"				
"	1.500	Overland Slope"				
"	0.026	Pervious Area"				
"	31.111	Pervious length"				
"	1.500	Pervious slope"				
"	0.086	Impervious Area"				
"	31.111	Impervious length"				
"	1.500	Impervious slope"				
"	0.250	Pervious Manning 'n' "				
"	35.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.500	Pervious Lag constant (hours) "				
"	7.500	Pervious Depression storage"				
"	0.015	Impervious Manning 'n' "				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.500	Impervious Lag constant (hours) "				
"	2.000	Impervious Depression storage"				
"		0.036	0.000	0.092	0.092 c.m/sec"	
"		Catchment 5	Pervious	Impervious	Total Area "	
"		Surface Area	0.026	0.086	0.112	hectare"
"		Time of concentration	13.369	2.246	3.588	minutes"
"		Time to Centroid	100.833	88.972	90.403	minutes"

"	Rainfall depth	63.151	63.151	63.151	mm"
"	Rainfall volume	16.13	54.60	70.73	c.m"
"	Rainfall losses	34.738	2.000	9.464	mm"
"	Runoff depth	28.413	61.151	53.687	mm"
"	Runoff volume	7.26	52.87	60.13	c.m"
"	Runoff coefficient	0.450	0.968	0.850	"
"	Maximum flow	0.005	0.031	0.036	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.036	0.036	0.092	0.092"
" 51	PIPE DESIGN"				
"	0.036	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.085	metre"	
"		Velocity	1.107	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.104	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"		0.036	0.036	0.036	0.092 c.m/sec"
" 40	HYDROGRAPH Combine 5"				
"	6	Combine "			
"	5	Node #"			
"					
"		Maximum flow	0.036	c.m/sec"	
"		Hydrograph volume	60.129	c.m"	
"		0.036	0.036	0.036	0.036"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.036	0.000	0.036	0.036"
" 33	CATCHMENT 6"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	6	No description"			
"	100.000	% Impervious"			
"	0.242	Total Area"			
"	55.000	Flow length"			
"	1.500	Overland Slope"			
"	0.000	Pervious Area"			
"	55.000	Pervious length"			
"	1.500	Pervious slope"			
"	0.242	Impervious Area"			
"	55.000	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.085	0.000	0.036	0.036 c.m/sec"
"	Catchment 6	Pervious	Impervious	Total Area	"
"	Surface Area	0.000	0.242	0.242	hectare"

"	Time of concentration	18.817	3.162	3.162	minutes"
"	Time to Centroid	105.098	88.996	88.996	minutes"
"	Rainfall depth	63.151	63.151	63.151	mm"
"	Rainfall volume	0.00	152.82	152.83	c.m"
"	Rainfall losses	34.738	2.000	2.000	mm"
"	Runoff depth	28.413	61.151	61.151	mm"
"	Runoff volume	0.00	147.98	147.99	c.m"
"	Runoff coefficient	0.000	0.968	0.968	"
"	Maximum flow	0.000	0.085	0.085	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.085	0.085	0.036	0.036"
" 51	PIPE DESIGN"				
"	0.085 Current peak flow				c.m/sec"
"	0.013 Manning 'n'"				
"	1.000 Diameter				metre"
"	1.000 Gradient				%"
"	Depth of flow		0.129		metre"
"	Velocity		1.438		m/sec"
"	Pipe capacity		2.398		c.m/sec"
"	Critical depth		0.161		metre"
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length				(metre)"
"		0.085	0.085	0.085	0.036 c.m/sec"
" 40	HYDROGRAPH Combine 6"				
"	6 Combine "				
"	6 Node #"				
"					
"	Maximum flow		0.085		c.m/sec"
"	Hydrograph volume		147.985		c.m"
"		0.085	0.085	0.085	0.085"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.085	0.000	0.085	0.085"
" 33	CATCHMENT 7"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	7 No description"				
"	63.300 % Impervious"				
"	0.146 Total Area"				
"	36.500 Flow length"				
"	1.500 Overland Slope"				
"	0.054 Pervious Area"				
"	36.500 Pervious length"				
"	1.500 Pervious slope"				
"	0.092 Impervious Area"				
"	36.500 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"		0.043	0.000	0.085	0.085 c.m/sec"

	Catchment 7	Pervious	Impervious	Total Area	"
"	Surface Area	0.054	0.092	0.146	hectare"
"	Time of concentration	14.714	2.472	5.070	minutes"
"	Time to Centroid	101.981	88.976	91.736	minutes"
"	Rainfall depth	63.151	63.151	63.151	mm"
"	Rainfall volume	33.84	58.36	92.20	c.m"
"	Rainfall losses	34.738	2.000	14.015	mm"
"	Runoff depth	28.413	61.151	49.136	mm"
"	Runoff volume	15.22	56.51	71.74	c.m"
"	Runoff coefficient	0.450	0.968	0.778	"
"	Maximum flow	0.010	0.033	0.043	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.043	0.043	0.085	0.085"	
" 51	PIPE DESIGN"				
"	0.043	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.093	metre"	
"		Velocity	1.167	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.113	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.043	0.043	0.043	0.085 c.m/sec"	
" 40	HYDROGRAPH Combine 7"				
"	6	Combine "			
"	7	Node #"			
"					
"		Maximum flow	0.043	c.m/sec"	
"		Hydrograph volume	71.739	c.m"	
"	0.043	0.043	0.043	0.043"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.043	0.000	0.043	0.043"	
" 33	CATCHMENT 8"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	8	No description"			
"	69.100	% Impervious"			
"	0.078	Total Area"			
"	9.070	Flow length"			
"	1.500	Overland Slope"			
"	0.024	Pervious Area"			
"	9.070	Pervious length"			
"	1.500	Pervious slope"			
"	0.054	Impervious Area"			
"	9.070	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			

"	2.000	Impervious Depression storage"				
"		0.026	0.000	0.043	0.043	c.m/sec"
"		Catchment 8	Pervious	Impervious	Total Area	"
"		Surface Area	0.024	0.054	0.078	hectare"
"		Time of concentration	6.381	1.072	1.986	minutes"
"		Time to Centroid	95.581	88.972	90.109	minutes"
"		Rainfall depth	63.151	63.151	63.151	mm"
"		Rainfall volume	15.22	34.04	49.26	c.m"
"		Rainfall losses	34.738	2.000	12.116	mm"
"		Runoff depth	28.413	61.151	51.035	mm"
"		Runoff volume	6.85	32.96	39.81	c.m"
"		Runoff coefficient	0.450	0.968	0.808	"
"		Maximum flow	0.007	0.019	0.026	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.026	0.026	0.043	0.043	"
" 51		PIPE DESIGN"				
"	0.026	Current peak flow	c.m/sec"			
"	0.013	Manning 'n'"				
"	1.000	Diameter	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.073	metre"		
"		Velocity	1.001	m/sec"		
"		Pipe capacity	2.398	c.m/sec"		
"		Critical depth	0.088	metre"		
" 53		ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"			
"		0.026	0.026	0.026	0.043	c.m/sec"
" 40		HYDROGRAPH Combine 8"				
"	6	Combine "				
"	8	Node #"				
"		"				
"		Maximum flow	0.026	c.m/sec"		
"		Hydrograph volume	39.807	c.m"		
"		0.026	0.026	0.026	0.026	"
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.026	0.000	0.026	0.026	"
" 33		CATCHMENT 9"				
"	2	Rectangular"				
"	1	Equal length"				
"	2	Horton equation"				
"	9	No description"				
"	42.100	% Impervious"				
"	0.214	Total Area"				
"	71.333	Flow length"				
"	1.500	Overland Slope"				
"	0.124	Pervious Area"				
"	71.333	Pervious length"				
"	1.500	Pervious slope"				
"	0.090	Impervious Area"				
"	71.333	Impervious length"				
"	1.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	35.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.500	Pervious Lag constant (hours)"				
"	7.500	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				

"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.047	0.000	0.026	0.026 c.m/sec"
"		Catchment 9	Pervious	Impervious	Total Area "
"		Surface Area	0.124	0.090	0.214 hectare"
"		Time of concentration	21.995	3.696	10.830 minutes"
"		Time to Centroid	107.787	89.110	96.392 minutes"
"		Rainfall depth	63.151	63.151	63.151 mm"
"		Rainfall volume	78.25	56.90	135.14 c.m"
"		Rainfall losses	34.738	2.000	20.955 mm"
"		Runoff depth	28.413	61.151	42.196 mm"
"		Runoff volume	35.21	55.09	90.30 c.m"
"		Runoff coefficient	0.450	0.968	"
"		Maximum flow	0.018	0.032	0.047 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.047	0.047	0.026	0.026"
" 51		PIPE DESIGN"			
"	0.047	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.097	metre"	
"		Velocity	1.205	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.119	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.047	0.047	0.047	0.026 c.m/sec"
" 40		HYDROGRAPH Combine 9"			
"	6	Combine "			
"	9	Node #"			
"		"			
"		Maximum flow	0.047	c.m/sec"	
"		Hydrograph volume	90.299	c.m"	
"		0.047	0.047	0.047	0.047"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.047	0.000	0.047	0.047"
" 33		CATCHMENT 10"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	10	No description"			
"	0.000	% Impervious"			
"	0.019	Total Area"			
"	2.317	Flow length"			
"	1.500	Overland Slope"			
"	0.019	Pervious Area"			
"	2.317	Pervious length"			
"	1.500	Pervious slope"			
"	0.000	Impervious Area"			
"	2.317	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			

"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.005	0.000	0.047	0.047 c.m/sec"
"		Catchment 10	Pervious	Impervious	Total Area "
"		Surface Area	0.019	0.000	0.019 hectare"
"		Time of concentration	2.814	0.473	2.814 minutes"
"		Time to Centroid	93.999	88.972	93.999 minutes"
"		Rainfall depth	63.151	63.151	63.151 mm"
"		Rainfall volume	12.00	0.00	12.00 c.m"
"		Rainfall losses	34.738	2.000	34.738 mm"
"		Runoff depth	28.413	61.151	28.413 mm"
"		Runoff volume	5.40	0.00	5.40 c.m"
"		Runoff coefficient	0.450	0.000	0.450 "
"		Maximum flow	0.005	0.000	0.005 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.005	0.005	0.047	0.047"
" 51		PIPE DESIGN"			
"	0.005	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.035	metre"	
"		Velocity	0.618	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.039	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.005	0.005	0.005	0.047 c.m/sec"
" 40		HYDROGRAPH Combine	10"		
"	6	Combine "			
"	10	Node #"			
"		"			
"		Maximum flow	0.005	c.m/sec"	
"		Hydrograph volume	5.399	c.m"	
"		0.005	0.005	0.005	0.005"
" 40		HYDROGRAPH Confluence	10"		
"	7	Confluence "			
"	10	Node #"			
"		"			
"		Maximum flow	0.005	c.m/sec"	
"		Hydrograph volume	5.399	c.m"	
"		0.005	0.005	0.005	0.000"
" 51		PIPE DESIGN"			
"	0.005	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.035	metre"	
"		Velocity	0.618	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.039	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.005	0.005	0.005	0.000 c.m/sec"
" 40		HYDROGRAPH Combine	999"		
"	6	Combine "			

```

"          999  Node #"
"          "
"          Maximum flow          0.005  c.m/sec"
"          Hydrograph volume     5.399  c.m"
"          0.005  0.005  0.005  0.005"
" 40  HYDROGRAPH  Confluence  9"
"          7  Confluence "
"          9  Node #"
"          "
"          Maximum flow          0.047  c.m/sec"
"          Hydrograph volume     90.299  c.m"
"          0.005  0.047  0.005  0.000"
" 54  POND DESIGN"
"          0.047  Current peak flow  c.m/sec"
"          0.025  Target outflow  c.m/sec"
"          90.3  Hydrograph volume  c.m"
"          3.  Number of stages"
"          243.150  Minimum water level  metre"
"          243.300  Maximum water level  metre"
"          243.150  Starting water level  metre"
"          0  Keep Design Data: 1 = True; 0 = False"
"          Level Discharge  Volume"
"          243.150  0.03040  0.4900"
"          243.225  0.03210  3.820"
"          243.300  0.03370  27.120"
"          Peak outflow          0.032  c.m/sec"
"          Maximum level         243.241  metre"
"          Maximum storage        8.925  c.m"
"          Centroidal lag         1.655  hours"
"          0.005  0.047  0.032  0.000 c.m/sec"
" 40  HYDROGRAPH Next link "
"          5  Next link "
"          0.005  0.032  0.032  0.000"
" 51  PIPE DESIGN"
"          0.032  Current peak flow  c.m/sec"
"          0.013  Manning 'n'"
"          0.250  Diameter  metre"
"          0.400  Gradient  %"
"          Depth of flow          0.179  metre"
"          Velocity               0.862  m/sec"
"          Pipe capacity          0.038  c.m/sec"
"          Critical depth         0.146  metre"
" 53  ROUTE  Pipe Route 28"
"          28.20  Pipe Route 28 Reach length  ( metre)"
"          0.000  X-factor <= 0.5"
"          24.537  K-lag  ( seconds)"
"          0.000  Default(0) or user spec.(1) values used"
"          0.500  X-factor <= 0.5"
"          30.000  K-lag  ( seconds)"
"          0.560  Beta weighting factor"
"          54.545  Routing time step  ( seconds)"
"          1  No. of sub-reaches"
"          Peak outflow          0.032  c.m/sec"
"          0.005  0.032  0.032  0.000 c.m/sec"
" 40  HYDROGRAPH  Combine  8"
"          6  Combine "
"          8  Node #"
"          "
"          Maximum flow          0.057  c.m/sec"
"          Hydrograph volume     129.923  c.m"

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"		0.005	0.032	0.032	0.057"
" 40	HYDROGRAPH	Confluence	8"		
"	7	Confluence "			
"	8	Node #"			
"	"				
"	Maximum flow		0.057	c.m/sec"	
"	Hydrograph volume		129.923	c.m"	
"		0.005	0.057	0.032	0.000"
" 54	POND DESIGN"				
"	0.057	Current peak flow	c.m/sec"		
"	0.035	Target outflow	c.m/sec"		
"	129.9	Hydrograph volume	c.m"		
"	3.	Number of stages"			
"	243.200	Minimum water level	metre"		
"	243.500	Maximum water level	metre"		
"	243.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	243.200	0.03240	1.830"		
"	243.350	0.03400	5.080"		
"	243.500	0.03550	27.810"		
"	Peak outflow		0.035	c.m/sec"	
"	Maximum level		243.429	metre"	
"	Maximum storage		17.009	c.m"	
"	Centroidal lag		1.694	hours"	
"		0.005	0.057	0.035	0.000 c.m/sec"
" 40	HYDROGRAPH	Next link "			
"	5	Next link "			
"		0.005	0.035	0.035	0.000"
" 51	PIPE DESIGN"				
"	0.035	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	0.250	Diameter	metre"		
"	2.200	Gradient	%"		
"	Depth of flow		0.109	metre"	
"	Velocity		1.690	m/sec"	
"	Pipe capacity		0.088	c.m/sec"	
"	Critical depth		0.151	metre"	
" 53	ROUTE	Pipe Route 54"			
"	53.50	Pipe Route 54 Reach length	(metre)"		
"	0.474	X-factor <= 0.5"			
"	23.736	K-lag (seconds)"			
"	0.000	Default(0) or user spec.(1) values used"			
"	0.500	X-factor <= 0.5"			
"	30.000	K-lag (seconds)"			
"	0.500	Beta weighting factor"			
"	24.000	Routing time step (seconds)"			
"	1	No. of sub-reaches"			
"	Peak outflow		0.035	c.m/sec"	
"		0.005	0.035	0.035	0.000 c.m/sec"
" 40	HYDROGRAPH	Combine	6"		
"	6	Combine "			
"	6	Node #"			
"	"				
"	Maximum flow		0.119	c.m/sec"	
"	Hydrograph volume		280.797	c.m"	
"		0.005	0.035	0.035	0.119"
" 40	HYDROGRAPH	Confluence	7"		
"	7	Confluence "			
"	7	Node #"			

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"
"      Maximum flow      0.043      c.m/sec"
"      Hydrograph volume 71.739      c.m"
"      0.005      0.043      0.035      0.000"
" 54      POND DESIGN"
"      0.043      Current peak flow      c.m/sec"
"      0.035      Target outflow      c.m/sec"
"      71.7      Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200      Minimum water level      metre"
"      243.500      Maximum water level      metre"
"      243.200      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.02710      0.4000"
"      243.350      0.02900      6.940"
"      243.500      0.03020      31.840"
"      Peak outflow      0.029      c.m/sec"
"      Maximum level      243.366      metre"
"      Maximum storage      9.603      c.m"
"      Centroidal lag      1.596      hours"
"      0.005      0.043      0.029      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.005      0.029      0.029      0.000"
" 51      PIPE DESIGN"
"      0.029      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.250      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.165      metre"
"      Velocity      0.846      m/sec"
"      Pipe capacity      0.038      c.m/sec"
"      Critical depth      0.138      metre"
" 53      ROUTE      Pipe Route 29"
"      28.60      Pipe Route 29 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      25.367      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.509      Beta weighting factor"
"      50.000      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.029      c.m/sec"
"      0.005      0.029      0.029      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      6"
"      6      Combine "
"      6      Node #"
"      "
"      Maximum flow      0.147      c.m/sec"
"      Hydrograph volume      354.452      c.m"
"      0.005      0.029      0.029      0.147"
" 40      HYDROGRAPH      Confluence      6"
"      7      Confluence "
"      6      Node #"
"      "
"      Maximum flow      0.147      c.m/sec"
"      Hydrograph volume      354.452      c.m"
"      0.005      0.147      0.029      0.000"

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" 54      POND DESIGN"
"      0.147    Current peak flow      c.m/sec"
"      0.100    Target outflow      c.m/sec"
"      354.5    Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200  Minimum water level      metre"
"      243.450  Maximum water level      metre"
"      243.200  Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200    0.1034      3.110"
"      243.325    0.1063      15.440"
"      243.450    0.1081      60.240"
"      Peak outflow      0.107      c.m/sec"
"      Maximum level      243.361      metre"
"      Maximum storage      28.216      c.m"
"      Centroidal lag      1.638      hours"
"      0.005      0.147      0.107      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.005      0.107      0.107      0.000"
" 51      PIPE DESIGN"
"      0.107    Current peak flow      c.m/sec"
"      0.013    Manning 'n'"
"      0.375    Diameter      metre"
"      0.400    Gradient      %"
"      Depth of flow      0.295      metre"
"      Velocity      1.144      m/sec"
"      Pipe capacity      0.111      c.m/sec"
"      Critical depth      0.240      metre"
" 53      ROUTE      Pipe Route 53"
"      52.90      Pipe Route 53 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      34.696      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.559      Beta weighting factor"
"      75.000      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.107      c.m/sec"
"      0.005      0.107      0.107      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      4"
"      6      Combine "
"      4      Node #"
"      "
"      Maximum flow      0.195      c.m/sec"
"      Hydrograph volume      501.022      c.m"
"      0.005      0.107      0.107      0.195"
" 40      HYDROGRAPH      Confluence      5"
"      7      Confluence "
"      5      Node #"
"      "
"      Maximum flow      0.036      c.m/sec"
"      Hydrograph volume      60.129      c.m"
"      0.005      0.036      0.107      0.000"
" 54      POND DESIGN"
"      0.036    Current peak flow      c.m/sec"
"      0.025    Target outflow      c.m/sec"
"      60.1    Hydrograph volume      c.m"

```



```

"          3.  Number of stages"
" 241.750  Minimum water level  metre"
" 242.000  Maximum water level  metre"
" 241.750  Starting water level  metre"
"          0  Keep Design Data: 1 = True; 0 = False"
"          Level Discharge  Volume"
"          241.750  0.01270  0.4000"
"          241.875  0.01360  8.340"
"          242.000  0.01410  37.170"
"          Peak outflow  0.014  c.m/sec"
"          Maximum level  241.914  metre"
"          Maximum storage  17.349  c.m"
"          Centroidal lag  1.730  hours"
"          0.005  0.036  0.014  0.000 c.m/sec"
" 40  HYDROGRAPH Next link "
"          5  Next link "
"          0.005  0.014  0.014  0.000"
" 51  PIPE DESIGN"
"          0.014  Current peak flow  c.m/sec"
"          0.013  Manning 'n'"
"          0.250  Diameter  metre"
"          0.400  Gradient  %"
"          Depth of flow  0.105  metre"
"          Velocity  0.707  m/sec"
"          Pipe capacity  0.038  c.m/sec"
"          Critical depth  0.093  metre"
" 53  ROUTE  Pipe Route 32"
"          31.50  Pipe Route 32 Reach length  ( metre)"
"          0.266  X-factor <= 0.5"
"          33.435  K-lag  ( seconds)"
"          0.000  Default(0) or user spec.(1) values used"
"          0.500  X-factor <= 0.5"
"          30.000  K-lag  ( seconds)"
"          0.500  Beta weighting factor"
"          46.154  Routing time step  ( seconds)"
"          1  No. of sub-reaches"
"          Peak outflow  0.014  c.m/sec"
"          0.005  0.014  0.014  0.000 c.m/sec"
" 40  HYDROGRAPH  Combine  4"
"          6  Combine "
"          4  Node #"
"          "
"          Maximum flow  0.208  c.m/sec"
"          Hydrograph volume  561.291  c.m"
"          0.005  0.014  0.014  0.208"
" 40  HYDROGRAPH  Confluence  4"
"          7  Confluence "
"          4  Node #"
"          "
"          Maximum flow  0.208  c.m/sec"
"          Hydrograph volume  561.291  c.m"
"          0.005  0.208  0.014  0.000"
" 54  POND DESIGN"
"          0.208  Current peak flow  c.m/sec"
"          0.100  Target outflow  c.m/sec"
"          561.3  Hydrograph volume  c.m"
"          3.  Number of stages"
"          243.200  Minimum water level  metre"
"          244.000  Maximum water level  metre"
"          243.200  Starting water level  metre"

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"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200      0.1717      3.370"
"          243.600      0.1747      15.090"
"          244.000      0.1776      50.250"
"          Peak outflow                      0.175      c.m/sec"
"          Maximum level                      243.701      metre"
"          Maximum storage                      23.930      c.m"
"          Centroidal lag                      1.647      hours"
"          0.005      0.208      0.175      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5      Next link "
"          0.005      0.175      0.175      0.000"
" 51      PIPE DESIGN"
"          0.175      Current peak flow      c.m/sec"
"          0.013      Manning 'n'"
"          0.450      Diameter      metre"
"          0.400      Gradient      %"
"          Depth of flow                      0.358      metre"
"          Velocity                      1.292      m/sec"
"          Pipe capacity                      0.180      c.m/sec"
"          Critical depth                      0.294      metre"
" 53      ROUTE      Pipe Route 28"
"          27.80      Pipe Route 28 Reach length      ( metre)"
"          0.000      X-factor <= 0.5"
"          16.139      K-lag      ( seconds)"
"          0.000      Default(0) or user spec.(1) values used"
"          0.500      X-factor <= 0.5"
"          30.000      K-lag      ( seconds)"
"          0.758      Beta weighting factor"
"          60.000      Routing time step      ( seconds)"
"          1      No. of sub-reaches"
"          Peak outflow                      0.175      c.m/sec"
"          0.005      0.175      0.175      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      3"
"          6      Combine "
"          3      Node #"
"          "
"          Maximum flow                      0.235      c.m/sec"
"          Hydrograph volume                      650.765      c.m"
"          0.005      0.175      0.175      0.235"
" 40      HYDROGRAPH      Confluence      3"
"          7      Confluence "
"          3      Node #"
"          "
"          Maximum flow                      0.235      c.m/sec"
"          Hydrograph volume                      650.765      c.m"
"          0.005      0.235      0.175      0.000"
" 51      PIPE DESIGN"
"          0.235      Current peak flow      c.m/sec"
"          0.013      Manning 'n'"
"          0.450      Diameter      metre"
"          0.400      Gradient      %"
"          Surcharged HGL                      0.677      %"
"          Velocity                      1.475      m/sec"
"          Pipe capacity                      0.180      c.m/sec"
"          Critical depth                      0.000      metre"
" 53      ROUTE      Pipe Route 45"
"          44.50      Pipe Route 45 Reach length      ( metre)"
"          0.000      X-factor <= 0.5"

```

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"      16.135    K-lag    ( seconds)"
"      0.000    Default(0) or user spec.(1) values used"
"      0.500    X-factor <= 0.5"
"      30.000    K-lag    ( seconds)"
"      0.758    Beta weighting factor"
"      60.000    Routing time step    ( seconds)"
"      1        No. of sub-reaches"
"      Peak outflow                0.235    c.m/sec"
"      0.005    0.235    0.235    0.000 c.m/sec"
" 40      HYDROGRAPH    Combine    2"
"      6        Combine "
"      2        Node #"
"      "
"      Maximum flow                0.297    c.m/sec"
"      Hydrograph volume            755.302    c.m"
"      0.005    0.235    0.235    0.297"
" 40      HYDROGRAPH    Confluence    2"
"      7        Confluence "
"      2        Node #"
"      "
"      Maximum flow                0.297    c.m/sec"
"      Hydrograph volume            755.302    c.m"
"      0.005    0.297    0.235    0.000"
" 54      POND DESIGN"
"      0.297    Current peak flow    c.m/sec"
"      0.091    Target outflow    c.m/sec"
"      755.3    Hydrograph volume    c.m"
"      3.        Number of stages"
"      242.100    Minimum water level    metre"
"      242.350    Maximum water level    metre"
"      242.100    Starting water level    metre"
"      0        Keep Design Data: 1 = True; 0 = False"
"      Level Discharge    Volume"
"      242.100    0.2831    2.500"
"      242.225    0.2932    7.000"
"      242.350    0.2998    23.820"
"      Peak outflow                0.292    c.m/sec"
"      Maximum level                242.224    metre"
"      Maximum storage                6.980    c.m"
"      Centroidal lag                1.629    hours"
"      0.005    0.297    0.292    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5        Next link "
"      0.005    0.292    0.292    0.000"
" 51      PIPE DESIGN"
"      0.292    Current peak flow    c.m/sec"
"      0.013    Manning 'n'"
"      0.450    Diameter    metre"
"      0.400    Gradient    %"
"      Surcharged HGL                1.052    %"
"      Velocity                1.838    m/sec"
"      Pipe capacity                0.180    c.m/sec"
"      Critical depth                0.000    metre"
" 53      ROUTE    Pipe Route 30"
"      30.00    Pipe Route 30 Reach length    ( metre)"
"      0.000    X-factor <= 0.5"
"      16.135    K-lag    ( seconds)"
"      0.000    Default(0) or user spec.(1) values used"
"      0.500    X-factor <= 0.5"
"      30.000    K-lag    ( seconds)"

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"      0.758  Beta weighting factor"
"      60.000 Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.292    c.m/sec"
"      0.005    0.292    0.292    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.005    0.292    0.292    0.000"
" 54      POND DESIGN"
"      0.292  Current peak flow    c.m/sec"
"      0.091  Target outflow    c.m/sec"
"      755.3  Hydrograph volume    c.m"
"      3.  Number of stages"
"      239.750 Minimum water level    metre"
"      240.650 Maximum water level    metre"
"      239.750 Starting water level    metre"
"      0  Keep Design Data: 1 = True; 0 = False"
"      Level Discharge    Volume"
"      239.750  0.07500    0.5700"
"      240.200  0.1034    231.770"
"      240.650  0.1299    462.970"
"      Peak outflow          0.111    c.m/sec"
"      Maximum level          240.328    metre"
"      Maximum storage        297.292    c.m"
"      Centroidal lag          2.287    hours"
"      0.005    0.292    0.111    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.005    0.111    0.111    0.000"
" 51      PIPE DESIGN"
"      0.111  Current peak flow    c.m/sec"
"      0.013  Manning 'n'"
"      0.450  Diameter    metre"
"      0.400  Gradient    %"
"      Depth of flow          0.255    metre"
"      Velocity                1.192    m/sec"
"      Pipe capacity          0.180    c.m/sec"
"      Critical depth          0.232    metre"
" 53      ROUTE  Pipe Route 25"
"      24.50  Pipe Route 25 Reach length  ( metre)"
"      0.000  X-factor <= 0.5"
"      15.418 K-lag  ( seconds)"
"      0.000  Default(0) or user spec.(1) values used"
"      0.500  X-factor <= 0.5"
"      30.000 K-lag  ( seconds)"
"      0.622  Beta weighting factor"
"      40.000 Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.111    c.m/sec"
"      0.005    0.111    0.111    0.000 c.m/sec"
" 40      HYDROGRAPH  Combine  999"
"      6  Combine "
"      999  Node #"
"      "
"      Maximum flow          0.111    c.m/sec"
"      Hydrograph volume      760.084    c.m"
"      0.005    0.111    0.111    0.111"
" 40      HYDROGRAPH  Confluence  999"
"      7  Confluence "
"      999  Node #"

```

"	"				
"	Maximum flow	0.111	c.m/sec"		
"	Hydrograph volume	760.084	c.m"		
"	0.005 0.111	0.111	0.000"		
" 38	START/RE-START TOTALS 999"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area	1.525	hectare"		
"	Total Impervious area	0.981	hectare"		
"	Total % impervious	64.313"			
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      February-07-10"
"          10  Units used:                      ie METRIC"
"          Job folder:                        C:\swm\MIDUSS\15888"
"          Output filename:                    pst50.out"
"          Licensee name:                      Bob"
"          Company                            "
"          Date & Time last used:              09/08/2022 at 11:36:18 AM"
" 31      TIME PARAMETERS"
"          10.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          766.038  Coefficient A"
"          1.838  Constant B"
"          0.668  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          142.054  mm/hr"
"          Total depth                71.105  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 2"
"          2  Rectangular"
"          1  Equal length"
"          2  Horton equation"
"          2  No description"
"          54.500  % Impervious"
"          0.226  Total Area"
"          38.966  Flow length"
"          1.500  Overland Slope"
"          0.103  Pervious Area"
"          38.966  Pervious length"
"          1.500  Pervious slope"
"          0.123  Impervious Area"
"          38.966  Impervious length"
"          1.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          35.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.500  Pervious Lag constant (hours)"
"          7.500  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.500  Impervious Lag constant (hours)"
"          2.000  Impervious Depression storage"
"          0.074  0.000  0.000  0.000 c.m/sec"
"          Catchment 2      Pervious  Impervious Total Area "
"          Surface Area      0.103    0.123    0.226  hectare"
"          Time of concentration 13.975    2.459    5.953  minutes"
"          Time to Centroid    102.609   88.878   93.044  minutes"
"          Rainfall depth     71.105   71.105   71.105  mm"
"          Rainfall volume     73.12    87.58   160.70  c.m"
"          Rainfall losses     35.050    2.000   17.038  mm"
"          Runoff depth        36.056   69.105   54.068  mm"
"          Runoff volume       37.08    85.12   122.19  c.m"
"          Runoff coefficient   0.507    0.972    0.760  "

```

"		Maximum flow	0.026	0.049	0.074	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.074	0.074	0.000	0.000"	
" 51		PIPE DESIGN"				
"	0.074	Current peak flow	c.m/sec"			
"	0.013	Manning 'n'"				
"	1.000	Diameter	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.121	metre"		
"		Velocity	1.379	m/sec"		
"		Pipe capacity	2.398	c.m/sec"		
"		Critical depth	0.150	metre"		
" 53		ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"			
"		0.074	0.074	0.074	0.000 c.m/sec"	
" 40		HYDROGRAPH Combine	2"			
"	6	Combine "				
"	2	Node #"				
"		"				
"		Maximum flow	0.074	c.m/sec"		
"		Hydrograph volume	122.193	c.m"		
"		0.074	0.074	0.074	0.074"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.074	0.000	0.074	0.074"	
" 33		CATCHMENT 3"				
"	2	Rectangular"				
"	1	Equal length"				
"	2	Horton equation"				
"	3	No description"				
"	46.000	% Impervious"				
"	0.200	Total Area"				
"	10.638	Flow length"				
"	1.500	Overland Slope"				
"	0.108	Pervious Area"				
"	10.638	Pervious length"				
"	1.500	Pervious slope"				
"	0.092	Impervious Area"				
"	10.638	Impervious length"				
"	1.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	35.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.500	Pervious Lag constant (hours)"				
"	7.500	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.500	Impervious Lag constant (hours)"				
"	2.000	Impervious Depression storage"				
"		0.074	0.000	0.074	0.074 c.m/sec"	
"		Catchment 3	Pervious	Impervious	Total Area	"
"		Surface Area	0.108	0.092	0.200	hectare"
"		Time of concentration	6.413	1.128	3.136	minutes"
"		Time to Centroid	96.785	88.878	91.882	minutes"
"		Rainfall depth	71.105	71.105	71.105	mm"
"		Rainfall volume	76.79	65.42	142.21	c.m"
"		Rainfall losses	35.050	2.000	19.847	mm"
"		Runoff depth	36.056	69.105	51.259	mm"

"	Runoff volume	38.94	63.58	102.52	c.m"
"	Runoff coefficient	0.507	0.972	0.721	"
"	Maximum flow	0.038	0.036	0.074	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.074	0.074	0.074	0.074"	
" 51	PIPE DESIGN"				
"	0.074	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"	Depth of flow	0.120	metre"		
"	Velocity	1.377	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.150	metre"		
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.074	0.074	0.074	0.074 c.m/sec"	
" 40	HYDROGRAPH Combine 3"				
"	6	Combine "			
"	3	Node #"			
"	"				
"	Maximum flow	0.074	c.m/sec"		
"	Hydrograph volume	102.517	c.m"		
"	0.074	0.074	0.074	0.074"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.074	0.000	0.074	0.074"	
" 33	CATCHMENT 4"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	4	No description"			
"	69.700	% Impervious"			
"	0.288	Total Area"			
"	23.607	Flow length"			
"	1.500	Overland Slope"			
"	0.087	Pervious Area"			
"	23.607	Pervious length"			
"	1.500	Pervious slope"			
"	0.201	Impervious Area"			
"	23.607	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"	0.109	0.000	0.074	0.074 c.m/sec"	
"	Catchment 4	Pervious	Impervious	Total Area	"
"	Surface Area	0.087	0.201	0.288	hectare"
"	Time of concentration	10.346	1.820	3.396	minutes"
"	Time to Centroid	99.096	88.878	90.767	minutes"
"	Rainfall depth	71.105	71.105	71.105	mm"
"	Rainfall volume	62.05	142.73	204.78	c.m"

"		Rainfall losses	35.050	2.000	12.014	mm"
"		Runoff depth	36.056	69.105	59.091	mm"
"		Runoff volume	31.46	138.72	170.18	c.m"
"		Runoff coefficient	0.507	0.972	0.831	"
"		Maximum flow	0.029	0.079	0.109	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.109	0.109	0.074	0.074"	
" 51		PIPE DESIGN"				
"	0.109	Current peak flow	c.m/sec"			
"	0.013	Manning 'n'"				
"	1.000	Diameter	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.145	metre"		
"		Velocity	1.545	m/sec"		
"		Pipe capacity	2.398	c.m/sec"		
"		Critical depth	0.182	metre"		
" 53		ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"			
"		0.109	0.109	0.109	0.074 c.m/sec"	
" 40		HYDROGRAPH Combine	4"			
"	6	Combine "				
"	4	Node #"				
"		"				
"		Maximum flow	0.109	c.m/sec"		
"		Hydrograph volume	170.183	c.m"		
"		0.109	0.109	0.109	0.109"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.109	0.000	0.109	0.109"	
" 33		CATCHMENT 5"				
"	2	Rectangular"				
"	1	Equal length"				
"	2	Horton equation"				
"	5	No description"				
"	77.200	% Impervious"				
"	0.112	Total Area"				
"	31.111	Flow length"				
"	1.500	Overland Slope"				
"	0.026	Pervious Area"				
"	31.111	Pervious length"				
"	1.500	Pervious slope"				
"	0.086	Impervious Area"				
"	31.111	Impervious length"				
"	1.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	35.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.500	Pervious Lag constant (hours)"				
"	7.500	Pervious Depression storage"				
"	0.015	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.500	Impervious Lag constant (hours)"				
"	2.000	Impervious Depression storage"				
"		0.041	0.000	0.109	0.109 c.m/sec"	
"		Catchment 5	Pervious	Impervious	Total Area "	
"		Surface Area	0.026	0.086	0.112	hectare"
"		Time of concentration	12.209	2.148	3.491	minutes"
"		Time to Centroid	101.009	88.878	90.498	minutes"

"	Rainfall depth	71.105	71.105	71.105	mm"
"	Rainfall volume	18.16	61.48	79.64	c.m"
"	Rainfall losses	35.050	2.000	9.535	mm"
"	Runoff depth	36.056	69.105	61.570	mm"
"	Runoff volume	9.21	59.75	68.96	c.m"
"	Runoff coefficient	0.507	0.972	0.866	"
"	Maximum flow	0.007	0.034	0.041	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.041 0.041 0.109 0.109"				
" 51	PIPE DESIGN"				
"	0.041 Current peak flow c.m/sec"				
"	0.013 Manning 'n'"				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.091 metre"				
"	Velocity 1.156 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.111 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre)"				
"	0.041 0.041 0.041 0.109 c.m/sec"				
" 40	HYDROGRAPH Combine 5"				
"	6 Combine "				
"	5 Node #"				
"	"				
"	Maximum flow 0.041 c.m/sec"				
"	Hydrograph volume 68.958 c.m"				
"	0.041 0.041 0.041 0.041"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.041 0.000 0.041 0.041"				
" 33	CATCHMENT 6"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	6 No description"				
"	100.000 % Impervious"				
"	0.242 Total Area"				
"	55.000 Flow length"				
"	1.500 Overland Slope"				
"	0.000 Pervious Area"				
"	55.000 Pervious length"				
"	1.500 Pervious slope"				
"	0.242 Impervious Area"				
"	55.000 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"	0.095 0.000 0.041 0.041 c.m/sec"				
"	Catchment 6 Pervious Impervious Total Area "				
"	Surface Area 0.000 0.242 0.242 hectare"				

"	Time of concentration	17.186	3.023	3.023	minutes"
"	Time to Centroid	105.142	88.889	88.889	minutes"
"	Rainfall depth	71.105	71.105	71.105	mm"
"	Rainfall volume	0.00	172.07	172.07	c.m"
"	Rainfall losses	35.050	2.000	2.000	mm"
"	Runoff depth	36.056	69.105	69.105	mm"
"	Runoff volume	0.00	167.23	167.23	c.m"
"	Runoff coefficient	0.000	0.972	0.972	"
"	Maximum flow	0.000	0.095	0.095	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.095	0.095	0.041	0.041"
" 51	PIPE DESIGN"				
"	0.095	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.136	metre"	
"		Velocity	1.487	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.170	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"		0.095	0.095	0.095	0.041 c.m/sec"
" 40	HYDROGRAPH Combine 6"				
"	6	Combine "			
"	6	Node #"			
"					
"		Maximum flow	0.095	c.m/sec"	
"		Hydrograph volume	167.235	c.m"	
"		0.095	0.095	0.095	0.095"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.095	0.000	0.095	0.095"
" 33	CATCHMENT 7"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	7	No description"			
"	63.300	% Impervious"			
"	0.146	Total Area"			
"	36.500	Flow length"			
"	1.500	Overland Slope"			
"	0.054	Pervious Area"			
"	36.500	Pervious length"			
"	1.500	Pervious slope"			
"	0.092	Impervious Area"			
"	36.500	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.050	0.000	0.095	0.095 c.m/sec"

	Catchment 7	Pervious	Impervious	Total Area	"
"	Surface Area	0.054	0.092	0.146	hectare"
"	Time of concentration	13.438	2.364	4.936	minutes"
"	Time to Centroid	102.134	88.878	91.957	minutes"
"	Rainfall depth	71.105	71.105	71.105	mm"
"	Rainfall volume	38.10	65.71	103.81	c.m"
"	Rainfall losses	35.049	2.000	14.129	mm"
"	Runoff depth	36.056	69.105	56.976	mm"
"	Runoff volume	19.32	63.87	83.19	c.m"
"	Runoff coefficient	0.507	0.972	0.801	"
"	Maximum flow	0.014	0.036	0.050	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.050	0.050	0.095	0.095"	
" 51	PIPE DESIGN"				
"	0.050	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"	Depth of flow	0.100	metre"		
"	Velocity	1.227	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.123	metre"		
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.050	0.050	0.050	0.095 c.m/sec"	
" 40	HYDROGRAPH Combine 7"				
"	6	Combine "			
"	7	Node #"			
"					
"	Maximum flow	0.050	c.m/sec"		
"	Hydrograph volume	83.185	c.m"		
"	0.050	0.050	0.050	0.050"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.050	0.000	0.050	0.050"	
" 33	CATCHMENT 8"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	8	No description"			
"	69.100	% Impervious"			
"	0.078	Total Area"			
"	9.070	Flow length"			
"	1.500	Overland Slope"			
"	0.024	Pervious Area"			
"	9.070	Pervious length"			
"	1.500	Pervious slope"			
"	0.054	Impervious Area"			
"	9.070	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			

"	2.000	Impervious Depression storage"			
"		0.030	0.000	0.050	0.050 c.m/sec"
"		Catchment 8	Pervious	Impervious	Total Area "
"		Surface Area	0.024	0.054	0.078 hectare"
"		Time of concentration	5.828	1.025	1.934 minutes"
"		Time to Centroid	96.432	88.878	90.307 minutes"
"		Rainfall depth	71.105	71.105	71.105 mm"
"		Rainfall volume	17.14	38.32	55.46 c.m"
"		Rainfall losses	35.049	2.000	12.212 mm"
"		Runoff depth	36.056	69.105	58.893 mm"
"		Runoff volume	8.69	37.25	45.94 c.m"
"		Runoff coefficient	0.507	0.972	0.828 "
"		Maximum flow	0.008	0.021	0.030 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.030	0.030	0.050	0.050"
" 51		PIPE DESIGN"			
"	0.030	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.078	metre"	
"		Velocity	1.046	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.094	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.030	0.030	0.030	0.050 c.m/sec"
" 40		HYDROGRAPH Combine 8"			
"	6	Combine "			
"	8	Node #"			
"		"			
"		Maximum flow	0.030	c.m/sec"	
"		Hydrograph volume	45.937	c.m"	
"		0.030	0.030	0.030	0.030"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.030	0.000	0.030	0.030"
" 33		CATCHMENT 9"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	9	No description"			
"	42.100	% Impervious"			
"	0.214	Total Area"			
"	71.333	Flow length"			
"	1.500	Overland Slope"			
"	0.124	Pervious Area"			
"	71.333	Pervious length"			
"	1.500	Pervious slope"			
"	0.090	Impervious Area"			
"	71.333	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			

"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.057	0.000	0.030	0.030 c.m/sec"
"		Catchment 9	Pervious	Impervious	Total Area "
"		Surface Area	0.124	0.090	0.214 hectare"
"		Time of concentration	20.087	3.534	10.449 minutes"
"		Time to Centroid	107.315	88.949	96.622 minutes"
"		Rainfall depth	71.105	71.105	71.105 mm"
"		Rainfall volume	88.10	64.06	152.17 c.m"
"		Rainfall losses	35.050	2.000	21.136 mm"
"		Runoff depth	36.056	69.105	49.970 mm"
"		Runoff volume	44.68	62.26	106.94 c.m"
"		Runoff coefficient	0.507	0.972	0.703 "
"		Maximum flow	0.024	0.036	0.057 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.057	0.057	0.030	0.030"
" 51		PIPE DESIGN"			
"	0.057	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.106	metre"	
"		Velocity	1.274	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.131	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.057	0.057	0.057	0.030 c.m/sec"
" 40		HYDROGRAPH Combine 9"			
"	6	Combine "			
"	9	Node #"			
"		"			
"		Maximum flow	0.057	c.m/sec"	
"		Hydrograph volume	106.935	c.m"	
"		0.057	0.057	0.057	0.057"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.057	0.000	0.057	0.057"
" 33		CATCHMENT 10"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	10	No description"			
"	0.000	% Impervious"			
"	0.019	Total Area"			
"	2.317	Flow length"			
"	1.500	Overland Slope"			
"	0.019	Pervious Area"			
"	2.317	Pervious length"			
"	1.500	Pervious slope"			
"	0.000	Impervious Area"			
"	2.317	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			

"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.007	0.000	0.057	0.057 c.m/sec"
"		Catchment 10	Pervious	Impervious	Total Area "
"		Surface Area	0.019	0.000	0.019 hectare"
"		Time of concentration	2.570	0.452	2.570 minutes"
"		Time to Centroid	95.060	88.878	95.060 minutes"
"		Rainfall depth	71.105	71.105	71.105 mm"
"		Rainfall volume	13.51	0.00	13.51 c.m"
"		Rainfall losses	35.050	2.000	35.049 mm"
"		Runoff depth	36.056	69.105	36.056 mm"
"		Runoff volume	6.85	0.00	6.85 c.m"
"		Runoff coefficient	0.507	0.000	0.507 "
"		Maximum flow	0.007	0.000	0.007 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.007	0.007	0.057	0.057"
" 51		PIPE DESIGN"			
"	0.007	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.039	metre"	
"		Velocity	0.662	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.044	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.007	0.007	0.007	0.057 c.m/sec"
" 40		HYDROGRAPH Combine	10"		
"	6	Combine "			
"	10	Node #"			
"		"			
"		Maximum flow	0.007	c.m/sec"	
"		Hydrograph volume	6.851	c.m"	
"		0.007	0.007	0.007	0.007"
" 40		HYDROGRAPH Confluence	10"		
"	7	Confluence "			
"	10	Node #"			
"		"			
"		Maximum flow	0.007	c.m/sec"	
"		Hydrograph volume	6.851	c.m"	
"		0.007	0.007	0.007	0.000"
" 51		PIPE DESIGN"			
"	0.007	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.039	metre"	
"		Velocity	0.662	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.044	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.007	0.007	0.007	0.000 c.m/sec"
" 40		HYDROGRAPH Combine	999"		
"	6	Combine "			

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"          999  Node #"
"          "
"          Maximum flow          0.007    c.m/sec"
"          Hydrograph volume     6.851    c.m"
"          0.007    0.007    0.007    0.007"
" 40      HYDROGRAPH Confluence  9"
"          7  Confluence "
"          9  Node #"
"          "
"          Maximum flow          0.057    c.m/sec"
"          Hydrograph volume     106.935  c.m"
"          0.007    0.057    0.007    0.000"
" 54      POND DESIGN"
"          0.057  Current peak flow  c.m/sec"
"          0.025  Target outflow   c.m/sec"
"          106.9  Hydrograph volume c.m"
"          3.    Number of stages"
"          243.150 Minimum water level  metre"
"          243.300 Maximum water level  metre"
"          243.150 Starting water level  metre"
"          0  Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"          243.150  0.03040  0.4900"
"          243.225  0.03210  3.820"
"          243.300  0.03370  27.120"
"          Peak outflow          0.033    c.m/sec"
"          Maximum level         243.263  metre"
"          Maximum storage       15.601    c.m"
"          Centroidal lag        1.676    hours"
"          0.007    0.057    0.033    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5  Next link "
"          0.007    0.033    0.033    0.000"
" 51      PIPE DESIGN"
"          0.033  Current peak flow  c.m/sec"
"          0.013  Manning 'n'"
"          0.250  Diameter  metre"
"          0.400  Gradient  %"
"          Depth of flow         0.181    metre"
"          Velocity              0.864    m/sec"
"          Pipe capacity         0.038    c.m/sec"
"          Critical depth        0.147    metre"
" 53      ROUTE Pipe Route 28"
"          28.20  Pipe Route 28 Reach length ( metre)"
"          0.000  X-factor <= 0.5"
"          24.484 K-lag ( seconds)"
"          0.000  Default(0) or user spec.(1) values used"
"          0.500  X-factor <= 0.5"
"          30.000 K-lag ( seconds)"
"          0.567  Beta weighting factor"
"          54.545 Routing time step ( seconds)"
"          1  No. of sub-reaches"
"          Peak outflow          0.033    c.m/sec"
"          0.007    0.033    0.033    0.000 c.m/sec"
" 40      HYDROGRAPH Combine  8"
"          6  Combine "
"          8  Node #"
"          "
"          Maximum flow          0.061    c.m/sec"
"          Hydrograph volume     149.990  c.m"

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"          0.007      0.033      0.033      0.061"
" 40      HYDROGRAPH Confluence      8"
"          7 Confluence "
"          8 Node #"
"          "
"          Maximum flow          0.061      c.m/sec"
"          Hydrograph volume      149.990      c.m"
"          0.007      0.061      0.033      0.000"
" 54      POND DESIGN"
"          0.061 Current peak flow      c.m/sec"
"          0.035 Target outflow      c.m/sec"
"          150.0 Hydrograph volume      c.m"
"          3. Number of stages"
"          243.200 Minimum water level      metre"
"          243.500 Maximum water level      metre"
"          243.200 Starting water level      metre"
"          0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200 0.03240      1.830"
"          243.350 0.03400      5.080"
"          243.500 0.03550      27.810"
"          Peak outflow          0.035      c.m/sec"
"          Maximum level          243.459      metre"
"          Maximum storage          21.634      c.m"
"          Centroidal lag          1.725      hours"
"          0.007      0.061      0.035      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5 Next link "
"          0.007      0.035      0.035      0.000"
" 51      PIPE DESIGN"
"          0.035 Current peak flow      c.m/sec"
"          0.013 Manning 'n'"
"          0.250 Diameter      metre"
"          2.200 Gradient      %"
"          Depth of flow          0.110      metre"
"          Velocity          1.694      m/sec"
"          Pipe capacity          0.088      c.m/sec"
"          Critical depth          0.152      metre"
" 53      ROUTE Pipe Route 54"
"          53.50 Pipe Route 54 Reach length (metre)"
"          0.473 X-factor <= 0.5"
"          23.681 K-lag (seconds)"
"          0.000 Default(0) or user spec.(1) values used"
"          0.500 X-factor <= 0.5"
"          30.000 K-lag (seconds)"
"          0.500 Beta weighting factor"
"          24.000 Routing time step (seconds)"
"          1 No. of sub-reaches"
"          Peak outflow          0.035      c.m/sec"
"          0.007      0.035      0.035      0.000 c.m/sec"
" 40      HYDROGRAPH Combine      6"
"          6 Combine "
"          6 Node #"
"          "
"          Maximum flow          0.129      c.m/sec"
"          Hydrograph volume      316.326      c.m"
"          0.007      0.035      0.035      0.129"
" 40      HYDROGRAPH Confluence      7"
"          7 Confluence "
"          7 Node #"

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"	"				
"		Maximum flow	0.050	c.m/sec"	
"		Hydrograph volume	83.185	c.m"	
"		0.007 0.050 0.035		0.000"	
" 54		POND DESIGN"			
"	0.050	Current peak flow	c.m/sec"		
"	0.035	Target outflow	c.m/sec"		
"	83.2	Hydrograph volume	c.m"		
"	3.	Number of stages"			
"	243.200	Minimum water level	metre"		
"	243.500	Maximum water level	metre"		
"	243.200	Starting water level	metre"		
"	0	Keep Design Data: 1 = True; 0 = False"			
"		Level Discharge	Volume"		
"	243.200	0.02710	0.4000"		
"	243.350	0.02900	6.940"		
"	243.500	0.03020	31.840"		
"		Peak outflow	0.029	c.m/sec"	
"		Maximum level	243.389	metre"	
"		Maximum storage	13.375	c.m"	
"		Centroidal lag	1.614	hours"	
"		0.007 0.050 0.029		0.000 c.m/sec"	
" 40		HYDROGRAPH Next link "			
"	5	Next link "			
"		0.007 0.029 0.029		0.000"	
" 51		PIPE DESIGN"			
"	0.029	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	0.250	Diameter	metre"		
"	0.400	Gradient	%"		
"		Depth of flow	0.166	metre"	
"		Velocity	0.847	m/sec"	
"		Pipe capacity	0.038	c.m/sec"	
"		Critical depth	0.138	metre"	
" 53		ROUTE Pipe Route 29"			
"	28.60	Pipe Route 29 Reach length	(metre)"		
"	0.000	X-factor <= 0.5"			
"	25.332	K-lag (seconds)"			
"	0.000	Default(0) or user spec.(1) values used"			
"	0.500	X-factor <= 0.5"			
"	30.000	K-lag (seconds)"			
"	0.512	Beta weighting factor"			
"	50.000	Routing time step (seconds)"			
"	1	No. of sub-reaches"			
"		Peak outflow	0.029	c.m/sec"	
"		0.007 0.029 0.029		0.000 c.m/sec"	
" 40		HYDROGRAPH Combine	6"		
"	6	Combine "			
"	6	Node #"			
"		"			
"		Maximum flow	0.157	c.m/sec"	
"		Hydrograph volume	398.574	c.m"	
"		0.007 0.029 0.029		0.157"	
" 40		HYDROGRAPH Confluence	6"		
"	7	Confluence "			
"	6	Node #"			
"		"			
"		Maximum flow	0.157	c.m/sec"	
"		Hydrograph volume	398.574	c.m"	
"		0.007 0.157 0.029		0.000"	

```

" 54      POND DESIGN"
"      0.157    Current peak flow      c.m/sec"
"      0.100    Target outflow      c.m/sec"
"      398.6    Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200  Minimum water level      metre"
"      243.450  Maximum water level      metre"
"      243.200  Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200    0.1034      3.110"
"          243.325    0.1063      15.440"
"          243.450    0.1081      60.240"
"          Peak outflow      0.107      c.m/sec"
"          Maximum level      243.375      metre"
"          Maximum storage      33.399      c.m"
"          Centroidal lag      1.657      hours"
"          0.007    0.157    0.107    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5      Next link "
"          0.007    0.107    0.107    0.000"
" 51      PIPE DESIGN"
"      0.107    Current peak flow      c.m/sec"
"      0.013    Manning 'n'"
"      0.375    Diameter      metre"
"      0.400    Gradient      %"
"          Depth of flow      0.296      metre"
"          Velocity      1.144      m/sec"
"          Pipe capacity      0.111      c.m/sec"
"          Critical depth      0.241      metre"
" 53      ROUTE      Pipe Route 53"
"      52.90    Pipe Route 53 Reach length      ( metre)"
"      0.000    X-factor <= 0.5"
"      34.691    K-lag      ( seconds)"
"      0.000    Default(0) or user spec.(1) values used"
"      0.500    X-factor <= 0.5"
"      30.000    K-lag      ( seconds)"
"      0.560    Beta weighting factor"
"      75.000    Routing time step      ( seconds)"
"          1      No. of sub-reaches"
"          Peak outflow      0.107      c.m/sec"
"          0.007    0.107    0.107    0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      4"
"          6      Combine "
"          4      Node #"
"          "
"          Maximum flow      0.212      c.m/sec"
"          Hydrograph volume      573.754      c.m"
"          0.007    0.107    0.107    0.212"
" 40      HYDROGRAPH      Confluence      5"
"          7      Confluence "
"          5      Node #"
"          "
"          Maximum flow      0.041      c.m/sec"
"          Hydrograph volume      68.958      c.m"
"          0.007    0.041    0.107    0.000"
" 54      POND DESIGN"
"      0.041    Current peak flow      c.m/sec"
"      0.025    Target outflow      c.m/sec"
"      69.0    Hydrograph volume      c.m"

```

```

"          3.   Number of stages"
" 241.750   Minimum water level   metre"
" 242.000   Maximum water level   metre"
" 241.750   Starting water level   metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"              Level Discharge   Volume"
"          241.750   0.01270   0.4000"
"          241.875   0.01360   8.340"
"          242.000   0.01410   37.170"
"          Peak outflow           0.014   c.m/sec"
"          Maximum level           241.931   metre"
"          Maximum storage           21.192   c.m"
"          Centroidal lag           1.763   hours"
"          0.007   0.041   0.014   0.000 c.m/sec"
" 40   HYDROGRAPH Next link "
"          5   Next link "
"              0.007   0.014   0.014   0.000"
" 51   PIPE DESIGN"
"          0.014   Current peak flow   c.m/sec"
"          0.013   Manning 'n'"
"          0.250   Diameter   metre"
"          0.400   Gradient   %"
"          Depth of flow           0.105   metre"
"          Velocity           0.707   m/sec"
"          Pipe capacity           0.038   c.m/sec"
"          Critical depth           0.094   metre"
" 53   ROUTE   Pipe Route 32"
"          31.50   Pipe Route 32 Reach length   ( metre)"
"          0.265   X-factor <= 0.5"
"          33.392   K-lag   ( seconds)"
"          0.000   Default(0) or user spec.(1) values used"
"          0.500   X-factor <= 0.5"
"          30.000   K-lag   ( seconds)"
"          0.500   Beta weighting factor"
"          46.154   Routing time step   ( seconds)"
"          1   No. of sub-reaches"
"          Peak outflow           0.014   c.m/sec"
"              0.007   0.014   0.014   0.000 c.m/sec"
" 40   HYDROGRAPH   Combine   4"
"          6   Combine "
"          4   Node #"
"          "
"          Maximum flow           0.225   c.m/sec"
"          Hydrograph volume           642.727   c.m"
"              0.007   0.014   0.014   0.225"
" 40   HYDROGRAPH   Confluence   4"
"          7   Confluence "
"          4   Node #"
"          "
"          Maximum flow           0.225   c.m/sec"
"          Hydrograph volume           642.727   c.m"
"              0.007   0.225   0.014   0.000"
" 54   POND DESIGN"
"          0.225   Current peak flow   c.m/sec"
"          0.100   Target outflow   c.m/sec"
"          642.7   Hydrograph volume   c.m"
"          3.   Number of stages"
"          243.200   Minimum water level   metre"
"          244.000   Maximum water level   metre"
"          243.200   Starting water level   metre"

```

```

"      0   Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200      0.1717      3.370"
"          243.600      0.1747      15.090"
"          244.000      0.1776      50.250"
"          Peak outflow              0.176      c.m/sec"
"          Maximum level              243.785      metre"
"          Maximum storage              31.319      c.m"
"          Centroidal lag              1.668      hours"
"          0.007      0.225      0.176      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5   Next link "
"              0.007      0.176      0.176      0.000"
" 51      PIPE DESIGN"
"          0.176   Current peak flow      c.m/sec"
"          0.013   Manning 'n'"
"          0.450   Diameter      metre"
"          0.400   Gradient      %"
"          Depth of flow              0.359      metre"
"          Velocity              1.292      m/sec"
"          Pipe capacity              0.180      c.m/sec"
"          Critical depth              0.295      metre"
" 53      ROUTE      Pipe Route 28"
"          27.80      Pipe Route 28 Reach length      ( metre)"
"          0.000      X-factor <= 0.5"
"          16.137      K-lag      ( seconds)"
"          0.000      Default(0) or user spec.(1) values used"
"          0.500      X-factor <= 0.5"
"          30.000      K-lag      ( seconds)"
"          0.761      Beta weighting factor"
"          60.000      Routing time step      ( seconds)"
"          1   No. of sub-reaches"
"          Peak outflow              0.176      c.m/sec"
"              0.007      0.176      0.176      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      3"
"          6   Combine "
"          3   Node #"
"              "
"          Maximum flow              0.247      c.m/sec"
"          Hydrograph volume              743.587      c.m"
"              0.007      0.176      0.176      0.247"
" 40      HYDROGRAPH      Confluence      3"
"          7   Confluence "
"          3   Node #"
"              "
"          Maximum flow              0.247      c.m/sec"
"          Hydrograph volume              743.587      c.m"
"              0.007      0.247      0.176      0.000"
" 51      PIPE DESIGN"
"          0.247   Current peak flow      c.m/sec"
"          0.013   Manning 'n'"
"          0.450   Diameter      metre"
"          0.400   Gradient      %"
"          Surcharged HGL              0.748      %"
"          Velocity              1.551      m/sec"
"          Pipe capacity              0.180      c.m/sec"
"          Critical depth              0.000      metre"
" 53      ROUTE      Pipe Route 45"
"          44.50      Pipe Route 45 Reach length      ( metre)"
"          0.000      X-factor <= 0.5"

```

```

"      16.135   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"      0.761   Beta weighting factor"
"      60.000   Routing time step   ( seconds)"
"      1       No. of sub-reaches"
"      Peak outflow                                0.247   c.m/sec"
"      0.007      0.247      0.247      0.000 c.m/sec"
" 40      HYDROGRAPH   Combine      2"
"      6       Combine "
"      2       Node #"
"      "
"      Maximum flow                                0.321   c.m/sec"
"      Hydrograph volume                          865.780   c.m"
"      0.007      0.247      0.247      0.321"
" 40      HYDROGRAPH   Confluence    2"
"      7       Confluence "
"      2       Node #"
"      "
"      Maximum flow                                0.321   c.m/sec"
"      Hydrograph volume                          865.780   c.m"
"      0.007      0.321      0.247      0.000"
" 54      POND DESIGN"
"      0.321   Current peak flow   c.m/sec"
"      0.091   Target outflow      c.m/sec"
"      865.8   Hydrograph volume   c.m"
"      3.      Number of stages"
"      242.100 Minimum water level   metre"
"      242.350 Maximum water level   metre"
"      242.100 Starting water level   metre"
"      0       Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      242.100      0.2831      2.500"
"      242.225      0.2932      7.000"
"      242.350      0.2998      23.820"
"      Peak outflow                                0.295   c.m/sec"
"      Maximum level                                242.254   metre"
"      Maximum storage                              10.912   c.m"
"      Centroidal lag                                1.650   hours"
"      0.007      0.321      0.295      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5       Next link "
"      0.007      0.295      0.295      0.000"
" 51      PIPE DESIGN"
"      0.295   Current peak flow   c.m/sec"
"      0.013   Manning 'n'"
"      0.450   Diameter   metre"
"      0.400   Gradient   %"
"      Surcharged HGL                                1.068   %"
"      Velocity                                1.853   m/sec"
"      Pipe capacity                              0.180   c.m/sec"
"      Critical depth                              0.000   metre"
" 53      ROUTE   Pipe Route 30"
"      30.00   Pipe Route 30 Reach length   ( metre)"
"      0.000   X-factor <= 0.5"
"      16.135   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"

```

```

"      0.761  Beta weighting factor"
"      60.000  Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.295  c.m/sec"
"      0.007  0.295  0.295  0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.007  0.295  0.295  0.000"
" 54      POND DESIGN"
"      0.295  Current peak flow  c.m/sec"
"      0.091  Target outflow  c.m/sec"
"      867.5  Hydrograph volume  c.m"
"      3.  Number of stages"
"      239.750  Minimum water level  metre"
"      240.650  Maximum water level  metre"
"      239.750  Starting water level  metre"
"      0  Keep Design Data: 1 = True; 0 = False"
"      Level Discharge  Volume"
"      239.750  0.07500  0.5700"
"      240.200  0.1034  231.770"
"      240.650  0.1299  462.970"
"      Peak outflow          0.116  c.m/sec"
"      Maximum level          240.418  metre"
"      Maximum storage          343.559  c.m"
"      Centroidal lag          2.343  hours"
"      0.007  0.295  0.116  0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.007  0.116  0.116  0.000"
" 51      PIPE DESIGN"
"      0.116  Current peak flow  c.m/sec"
"      0.013  Manning 'n'"
"      0.450  Diameter  metre"
"      0.400  Gradient  %"
"      Depth of flow          0.263  metre"
"      Velocity          1.205  m/sec"
"      Pipe capacity          0.180  c.m/sec"
"      Critical depth          0.238  metre"
" 53      ROUTE  Pipe Route 25"
"      24.50  Pipe Route 25 Reach length  ( metre)"
"      0.000  X-factor <= 0.5"
"      15.253  K-lag  ( seconds)"
"      0.000  Default(0) or user spec.(1) values used"
"      0.500  X-factor <= 0.5"
"      30.000  K-lag  ( seconds)"
"      0.637  Beta weighting factor"
"      40.000  Routing time step  ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow          0.116  c.m/sec"
"      0.007  0.116  0.116  0.000 c.m/sec"
" 40      HYDROGRAPH  Combine  999"
"      6  Combine "
"      999  Node #"
"      "
"      Maximum flow          0.117  c.m/sec"
"      Hydrograph volume          873.341  c.m"
"      0.007  0.116  0.116  0.117"
" 40      HYDROGRAPH  Confluence  999"
"      7  Confluence "
"      999  Node #"

```

"	"				
"	Maximum flow	0.117	c.m/sec"		
"	Hydrograph volume	873.341	c.m"		
"	0.007 0.117	0.116	0.000"		
" 38	START/RE-START TOTALS 999"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area	1.525	hectare"		
"	Total Impervious area	0.981	hectare"		
"	Total % impervious	64.313"			
" 19	EXIT"				


```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      February-07-10"
"          10  Units used:                      ie METRIC"
"          Job folder:                          C:\swm\MIDUSS\15888"
"          Output filename:                     pst100.out"
"          Licensee name:                      Bob"
"          Company                             "
"          Date & Time last used:              09/08/2022 at 7:37:04 AM"
" 31      TIME PARAMETERS"
"          10.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          801.041  Coefficient A"
"          1.501  Constant B"
"          0.657  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          155.782  mm/hr"
"          Total depth                78.830  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 2"
"          2  Rectangular"
"          1  Equal length"
"          2  Horton equation"
"          2  No description"
"          54.500  % Impervious"
"          0.226  Total Area"
"          38.966  Flow length"
"          1.500  Overland Slope"
"          0.103  Pervious Area"
"          38.966  Pervious length"
"          1.500  Pervious slope"
"          0.123  Impervious Area"
"          38.966  Impervious length"
"          1.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          35.000  Pervious Max.infiltration"
"          5.000  Pervious Min.infiltration"
"          0.500  Pervious Lag constant (hours)"
"          7.500  Pervious Depression storage"
"          0.015  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.500  Impervious Lag constant (hours)"
"          2.000  Impervious Depression storage"
"          0.085  0.000  0.000  0.000 c.m/sec"
"          Catchment 2          Pervious  Impervious Total Area "
"          Surface Area          0.103  0.123  0.226  hectare"
"          Time of concentration  13.181  2.369  5.836  minutes"
"          Time to Centroid      102.911  88.849  93.357  minutes"
"          Rainfall depth        78.830  78.830  78.830  mm"
"          Rainfall volume        81.06  97.10  178.16  c.m"
"          Rainfall losses        35.397  2.000  17.196  mm"
"          Runoff depth           43.433  76.830  61.635  mm"
"          Runoff volume           44.66  94.63  139.29  c.m"
"          Runoff coefficient      0.551  0.975  0.782  "

```

"	Maximum flow	0.032	0.053	0.085	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.085 0.085 0.000 0.000"				
" 51	PIPE DESIGN"				
"	0.085 Current peak flow c.m/sec"				
"	0.013 Manning 'n'"				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.129 metre"				
"	Velocity 1.436 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.160 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre)"				
"	0.085 0.085 0.085 0.000 c.m/sec"				
" 40	HYDROGRAPH Combine 2"				
"	6 Combine "				
"	2 Node #"				
"	"				
"	Maximum flow 0.085 c.m/sec"				
"	Hydrograph volume 139.294 c.m"				
"	0.085 0.085 0.085 0.085"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.085 0.000 0.085 0.085"				
" 33	CATCHMENT 3"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	3 No description"				
"	46.000 % Impervious"				
"	0.200 Total Area"				
"	10.638 Flow length"				
"	1.500 Overland Slope"				
"	0.108 Pervious Area"				
"	10.638 Pervious length"				
"	1.500 Pervious slope"				
"	0.092 Impervious Area"				
"	10.638 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n' "				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n' "				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"	0.084 0.000 0.085 0.085 c.m/sec"				
"	Catchment 3 Pervious Impervious Total Area "				
"	Surface Area 0.108 0.092 0.200 hectare"				
"	Time of concentration 6.048 1.087 3.066 minutes"				
"	Time to Centroid 97.400 88.849 92.260 minutes"				
"	Rainfall depth 78.830 78.830 78.830 mm"				
"	Rainfall volume 85.14 72.52 157.66 c.m"				
"	Rainfall losses 35.397 2.000 20.034 mm"				
"	Runoff depth 43.433 76.830 58.796 mm"				

"	Runoff volume	46.91	70.68	117.59	c.m"
"	Runoff coefficient	0.551	0.975	0.746	"
"	Maximum flow	0.044	0.040	0.084	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.084	0.084	0.085	0.085"	
" 51	PIPE DESIGN"				
"	0.084	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"	Depth of flow	0.128	metre"		
"	Velocity	1.430	m/sec"		
"	Pipe capacity	2.398	c.m/sec"		
"	Critical depth	0.159	metre"		
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.084	0.084	0.084	0.085 c.m/sec"	
" 40	HYDROGRAPH Combine 3"				
"	6	Combine "			
"	3	Node #"			
"	"				
"	Maximum flow	0.084	c.m/sec"		
"	Hydrograph volume	117.592	c.m"		
"	0.084	0.084	0.084	0.084"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.084	0.000	0.084	0.084"	
" 33	CATCHMENT 4"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	4	No description"			
"	69.700	% Impervious"			
"	0.288	Total Area"			
"	23.607	Flow length"			
"	1.500	Overland Slope"			
"	0.087	Pervious Area"			
"	23.607	Pervious length"			
"	1.500	Pervious slope"			
"	0.201	Impervious Area"			
"	23.607	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"	0.122	0.000	0.084	0.084 c.m/sec"	
"	Catchment 4	Pervious	Impervious	Total Area	"
"	Surface Area	0.087	0.201	0.288	hectare"
"	Time of concentration	9.758	1.754	3.333	minutes"
"	Time to Centroid	99.544	88.849	90.959	minutes"
"	Rainfall depth	78.830	78.830	78.830	mm"
"	Rainfall volume	68.79	158.24	227.03	c.m"

"		Rainfall losses	35.397	2.000	12.119	mm"
"		Runoff depth	43.433	76.830	66.711	mm"
"		Runoff volume	37.90	154.23	192.13	c.m"
"		Runoff coefficient	0.551	0.975	0.846	"
"		Maximum flow	0.035	0.087	0.122	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.122	0.122	0.084	0.084"	
" 51		PIPE DESIGN"				
"	0.122	Current peak flow	c.m/sec"			
"	0.013	Manning 'n'"				
"	1.000	Diameter	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.154	metre"		
"		Velocity	1.600	m/sec"		
"		Pipe capacity	2.398	c.m/sec"		
"		Critical depth	0.193	metre"		
" 53		ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre) "			
"		0.122	0.122	0.122	0.084 c.m/sec"	
" 40		HYDROGRAPH Combine	4"			
"	6	Combine "				
"	4	Node #"				
"		"				
"		Maximum flow	0.122	c.m/sec"		
"		Hydrograph volume	192.127	c.m"		
"		0.122	0.122	0.122	0.122"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.122	0.000	0.122	0.122"	
" 33		CATCHMENT 5"				
"	2	Rectangular"				
"	1	Equal length"				
"	2	Horton equation"				
"	5	No description"				
"	77.200	% Impervious"				
"	0.112	Total Area"				
"	31.111	Flow length"				
"	1.500	Overland Slope"				
"	0.026	Pervious Area"				
"	31.111	Pervious length"				
"	1.500	Pervious slope"				
"	0.086	Impervious Area"				
"	31.111	Impervious length"				
"	1.500	Impervious slope"				
"	0.250	Pervious Manning 'n' "				
"	35.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.500	Pervious Lag constant (hours) "				
"	7.500	Pervious Depression storage"				
"	0.015	Impervious Manning 'n' "				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.500	Impervious Lag constant (hours) "				
"	2.000	Impervious Depression storage"				
"		0.046	0.000	0.122	0.122 c.m/sec"	
"		Catchment 5	Pervious	Impervious	Total Area "	
"		Surface Area	0.026	0.086	0.112	hectare"
"		Time of concentration	11.515	2.070	3.421	minutes"
"		Time to Centroid	101.294	88.849	90.629	minutes"

"	Rainfall depth	78.830	78.830	78.830	mm"
"	Rainfall volume	20.13	68.16	88.29	c.m"
"	Rainfall losses	35.397	2.000	9.614	mm"
"	Runoff depth	43.433	76.830	69.216	mm"
"	Runoff volume	11.09	66.43	77.52	c.m"
"	Runoff coefficient	0.551	0.975	0.878	"
"	Maximum flow	0.009	0.037	0.046	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.046 0.046 0.122 0.122"				
" 51	PIPE DESIGN"				
"	0.046 Current peak flow c.m/sec"				
"	0.013 Manning 'n'"				
"	1.000 Diameter metre"				
"	1.000 Gradient %"				
"	Depth of flow 0.096 metre"				
"	Velocity 1.197 m/sec"				
"	Pipe capacity 2.398 c.m/sec"				
"	Critical depth 0.118 metre"				
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length (metre)"				
"	0.046 0.046 0.046 0.122 c.m/sec"				
" 40	HYDROGRAPH Combine 5"				
"	6 Combine "				
"	5 Node #"				
"	"				
"	Maximum flow 0.046 c.m/sec"				
"	Hydrograph volume 77.522 c.m"				
"	0.046 0.046 0.046 0.046"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.046 0.000 0.046 0.046"				
" 33	CATCHMENT 6"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	6 No description"				
"	100.000 % Impervious"				
"	0.242 Total Area"				
"	55.000 Flow length"				
"	1.500 Overland Slope"				
"	0.000 Pervious Area"				
"	55.000 Pervious length"				
"	1.500 Pervious slope"				
"	0.242 Impervious Area"				
"	55.000 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"	0.105 0.000 0.046 0.046 c.m/sec"				
"	Catchment 6 Pervious Impervious Total Area "				
"	Surface Area 0.000 0.242 0.242 hectare"				

"	Time of concentration	16.209	2.914	2.914	minutes"
"	Time to Centroid	0.000	88.849	88.849	minutes"
"	Rainfall depth	78.830	78.830	78.830	mm"
"	Rainfall volume	0.00	190.77	190.77	c.m"
"	Rainfall losses	78.830	2.000	2.000	mm"
"	Runoff depth	0.000	76.830	76.830	mm"
"	Runoff volume	0.00	185.93	185.93	c.m"
"	Runoff coefficient	0.000	0.975	0.975	"
"	Maximum flow	0.000	0.105	0.105	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.105	0.105	0.046	0.046"
" 51	PIPE DESIGN"				
"	0.105 Current peak flow		c.m/sec"		
"	0.013 Manning 'n'"				
"	1.000 Diameter		metre"		
"	1.000 Gradient		%"		
"	Depth of flow		0.142		metre"
"	Velocity		1.528		m/sec"
"	Pipe capacity		2.398		c.m/sec"
"	Critical depth		0.178		metre"
" 53	ROUTE Zero Route"				
"	0.00 Zero Route Reach length		(metre)"		
"		0.105	0.105	0.105	0.046 c.m/sec"
" 40	HYDROGRAPH Combine 6"				
"	6 Combine "				
"	6 Node #"				
"	"				
"	Maximum flow		0.105		c.m/sec"
"	Hydrograph volume		185.929		c.m"
"		0.105	0.105	0.105	0.105"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.105	0.000	0.105	0.105"
" 33	CATCHMENT 7"				
"	2 Rectangular"				
"	1 Equal length"				
"	2 Horton equation"				
"	7 No description"				
"	63.300 % Impervious"				
"	0.146 Total Area"				
"	36.500 Flow length"				
"	1.500 Overland Slope"				
"	0.054 Pervious Area"				
"	36.500 Pervious length"				
"	1.500 Pervious slope"				
"	0.092 Impervious Area"				
"	36.500 Impervious length"				
"	1.500 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	35.000 Pervious Max.infiltration"				
"	5.000 Pervious Min.infiltration"				
"	0.500 Pervious Lag constant (hours)"				
"	7.500 Pervious Depression storage"				
"	0.015 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.500 Impervious Lag constant (hours)"				
"	2.000 Impervious Depression storage"				
"		0.057	0.000	0.105	0.105 c.m/sec"

	Catchment 7	Pervious	Impervious	Total Area	"
"	Surface Area	0.054	0.092	0.146	hectare"
"	Time of concentration	12.674	2.278	4.844	minutes"
"	Time to Centroid	102.447	88.849	92.205	minutes"
"	Rainfall depth	78.830	78.830	78.830	mm"
"	Rainfall volume	42.24	72.85	115.09	c.m"
"	Rainfall losses	35.397	2.000	14.257	mm"
"	Runoff depth	43.433	76.830	64.574	mm"
"	Runoff volume	23.27	71.00	94.28	c.m"
"	Runoff coefficient	0.551	0.975	0.819	"
"	Maximum flow	0.017	0.040	0.057	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.057	0.057	0.105	0.105"	
" 51	PIPE DESIGN"				
"	0.057	Current peak flow	c.m/sec"		
"	0.013	Manning 'n'"			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.107	metre"	
"		Velocity	1.275	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.131	metre"	
" 53	ROUTE Zero Route"				
"	0.00	Zero Route Reach length	(metre)"		
"	0.057	0.057	0.057	0.105 c.m/sec"	
" 40	HYDROGRAPH Combine 7"				
"	6	Combine "			
"	7	Node #"			
"					
"		Maximum flow	0.057	c.m/sec"	
"		Hydrograph volume	94.277	c.m"	
"	0.057	0.057	0.057	0.057"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.057	0.000	0.057	0.057"	
" 33	CATCHMENT 8"				
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	8	No description"			
"	69.100	% Impervious"			
"	0.078	Total Area"			
"	9.070	Flow length"			
"	1.500	Overland Slope"			
"	0.024	Pervious Area"			
"	9.070	Pervious length"			
"	1.500	Pervious slope"			
"	0.054	Impervious Area"			
"	9.070	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			
"	0.015	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			

"	2.000	Impervious Depression storage"				
"		0.033	0.000	0.057	0.057 c.m/sec"	
"		Catchment 8	Pervious	Impervious	Total Area	"
"		Surface Area	0.024	0.054	0.078	hectare"
"		Time of concentration	5.497	0.988	1.898	minutes"
"		Time to Centroid	97.035	88.849	90.501	minutes"
"		Rainfall depth	78.830	78.830	78.830	mm"
"		Rainfall volume	19.00	42.49	61.49	c.m"
"		Rainfall losses	35.397	2.000	12.320	mm"
"		Runoff depth	43.433	76.830	66.511	mm"
"		Runoff volume	10.47	41.41	51.88	c.m"
"		Runoff coefficient	0.551	0.975	0.844	"
"		Maximum flow	0.010	0.023	0.033	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.033	0.033	0.057	0.057"	
" 51		PIPE DESIGN"				
"	0.033	Current peak flow		c.m/sec"		
"	0.013	Manning 'n' "				
"	1.000	Diameter	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.082	metre"		
"		Velocity	1.081	m/sec"		
"		Pipe capacity	2.398	c.m/sec"		
"		Critical depth	0.100	metre"		
" 53		ROUTE Zero Route"				
"	0.00	Zero Route Reach length		(metre) "		
"		0.033	0.033	0.033	0.057 c.m/sec"	
" 40		HYDROGRAPH Combine 8"				
"	6	Combine "				
"	8	Node #"				
"		"				
"		Maximum flow	0.033	c.m/sec"		
"		Hydrograph volume	51.878	c.m"		
"		0.033	0.033	0.033	0.033"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.033	0.000	0.033	0.033"	
" 33		CATCHMENT 9"				
"	2	Rectangular"				
"	1	Equal length"				
"	2	Horton equation"				
"	9	No description"				
"	42.100	% Impervious"				
"	0.214	Total Area"				
"	71.333	Flow length"				
"	1.500	Overland Slope"				
"	0.124	Pervious Area"				
"	71.333	Pervious length"				
"	1.500	Pervious slope"				
"	0.090	Impervious Area"				
"	71.333	Impervious length"				
"	1.500	Impervious slope"				
"	0.250	Pervious Manning 'n' "				
"	35.000	Pervious Max.infiltration"				
"	5.000	Pervious Min.infiltration"				
"	0.500	Pervious Lag constant (hours) "				
"	7.500	Pervious Depression storage"				
"	0.015	Impervious Manning 'n' "				
"	0.000	Impervious Max.infiltration"				

"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours)"			
"	2.000	Impervious Depression storage"			
"		0.066	0.000	0.033	0.033 c.m/sec"
"		Catchment 9	Pervious	Impervious	Total Area "
"		Surface Area	0.124	0.090	0.214 hectare"
"		Time of concentration	18.945	3.406	10.203 minutes"
"		Time to Centroid	107.631	88.877	97.080 minutes"
"		Rainfall depth	78.830	78.830	78.830 mm"
"		Rainfall volume	97.68	71.02	168.70 c.m"
"		Rainfall losses	35.397	2.000	21.337 mm"
"		Runoff depth	43.433	76.830	57.493 mm"
"		Runoff volume	53.82	69.22	123.04 c.m"
"		Runoff coefficient	0.551	0.975	0.729 "
"		Maximum flow	0.027	0.039	0.066 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.066	0.066	0.033	0.033"
" 51		PIPE DESIGN"			
"	0.066	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.114	metre"	
"		Velocity	1.328	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.141	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre)"		
"		0.066	0.066	0.066	0.033 c.m/sec"
" 40		HYDROGRAPH Combine 9"			
"	6	Combine "			
"	9	Node #"			
"		"			
"		Maximum flow	0.066	c.m/sec"	
"		Hydrograph volume	123.036	c.m"	
"		0.066	0.066	0.066	0.066"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.066	0.000	0.066	0.066"
" 33		CATCHMENT 10"			
"	2	Rectangular"			
"	1	Equal length"			
"	2	Horton equation"			
"	10	No description"			
"	0.000	% Impervious"			
"	0.019	Total Area"			
"	2.317	Flow length"			
"	1.500	Overland Slope"			
"	0.019	Pervious Area"			
"	2.317	Pervious length"			
"	1.500	Pervious slope"			
"	0.000	Impervious Area"			
"	2.317	Impervious length"			
"	1.500	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	35.000	Pervious Max.infiltration"			
"	5.000	Pervious Min.infiltration"			
"	0.500	Pervious Lag constant (hours)"			
"	7.500	Pervious Depression storage"			

"	0.015	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.500	Impervious Lag constant (hours) "			
"	2.000	Impervious Depression storage"			
"		0.008	0.000	0.066	0.066 c.m/sec"
"		Catchment 10	Pervious	Impervious	Total Area "
"		Surface Area	0.019	0.000	0.019 hectare"
"		Time of concentration	2.424	0.436	2.424 minutes"
"		Time to Centroid	95.757	0.000	95.757 minutes"
"		Rainfall depth	78.830	78.830	78.830 mm"
"		Rainfall volume	14.98	0.00	14.98 c.m"
"		Rainfall losses	35.397	78.830	35.397 mm"
"		Runoff depth	43.433	0.000	43.433 mm"
"		Runoff volume	8.25	0.00	8.25 c.m"
"		Runoff coefficient	0.551	0.000	0.551 "
"		Maximum flow	0.008	0.000	0.008 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.008	0.008	0.066	0.066"
" 51		PIPE DESIGN"			
"	0.008	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.041	metre"	
"		Velocity	0.693	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.048	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre) "		
"		0.008	0.008	0.008	0.066 c.m/sec"
" 40		HYDROGRAPH Combine	10"		
"	6	Combine "			
"	10	Node #"			
"		"			
"		Maximum flow	0.008	c.m/sec"	
"		Hydrograph volume	8.252	c.m"	
"		0.008	0.008	0.008	0.008"
" 40		HYDROGRAPH Confluence	10"		
"	7	Confluence "			
"	10	Node #"			
"		"			
"		Maximum flow	0.008	c.m/sec"	
"		Hydrograph volume	8.252	c.m"	
"		0.008	0.008	0.008	0.000"
" 51		PIPE DESIGN"			
"	0.008	Current peak flow	c.m/sec"		
"	0.013	Manning 'n' "			
"	1.000	Diameter	metre"		
"	1.000	Gradient	%"		
"		Depth of flow	0.041	metre"	
"		Velocity	0.693	m/sec"	
"		Pipe capacity	2.398	c.m/sec"	
"		Critical depth	0.048	metre"	
" 53		ROUTE Zero Route"			
"	0.00	Zero Route Reach length	(metre) "		
"		0.008	0.008	0.008	0.000 c.m/sec"
" 40		HYDROGRAPH Combine	999"		
"	6	Combine "			

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"      999  Node #"
"
"      Maximum flow                0.008    c.m/sec"
"      Hydrograph volume           8.252    c.m"
"      0.008    0.008    0.008    0.008"
" 40      HYDROGRAPH Confluence 9"
"      7  Confluence "
"      9  Node #"
"      "
"      Maximum flow                0.066    c.m/sec"
"      Hydrograph volume           123.036  c.m"
"      0.008    0.066    0.008    0.000"
" 54      POND DESIGN"
"      0.066  Current peak flow    c.m/sec"
"      0.025  Target outflow      c.m/sec"
"      123.0  Hydrograph volume    c.m"
"      3.    Number of stages"
"      243.150 Minimum water level  metre"
"      243.300 Maximum water level  metre"
"      243.150 Starting water level  metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge Volume"
"      243.150 0.03040 0.4900"
"      243.225 0.03210 3.820"
"      243.300 0.03370 27.120"
"      Peak outflow                0.033    c.m/sec"
"      Maximum level                243.280  metre"
"      Maximum storage              20.989    c.m"
"      Centroidal lag              1.710    hours"
"      0.008    0.066    0.033    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5  Next link "
"      0.008    0.033    0.033    0.000"
" 51      PIPE DESIGN"
"      0.033  Current peak flow    c.m/sec"
"      0.013  Manning 'n'"
"      0.250  Diameter    metre"
"      0.400  Gradient    %"
"      Depth of flow                0.183    metre"
"      Velocity                    0.865    m/sec"
"      Pipe capacity                0.038    c.m/sec"
"      Critical depth              0.148    metre"
" 53      ROUTE Pipe Route 28"
"      28.20    Pipe Route 28 Reach length ( metre)"
"      0.000    X-factor <= 0.5"
"      24.446    K-lag ( seconds)"
"      0.000    Default(0) or user spec.(1) values used"
"      0.500    X-factor <= 0.5"
"      30.000    K-lag ( seconds)"
"      0.573    Beta weighting factor"
"      54.545    Routing time step ( seconds)"
"      1  No. of sub-reaches"
"      Peak outflow                0.033    c.m/sec"
"      0.008    0.033    0.033    0.000 c.m/sec"
" 40      HYDROGRAPH Combine 8"
"      6  Combine "
"      8  Node #"
"      "
"      Maximum flow                0.065    c.m/sec"
"      Hydrograph volume           176.077  c.m"

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"          0.008      0.033      0.033      0.065"
" 40      HYDROGRAPH Confluence      8"
"          7 Confluence "
"          8 Node #"
"          "
"          Maximum flow          0.065      c.m/sec"
"          Hydrograph volume      176.077      c.m"
"          0.008      0.065      0.033      0.000"
" 54      POND DESIGN"
"          0.065 Current peak flow      c.m/sec"
"          0.035 Target outflow      c.m/sec"
"          176.1 Hydrograph volume      c.m"
"          3. Number of stages"
"          243.200 Minimum water level      metre"
"          243.500 Maximum water level      metre"
"          243.200 Starting water level      metre"
"          0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200 0.03240      1.830"
"          243.350 0.03400      5.080"
"          243.500 0.03550      27.810"
"          Peak outflow          0.035      c.m/sec"
"          Maximum level          243.481      metre"
"          Maximum storage          24.945      c.m"
"          Centroidal lag          1.776      hours"
"          0.008      0.065      0.035      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5 Next link "
"          0.008      0.035      0.035      0.000"
" 51      PIPE DESIGN"
"          0.035 Current peak flow      c.m/sec"
"          0.013 Manning 'n'"
"          0.250 Diameter      metre"
"          2.200 Gradient      %"
"          Depth of flow          0.110      metre"
"          Velocity          1.697      m/sec"
"          Pipe capacity          0.088      c.m/sec"
"          Critical depth          0.153      metre"
" 53      ROUTE Pipe Route 54"
"          53.50 Pipe Route 54 Reach length (metre)"
"          0.473 X-factor <= 0.5"
"          23.646 K-lag (seconds)"
"          0.000 Default(0) or user spec.(1) values used"
"          0.500 X-factor <= 0.5"
"          30.000 K-lag (seconds)"
"          0.500 Beta weighting factor"
"          24.000 Routing time step (seconds)"
"          1 No. of sub-reaches"
"          Peak outflow          0.035      c.m/sec"
"          0.008      0.035      0.035      0.000 c.m/sec"
" 40      HYDROGRAPH Combine      6"
"          6 Combine "
"          6 Node #"
"          "
"          Maximum flow          0.138      c.m/sec"
"          Hydrograph volume      363.114      c.m"
"          0.008      0.035      0.035      0.138"
" 40      HYDROGRAPH Confluence      7"
"          7 Confluence "
"          7 Node #"

```

```

"
"      Maximum flow      0.057      c.m/sec"
"      Hydrograph volume  94.277      c.m"
"      0.008      0.057      0.035      0.000"
" 54      POND DESIGN"
"      0.057      Current peak flow      c.m/sec"
"      0.035      Target outflow      c.m/sec"
"      94.3      Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200      Minimum water level      metre"
"      243.500      Maximum water level      metre"
"      243.200      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.02710      0.4000"
"      243.350      0.02900      6.940"
"      243.500      0.03020      31.840"
"      Peak outflow      0.029      c.m/sec"
"      Maximum level      243.409      metre"
"      Maximum storage      16.756      c.m"
"      Centroidal lag      1.631      hours"
"      0.008      0.057      0.029      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.008      0.029      0.029      0.000"
" 51      PIPE DESIGN"
"      0.029      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.250      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.166      metre"
"      Velocity      0.848      m/sec"
"      Pipe capacity      0.038      c.m/sec"
"      Critical depth      0.139      metre"
" 53      ROUTE      Pipe Route 29"
"      28.60      Pipe Route 29 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      25.300      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.515      Beta weighting factor"
"      50.000      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.029      c.m/sec"
"      0.008      0.029      0.029      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      6"
"      6      Combine "
"      6      Node #"
"      "
"      Maximum flow      0.167      c.m/sec"
"      Hydrograph volume      458.783      c.m"
"      0.008      0.029      0.029      0.167"
" 40      HYDROGRAPH      Confluence      6"
"      7      Confluence "
"      6      Node #"
"      "
"      Maximum flow      0.167      c.m/sec"
"      Hydrograph volume      458.783      c.m"
"      0.008      0.167      0.029      0.000"

```

```

" 54      POND DESIGN"
"      0.167    Current peak flow      c.m/sec"
"      0.100    Target outflow      c.m/sec"
"      458.8    Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200  Minimum water level      metre"
"      243.450  Maximum water level      metre"
"      243.200  Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"          243.200    0.1034      3.110"
"          243.325    0.1063      15.440"
"          243.450    0.1081      60.240"
"          Peak outflow      0.107      c.m/sec"
"          Maximum level      243.391      metre"
"          Maximum storage      39.164      c.m"
"          Centroidal lag      1.688      hours"
"          0.008    0.167    0.107    0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5      Next link "
"          0.008    0.107    0.107    0.000"
" 51      PIPE DESIGN"
"      0.107    Current peak flow      c.m/sec"
"      0.013    Manning 'n'"
"      0.375    Diameter      metre"
"      0.400    Gradient      %"
"          Depth of flow      0.297      metre"
"          Velocity      1.144      m/sec"
"          Pipe capacity      0.111      c.m/sec"
"          Critical depth      0.241      metre"
" 53      ROUTE      Pipe Route 53"
"      52.90      Pipe Route 53 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      34.687      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.562      Beta weighting factor"
"      75.000      Routing time step      ( seconds)"
"          1      No. of sub-reaches"
"          Peak outflow      0.107      c.m/sec"
"          0.008    0.107    0.107    0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      4"
"          6      Combine "
"          4      Node #"
"          "
"          Maximum flow      0.226      c.m/sec"
"          Hydrograph volume      646.140      c.m"
"          0.008    0.107    0.107    0.226"
" 40      HYDROGRAPH      Confluence      5"
"          7      Confluence "
"          5      Node #"
"          "
"          Maximum flow      0.046      c.m/sec"
"          Hydrograph volume      77.522      c.m"
"          0.008    0.046    0.107    0.000"
" 54      POND DESIGN"
"      0.046    Current peak flow      c.m/sec"
"      0.025    Target outflow      c.m/sec"
"      77.5    Hydrograph volume      c.m"

```

```

"      3.  Number of stages"
"      241.750  Minimum water level      metre"
"      242.000  Maximum water level      metre"
"      241.750  Starting water level     metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      241.750  0.01270      0.4000"
"      241.875  0.01360      8.340"
"      242.000  0.01410      37.170"
"      Peak outflow          0.014      c.m/sec"
"      Maximum level          241.946      metre"
"      Maximum storage        24.695      c.m"
"      Centroidal lag          1.797      hours"
"      0.008      0.046      0.014      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.008      0.014      0.014      0.000"
" 51      PIPE DESIGN"
"      0.014      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.250      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow          0.105      metre"
"      Velocity                0.708      m/sec"
"      Pipe capacity          0.038      c.m/sec"
"      Critical depth          0.094      metre"
" 53      ROUTE      Pipe Route 32"
"      31.50      Pipe Route 32 Reach length ( metre)"
"      0.264      X-factor <= 0.5"
"      33.353      K-lag ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag ( seconds)"
"      0.500      Beta weighting factor"
"      46.154      Routing time step ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow          0.014      c.m/sec"
"      0.008      0.014      0.014      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      4"
"      6      Combine "
"      4      Node #"
"      "
"      Maximum flow          0.239      c.m/sec"
"      Hydrograph volume      723.374      c.m"
"      0.008      0.014      0.014      0.239"
" 40      HYDROGRAPH      Confluence      4"
"      7      Confluence "
"      4      Node #"
"      "
"      Maximum flow          0.239      c.m/sec"
"      Hydrograph volume      723.374      c.m"
"      0.008      0.239      0.014      0.000"
" 54      POND DESIGN"
"      0.239      Current peak flow      c.m/sec"
"      0.100      Target outflow      c.m/sec"
"      723.4      Hydrograph volume      c.m"
"      3.      Number of stages"
"      243.200  Minimum water level      metre"
"      244.000  Maximum water level      metre"
"      243.200  Starting water level      metre"

```

```

"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      243.200      0.1717      3.370"
"      243.600      0.1747      15.090"
"      244.000      0.1776      50.250"
"      Peak outflow      0.176      c.m/sec"
"      Maximum level      243.857      metre"
"      Maximum storage      37.655      c.m"
"      Centroidal lag      1.694      hours"
"      0.008      0.239      0.176      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.008      0.176      0.176      0.000"
" 51      PIPE DESIGN"
"      0.176      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Depth of flow      0.360      metre"
"      Velocity      1.292      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.295      metre"
" 53      ROUTE      Pipe Route 28"
"      27.80      Pipe Route 28 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"
"      16.135      K-lag      ( seconds)"
"      0.000      Default(0) or user spec.(1) values used"
"      0.500      X-factor <= 0.5"
"      30.000      K-lag      ( seconds)"
"      0.764      Beta weighting factor"
"      60.000      Routing time step      ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow      0.176      c.m/sec"
"      0.008      0.176      0.176      0.000 c.m/sec"
" 40      HYDROGRAPH      Combine      3"
"      6      Combine "
"      3      Node #"
"      "
"      Maximum flow      0.257      c.m/sec"
"      Hydrograph volume      844.405      c.m"
"      0.008      0.176      0.176      0.257"
" 40      HYDROGRAPH      Confluence      3"
"      7      Confluence "
"      3      Node #"
"      "
"      Maximum flow      0.257      c.m/sec"
"      Hydrograph volume      844.405      c.m"
"      0.008      0.257      0.176      0.000"
" 51      PIPE DESIGN"
"      0.257      Current peak flow      c.m/sec"
"      0.013      Manning 'n'"
"      0.450      Diameter      metre"
"      0.400      Gradient      %"
"      Surcharged HGL      0.812      %"
"      Velocity      1.616      m/sec"
"      Pipe capacity      0.180      c.m/sec"
"      Critical depth      0.000      metre"
" 53      ROUTE      Pipe Route 45"
"      44.50      Pipe Route 45 Reach length      ( metre)"
"      0.000      X-factor <= 0.5"

```



```

"      16.135   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"      0.764   Beta weighting factor"
"      60.000   Routing time step   ( seconds)"
"      1       No. of sub-reaches"
"      Peak outflow                                0.257   c.m/sec"
"      0.008   0.257   0.257   0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   2"
"      6       Combine "
"      2       Node #"
"      "
"      Maximum flow                                0.342   c.m/sec"
"      Hydrograph volume                            983.700   c.m"
"      0.008   0.257   0.257   0.342"
" 40      HYDROGRAPH   Confluence   2"
"      7       Confluence "
"      2       Node #"
"      "
"      Maximum flow                                0.342   c.m/sec"
"      Hydrograph volume                            983.700   c.m"
"      0.008   0.342   0.257   0.000"
" 54      POND DESIGN"
"      0.342   Current peak flow   c.m/sec"
"      0.091   Target outflow   c.m/sec"
"      983.7   Hydrograph volume   c.m"
"      3.       Number of stages"
"      242.100   Minimum water level   metre"
"      242.350   Maximum water level   metre"
"      242.100   Starting water level   metre"
"      0       Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      242.100   0.2831   2.500"
"      242.225   0.2932   7.000"
"      242.350   0.2998   23.820"
"      Peak outflow                                0.296   c.m/sec"
"      Maximum level                                242.313   metre"
"      Maximum storage                            18.807   c.m"
"      Centroidal lag                                1.675   hours"
"      0.008   0.342   0.296   0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5       Next link "
"      0.008   0.296   0.296   0.000"
" 51      PIPE DESIGN"
"      0.296   Current peak flow   c.m/sec"
"      0.013   Manning 'n'"
"      0.450   Diameter   metre"
"      0.400   Gradient   %"
"      Surcharged HGL                                1.078   %"
"      Velocity                                1.861   m/sec"
"      Pipe capacity                                0.180   c.m/sec"
"      Critical depth                                0.000   metre"
" 53      ROUTE   Pipe Route 30"
"      30.00   Pipe Route 30 Reach length   ( metre)"
"      0.000   X-factor <= 0.5"
"      16.135   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"

```

```

"      0.764   Beta weighting factor"
"      60.000   Routing time step   ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow                0.296   c.m/sec"
"      0.008   0.296   0.296   0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.008   0.296   0.296   0.000"
" 54      POND DESIGN"
"      0.296   Current peak flow    c.m/sec"
"      0.091   Target outflow      c.m/sec"
"      1041.1   Hydrograph volume   c.m"
"      3.      Number of stages"
"      239.750   Minimum water level  metre"
"      240.650   Maximum water level  metre"
"      239.750   Starting water level  . metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      239.750   0.07500   0.5700"
"      240.200   0.1034   231.770"
"      240.650   0.1299   462.970"
"      Peak outflow                0.126   c.m/sec"
"      Maximum level                240.583   metre"
"      Maximum storage              428.491   c.m"
"      Centroidal lag              2.439   hours"
"      0.008   0.296   0.126   0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.008   0.126   0.126   0.000"
" 51      PIPE DESIGN"
"      0.126   Current peak flow    c.m/sec"
"      0.013   Manning 'n'"
"      0.450   Diameter    metre"
"      0.400   Gradient    %"
"      Depth of flow                0.277   metre"
"      Velocity                    1.226   m/sec"
"      Pipe capacity                0.180   c.m/sec"
"      Critical depth              0.248   metre"
" 53      ROUTE   Pipe Route 25"
"      24.50   Pipe Route 25 Reach length   ( metre)"
"      0.000   X-factor <= 0.5"
"      14.989   K-lag   ( seconds)"
"      0.000   Default(0) or user spec.(1) values used"
"      0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"      0.656   Beta weighting factor"
"      42.857   Routing time step   ( seconds)"
"      1      No. of sub-reaches"
"      Peak outflow                0.126   c.m/sec"
"      0.008   0.126   0.126   0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   999"
"      6      Combine "
"      999   Node #"
"      "
"      Maximum flow                0.126   c.m/sec"
"      Hydrograph volume          1048.758   c.m"
"      0.008   0.126   0.126   0.126"
" 40      HYDROGRAPH   Confluence   999"
"      7      Confluence "
"      999   Node #"

```

"	"				
"	Maximum flow		0.126	c.m/sec"	
"	Hydrograph volume		1048.758	c.m"	
"		0.008	0.126	0.126	0.000"
" 38	START/RE-START TOTALS 999"				
"	3	Runoff Totals on EXIT"			
"	Total Catchment area			1.525	hectare"
"	Total Impervious area			0.981	hectare"
"	Total % impervious			64.313"	
" 19	EXIT"				

Appendix 'D'
Preliminary Storm Sewer Design Calculations

STORM SEWER DESIGN

C[#] 0.879

[illegible]

NORFOLK DISPOSAL SERVICES LTD.

LAND USE COMPATIBILITY STUDY NORFOLK DISPOSAL EXPANSION PROJECT

SEPTEMBER 23, 2022

DRAFT





LAND USE COMPATIBILITY STUDY

NORFOLK DISPOSAL EXPENSION PROJECT

NORFOLK DISPOSAL SERVICE LTD.

DRAFT

PROJECT NO.: 221-08564-00

DATE: SEPTEMBER 23, 2022

WSP
UNIT 2
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September 23, 2022

Norfolk Disposal Services Ltd.
811 Old Highway 24
Waterford, ON N0E 1Y0

Attention: Bernie Debono, General Manager

Subject: Norfolk Disposal Expansion Project Land Use Compatibility Study

WSP Canada Inc. (WSP) was retained by Norfolk Disposal Services Ltd. (Norfolk Disposal) to complete a Land Use Compatibility Study (the 'Study') to assess potential air quality, dust, odour, noise and vibration concerns for the proposed expansion project (the 'Proposed Expansion') at their waste disposal facility, which is located at 811 Old Highway 24 and 42 Thompson Road West, in Waterford, Ontario (the 'Site'). It is understood that the Proposed Expansion will include an increase of the existing disposal services at the Site and the addition of a new transfer building for recyclable materials, plus a public drop-off area with approximately 12 parking spaces to accommodate employees and other users of the Site. It is also understood that the Proposed Expansion will include a landscaped berm at the northeast corner of the Site and a landscaped area along the entire frontage of Old Highway 24 to provide a buffer between the existing and proposed uses of the Site, as well as between the Proposed Expansion and the nearby sensitive land uses.

The Study was completed in support of a Site Plan Application ('SPA'), as requested by the Norfolk County ('County'). It is understood that the Site is currently zoned as General Industrial ('GM') and the Proposed Expansion is permitted under the current zoning designation.

The Study was conducted in accordance with the guidance provided in the document "Compatibility between Industrial Facilities and Sensitive Land Uses", published by the Ontario Ministry of the Environment, Conservation and Parks (MECP) as Guideline D-6 (the 'D-6 Guideline').

The purpose of the Study was to assess potential impacts that the Proposed Expansion could have on the surrounding sensitive land uses, and vice versa. The objective was to review compatibility of land uses and flexibility for growth in developing the community.

Sincerely,

WSP Canada Inc.

Lillian Li, M.Eng.
Air Quality Specialist

WSP ref.: 221-08564-00

SIGNATURES

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A	SITE'S CURRENT ENVIRONMENTAL COMPLIANCE APPROVALS (ECA)
B	INDUSTRIAL CLASS DEFINITIONS
C	SUMMARY OF SENSITIVE RECEPTORS

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Norfolk Disposal Services Ltd. (Norfolk Disposal) to prepare a Land Use Compatibility Study (the ‘Study’) for the proposed expansion project (the ‘Proposed Expansion’) at their waste disposal facility, which is located at 811 Old Highway 24 and 42 Thompson Road West, in Waterford, Ontario (the ‘Site’). WSP has reviewed the surrounding land uses with respect to the guideline “Compatibility between Industrial Facilities and Sensitive Land Uses”, published by the Ontario Ministry of the Environment, Conservation and Parks (MECP) as Guideline D-6 (the ‘D-6 Guideline’).

The purpose of the Study is to assess potential air quality, dust, odour, noise, and vibration (nuisance) impacts that the Proposed Expansion could have on the surrounding sensitive land uses, and vice versa. The objective is to evaluate compatibility of land uses and flexibility for growth in developing the community. This report describes the industrial operations at the Site and identifies nearby sensitive receptors which have the greatest potential to be impacted by the Proposed Expansion, with respect to air quality, dust, odour, noise and vibration.

The methodology, findings, conclusions, and recommendations of the Study are presented in the subsequent sections of this report.

1.1 PROPOSED EXPANSION

Norfolk Disposal operates a waste disposal facility at 811 Old Highway 24 and 42 Thompson Road West, in Waterford, Ontario, as shown in **Figure 1**, for the receipt, processing, temporary storage and transfer of non-hazardous solid industrial, commercial and residential waste serving the Province of Ontario. The Site currently operates under an Air and Noise Environment Compliance Approval (ECA) No. 3784-B9TSW9 issued by the MECP on May 3, 2019, and a Waste Processing ECA No. A-500-1210926002 issued by the MECP on November 19, 2021. A copy of both ECAs can be found in **Appendix A**.

It is understood that the Proposed Expansion will include an expansion of the existing disposal services at the Site through the addition of a new transfer building for recyclable materials, plus a public drop-off area with approximately 12 parking spaces to accommodate employees and other users of the Site. It is also understood that the Proposed Expansion will include a landscaped berm at the northeast corner of the Site and a landscaped area along the entire frontage of Old Highway 24 to provide an approximate 21 m buffer from the Site’s northeast boundary and an approximate 17 m buffer from the Site’s east boundary. The landscaped area will also provide a buffer between the existing and proposed uses of the Site. A copy of the Concept Plan for the Proposed Expansion can be found in **Figure 2**, as provided by Norfolk Disposal.

It is understood that Norfolk Disposal is required to submit a Site Plan Application (‘SPA’) application to the Norfolk County (‘County’). This Study has been prepared to support this application.

1.2 ZONING

The Site is located in Norfolk County, Ontario, and is currently zoned as General Industrial (‘GM’) under the Norfolk County Zoning By-Law. It is understood that the Proposed Expansion is permitted under the current zoning designation. The area surrounding the Site consists primarily of commercial and industrial zoning to the north, commercial and residential zoning to the east, industrial zoning to the south, and agricultural and development zoning to the west. A zoning map of the land surrounding the Site is shown in **Figure 3**.

1.3 EVALUATION OF SURROUNDING LAND USES

Following the D-6 Guideline, a Study Area of 1,000 m around the Site was established. The D-6 Guideline outlines recommended minimum separation distances and potential influence areas between industrial facilities and sensitive land uses based on an industrial classification system. The recommended minimum separation distance is the distance (property line to property line) between land uses, within which an industrial use is expected to cause an

adverse effect. As a result, the D-6 Guideline states that incompatible development should be avoided within minimum separation distances. The potential influence area is a greater distance in which the industrial operations may have the potential to cause an adverse effect, depending on site operations, source emission controls, and meteorological conditions. Facilities that are located outside of their respective recommended minimum separation distance and potential influence area from sensitive land use are expected to be negligible with respect to creating nuisance issues that would give rise to complaints. Therefore, this Study addresses the neighbouring sensitive land uses within the recommended minimum separation distance and potential influence area of the Site as having the highest potential to be impacted by the Site's operations.

In this Study, surrounding sensitive land uses were identified based on readily available information (*i.e.*, aerial photography, Norfolk County zoning database, etc.).

2 APPLICABLE GUIDELINES

The following regulations and guidelines have been reviewed as part of this Study:

- MECP Environmental Land Use Planning Guide, D-6 Compatibility between Industrial Facilities and Sensitive Land Uses (D-6 Guideline);
- Ontario Environmental Protection Act, R.S.O. 1990, c.E19;
- Ontario Regulation 419/05: Air Pollution – Local Air Quality;
- Ontario Regulation 524/98: Air Pollution – Environmental Compliance Approvals – Exemptions from Section 9 of the Act;
- Ontario Regulation 1/17: Registrations Under Part II.2 of The Act – Activities Requiring Assessment of Air Emissions; and
- Ontario Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning (NPC-300)

3 CLASSIFYING INDUSTRIAL LAND USES

3.1 D-6 GUIDELINE

The objective of the D-6 Guideline is to prevent or minimize the encroachment of sensitive land uses upon industrial land uses and vice versa. These two land uses may be considered incompatible due to possible adverse effects on sensitive land uses created by industrial operations. The D-6 Guideline categorizes industrial facilities into three (3) classes according to their size, volume of operations, and nature of their emissions and defines a sensitive land use.

The D-6 Guideline provides definitions and examples to illustrate the three industrial classes, provided in **Appendix B** and below.

- A Class I facility is a place of business for a small-scale, self-contained plant or building which produces and stores a product that is contained in a package and has low probability of fugitive emissions. It has daytime operations only, with infrequent movement of products and heavy trucks and no outside storage;
- A Class II facility is a place of business for medium scale processing and manufacturing with outdoor storage of wastes or materials. It could have shift operations and there is frequent movement of products and heavy trucks during daytime hours. It has periodic outputs of major annoyance; and
- A Class III facility is a place of business for large scale manufacturing or processing, which has large physical size, outside storage of raw and finished products, large production volumes and continuous movement of products and employees during daily shift operations. It has frequent outputs of major annoyance and there is high probability of fugitive emissions.

Facilities that do not meet the definition of any one of the three industrial classes are understood to have little potential for creating nuisance issues that would give rise to complaints. The definitions and examples in the D-6 Guideline relevant to nuisance concerns were used to characterize the Site. The D-6 Guideline defines a recommended minimum separation distance and potential influence area between industrial facilities and sensitive land uses for each industrial classification, presented in **Table 3-1**.

Table 3-1 Guideline D-6 Recommended Minimum Separation Distance and Potential Influence Areas for Industrial Land Uses

INDUSTRIAL CLASSIFICATION	RECOMMENDED MINIMUM SEPARATION DISTANCE (m)	POTENTIAL INFLUENCE AREA (m)
Class I – Light Industrial	20	70
Class II – Medium Industrial	70	300
Class III – Heavy Industrial	300	1 000

3.2 POTENTIAL SOURCES OF EMISSIONS

Norfolk Disposal operates a waste disposal facility at the Site for the receipt, processing, temporary storage and transfer of non-hazardous solid industrial, commercial and residential waste including scrap metal, wood, concrete, cardboard, paper, blue box materials as well as electronics.

The Site's existing and proposed operations were reviewed in the Study and potential sources of air quality, dust, odour and noise emissions that could generate nuisance impacts to off-site receptors have been identified as below. Based on the existing and proposed activities at the Site, vibration nuisance impacts are expected to be negligible off-site.

3.2.1 EXISTING OPERATIONS

Based on a review of the Site's current ECAs, the latest Emission Summary and Dispersion Modelling (ESDM) report and Acoustic Assessment Report (AAR), the following existing sources of air quality, dust, odour and noise emissions that could generate nuisance impacts to off-site receptors have been identified:

- Air quality, dust, odour and noise emissions from the operation of one (1) paint booth which is equipped with one (1) paint spray gun, 14.5 square metres of dry type paint arrestor filters and one (1) natural gas fired air make up unit;
- Dust emissions from the operation of one (1) maintenance welding station;
- Dust and noise emissions from the operation of one (1) electric wood grinder and its associated conveyor;
- Air quality and odour emissions from the operation of one (1) paint mixing room;
- Odour emissions from receiving, processing, storing and transferring wastes;
- Dust emissions from vehicles travelling on unpaved parking lots and roadways;
- Dust emissions from outside stockpiles of scrap metals;
- Noise emissions from the operation of one (1) carboard baler;
- Noise emission from the operation of two (2) indoor loaders;
- Dust and noise emissions from three (3) yard trucks travelling within the Site;
- Dust and noise emissions from over fifty (50) on-road trucks travelling within the Site; and
- Noise emissions from the operation of three (3) indoor excavators.

It is understood that the Site has implemented a Dust Control Plan (DCP) dated June 26, 2017 for the control of existing fugitive dust at the Site. It is also understood that the ECAs include a condition to conduct daily visual inspection of the Site to ensure the operations are not causing any dust, odour and noise nuisances, as well as a condition to mitigate dust, noise and odour emission sources to not cause an adverse effect. The ESDM Report and AAR that support the existing operations, demonstrate that compliance with relevant air quality and noise limits can be achieved for the existing facility operations.

3.2.2 PROPOSED OPERATIONS

Based on a review of the Concept Plan and the expected activities associated with the Proposed Expansion, the following new sources of dust, odour and noise emissions that could generate nuisance impacts to off-site receptors have been identified:

- Dust and noise emissions from the operation of one (1) new waste compactor to be located within the proposed new transfer building; it is expected that noise generated by the waste compactor will not be audible offsite if there are no open bay doors, windows and louvres at the new transfer building when the compactor is operating;
- Dust emissions from additional vehicles travelling on unpaved parking lots and roadways; and
- Odour emissions from receiving, processing, storing and transferring of additional waste.

Some of the new sources may trigger the need to amend the existing ECAs for the Site, including the preparation of updated ESDM Report and AAR to demonstrate that the Site can continue to operate in compliance with the relevant limits with the Proposed Expansion. Some of the proposed new operations (e.g., fugitive road dust) do not require assessment as part of an ECA but still have the potential to generate nuisance.

3.3 SITE INDUSTRIAL CLASSIFICATION

Based on the definitions and examples of industrial classes outlined in **Appendix B**, it was determined the Site aligns with a Class II industrial facility based on the following criteria associated with emission sources operated at the Site:

- Dust and odour emissions potentially frequent and occasionally intense;
- Noise occasionally audible off property;
- Outside storage of scrap metal; and
- Frequent movement of heavy trucks with the majority of movements during daytime hours.

It should be noted that Section 4.1.3 of the D-6 Guideline states that mitigation at the industrial source may enable an industry to be categorized as a lesser Class (e.g., from a Class II to a Class I), thereby reducing the minimum separation distance requirements set out in Section 4.3 “Recommended Minimum Separation Distances”.

4 EVALUATING NEARBY SENSITIVE LAND USES

Since the Site is classified as a Class II industrial facility, the Guideline D-6 recommends a minimum separation distance of 70 m and a potential influence area of 300 m from the Site. Sensitive receptors located outside potential influence area are not expected to have adverse nuisance impacts caused by the Proposed Expansion. Therefore, this Study addresses the neighbouring sensitive land uses within the recommended minimum separation distance and potential influence area of the Site as having the highest potential to be impacted by the Proposed Expansion.

4.1 IDENTIFYING NEARBY SENSITIVE LAND USES

After reviewing maps and aerial imagery of the area, one hundred and one (101) sensitive land uses that could be impacted by operations at the Site's existing and proposed operations were identified, as shown in **Table C1** located in **Appendix C**. **Figure 4** outlines the location and identification of the properties evaluated as part of this Study. Sensitive receptors located within the recommended minimum separation distance of 70 m are listed in **Table 4-1**.

Table 4-1 Sensitive Receptors Identified Within the MECP D-6 Recommended Minimum Separation Distance

SENSITIVE RECEPTORS	APPROXIMATE DISTANCE FROM SITE (M)	APPROXIMATE DISTANCE FROM SITE CONSIDERING BUFFER LENGTH (M)
Residential Property at 822 Old Highway 24	19	47
Residential Property at 832 Old Highway 24	38	71
Residential Property at 4 Thompson Road East	61	72

Notes:

X – indicates receptor is within the recommended minimum separation distance

X – indicates receptor is outside the recommended minimum separation distance, but within the potential influence area

Three (3) residential properties (822 Old Highway 24, 832 Old Highway 24 & 4 Thompson Road East) are located northeast of the Site and within the recommended minimum separation distance for a Class II facility. It is noted that after the proposed landscaped buffer area is taken into consideration, one (1) residential property (822 Old Highway 24) will still be located within the recommended minimum separation distance. One hundred (100) additional residential properties are located north, east, southwest of the Site were identified as being within the potential influence area for a Class II facility but outside of the recommended minimum separation distance.

As stated above, the Site is an existing operating facility that operates in compliance with an ECA for air and noise emissions. The proposed operations do not change the D-6 classification of the facility but are anticipated to result in an increase in air and noise emissions. The Air and Noise ECA for the Site, including supporting ESDM Report and AAR, may need to be updated to include the new sources. This would include an update of the demonstrate that the Site can continue to demonstrate compliance with the relevant air quality and noise limits. Some of the proposed new operations (e.g., fugitive road dust) do not require assessment as part of an ECA but still have the potential to generate nuisance.

An analysis of meteorological data was completed to further examine the potential for nuisance impacts from the Site's operations on the residential properties located within the minimum separation distance and potential influence area.

4.2 METEOROLOGICAL DATA ANALYSIS

Localized meteorological data was reviewed to assess the prevailing wind direction and frequency of winds blowing from the Site towards nearby sensitive receptors. WSP obtained historical climate data from the Environment and Climate Change Canada (ECCC) website and reviewed the meteorological data for the frequency analysis. The Hamilton A Station (Climate ID #6153193) was selected based on proximity to the Site, data availability¹, and would provide representative wind conditions at the Site.

The wind data averaged from 2017 to 2021 compiled from the Hamilton A Station, located approximately 40 km northeast from the Site, was analyzed and applied to the area to determine the frequency that the wind could contribute to nuisance issues such as fugitive dust and odour from the Site. A 'blowing from' wind rose was produced for the aforementioned period and is included in this report as **Figure 5**. The frequency data is included in **Table 4-2** below.

Table 4-2 Wind Data for Station #6153193

WIND BLOWING FROM	FREQUENCY (%)	EQUIVALENT DAYS PER YEAR
N	3.1	11
NNE	5.1	19
NE	11.1	40
ENE	6.2	23
E	2.0	7
ESE	1.2	4
SE	1.1	4
SSE	1.9	7
S	4.2	15
SSW	8.8	32
SW	12.3	45
WSW	12.3	45
W	9.1	33
WNW	6.7	24
NW	4.6	17
NNW	2.9	11

Note: A total of 8.2 % of hourly data (equivalent to 27 days per year) is missing/incomplete or are calms² from the ECCC weather station.

Based on the data presented in **Table 4-2**, the dominant wind direction at the Site is blowing from the southwest and west southwest, towards nearby sensitive receptors. Winds blowing from the northeast are also notable. Since the closest residential properties are located northeast of the Site, they are located downwind of the dominant wind direction. Winds blowing from the southwest and west southwest towards the residential property occur approximately 24.6% of the time, accounting for approximately 90 days of the year. As a result, it would be

¹ The closest weather station which has less than 10% of hourly data is missing/incomplete or are calms from the ECCC weather station is selected to represent Site's conditions in the Study.

² The calms are defined as an absence of wind flow or any other air motion according to the ECCC website.

recommended that the dust control plan for the site be updated to consider the new sources. A Best Management Practices Plan (BMPP) would also be recommended to help mitigate the potential for odour.

5 SUMMARY OF POTENTIAL IMPACTS

The MECP D-6 methodology was used to determine the Site's industrial classification and to identify the potential influence area and minimum setback distance of the Site. Based on a review of the Site's current ECAs, the latest ESDM report and AAR, as well as the expected activities associated with the Proposed Expansion, the Site has been classified as a Class II facility and its recommended minimum separation distance is 70 m and its potential influence area is 300 m. Therefore, a 300 m radius area around the Site was used to identify the location of surrounding sensitive land uses that have the highest potential to be impacted by the Site's operations.

A total of one hundred and one (101) sensitive receptors were identified in the Study. The location of each receptor is indicated on **Figure 4**. Three (3) residential properties (822 Old Highway 24, 832 Old Highway 24 & 4 Thompson Road East) are located northeast of the Site and within the recommended minimum separation distance. It is noted that after the proposed landscaped buffer area is taken into consideration, one (1) residential property (822 Old Highway 24) will still be located within the recommended minimum separation distance. One hundred (100) additional residential properties are located north, east, southwest of the Site were identified as being within the potential influence area, but outside of the recommended minimum separation distance.

As the Site was granted an Air and Noise ECA by the MECP, an ESDM Report would have been prepared to demonstrate that the air quality, dust and odour emissions from the existing Site operations comply with the MECP air quality limits at ground level locations, and beyond the property line. An update to the existing ESDM Report may be required to demonstrate that the expansion operations can operate in compliance with MECP air quality limits. Given that the Proposed Expansion will introduce new fugitive dust and odour emission sources which may not require consideration in the ESDM Report, WSP recommends the Site update their 2017 DCP to include the new dust emission sources. WSP also recommends the Site prepare and implement an Odour BMPP to manage odour sources at the Site. If an Odour BMPP already exists for the Site, WSP recommends that the plan be updated to include new odour sources at the Site. Based on the Concept Plan, the proposed new dust and odour emission sources are expected to be located greater than 70 m from the nearest receptors.

Noise generated at the Site may be occasionally audible off site and may impact sensitive land uses nearby. As the Site was granted an Air and Noise ECA, the Site would have been required to prepare an AAR demonstrating compliance with Ontario MECP limits for noise at existing noise sensitive receptors. An update to the existing AAR may be required to demonstrate that the expansion operations can operate in compliance with MECP noise limits. Given that the proposed waste compactor is expected to be located inside the new waste transfer building, the cumulative noise impacts from the Site at the nearby receptors are not anticipated to be significantly impacted assuming that there are no open bay doors windows and louvres when the waste compact is operating. Based on the Concept Plan, the proposed new waste compactor is expected to be located indoors and greater than 70 m from the nearest receptors.

Based on the above assessment, the Proposed Expansion may have the potential to result in adverse dust and odour impacts to nearby sensitive land uses due to proximity to on-site sources; however, impacts could be minimized through the implementation of a site specific DCP and Odour BMPP.

6 CONCLUSIONS AND RECOMMENDATIONS

Based on the Site's existing and proposed operations and nearby sensitive receptors, the conclusions and recommendations are outlined below:


- The Site has been classified as a Class II facility based on the following criteria:
 - Dust and odour emissions potentially frequent and occasionally intense;
 - Noise occasionally audible off property;
 - Outside storage of scrap metal; and
 - Frequent movement of heavy trucks with the majority of movements during daytime hours.
- A total of 101 sensitive receptors were identified within the potential influence area of the Site; however, given that the Site operates with ECAs and controls to minimize dust and odour, it is expected that the actual influence area of the Site is less than 300 m for a Class II facility.
- Given that the Proposed Expansion will introduce new dust and odour emission sources, WSP recommends the Site update its 2017 DCP to include the new emission sources and prepare and implement an Odour BMPP to manage odour sources at the Site. WSP also recommends that the site inspection and mitigation conditions listed under the Site's ECAs be applied to the proposed new dust and odour emission sources.
- Given that the Proposed Expansion includes an increase in on-site activities, the ESDM Report and AAR that support the Air and Noise ECA should be reviewed to confirm whether updates are required. An Air and Noise ECA Amendment application may be required.
- Based on a review of publicly available information, no environmental annual reports have been filed under the Site. WSP recommends a review of Canadian NPRI program to confirm if the Site meets the exemption criteria for annual reporting.
- WSP recommends the Site to maintain the proposed landscaped buffer area included in the Concept Plan for the Proposed Expansion.
- Based on the Study, operations at the Site are not expected to result in land use compatibility issues with respect to air quality, dust, odour, noise and vibration impacts once the updated DCP and Odour BMPP are developed and implemented.


FIGURES




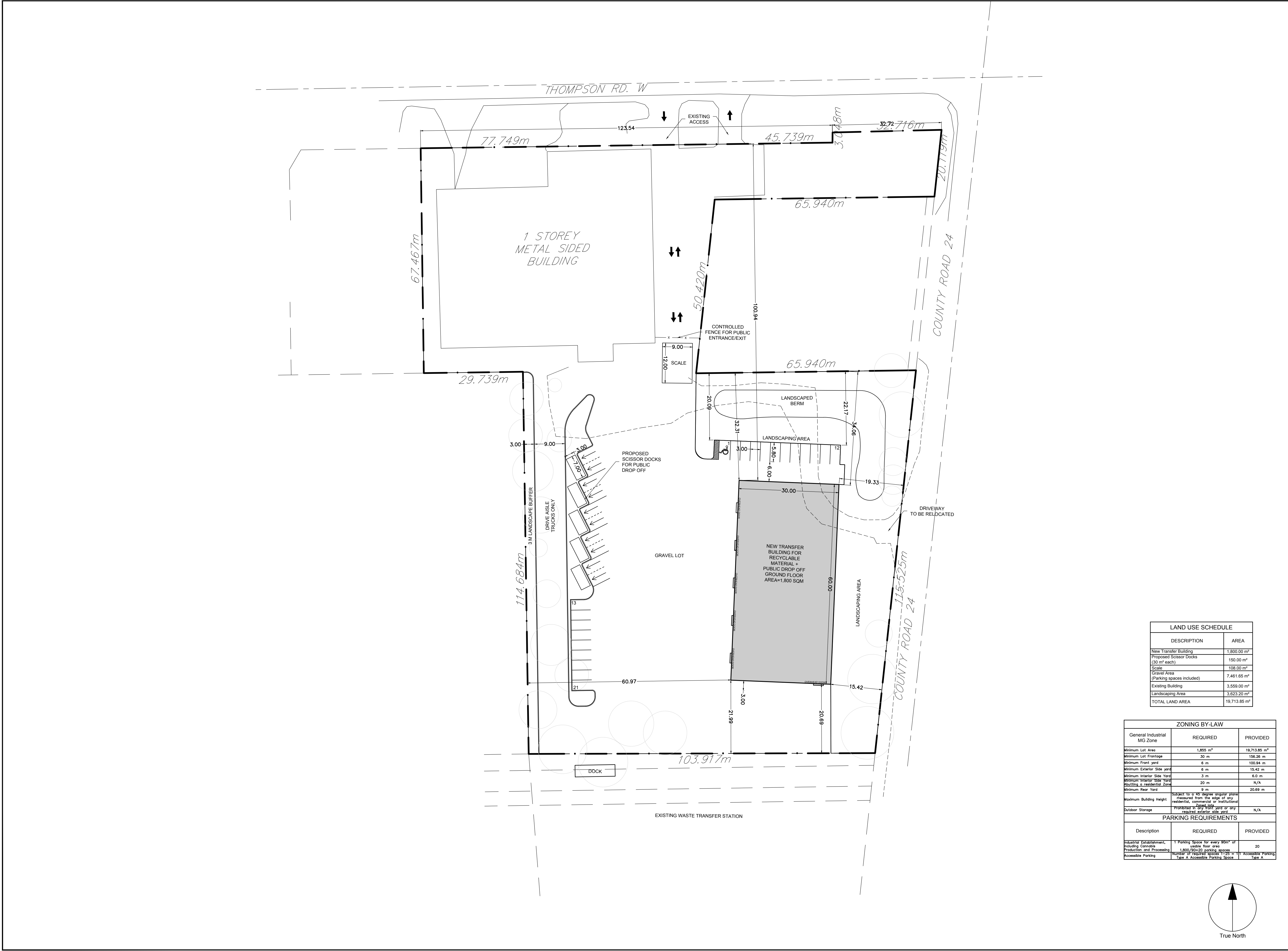


LEGEND:

 SITE BOUNDARY

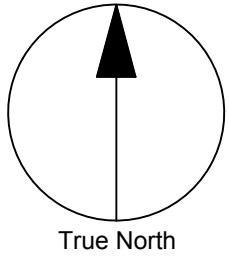
 1000 m STUDY AREA

TITLE: SITE LOCATION		
PROJECT: NORFOLK DISPOSAL EXPANSION D6 STUDY WATERFORD, ONTARIO		
CLIENT: IBI GROUP		
 GOLDER	PROJECT NO.: 221-07861-00	REVIEWED BY: CR
	DATE: AUGUST 2022	FIGURE: 1



LAND USE SCHEDULE	
DESCRIPTION	AREA
New Transfer Building	1,800.00 m²
Proposed Scissor Docks (30 m² each)	150.00 m²
Gravel Area	108.00 m²
Landscaping Area (Parking spaces included)	7,461.85 m²
Existing Building	3,559.00 m²
Landscaping Area	3,623.20 m²
TOTAL LAND AREA	19,713.85 m²

ZONING BY-LAW		
General Industrial MG Zone	REQUIRED	PROVIDED
Minimum Lot Area	1,855 m²	19,713.85 m²
Minimum Lot Frontage	30 m	156.26 m
Minimum Front Yard	6 m	100.84 m
Minimum Exterior Side Yard	6 m	15.42 m
Minimum Interior Side Yard	3 m	6.0 m
Minimum Interior Side Yard Building a residential Zone	20 m	N/A
Minimum Rear Yard	9 m	20.69 m
Maximum Building Height	Suggest 15 to 20 degree angular slope measured from the side of any wall, unless otherwise specified. Prohibited to 15.7 m or 50 feet or any required exterior side yard.	N/A
Outdoor Storage		N/A
PARKING REQUIREMENTS		
Description	REQUIRED	PROVIDED
Industrial Establishment, including Commercial Production and Processing	1 Parking Space for every 90m² of usable floor area	20
Accessible Parking	1,800/20=20 parking spaces	20
	1 Accessible Parking Space	1 Accessible Parking Space



CLIENT

NORFOLK DISPOSAL

811 Old Hwy 24 Suite 1, Waterford, ON N0E 1Y0

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ISSUES

No.	DESCRIPTION	DATE
####	####	####

PRELIMINARY - SUBJECT TO REVISION

KEY PLAN

IBI GROUP

Suite 200 - 360 James Street North
Hamilton ON L8L 1H5 Canada
tel 905 546 1010 fax 905 546 1011
ibigroup.com

PROJECT

NORFOLK DISPOSAL
NEW TRANSFER STATION

811 Old Hwy 24 , Waterford, ON N0E 1Y0

PROJECT NO:
136731

DRAWN BY:
M. ROJAS

PROJECT MGR:
J. ARIENS

SCALE:
1:500

CHECKED BY:
B. McIntosh

APPROVED BY:
J. ARIENS

SHEET TITLE

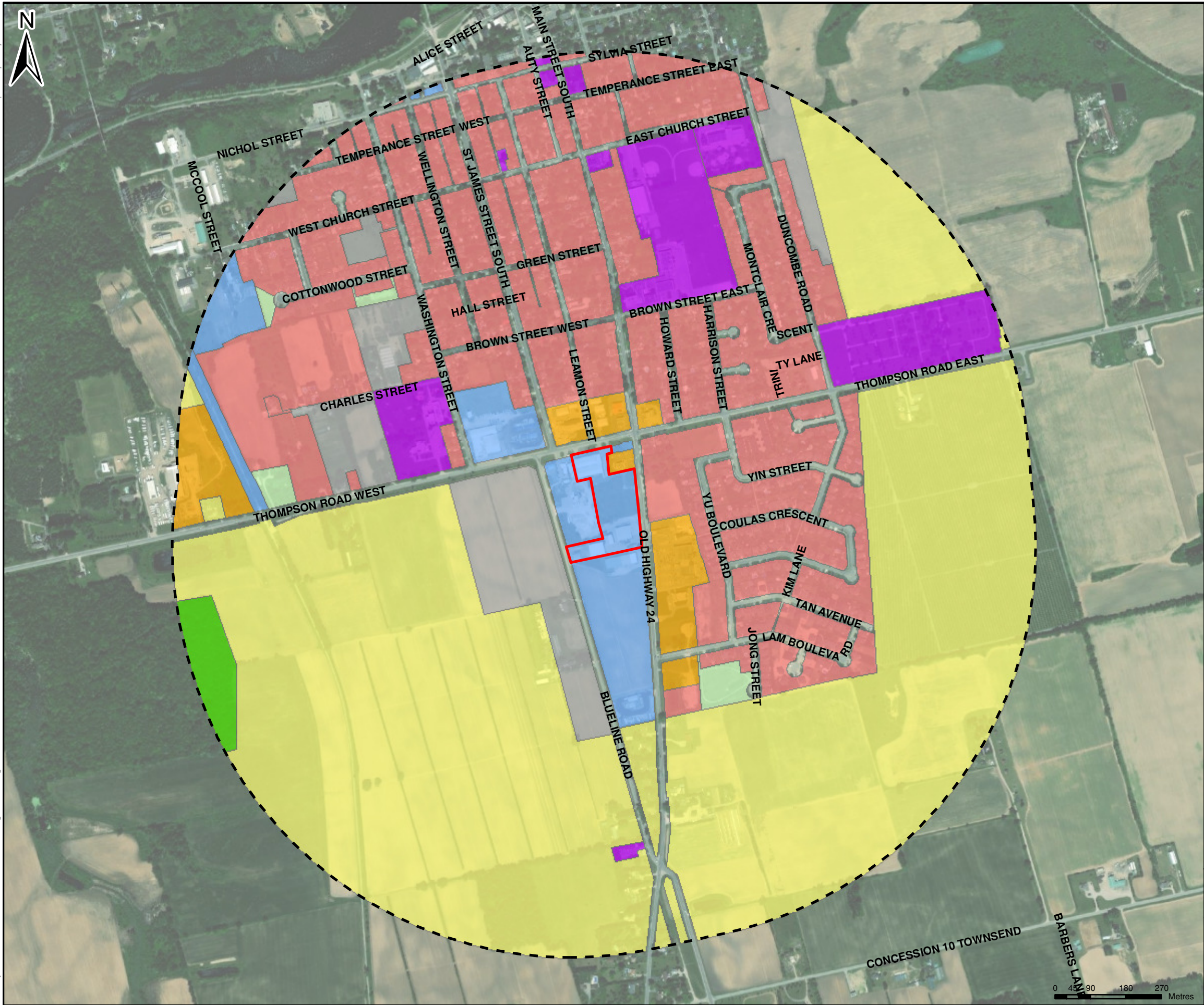
CONCEPT PLAN

SHEET NUMBER


1

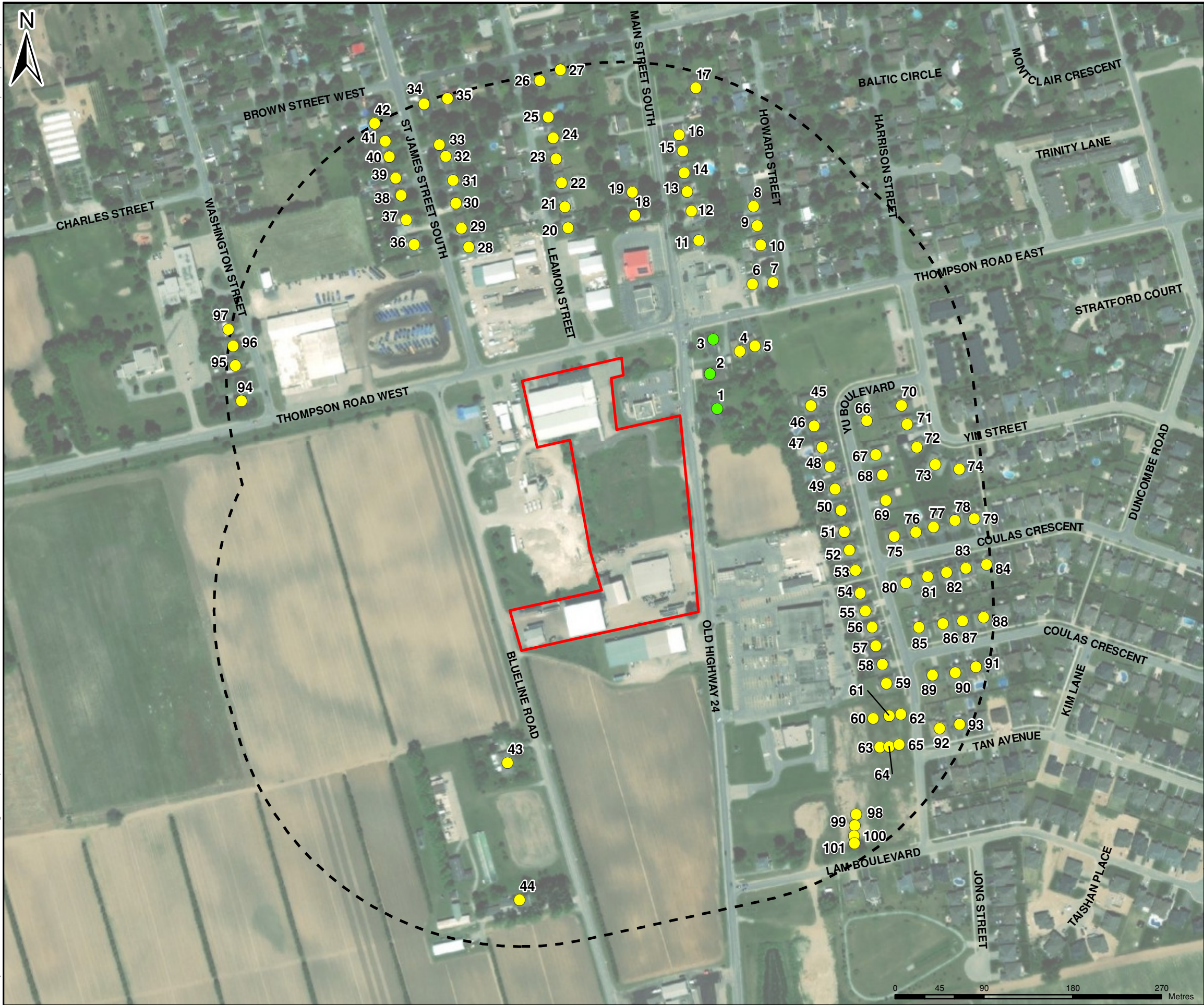
ISSUE

0



- LEGEND:
- SITE BOUNDARY
 - 1000 m STUDY AREA
 - AGRICULTURAL
 - COMMERCIAL
 - DEVELOPMENT
 - HAZARD LAND
 - INSTITUTIONAL
 - INDUSTRIAL
 - OPEN SPACE
 - RESIDENTIAL

TITLE: ZONING MAP		
PROJECT: NORFOLK DISPOSAL EXPANSION D6 STUDY WATERFORD, ONTARIO		
CLIENT: IBI GROUP		
	PROJECT NO.: 221-07861-00	REVIEWED BY: CR
	DATE: AUGUST 2022	FIGURE: 3



LEGEND:

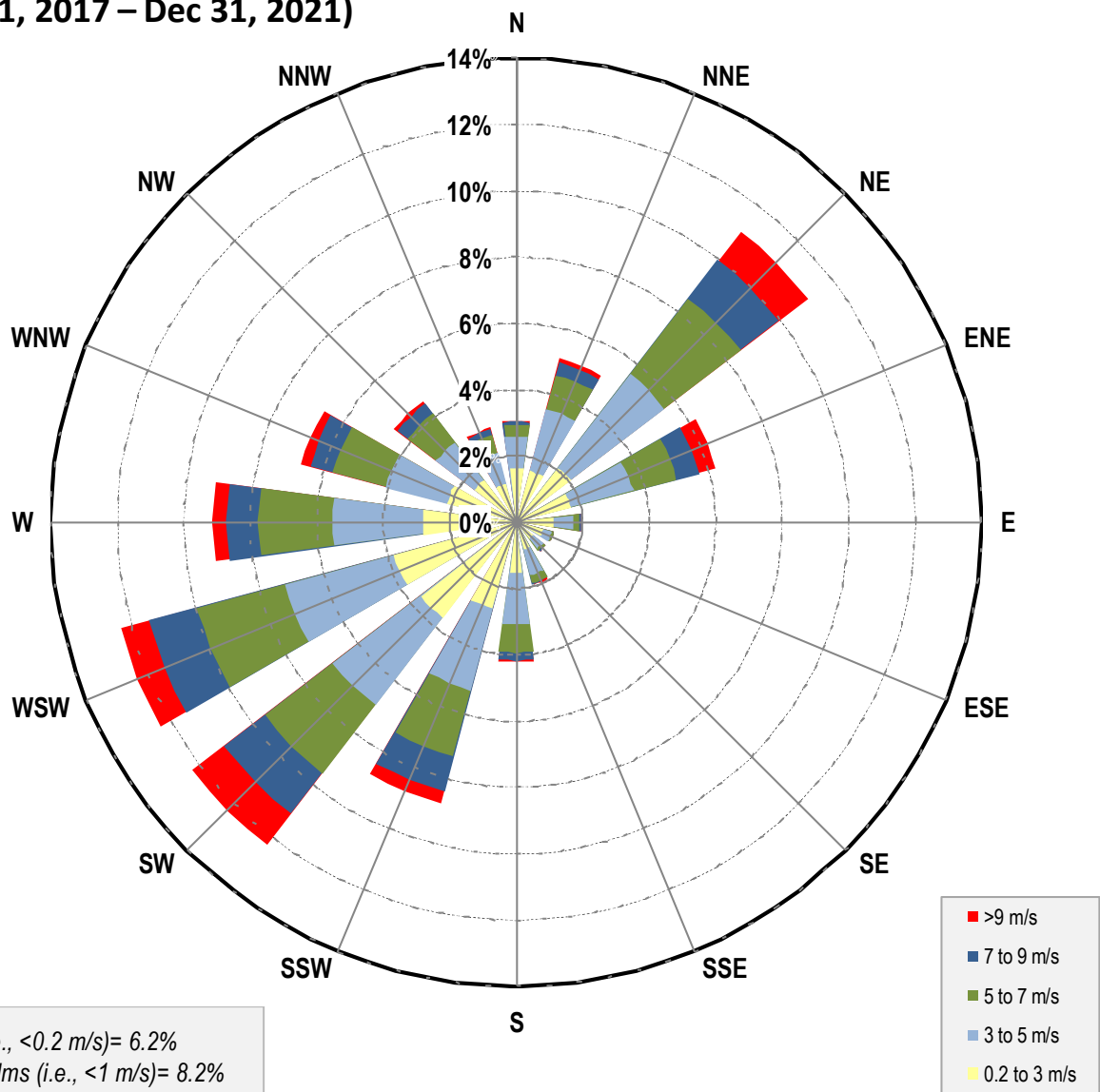
- SITE BOUNDARY
- POTENTIAL INFLUENCE AREA
- SENSITIVE RECEPTORS WITHIN THE MINIMUM SEPARATION DISTANCE OF THE PROPOSED DEVELOPMENT
- SENSITIVE RECEPTORS WITHIN THE AREA OF INFLUENCE OF THE PROPOSED DEVELOPMENT

TITLE: LOCATION OF SENSITIVE RECEPTORS WITHIN THE POTENTIAL INFLUENCE AREA		
PROJECT: NORFOLK DISPOSAL EXPANSION D6 STUDY WATERFORD, ONTARIO		
CLIENT: IBI GROUP		
	PROJECT NO.: 221-07861-00	REVIEWED BY: CR
	DATE: SEPTEMBER 2022	FIGURE: 4

WIND ROSE PLOT:

Hamilton A Wind Rose (blowing from)

HAMILTON A (Jan 1, 2017 – Dec 31, 2021)



COMMENTS:

Figure 5

DATA PERIOD:

Start Date: 2017-01-01 - 00:00
End Date: 2021-12-31 - 23:00

COMPANY NAME:

WSP Canada

CALM WINDS:

8.20%

TOTAL COUNT:

43824 hrs.

AVG. WIND SPEED:

4.50 m/s

DATE:

2022-09-23

PROJECT NO.:

221-08564-00

APPENDIX

A SITE'S CURRENT ENVIRONMENTAL COMPLIANCE APPROVALS (ECA)

ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A-500-1210926002

Version: 1.0

Issue Date: November 19, 2021

Pursuant to section 20.3 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 and subject to all other applicable Acts or regulations this Environmental Compliance Approval is issued to:

NORFOLK DISPOSAL SERVICES
LIMITED

811 OLD HIGHWAY 24
WATERFORD ONTARIO
N0E 1Y0

For the following site:

811 OLD HIGHWAY 24 , WATERFORD, NORFOLK, ONTARIO,
CANADA, N0E 1Y0

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s) A110105, issued on June 26, 2020.

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

a 1.2 hectare Waste Disposal Site (Processing and Transfer) approved for the receipt, processing, temporary storage and transfer of non-hazardous solid industrial, commercial and residential waste serving the Province of Ontario

DEFINITIONS

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Adverse Effect" has the same meaning as defined in the EPA;
2. "Approval" means this entire Environmental Compliance Approval and any Schedules attached to it;
3. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;
4. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Site is geographically located;
5. "EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19;
6. "Minister" means the Minister of the Ministry or such other member of the Executive Council as may be assigned the administration of the EPA and OWRA under the Executive Council Act, R.S.O. 1990, c. E.25;

7. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;
8. "OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40;
9. "NMA" means the Nutrient Management Act, 2002, S.O. 2002, c. 4;
10. "Operator" means any person, other than the Owner's employees, authorized by the Owner as having the charge, management or control of any aspect of the Site and includes its successors or assigns;
11. "Owner" means any person that is responsible for the establishment or operation of the Site being approved by this Approval, and includes Norfolk Disposal Services Limited and its successors and assigns;
12. "PA" means the Pesticides Act, R.S.O. (1990), c. P.11;
13. "Provincial Officer" means any person designated in writing by the Minister as a provincial officer pursuant to Section 5 of the OWRA, Section 5 of the EPA, Section 17 of the PA, Section 4 of the NMA, or Section 8 of the SDWA;
14. "SDWA" means the Safe Drinking Water Act, 2002, S.O. 2002, c. 32;
15. "Schedules" means the following schedules attached to this Approval and forming part of this Approval namely:
 - Schedule 1 - Supporting Documentation
16. "Site" means the entire waste disposal site, located at 811 Old Highway 24, Waterford, Ontario;
17. "Trained" means knowledgeable in the following through instruction and/or practice:
 - relevant waste management legislation, regulations and guidelines; and/or
 - major environmental concerns pertaining to the waste to be handled; and/or
 - occupational health and safety concerns pertaining to the wastes to be handled; and/or
 - emergency response procedures; and/or
 - specific written procedures for the control of nuisance/upset conditions; and/or
 - specific written procedures for refusal of unacceptable waste loads; and/or
 - the requirements of this Approval.
18. "Supporting Documentation" means the documents listed in Schedule 1 of this Approval;

TERMS AND CONDITIONS

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

1. Compliance

1. The Owner shall ensure compliance with all the conditions of this Approval and shall ensure that any person authorized to carry out work on or operate any aspect of the Site is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
2. Any person authorized to carry out work on or operate any aspect of the Site shall comply with the conditions of this Approval.

2. In Accordance

1. Except as otherwise provided by this Approval, the Site shall be designed, developed, built, operated and maintained in accordance with the documentation listed in the attached Schedule 1.

3. Interpretation

1. Where there is a conflict between a provision of any document listed in Schedule 1 in this Approval, and the conditions of this Approval, the conditions in this Approval shall take precedence.
2. Where there is a conflict between the application and a provision in any document listed in Schedule 1, the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the Ministry approved the amendment.
3. Where there is a conflict between any two documents listed in Schedule 1, the document bearing the most recent date shall take precedence.
4. The conditions of this Approval are severable. If any condition of this Approval, or the application of any condition of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

4. Other Legal Obligations

1. The issuance of, and compliance with, this Approval does not:
 - a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
 - b. limit in any way the authority of the Ministry to require certain steps be taken or to require the Owner and Operator to furnish any further information related to compliance with this Approval.

5. Adverse Effect

1. The Owner and Operator shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the Site, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.
2. Despite an Owner, operator or any other person fulfilling any obligations imposed by this Approval, the person remains responsible for any contravention of any other condition of this Approval or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

6. Change of Owner

1. The Owner shall notify the Director, in writing, and forward a copy of the notification to the District Manager, within 30 days of the occurrence of any changes in the following information:
 - a. the ownership of the Site;
 - b. the Operator of the Site;

- c. the address of the Owner or Operator; and
 - d. the partners, where the Owner or Operator is or at any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R. S. O. 1990, c. B.17, shall be included in the notification.
2. No portion of this Site shall be transferred or encumbered prior to or after closing of the Site unless the Director is notified in advance and sufficient financial assurance is deposited with the Ministry to ensure that these conditions will be carried out.
 3. In the event of any change in ownership of the Site, other than change to a successor municipality, the Owner shall notify the successor of and provide the successor with a copy of this Approval, and the Owner shall provide a copy of the notification to the District Manager and the Director.

7. Information and Record Retention

1. Except as authorized in writing by the Director, all records required by this Approval shall be retained at the Site for a minimum of two (2) years from their date of creation.
2. The Owner shall retain all documentation listed in Schedule 1 for as long as this Approval is valid.
3. The Owner shall retain employee training records as long as the employee is working at the Site.
4. The Owner shall make all of the above documents available for inspection upon request of Ministry staff.
5. The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action under this Approval or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:
 - a. an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or condition of this Approval or any statute, regulation or other legal requirement; or
 - b. acceptance by the Ministry of the information's completeness or accuracy.
6. The Owner shall ensure that a copy of this Approval, in its entirety and including all its Notices of Amendment, and documentation listed in Schedule 1, are retained at the Site at all times.
7. Any information related to this Approval and contained in Ministry files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, RSO 1990, CF-31.

8. Inspections by the Ministry

1. No person shall hinder or obstruct a Provincial Officer from carrying out any and all inspections authorized by the OWRA, the EPA, the PA, the SDWA or the NMA, of any place to which this Approval relates, and without limiting the foregoing:
 - a. to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this Approval are kept;
 - b. to have access to, inspect, and copy any records required to be kept by the conditions of this Approval;
 - c. to inspect the Site, related equipment and appurtenances;

- d. to inspect the practices, procedures, or operations required by the conditions of this Approval; and
- e. to sample and monitor for the purposes of assessing compliance with the terms and conditions of this Approval or the EPA, the OWRA, the PA, the SDWA or the NMA.

9. Financial Assurance

1. The Owner shall maintain financial assurance, as defined in Section 131 of the EPA, in the amount of \$22,250.00. This financial assurance shall be in a form acceptable to the Director and shall provide sufficient funds for the analysis, transportation, Site clean-up, monitoring and disposal of all quantities of waste on-site at any one time.
2. Commencing on June 30, 2024 and at intervals of four (4) years thereafter, the Company shall submit to the Director, a re-evaluation of the amount of financial assurance to implement the actions required under sub-condition 1 above. The re-evaluation shall include an assessment based on any new information relating to the environmental conditions of the Site and shall include the costs of additional monitoring and/or implementation of contingency plans required by the Director upon review of the closure plan and annual reports. The financial assurance must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.
3. Commencing on June 30, 2022, the Company shall prepare and maintain at the Site an updated re-evaluation of the amount of financial assurance required to implement the actions required under the condition above for each of the intervening years in which a re-evaluation is not required to be submitted to the Director under sub-condition 2 above. The re-evaluation shall be made available to the Ministry, upon request.
4. The amount of financial assurance is subject to review at any time by the Director and may be amended at his/her discretion.
5. If any financial assurance is scheduled to expire or notice is received, indicating financial assurance will not be renewed, and satisfactory methods have not been made to replace the financial assurance at least sixty (60) days before the financial assurance terminates, the financial assurance shall forthwith be replaced by cash.

10. Spills

1. The Owner shall promptly take all necessary steps to contain and clean up any spills or upsets which result from this operation.
2. The Owner shall forthwith notify the Ministry's Spills Action Centre at 1-800-268-6060, and the local municipality, of any spill, as defined by the EPA, that occurs at this Site.
3. The Owner shall submit a written report to the District Manager within three (3) days of any spill outlining the nature of the spill, remedial measures taken and the measures taken to prevent future occurrences at this Site.

11. Service Area

1. Only waste that is generated within geographical boundaries of the Province of Ontario shall be accepted at the Site.

12. Hours of Operation

1. The Owner shall ensure that waste processing operations at the Site, limited to sorting and compaction, are restricted to the following hours only, excluding statutory holidays:
 - a. Mondays to Fridays from 6:00 a.m. to 6:00 p.m.; and
 - b. Saturdays from 7:00 a.m. to 4:00 p.m.
2. The Owner shall ensure that waste receiving and transfer operations at the Site are restricted to the following hours only:
 - a. Mondays to Fridays from 6:00 a.m. to 10:00 p.m.; and
 - b. Saturdays, Sundays and statutory holidays from 7:00 a.m. to 6:00 p.m.

13. Signs

1. The Owner shall ensure a sign is posted at the entrance to this Site, readable from the nearest public roadway bordering this Site, identifying the name of the facility, the Approval number and a 24-hour phone number that can be used by the public in the case of an emergency or for filing complaints at any time odours, pests, litter, dust, noise or other such nuisances are generated at this Site.
2. The Owner shall post signs in storage areas clearly indicating the type of waste stored in the area. These signs shall be kept current on a daily basis.
3. The Owner shall clearly label all storage containers, drums, bins, etc. containing waste with the name of the waste or waste class and maximum storage capacity. The Company shall ensure the label is clearly visible at all times for inspection and record keeping.

14. Site Security

1. The Owner shall ensure that a Trained attendant is available at this Site during the hours of operation.
2. The Owner shall ensure all Site operations including loading and unloading of vehicles or containers at this Site, or processing of waste at this Site, occurs only when such operations are conducted or supervised by Trained personnel.
3. The Owner shall ensure this Site is locked and secured when a Trained attendant is not present.
4. The Owner shall ensure all entrances to this Site are illuminated after business hours and that provisions are in place to provide illumination to all storage areas should illumination in the storage areas be necessary in case of an emergency.
5. The Owner shall ensure that the Site is secured by fencing and locking gates in order to regulate and limit the access to authorized personnel and to discourage access by unauthorized personnel.

15. Approved Waste Types and Waste Screening

1. The Owner may only accept solid Municipal Waste at the Site.
2. The Owner shall ensure all incoming loads are inspected by a Trained attendant to ensure only waste approved under this ECA are received at this Site;
3. If any incoming waste load is known to, or is discovered to, contain unapproved waste, that load shall not be accepted at the Site; and
4. If any unapproved waste is discovered on-site, that waste shall be immediately disposed of in accordance with the EPA and Reg. 347.

16. Approved Waste Quantities

1. The amount of waste that may be received at the Site shall not exceed 550 tonnes of waste in any one day.
2. The amount of residual waste that may be transferred from the Site for final disposal shall not exceed 850 tonnes of waste per day.
3. The maximum amount of waste, including unprocessed waste, in-process waste, processed waste and residual waste that may be stored at the Site at any one time shall not exceed 300 tonnes.
4. In the event that residual waste and/or processed waste cannot be transferred from the Site, the Owner shall cease accepting any additional waste.

17. Waste Processing

1. Processing carried out at the Site is limited to the sorting and compaction of Municipal Waste as described in the current Design and Operations Report.
2. The Owner shall not operate the proposed electric grinder until the Ministry has received and reviewed the Company's Environmental Compliance Approval (Section 9) application, including a noise assessment, and the review of the application concludes the shredder may be operated in compliance with the Ministry's noise standards.
3. Subject to the condition above, the Owner shall only grind wood waste including painted wood, treated wood, laminated wood and such contaminants that may be present in wood waste generated from construction and demolitions sites.
4. The Owner shall ensure the electric grinder is operated in a manner which does not cause an adverse effect, including, but not limited to effects from noise and dust.

18. Complaint Response Procedure

1. If at any time, the Owner receives complaints regarding the operation of the Site, the Company shall respond to these complaints according to the following procedure:
 - a. The Owner shall record each complaint on a formal complaint form entered in a sequentially numbered log book. The information recorded shall include the nature of the complaint, the name, address and telephone number of the complainant and the time and date of the complaint;
 - b. The Owner, upon notification of the complaint shall initiate appropriate steps to determine all possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and
 - c. The Owner shall submit, within three (3) days of the occurrence, a written report to the District Manager identifying the source(s) of the complaint and details of what action was taken to rectify the problem and prevent a recurrence.

19. Nuisance Mitigation

1. The Owner shall ensure that any dirt, dust, smoke, noise, odour and/or other airborne contaminant, resulting from activities at this Site, is controlled and does not cause an adverse effect.

2. The Owner shall ensure that vehicles leaving this Site do not drag out onto roads, dirt and/or other material that may become a contaminant or cause an adverse effect.
3. The Owner shall pick up litter daily to ensure that this Site and surrounding areas are not impacted.
4. The Owner shall ensure that all litter collected is stored indoors, or if stored outdoors is stored only in closed or covered containers.
5. The Owner shall take all reasonable action to ensure that incoming or outgoing vehicles to or from this Site do not cause line-ups or similar traffic problems on the roads that provide access to this Site.

20. Stormwater Management

1. The Owner shall have in place a stormwater management plan accepted to the District Manager. The stormwater management plan shall include a maintenance plan to ensure that all stormwater management facilities are serviced regularly and inspected to ensure they are operating effectively.

21. Contingency Plan

1. The Owner shall have in place a contingency plan for the Site. The contingency plan shall include, as a minimum, the following:
 - a. notification of person(s) responsible for this Site including home phone numbers and work location;
 - b. list of emergency phone numbers for the local Ministry office, the Ministry's Spill Action Centre and the local fire department;
 - c. measures to prevent spills / fires;
 - d. details of fire protection system, control and safety devices;
 - e. measures for spill / fire alerting, containment, treatment, disposal and clean up;
 - f. availability of spill / fire clean-up related equipment;
 - g. maintenance and testing program for spill / fire related equipment;
 - h. a review of the need for additional level indicators and alarm systems;
 - i. a detailed Site plan including location of all waste received, generated and stored on-site;
 - j. measures to be undertaken in the event any un-authorized non-hazardous or hazardous or unidentified waste appears at this Site; and
 - k. measures to be undertaken to control air emissions that cause an adverse effect.
2. A copy of the contingency plan shall be kept at this Site, in a location accessible to all staff, at all times.
3. A copy of the contingency plan shall be available for inspection by a Provincial Officer, the local municipality and/or the local fire department, upon request.
4. The Owner shall review the contingency plan on an annual basis, as a minimum, and make revisions as required. In particular, the Owner shall ensure that all contact telephone numbers are up to date.

22. Site Inspections

1. A visual inspection of the Site shall be conducted by a Trained person on each day the Site is in operation to ensure that:
 - a. the Site is secure;
 - b. that the operation of the Site is not causing any nuisances including those from dust, odours, vectors, vermin, birds, litter, noise and traffic;
 - c. that the operation of the Site is not causing any adverse effects on the environment; and
 - d. that the Site is being operated in compliance with this ECA.
2. Any deficiencies discovered as a result of an inspection shall be remedied immediately, including temporarily ceasing operations at the Site if needed.
3. A record of the inspections shall be kept in the daily log book that includes the following information:
 - a. the name and signature of the Trained person that conducted the inspection;
 - b. the date and time of the inspection;
 - c. a list of any deficiencies discovered;
 - d. any recommendations for action; and
 - e. the date, time and description of actions taken to remedy deficiency.

23. Record Keeping

1. The Owner shall maintain at this Site a written record of all waste received, stored, processed and transferred from this Site, as well as, the calculated total volume of waste remaining at this Site at the end of each day. The record shall be in the form of a log, be reported in metric tonnes and shall include, as a minimum the following:
 - a. for waste received at this Site:
 - i. date;
 - ii. quantity;
 - iii. manifest number, if applicable;
 - iv. generator name and address;
 - v. generator registration number, if applicable, or inventory number;
 - vi. carrier name and address; and
 - vii. carrier Environmental Compliance Approval number, if applicable.
 - b. for waste processed at this Site:
 - i. date;
 - ii. quantity processed; and
 - iii. type of waste.
 - c. for separated waste transferred off-site:
 - i. date;

- ii. quantity;
 - iii. type of waste;
 - iv. length of time stored at this Site prior to transfer off-site; and
 - v. destination, including name and address.
 - d. for residual waste transferred off-site:
 - i. date;
 - ii. quantity;
 - iii. carrier name and address;
 - iv. carrier approval number;
 - v. disposal destination location and approval number; and
 - vi. length of time stored at this Site prior to transfer off-site.
2. A log book of all spills shall be maintained at this Site. The log book must include the type and amount of material spilled, a description of how the material was cleaned up and stored, and the location and time of final disposal.

24. Annual Report

1. The Owner shall submit to the District Manager an annual report on the operation of this Site by October 1 of each year. The report shall cover the previous calendar year and include, as a minimum, the following (all numbers are reported in metric tonnes):
 - a. an annual summary of mass balance of the waste received and transferred from this Site;
 - b. an annual summary of any deficiencies, items of non-compliance or process aberrations that occurred at this Site and any remedial / mitigative action taken to correct them;
 - c. a description of any spills, incidents or other emergency situations which have occurred at this Site, any remedial measures taken, and the measures taken to prevent future occurrences;
 - d. a monthly summary by waste type of the waste stored at this Site at the end of each month including quantity;
 - e. a descriptive summary describing any rejected waste including quantity, waste class, waste characteristic, reasons for rejection and generator of the rejected waste;
 - f. a description of markets for the processed wastes.

25. Closure Plan

1. At least thirty (30) days prior to the closure of this Site, the Owner shall submit to the District Manager a detailed clean-up and closure plan for this Site which confirms that this Site will be closed in an environmentally acceptable manner.
2. Within thirty (30) days of the closure of this Site, the Owner shall submit independent written confirmation, to the District Manager and the Director, that this Site has been closed in accordance with the submitted plan, and present this Approval for revocation to the Director.

REASONS

The reasons for the imposition of these terms and conditions are as follows:

1. The reason for Condition 1, 3, 4, 5 and 7 is to clarify the legal rights and responsibilities of the Owner under this Approval.
2. The reasons for Conditions 2, 15, 16 and 17 is to ensure that the Site is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.
3. The reasons for Condition 6 are:
 1. to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the Director is informed of any changes,
 2. to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this Approval, and
 3. to ensure that the successor is aware of its legal responsibilities.
4. The reason for Condition 8 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Approval. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.
5. The reason for Condition 9 is to ensure that funds are available to remediate and to remove and dispose of any processed or unprocessed material and any residual waste relating to the operations carried out at the Site in the event the Company is unable or unwilling to do so.
6. The reasons for Condition 10 is to ensure that spills are responded to in an expeditious and appropriate manner.
7. The reason for Condition 11 is to specify the approved service area from which waste may be accepted at the Site.
8. The reason for Condition 12 is to specify the hours of operation for the Site.
9. The reason for Condition 13 is to ensure that users of the Site are fully aware of important information and restrictions related to Site operations and access under this ECA.
10. The reason for Condition 14 is to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.
11. The reason for Condition 18 is to ensure that any complaints regarding Site operations at the Site are responded to in a timely manner.
12. The reason for Condition 19 and 20 is to ensure that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.
13. The reason for Condition 21 is to ensure that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.
14. The reason for Condition 22 is to ensure that detailed records of Site inspections are recorded and maintained for inspection and information purposes.

15. The reason for the Condition 23 is to provide for the proper assessment of effectiveness and efficiency of site design and operation, their effect or relationship to any nuisance or environmental impacts, and the occurrence of any public complaints or concerns. Record keeping is necessary to determine compliance with this ECA, the EPA and its regulations.
16. The reasons for the Condition 24 are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.
17. The reason for the Condition 25 is to ensure that the Site is closed in accordance with Ministry standards and to protect the health and safety of the public and the environment.

APPEAL PROVISIONS

In accordance with Section 139 of the *Environmental Protection Act*, you may by written notice served upon me and the Ontario Land Tribunal within 15 days after receipt of this notice, require a hearing by the Tribunal. Section 142 of the *Environmental Protection Act* provides that the notice requiring the hearing ("the Notice") shall state:

- I. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
- II. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the *Environmental Protection Act*, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

- I. The name of the appellant;
- II. The address of the appellant;
- III. The environmental compliance approval number;
- IV. The date of the environmental compliance approval;
- V. The name of the Director, and;
- VI. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

Registrar*
Ontario Land Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5
OLT.Registrar@ontario.ca

and

The Director appointed for the purposes of Part II.1 of the
Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Ontario Land Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349 or 1 (866) 448-2248, or www.olt.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the *Environmental Protection Act*.

Dated at Toronto this 19th day of November, 2021



Mohsen Keyvani

Director

appointed for the purposes of Part II.1 of the Environmental Protection Act

c: Greg Thomas, PRIME Environmental Services Inc.

The following schedules are a part of this environmental compliance approval:

SCHEDULE 1

1. Environmental Compliance Approval application, dated May 15, 2015, signed by Mr. Bernie Debono, General Manager, Norfolk Disposal Services Limited.
2. Design and Operations Report, Norfolk Disposal Services Limited, prepared by PRIME Environmental Services Inc., dated May 15, 2015.
3. Norfolk Disposal Services Limited Contingency Plan, dated March 2014.
4. Letter dated July 5, 1994, from Louis Debono, Norfolk Disposal Services Limited, to Kim Lendvay, Ministry of Environment and Energy, RE: Withdrawal of request to receive waste oil.
5. Letter dated August 8, 1994, from Louis Debono, Norfolk Disposal Services Limited, to Kim Lendvay, Ministry of Environment and Energy, RE: Contingency Plan and Estimate for Financial Assurance.
6. Letter dated August 19, 1999 from Norfolk Disposal Services Ltd. to the Ministry of the Environment RE: Storage locations.
7. Environmental Compliance Approval application, signed by Mr. Bernie Debono, General Manager, Norfolk Disposal Services Limited, dated March 8, 2016.
8. Design and Operations Report, Norfolk Disposal Services Limited, prepared by PRIME Environmental Services Inc., dated March 17, 2016.
9. Email dated June 24, 2020 with Financial Assurance calculation, from Bernie Debono, Norfolk Disposal Service Ltd to Julius Arscott, Application Assessment Officer, MECP.

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 3784-B9TSW9

Issue Date: May 3, 2019

Norfolk Disposal Services Limited
811 Old Highway 24
Norfolk, Ontario
N0E 1Y0

Site Location: 811 Old Highway 24 Road
Norfolk County, Ontario.

*You have applied under section 20.2 of Part II.1 of the Environmental Protection Act ,
R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:*

- one (1) paint spray booth for the application of surface coatings at a maximum rate of 8.0 litres per hour, equipped with a natural gas fired air make up unit, having a heat input of 1,260,000 kilojoules per hour, one (1) paint spray gun and 14.5 square metres of dry type paint arrestor filters, discharging into the air at a volumetric flow rate of 5.66 actual cubic metres per second, through a stack, having an exit diameter of 0.74 metre, extending 2.0 metres above the roof and 8.6 metres above grade;
- one (1) maintenance welding station;
- one (1) electric wood waste grinder, having a processing capacity of 20 tonnes per hour, located inside the Large Waste Transfer Building;
- one (1) paint mixing room, discharging into the air at a volumetric flow rate of 0.68 actual cubic metres per second, through a stack, having an exit diameter of 0.3 metre, extending 1.2 metres above the roof and 5.0 metres above grade;

All in accordance with the application for an Approval (Air and Noise) and all supporting information, dated December 21, 2018, signed by Bernie Debono of Norfolk Disposal Services Limited.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this Environmental Compliance Approval, including the application and supporting documentation listed above;
2. "Company" means Norfolk Disposal Services Limited, that is responsible for the

- construction or operation of the *Facility* and includes any successors and assigns;
3. "*EPA*" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended ;
 4. "*Equipment*" means the paint spray booth, welding station, and wood waste grinder described in the *Company's* application, this *Approval* and in the supporting documentation submitted with the application, to the extent approved by this *Approval*;
 5. "*Facility*" means the entire operation located on the property where the *Equipment* is located;
 6. "*Manual*" means a document or a set of documents that provide written instructions to staff of the *Company*;
 7. "*Ministry*" means the ministry of the government of Ontario responsible for the *EPA* and includes all officials, employees or other persons acting on its behalf;
 8. "*Publication NPC-300*" means the *Ministry* Publication NPC-300, "Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning, Publication NPC-300", August 2013 as amended.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. OPERATION AND MAINTENANCE

1. The *Company* shall ensure that the *Equipment* is properly operated and maintained at all times. The *Company* shall:
 - a. prepare, not later than three (3) months after the date of this *Approval*, and update as necessary, a *Manual* outlining the operating procedures and a maintenance program for the *Equipment*, including:
 - i. routine operating and maintenance procedures in accordance with good engineering practices and as recommended by the *Equipment* suppliers;
 - ii. emergency procedures, including spill clean-up procedures;
 - iii. procedures for any record keeping activities relating to operation and maintenance of the *Equipment*;
 - iv. all appropriate measures to minimize noise, dust and odorous emissions from all potential sources; and

- b. implement the recommendations of the *Manual*; and
- c. retain, for a minimum of two (2) years from the date of their creation, all records on the maintenance, repair and inspection of the *Equipment*, and make these records available for review by staff of the *Ministry* upon request.

2. NOISE

- 1. The *Company* shall, at all times, ensure that the noise emissions from the *Facility* comply with the limits set out in *Ministry Publication NPC-300*.
- 2. The *Company* shall restrict operation of the *Facility* to the daytime period between 7:00 AM to 7:00 PM.

3. RECORD RETENTION

- 1. The Company shall retain, for a minimum of two (2) years from the date of their creation, all records and information related to or resulting from the recording activities required by this Approval, and make these records available for review by staff of the Ministry upon request. The Company shall retain:
 - a. all records on the maintenance, repair and inspection of the Equipment; and
 - b. all records of any environmental complaints; including:
 - i. a description, time and date of each incident to which the complaint relates;
 - ii. wind direction at the time of the incident to which the complaint relates; and
 - iii. a description of the measures taken to address the cause of the incident to which the complaint relates and to prevent a similar occurrence in the future.

4. NOTIFICATION OF COMPLAINTS

- 1. The Company shall notify the District Manager, in writing, of each environmental complaint within two (2) business days of the complaint. The notification shall include:
 - a. a description of the nature of the complaint; and
 - b. the time and date of the incident to which the complaint relates.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition No. 1 is included to emphasize that the *Equipment* must be maintained and operated according to a procedure that will result in compliance with the *EPA*, the Regulations and this *Approval*.
2. Condition No. 2 is included to provide the minimum operational and performance requirements considered necessary to prevent an adverse effect resulting from the operation of the *Facility*.
3. Condition No. 3 is included to require the *Company* to keep records and to provide information to staff of the *Ministry* so that compliance with the *EPA*, the Regulations and this *Approval* can be verified.
4. Condition No. 4 is included to require the *Company* to notify staff of the *Ministry* so as to assist the *Ministry* with the review of the site's compliance.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 0754-AR6RTV issued on April 23, 2018.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

- a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
- b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;

5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Environmental
Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment, Conservation
and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 3rd day of May,
2019

Jeffrey McKerrall, P.Eng.
Director
appointed for the purposes of Part
II.1 of the *Environmental Protection
Act*

QN/
c: District Manager, MECP Hamilton - District
Greg Thomas, PRIME Environmental Services Inc.

APPENDIX

B

INDUSTRIAL CLASS DEFINITIONS

APPENDIX

DEFINITION OF CLASSES FROM D-6 GUIDELINE

CLASS I INDUSTRIAL FACILITY

A place of business for a small scale, self-contained plant or building which produces and/or stores a product which is contained in a package and has a low probability of fugitive emissions for any of the following: noise, odour, dust, and/or vibration. There are daytime operations only, with infrequent movement of products and/or heavy trucks and no outside storage.

CLASS II INDUSTRIAL FACILITY

A place of business for medium scale processing and manufacturing with outdoor storage of wastes or material (i.e. it has an open process) and/or there are periodic outputs of minor annoyance. There are occasional outputs of either point source or fugitive emissions of any of the following: noise, odour, dust, and/or vibration, and low probability of fugitive emissions. Shift operations are permitted and there is frequent movement of products and/or heavy trucks during daytime hours.

CLASS III INDUSTRIAL FACILITY

A place of business for large scale manufacturing or processing, characterized by: large physical size, outside storage of raw and finished products, large production volumes and continuous movement of products and employees during daily shift operations. It has frequent outputs of major annoyance and there is a high probability of fugitive emissions.

APPENDIX

Table A-1 Industrial Class Definitions and Specifications as outlined in D-6 Guideline

INDUSTRIAL CLASSIFICATION	OUTPUTS	SCALE	PROCESS	OPERATION/INTENSITY
Class I – Light Industrial	<p>Noise" Sound not audible off property</p> <p>Dust and/or Odour: infrequent and not intense</p> <p>Vibration: No ground borne vibration on plant property</p>	<p>No outside storage</p> <p>Small scale plant or scale is irrelevant in relation to all other criteria for this Class</p>	<p>Self-contained plant or building which produces/stores a packaged product. Low probability of fugitive emissions</p>	<p>Daytime operations only</p> <p>Infrequent movement of products and/or heavy trucks</p>
Class II – Medium Industrial	<p>Noise: Sound occasionally audible off property</p> <p>Dust and/or Odour: Frequent and occasionally intense</p> <p>Vibration: Possible ground borne vibration, but cannot be perceived off property</p>	<p>Outside storage permitted</p> <p>Medium level of production allowed</p>	<p>Open process</p> <p>Periodic outputs of minor annoyance</p> <p>Low probability of fugitive emissions</p>	<p>Shift operations permitted</p> <p>Frequent movement of products and/or heavy trucks with the majority of movements during daytime hours</p>
Class III – Heavy Industrial	<p>Noise: sound frequently audible off property</p> <p>Dust and/or Odour: Persistent and/or intense</p> <p>Vibration: Ground-borne vibration can frequently be perceived off property</p>	<p>Outside storage of raw and finished products</p> <p>Large production levels</p>	<p>Open process</p> <p>Frequent outputs of major annoyances</p> <p>High probability of fugitive emissions</p>	<p>Continuous movement of products and employees</p> <p>Daily shift operations permitted</p>

APPENDIX

C

SUMMARY OF
SENSITIVE
RECEPTORS

Project Name: Norfolk Disposal Expansion Project Land Use Compatibility Study
Site Address: at 811 Old Highway 24 and 42 Thompson Road West, in Waterford, Ontario

Table C1: Sensitive Receptors within the Study Area of the Proposed Development

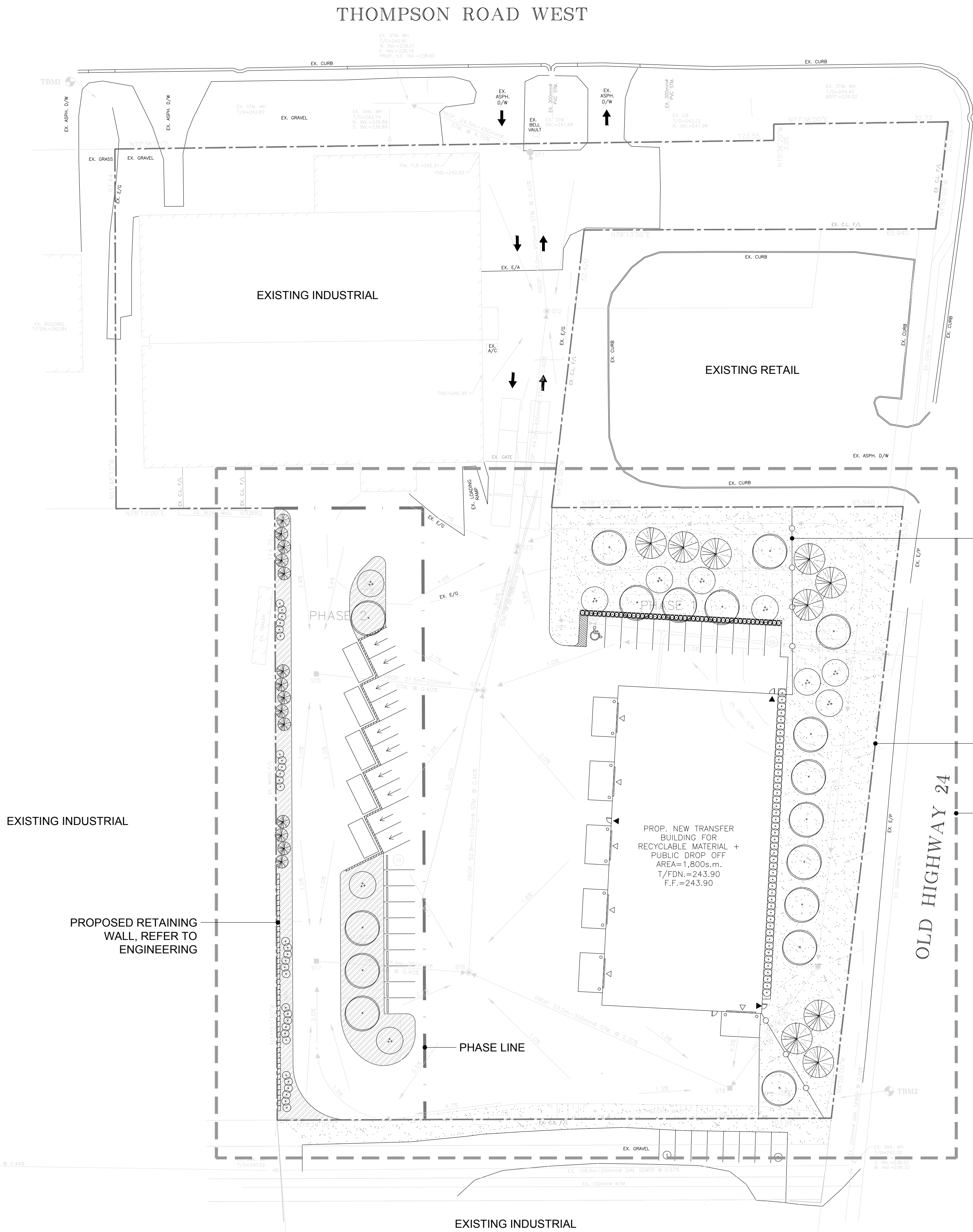
Receptor ID	Receptor Description	Address	Minimum Distance from Proposed Development (Property-Line to Property-Line)	Minimum Distance from Proposed Development (including landscape Buffer)	MECP D-6 Minimum Separation from Proposed Development	MOECC D-6 Potential Area of Influence from Proposed Development
			(m)		(m)	(m)
1	Residential Property on Old Highway 24	822 Old Highway 24, Waterford	19	47	70	300
2	Residential Property on Old Highway 24	832 Old Highway 24, Waterford	38	71	70	300
3	Residential Property on Thompson Road	4 Thompson Road East, Waterford	61	72	70	300
4	Residential Property on Thompson Road	8 Thompson Road East, Waterford	72	106	70	300
5	Residential Property on Thompson Road	10 Thompson Road East, Waterford	88	122	70	300
6	Residential Property on Thompson Road	19 Thompson Road East, Waterford	144	144	70	300
7	Residential Property on Thompson Road	23 Thompson Road East, Waterford	158	158	70	300
8	Residential Property on Howard Street	288 Howard Street, Waterford	198	198	70	300
9	Residential Property on Howard Street	290 Howard Street, Waterford	185	185	70	300
10	Residential Property on Howard Street	300 Howard Street, Waterford	175	175	70	300
11	Residential Property on Main Street	291 Main Street South, Waterford	123	123	70	300
12	Residential Property on Main Street	287 Main Street South, Waterford	152	152	70	300
13	Residential Property on Main Street	281 Main Street South, Waterford	170	170	70	300
14	Residential Property on Main Street	275 Main Street South, Waterford	183	183	70	300
15	Residential Property on Main Street	271 Main Street South, Waterford	203	203	70	300
16	Residential Property on Main Street	267 Main Street South, Waterford	223	223	70	300
17	Residential Property on Main Street	249 Main Street South, Waterford	247	247	70	300
18	Residential Property on Main Street	284 Main Street South, Waterford	139	139	70	300
19	Residential Property on Main Street	280 Main Street South, Waterford	162	162	70	300
20	Residential Property on Leamon Street	277 Leamon Street, Waterford	131	131	70	300
21	Residential Property on Leamon Street	275 Leamon Street, Waterford	157	157	70	300
22	Residential Property on Leamon Street	265 Leamon Street, Waterford	181	181	70	300
23	Residential Property on Leamon Street	259 Leamon Street, Waterford	201	201	70	300
24	Residential Property on Leamon Street	255 Leamon Street, Waterford	225	225	70	300
25	Residential Property on Leamon Street	249 Leamon Street, Waterford	246	246	70	300
26	Residential Property on Leamon Street	237 Leamon Street, Waterford	270	270	70	300
27	Residential Property on Brown Street	28 Brown Street West, Waterford	269	269	70	300
28	Residential Property on St James Street	275 St James Street South, Waterford	133	133	70	300
29	Residential Property on St James Street	271 St James Street South, Waterford	156	156	70	300
30	Residential Property on St James Street	265 St James Street South, Waterford	182	182	70	300
31	Residential Property on St James Street	257 St James Street South, Waterford	204	204	70	300
32	Residential Property on St James Street	251 St James Street South, Waterford	230	230	70	300
33	Residential Property on St James Street	245 St James Street South, Waterford	250	250	70	300
34	Residential Property on St James Street	239 St James Street South, Waterford	274	274	70	300
35	Residential Property on Brown Street	58 Brown Street West, Waterford	277	277	70	300
36	Residential Property on St James Street	272 St James Street South, Waterford	161	161	70	300
37	Residential Property on St James Street	268 St James Street South, Waterford	184	184	70	300
38	Residential Property on St James Street	260 St James Street South, Waterford	204	204	70	300
39	Residential Property on St James Street	254 St James Street South, Waterford	233	233	70	300
40	Residential Property on St James Street	248 St James Street South, Waterford	255	255	70	300
41	Residential Property on St James Street	244 St James Street South, Waterford	269	269	70	300
42	Residential Property on St James Street	240 St James Street South, Waterford	290	290	70	300
43	Residential Property on Blueline Road	2247 Blueline Road, Waterford	76	76	70	300
44	Residential Property on Blueline Road	2233 Blueline Road, Waterford	140	140	70	300
45	Residential Property on Yu Boulevard	19 Yu Boulevard, Waterford	109	130	70	300
46	Residential Property on Yu Boulevard	23 Yu Boulevard, Waterford	109	130	70	300
47	Residential Property on Yu Boulevard	27 Yu Boulevard, Waterford	115	136	70	300
48	Residential Property on Yu Boulevard	31 Yu Boulevard, Waterford	119	140	70	300
49	Residential Property on Yu Boulevard	35 Yu Boulevard, Waterford	123	144	70	300
50	Residential Property on Yu Boulevard	39 Yu Boulevard, Waterford	126	147	70	300
51	Residential Property on Yu Boulevard	43 Yu Boulevard, Waterford	129	129	70	300
52	Residential Property on Yu Boulevard	47 Yu Boulevard, Waterford	136	136	70	300
53	Residential Property on Yu Boulevard	51 Yu Boulevard, Waterford	137	137	70	300
54	Residential Property on Yu Boulevard	55 Yu Boulevard, Waterford	140	140	70	300
55	Residential Property on Yu Boulevard	59 Yu Boulevard, Waterford	143	143	70	300
56	Residential Property on Yu Boulevard	63 Yu Boulevard, Waterford	149	149	70	300
57	Residential Property on Yu Boulevard	67 Yu Boulevard, Waterford	157	157	70	300
58	Residential Property on Yu Boulevard	71 Yu Boulevard, Waterford	167	167	70	300
59	Residential Property on Yu Boulevard	75 Yu Boulevard, Waterford	178	178	70	300
60	Residential Property on Winterberry Lane	28 Winterberry Lane	200	200	70	300
61	Residential Property on Winterberry Lane	30 Winterberry Lane	208	208	70	300
62	Residential Property on Winterberry Lane	32 Winterberry Lane	218	218	70	300
63	Residential Property on Winterberry Lane	29 Winterberry Lane	224	224	70	300
64	Residential Property on Winterberry Lane	31 Winterberry Lane	233	233	70	300
65	Residential Property on Winterberry Lane	33 Winterberry Lane	242	242	70	300
66	Residential Property on Yu Boulevard	24 Yu Boulevard, Waterford	172	172	70	300
67	Residential Property on Yu Boulevard	30 Yu Boulevard, Waterford	178	178	70	300
68	Residential Property on Yu Boulevard	34 Yu Boulevard, Waterford	180	180	70	300
69	Residential Property on Yu Boulevard	38 Yu Boulevard, Waterford	183	183	70	300
70	Residential Property on Yu Boulevard	12 Yin Street, Waterford	199	199	70	300
71	Residential Property on Yu Boulevard	14 Yin Street, Waterford	206	206	70	300
72	Residential Property on Yu Boulevard	16 Yin Street, Waterford	218	218	70	300
73	Residential Property on Yu Boulevard	18 Yin Street, Waterford	224	224	70	300
74	Residential Property on Yu Boulevard	20 Yin Street, Waterford	264	264	70	300
75	Residential Property on Coulas Crescent	3 Coulas Crescent, Waterford	189	189	70	300
76	Residential Property on Coulas Crescent	7 Coulas Crescent, Waterford	221	221	70	300
77	Residential Property on Coulas Crescent	11 Coulas Crescent, Waterford	240	240	70	300
78	Residential Property on Coulas Crescent	15 Coulas Crescent, Waterford	262	262	70	300
79	Residential Property on Coulas Crescent	19 Coulas Crescent, Waterford	280	280	70	300
80	Residential Property on Coulas Crescent	2 Coulas Crescent, Waterford	193	193	70	300
81	Residential Property on Coulas Crescent	6 Coulas Crescent, Waterford	222	222	70	300
82	Residential Property on Coulas Crescent	10 Coulas Crescent, Waterford	247	247	70	300
83	Residential Property on Coulas Crescent	14 Coulas Crescent, Waterford	264	264	70	300
84	Residential Property on Coulas Crescent	18 Coulas Crescent, Waterford	284	284	70	300
85	Residential Property on Coulas Crescent	170 Coulas Crescent, Waterford	207	207	70	300
86	Residential Property on Coulas Crescent	166 Coulas Crescent, Waterford	233	233	70	300
87	Residential Property on Coulas Crescent	162 Coulas Crescent, Waterford	254	254	70	300
88	Residential Property on Coulas Crescent	158 Coulas Crescent, Waterford	273	273	70	300
89	Residential Property on Coulas Crescent	169 Coulas Crescent, Waterford	225	225	70	300

Project Name: Norfolk Disposal Expansion Project Land Use Compatibility Study
Site Address: at 811 Old Highway 24 and 42 Thompson Road West, in Waterford, Ontario

Table C1: Sensitive Receptors within the Study Area of the Proposed Development

Receptor ID	Receptor Description	Address	Minimum Distance from Proposed Development (Property-Line to Property-Line)	Minimum Distance from Proposed Development (including landscape Buffer)	MECP D-6 Minimum Separation from Proposed Development	MOECC D-6 Potential Area of Influence from Proposed Development
			(m)		(m)	(m)
90	Residential Property on Coulas Crescent	165 Coulas Crescent, Waterford	246	246	70	300
91	Residential Property on Coulas Crescent	161 Coulas Crescent, Waterford	272	272	70	300
92	Residential Property on Tan Avenue	3 Tan Avenue, Waterford	248	248	70	300
93	Residential Property on Tan Avenue	7 Tan Avenue, Waterford	265	265	70	300
94	Residential Property on Washington Street	302 Washington Street, Waterford	266	266	70	300
95	Residential Property on Washington Street	288 Washington Street, Waterford	278	278	70	300
96	Residential Property on Washington Street	284 Washington Street, Waterford	282	282	70	300
97	Residential Property on Washington Street	280 Washington Street, Waterford	293	293	70	300
98	Residential Property on Winterberry Lane	8 Winterberry Lane, Waterford	248	248	70	300
99	Residential Property on Winterberry Lane	6 Winterberry Lane, Waterford	258	258	70	300
100	Residential Property on Winterberry Lane	4 Winterberry Lane, Waterford	268	268	70	300
101	Residential Property on Winterberry Lane	2 Winterberry Lane, Waterford	278	278	70	300

- Indicates that the sensitive receptor is within the minimum separation distance of the proposed development.
- Indicates that the sensitive receptor is within the area of influence of the proposed development but outside the recommended minimum separation distance.



CLIENT

NORFOLK DISPOSAL

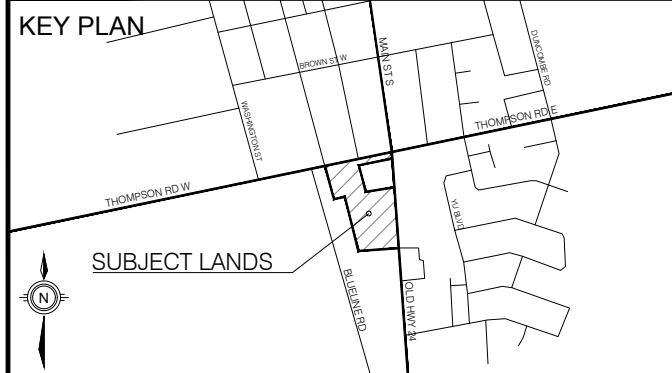
811 OLD HWY 24 SUITE 1, WATERFORD,
ON NOE 1Y0

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ISSUES		
No.	DESCRIPTION	DATE
01	SITE PLAN SUBMISSION	2023-03-31



IBI GROUP
Suite 200 - 360 James Street North
Hamilton ON L8L 1H5 Canada
tel 905 546 1010 fax 905 546 1011
ibigroup.com

PROJECT

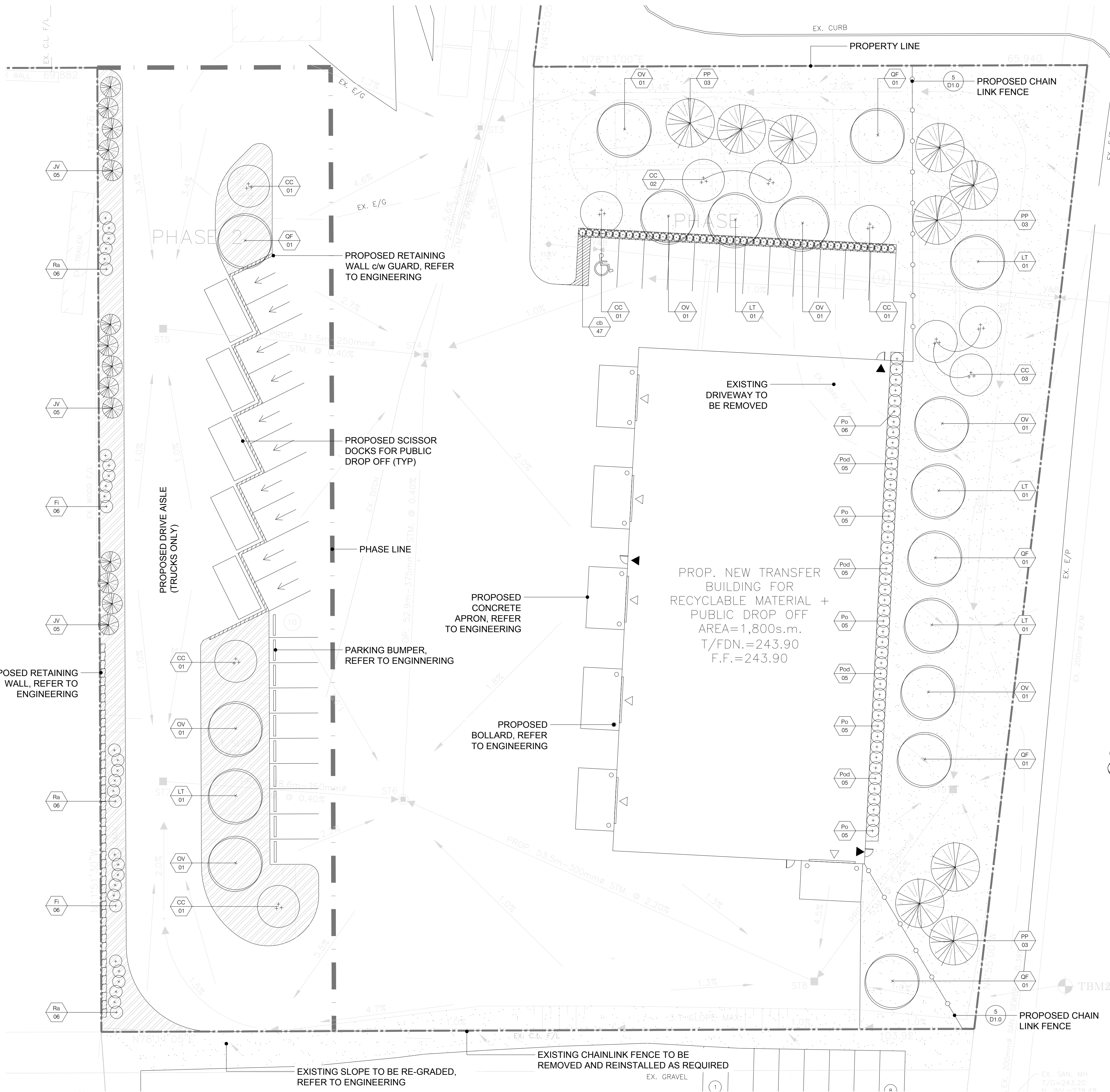
NORFOLK DISPOSAL
NEW TRANSFER STATION
811 OLD HWY 24, WATERFORD, ON
NOE 1Y0

PROJECT NO: 136731	SCALE: 1:500
DRAWN BY: L. GUILHERME	CHECKED BY: T. O'BRIEN
PROJECT MGR: T. TUCKER	APPROVED BY: T. O'BRIEN

SHEET TITLE

LANDSCAPE PLAN

SHEET NUMBER	ISSUE
L1.0	1



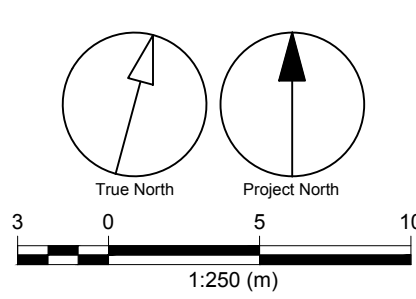
LEGEND

- TOPSOIL AND SOD AS SPECIFIED MINIMUM 150mm TOPSOIL DEPTH
- TOPSOIL AND SEED A AS SPECIFIED MINIMUM 150mm TOPSOIL DEPTH
- PROPOSED DECIDUOUS SHADE TREE
- PROPOSED DECIDUOUS MULTISTEM TREE
- PROPOSED CONIFEROUS TREE
- PROPOSED DECIDUOUS SHRUBS
- PROPOSED ORNAMENTAL GRASSES
- BLACK VINYL CHAIN LINK FENCE
- PLANT SPECIES QUANTITY
- DETAIL NUMBER SHEET NUMBER

NOT FOR CONSTRUCTION

SEED MIX A:
CONTRACTOR TO SOW NURSE CROP AVENA SATIVA OVER ENTIRE AREA:
TO BE SEED AT A RATE OF 25kg/HECTARE
8340 - LOW MAINTENANCE ECO LAWN SEED MIXTURE BY OSC SEEDS. TO
BE SEED AT A RATE OF 1.5KG PER 61 SQ.M. SEED MIX TO INCLUDE:

- Creeping Red Fescue
- Ecotart Hard Fescue
- Chewings Fescue
- Perennial Rye



OLD HIGHWAY 24

PROPOSED PLANT LIST									
KEY	BOTANICAL NAME	COMMON NAME	CAL.	SIZE	COND	MATURE HEIGHT (m)	MATURE SPREAD (m)	O.C. SPACING (m)	QNTY.
DECIDUOUS TREES									
CC	Cercis canadensis	Eastern Redbud	Clump	200cm	W.B.	10.0	7.0	5.5	10
LT	Liriodendron tulipifera	Tulip Tree	60mm		W.B.	22.0	12.0	8.0	5
OV	Ostrya virginiana	Ironwood	60mm		W.B.	12.0	8.0	8.0	7
QF	Quercus robur 'Fastigiata'	English Columnar Oak	60mm		W.B.	16.0	6.0	8.0	5
TOTAL									27
CONIFEROUS TREES									
JV	Juniperus virginiana	Eastern Red Cedar		200cm	W.B.	7.0	3.0	2.0	15
PP	Picea pungens	Blue Spruce		250cm	W.B.	18.0	6.0	6.0	9
TOTAL									24
SHRUBS									
Fi	Forsythia x intermedia 'Lynwood Gold'	Lynwood Gold Forsythia		50cm	3 gal	1.7	1.7	1.2	12
Po	Physocarpus opulifolius	Common Ninebark		50cm	3 gal	1.7	1.7	1.2	26
Pod	Physocarpus opulifolius 'Diabolo'	Diabolo Ninebark		50cm	3 gal	1.7	1.5	1.2	20
Ra	Rhus aromatica	Fragrant Sumac		50cm	3 gal	1.5	1.7	1.2	18
TOTAL									76
PERENNIALS / GRASSES / VINES									
cb	Calamagrostis canadensis	Canada Bluejoint			1 gal	1.5	1.2	0.9	47
TOTAL									47

CLIENT

NORFOLK DISPOSAL

811 OLD HWY 24 SUITE 1, WATERFORD, ON N0E 1Y0

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ISSUES

No.	DESCRIPTION	DATE
01	SITE PLAN SUBMISSION	2023-03-31

KEY PLAN

SUBJECT LANDS

PROJECT

NORFOLK DISPOSAL

NEW TRANSFER STATION

811 OLD HWY 24, WATERFORD, ON N0E 1Y0

PROJECT NO: 136731
SCALE: 1:500

DRAWN BY: L. GUILHERME
CHECKED BY: T. O'BRIEN

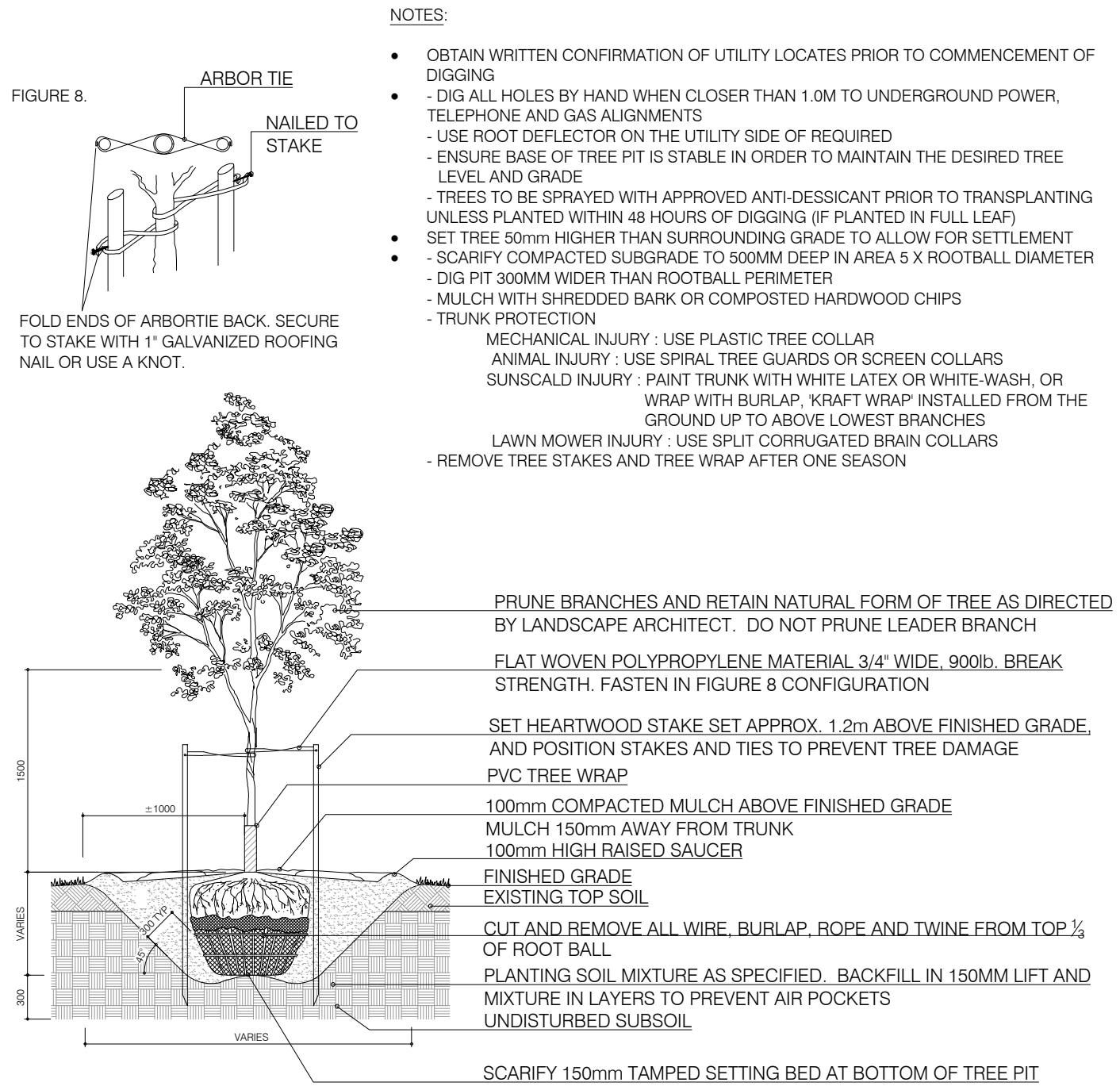
PROJECT MGR: T. TUCKER
APPROVED BY: T. O'BRIEN

SHEET TITLE

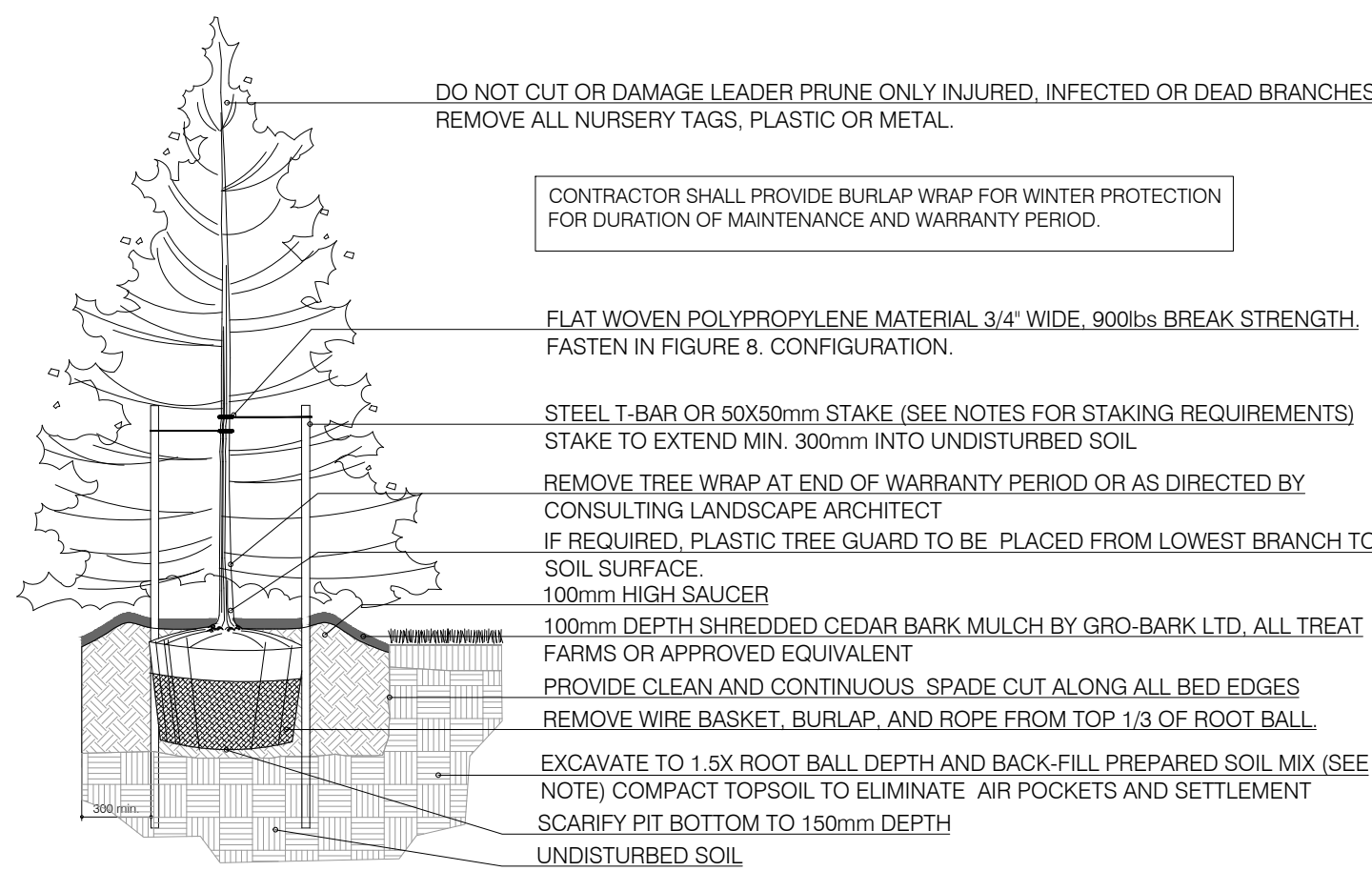
LANDSCAPE PLAN

ENLARGEMENT

SHEET NUMBER **L2.0** **ISSUE** **1**

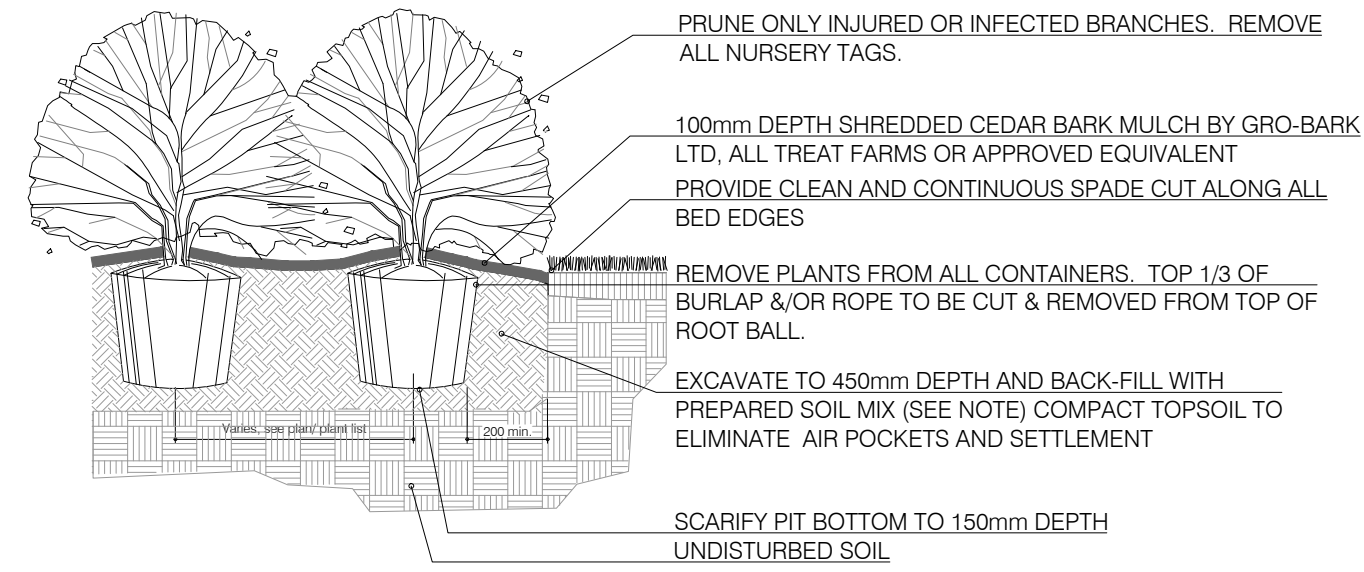


1 BALLED & BURLAPPED/WIRE BASKET DECIDUOUS TREE
D1.0 N.T.S.



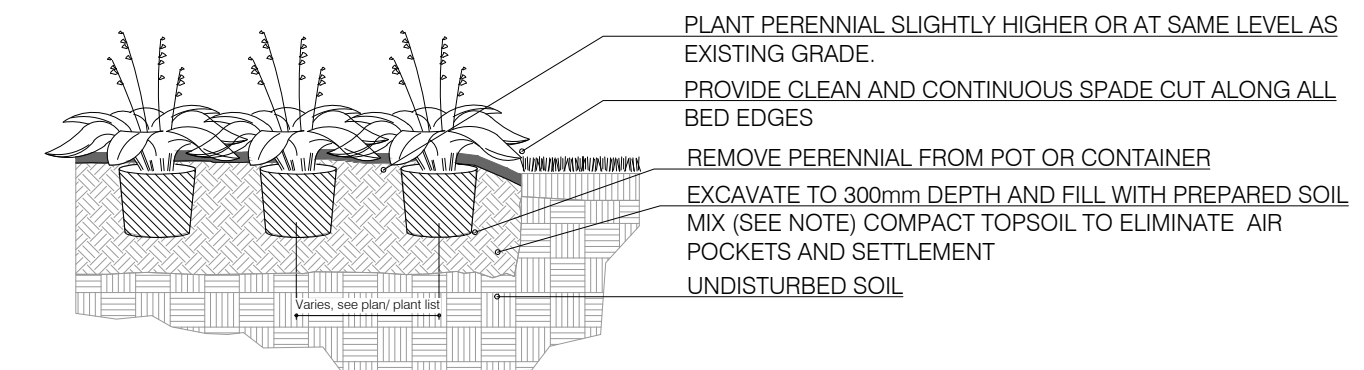
- NOTES:
- SOIL MIXTURE: FOUR (4) PARTS NATIVE SOIL, ONE (1) PART WELL ROTTED COMPOST.
 - SAUCER SHALL BE SOAKED WITH WATER AND MULCHED IMMEDIATELY FOLLOWING PLANTING.
 - ALL DIMENSIONS ARE IN mm.
 - STAKING SCHEDULE:
 - < 2500mm HT. - ONE STAKE
 - > 2500mm HT. - TWO STAKES
 - SPADED TREES - THREE STAKES OR QTY WIRES
 - ALL SUPPORT SYSTEMS MUST BE REMOVED ONCE TREE IS ESTABLISHED.
 - ALL TREES TO BE STRAIGHT AND PLANTED VERTICALLY REGARDLESS OF SLOPE.
 - TOP OF ROOT FLARE SHALL BE POSITIONED 50mm ABOVE GRADE.

2 BALLED & BURLAPPED/WIRE BASKET CONIFEROUS TREE
D1.0 N.T.S.



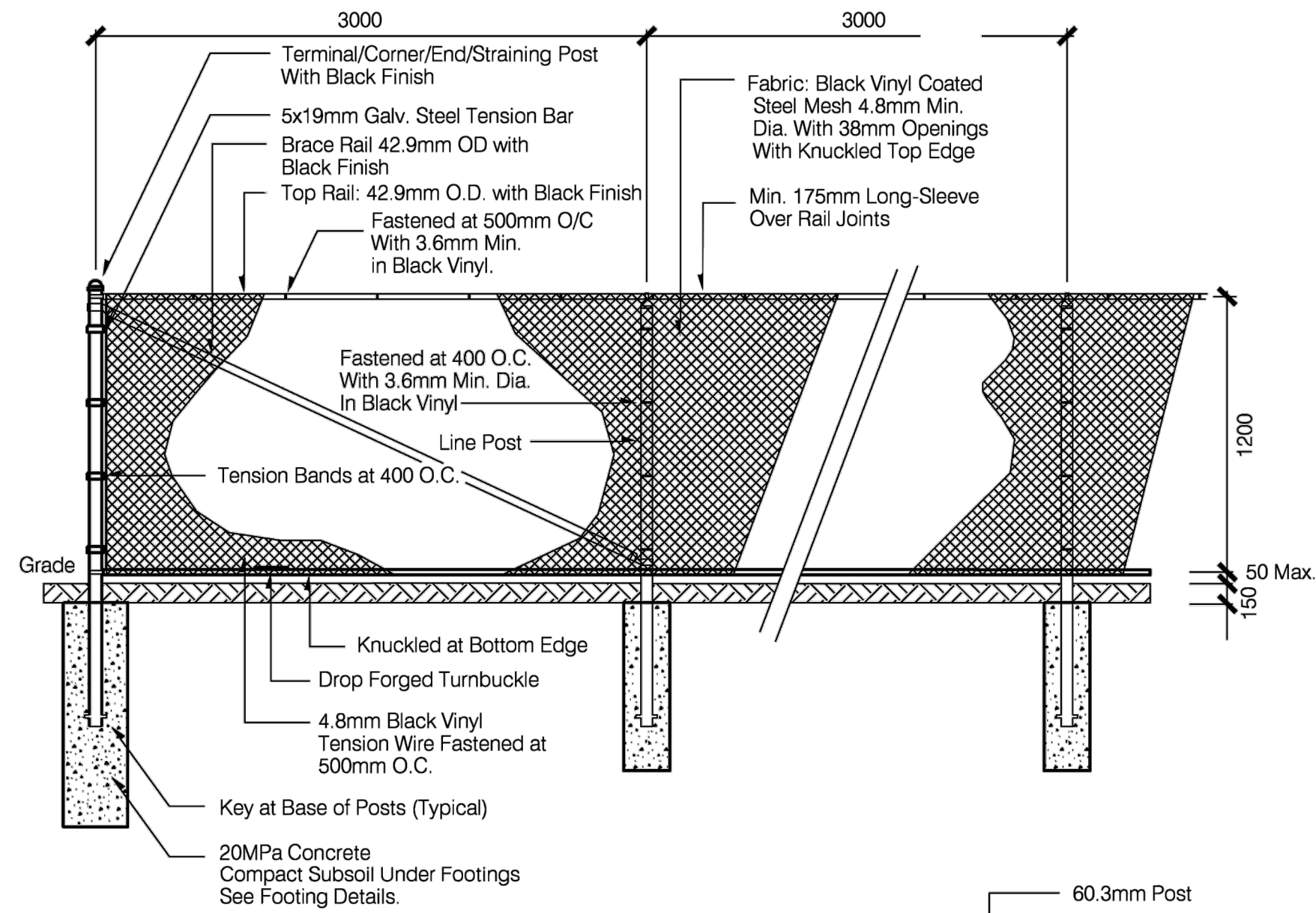
- NOTES:
- SOIL MIXTURE: FOUR (4) PARTS NATIVE SOIL, ONE (1) PART WELL ROTTED COMPOST.
 - SAUCER SHALL BE SOAKED WITH WATER AND MULCHED IMMEDIATELY FOLLOWING PLANTING.
 - ALL DIMENSIONS ARE IN mm.
 - IN POORLY DRAINED SOILS PLANT SHRUB SLIGHTLY HIGHER THAN ADJACENT GRADE.
 - ALL PLANTS TO BE STRAIGHT AND PLANTED VERTICALLY REGARDLESS OF SLOPE.

3 BALLED AND BURLAPPED/POTTED SHRUB
D1.0 N.T.S.



- NOTES:
- SOIL MIXTURE: FOUR (4) PARTS NATIVE SOIL, ONE (1) PART WELL ROTTED COMPOST.
 - SAUCER SHALL BE SOAKED WITH WATER AND MULCHED IMMEDIATELY FOLLOWING PLANTING.
 - ALL DIMENSIONS ARE IN mm.
 - CUT AND REMOVE CONTAINER. SCARIFY ROOTBALL SIDES.
 - ALL PLANTS TO BE STRAIGHT AND PLANTED VERTICALLY REGARDLESS OF SLOPE.
- CONTRACTOR SHALL PROVIDE 75mm MULCH FOR ALL PERENNIALS EXCEPT GROUNDCOVERS UNLESS SPECIFIED OTHERWISE.

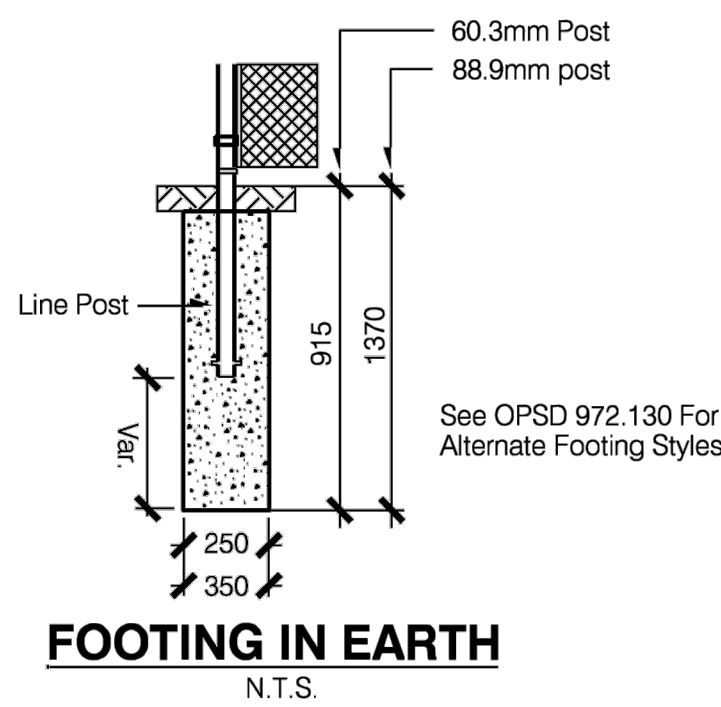
4 CONTAINER GROWN PERENNIAL/GRASS
D1.0 N.T.S.



SECTION N.T.S.

Post Details		
Post Type	OD (mm)	Post Length Standard (m)
Line Post	60.3	2.3
End, Corner or Straining Post	88.9	2.6

- NOTES:
- Fences Shall Conform to Norfolk County By-Laws.
 - To be Used in Conjunction With But Taking Precedence Over OPSD 972.130.
 - All Posts, Rails and Hardware Shall be Black.
 - All Dimensions are in Millimeters Unless Otherwise Noted.



5 1.2M CHAIN LINK FENCE
D1.0 N.T.S.

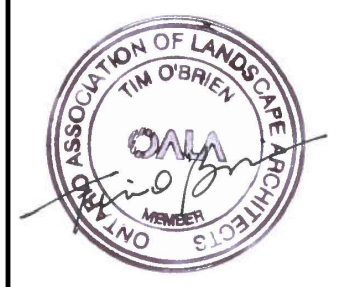
CLIENT
NORFOLK DISPOSAL

811 OLD HWY 24 SUITE 1, WATERFORD, ON NOE 1Y0

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ISSUES		
No.	DESCRIPTION	DATE
01	SITE PLAN SUBMISSION	2023-03-31



IBI GROUP
Suite 200 - 360 James Street North
Hamilton ON L8L 1H5 Canada
tel 905 546 1010 fax 905 546 1011
ibigroup.com

PROJECT
NORFOLK DISPOSAL
NEW TRANSFER STATION
811 OLD HWY 24, WATERFORD, ON
NOE 1Y0

PROJECT NO: 136731	SCALE: 1:500
DRAWN BY: L. GUILHERME	CHECKED BY: T. O'BRIEN
PROJECT MGR: T. TUCKER	APPROVED BY: T. O'BRIEN

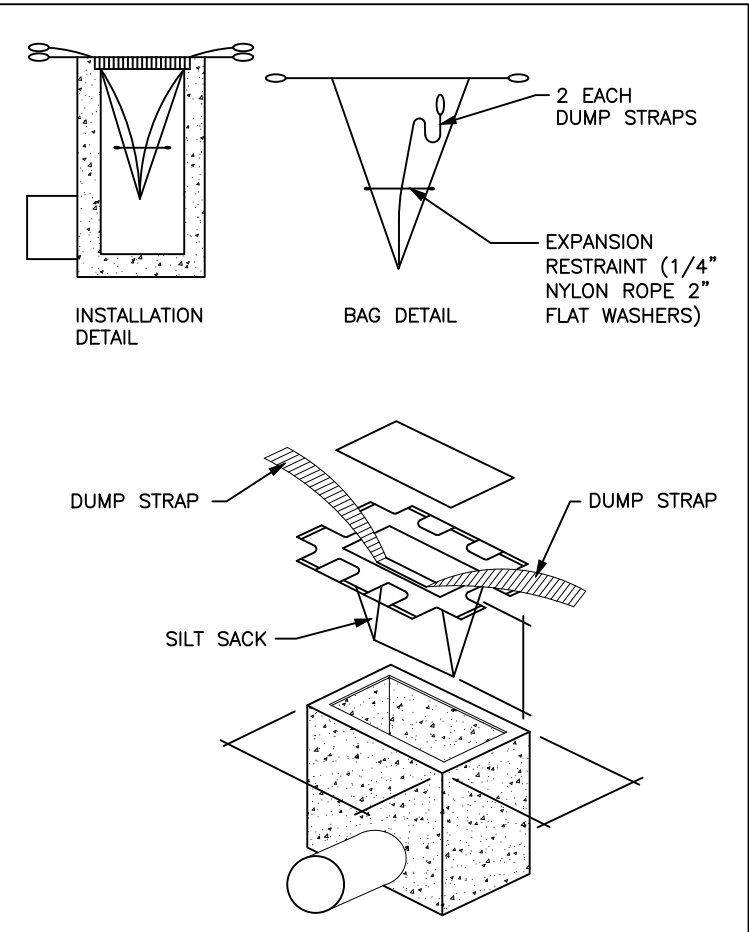
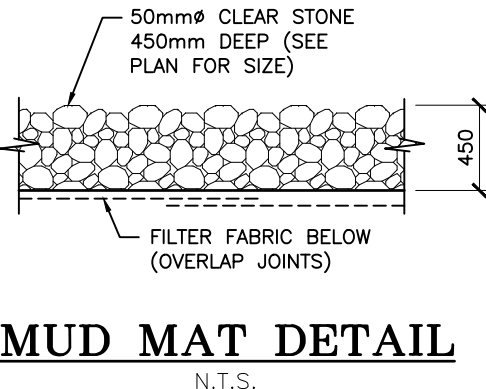
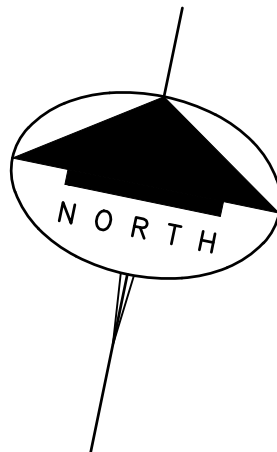
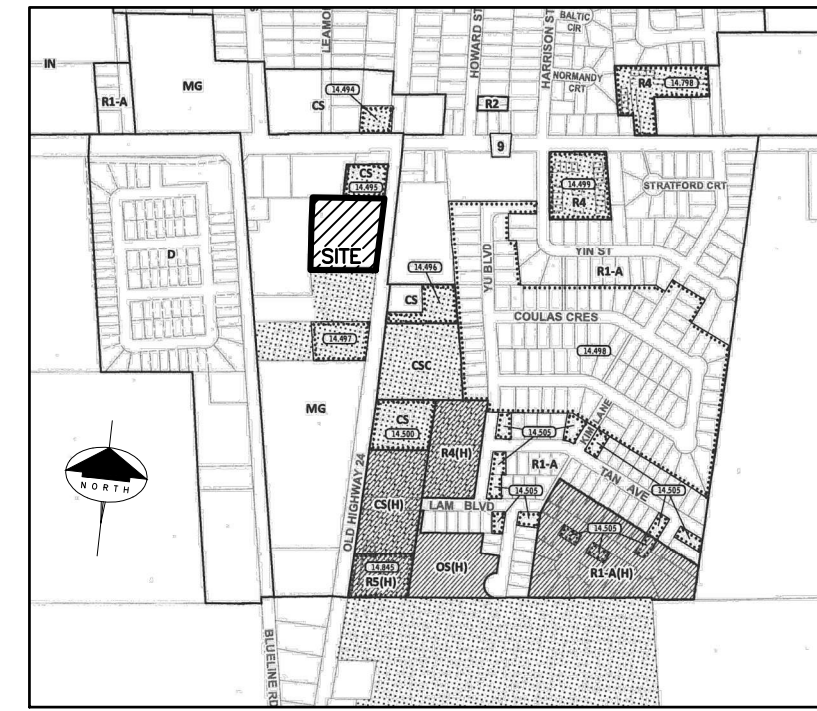
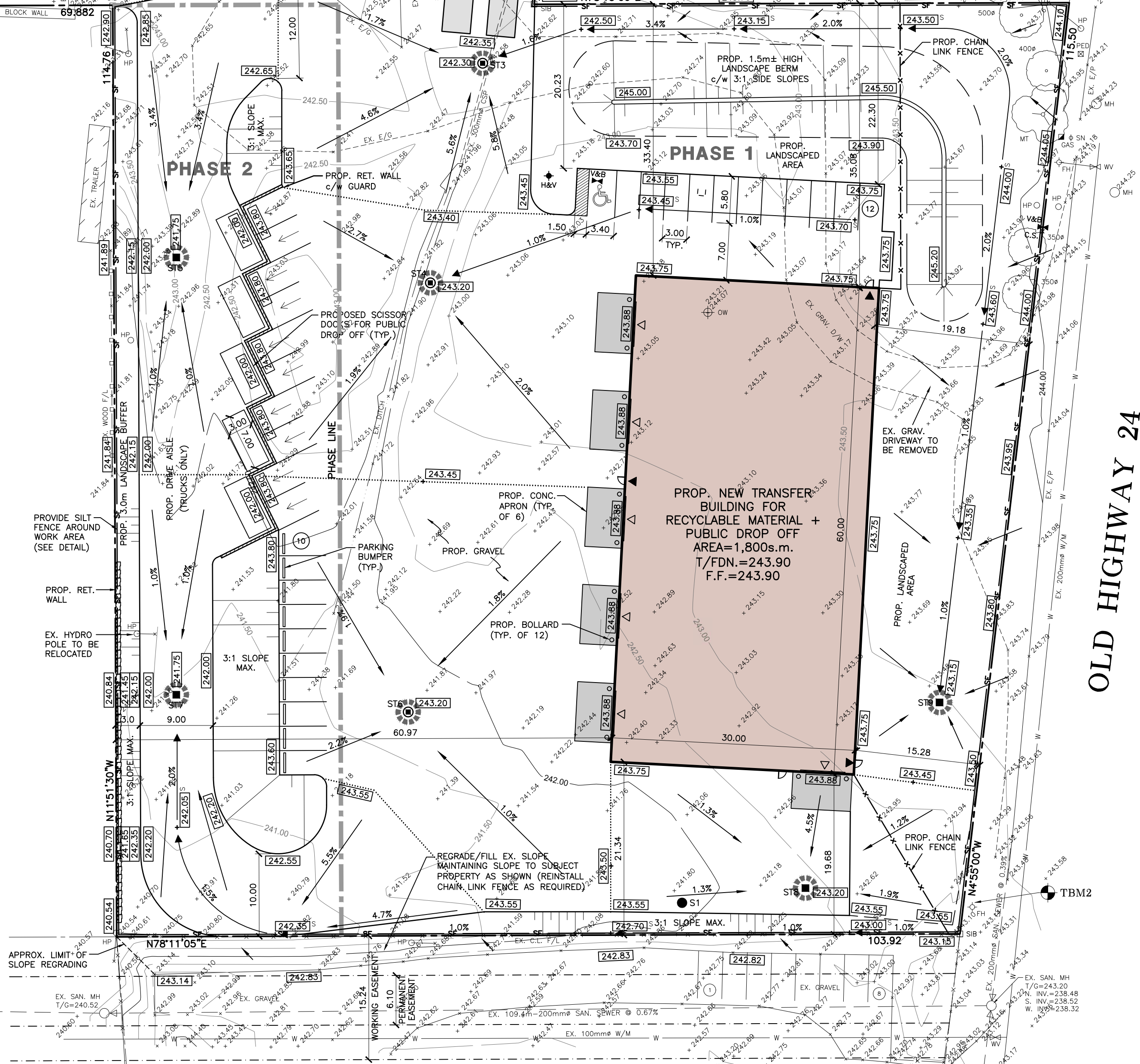
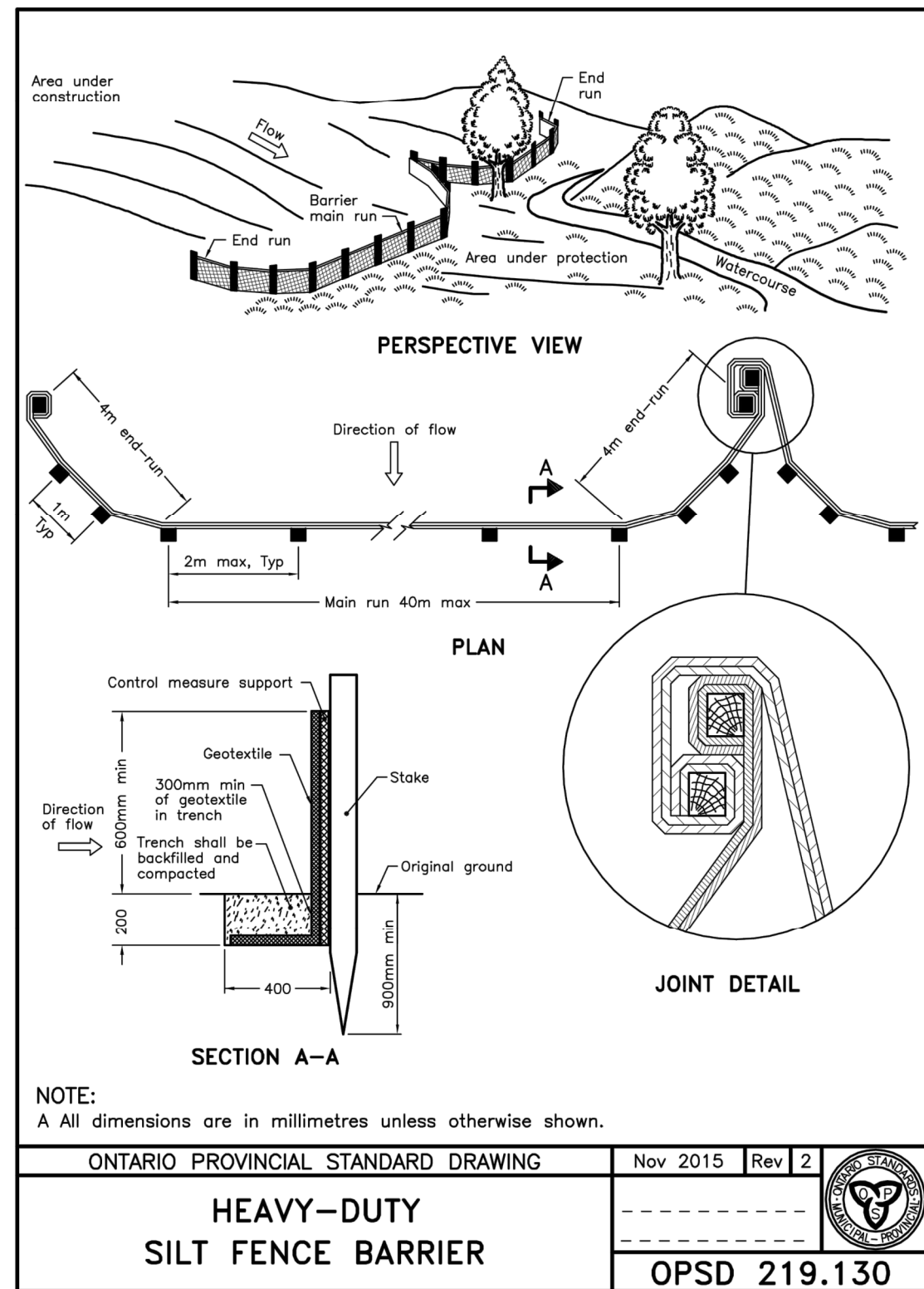
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LANDSCAPE DETAILS

SHEET NUMBER
D1.0

ISSUE
1

THOMPSON ROAD WEST

BLUELINE RD.



LEGEND:

- EXISTING ELEVATIONS
- PROPOSED ELEVATIONS
- PROPOSED SWALE ELEVATIONS
- PROPOSED SWALE
- GENERAL DRAINAGE
- SILTATION FENCE
- SILT SACK AS SHOWN

NOTES:

- ALL ELEVATIONS SHOWN ARE METRIC.
- BUILDER/OWNER TO VERIFY COMPLIANCE WITH ZONING BYLAWS (i.e. SIDEYARDS, SETBACKS, REARYARDS ETC.)
- THE SILTATION & EROSION CONTROL (SEC) MEASURES ILLUSTRATED ON THIS PLAN ARE CONSIDERED TO BE THE MINIMUM REQUIREMENT. SITE CONDITIONS MAY REQUIRE ADDITIONAL MEASURES WHICH WILL BE IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION.
- ALL SEC MEASURES ARE TO BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
- OWNER/CONTRACTOR TO MAINTAIN EROSION CONTROL MEASURES THROUGHOUT SITE UNTIL A COMPLETE GRASS/VEGETATION COVER IS ACHIEVED.
- ONLY AT THE DIRECTION OF THE ENGINEER ARE THE SEC MEASURES TO BE REMOVED.
- SITE WORKS ARE TO BE STAGED IN SUCH A MANNER THAT EROSION WILL BE MINIMIZED, AND THE CONSULTANT MUST PROVIDE CONFIRMATION THAT ALL APPROVED SILTATION AND EROSION CONTROL FACILITIES HAVE BEEN INSTALLED PRIOR TO THE COMMENCEMENT OF ANY GRADING, EXCAVATION OR DEMOLITION.
- CLEARING AND GRUBBING OF THE SITE SHOULD BE KEPT TO A MINIMUM AND VEGETATION REMOVED ONLY IN ADVANCE OF IMMEDIATE CONSTRUCTION.
- STOCKPILES OF EARTH OR TOPSOIL ARE TO BE LOCATED AND PROTECTED TO MINIMIZE ENVIRONMENTAL INTERFERENCE. EROSION CONTROL FENCING IS TO BE INSTALLED AROUND THE BASE OF ALL STOCKPILES.
- THE OWNER IS RESPONSIBLE TO ENSURE THE MUNICIPAL ROADWAYS ARE CLEANED OF ALL SEDIMENTS FROM VEHICULAR TRACKING ETC. TO AND FROM THE SITE, AT THE END OF EACH WORKDAY.
- ALL DISTURBED AREAS, NOT INCLUDED IN THE CONSTRUCTION ZONE, ARE TO BE TOPSOILED AND SEEDED IMMEDIATELY AFTER COMPLETION OF AREA GRADING.
- ALL EXISTING AND PROPOSED CATCHBASINS ON THE SUBJECT PROPERTY, PLUS ANY CATCHBASINS WITHIN THE INFLUENCE OF RUNOFF FROM THE SITE, ARE TO BE PROTECTED WITH FILTER CLOTH OR APPROVED EQUIVALENT.
- ADDITIONAL SILT CONTROLS MAY BE REQUIRED AS DETERMINED BY THE COUNTY AND/OR THE ENGINEER.

T.B.M. No. 1 ELEV. = 243.30m (GEO)
NAIL ON SIDE OF HYDRO POLE WEST OF EXISTING BUILDING

T.B.M. No. 2 ELEV. = 244.14m (GEO)
TOP NUT OF HYDRANT, SOUTH EAST CORNER OF PROPERTY

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

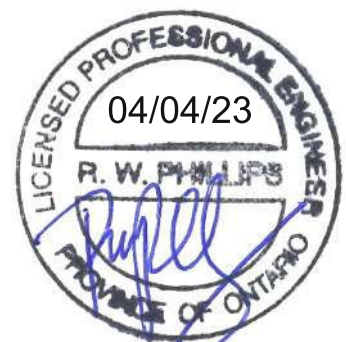
440 HARDY ROAD, UNIT #1, BRANTFORD - ONTARIO, N3T 5L8
TEL. (519) 753-2656 FAX. (519) 753-4263 www.cohooneg.com

PROJECT:
PROPOSED SORTING FACILITY
NORFOLK DISPOSAL SERVICES LIMITED
106 THOMPSON ROAD WEST
WATERFORD, ONTARIO

CLIENT:
PK CONSTRUCTION INC.

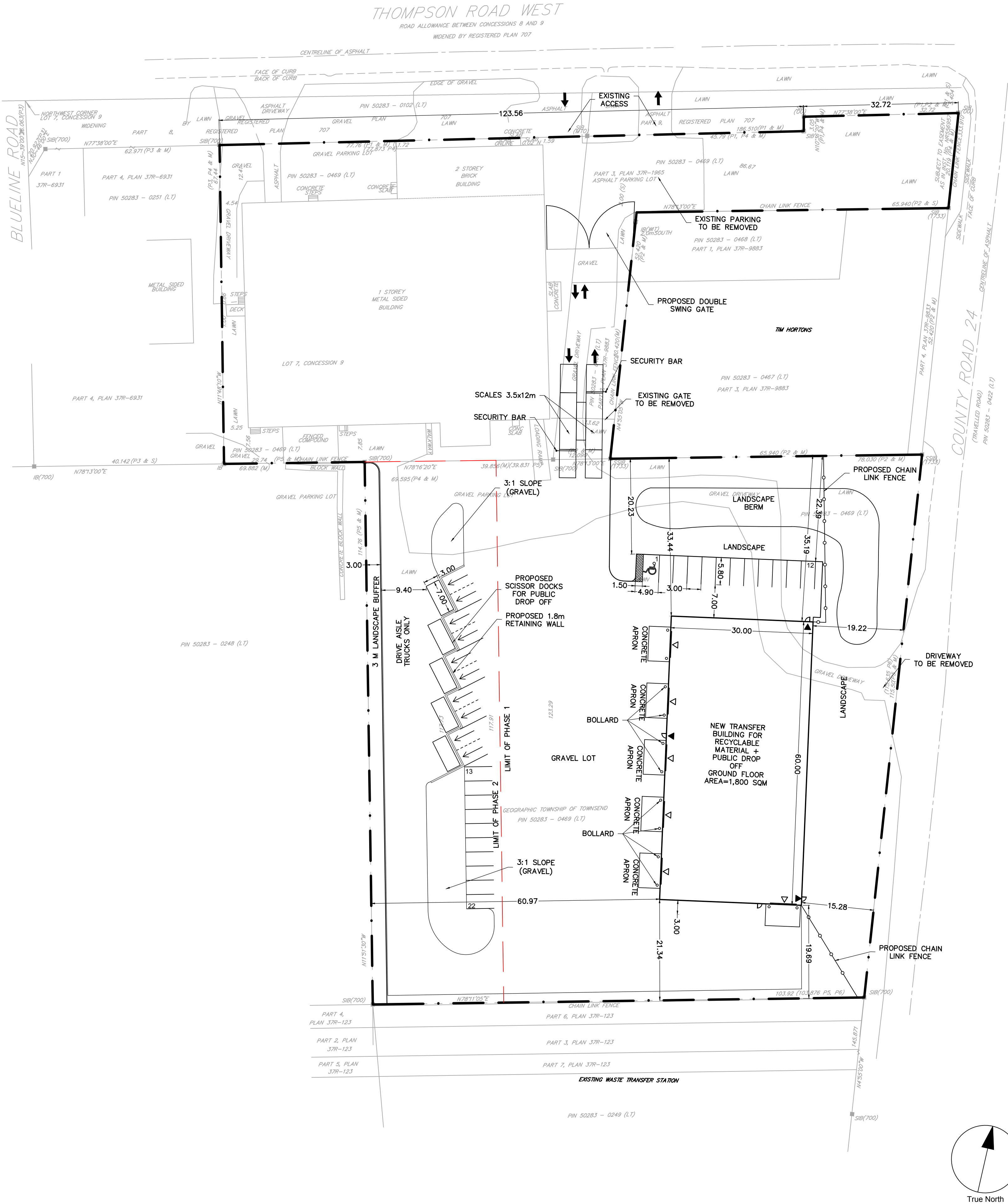
GRADING AND SILTATION & EROSION CONTROL PLAN

DESIGN:	R.W.P.	SCALE:	1:400
DRAWN:	K.P.B.	JOB No:	15888
CHECKED:	R.W.P.		
SHEET:	1 of 3	DWG. No:	15888-1
DATE:	APR. 4/23		



NORFOLK COUNTY ZONING BY-LAW No. 1-Z-2014		
General Industrial MG Zone	REQUIRED	PROVIDED
MINIMUM LOT AREA	1,855 m ²	19,713.85 m ²
MINIMUM LOT FRONTAGE	30 m	156.26 m
MINIMUM FRONT YARD	6 m	101.87 m
MINIMUM EXTERIOR SIDE YARD	6 m	15.42 m
MINIMUM INTERIOR SIDE YARD	3 m	6.97 m
MINIMUM INTERIOR SIDE YARD ABUTTING A RESIDENTIAL ZONE	20 m	N/A
MINIMUM REAR YARD	9 m	19.69 m
MAXIMUM BUILDING HEIGHT	SUBJECT TO A 45 DEGREE ANGULAR PLANE MEASURED FROM THE EDGE OF ANY RESIDENTIAL, COMMERCIAL OR INSTITUTIONAL ZONED LOTS	14.289 m
OUTDOOR STORAGE	PROHIBITED IN ANY FRONT YARD OR ANY REQUIRED EXTERIOR SIDE YARD	REAR YARD

PARKING REQUIREMENTS		
Description	REQUIRED	PROVIDED
INDUSTRIAL ESTABLISHMENT, INCLUDING CANNABIS PRODUCTION AND PROCESSING	1 PARKING SPACE FOR EVERY 90M ² OF USABLE FLOOR AREA 1,800/90=20 PARKING SPACES	20
ACCESSIBLE PARKING	NUMBER OF REQUIRED SPACES 1-25 = 1 TYPE A ACCESSIBLE PARKING SPACE	1 ACCESSIBLE PARKING, TYPE A



CLIENT
NORFOLK DISPOSAL

811 OLD HWY 24
WATERFORD, ON

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is a member of the IBI Group of companies

ISSUES		
No.	DESCRIPTION	DATE
01	FIRST SITE PLAN SUBMISSION	2023-04-26

PRELIMINARY - SUBJECT TO REVISION

KEY PLAN

LEGEND	
	OVERHANG DOOR
	DOOR

IBI GROUP
Suite 200 - 360 James Street North
Hamilton ON L8L 1H5 Canada
tel 905 546 1010 fax 905 546 1011
ibigroup.com

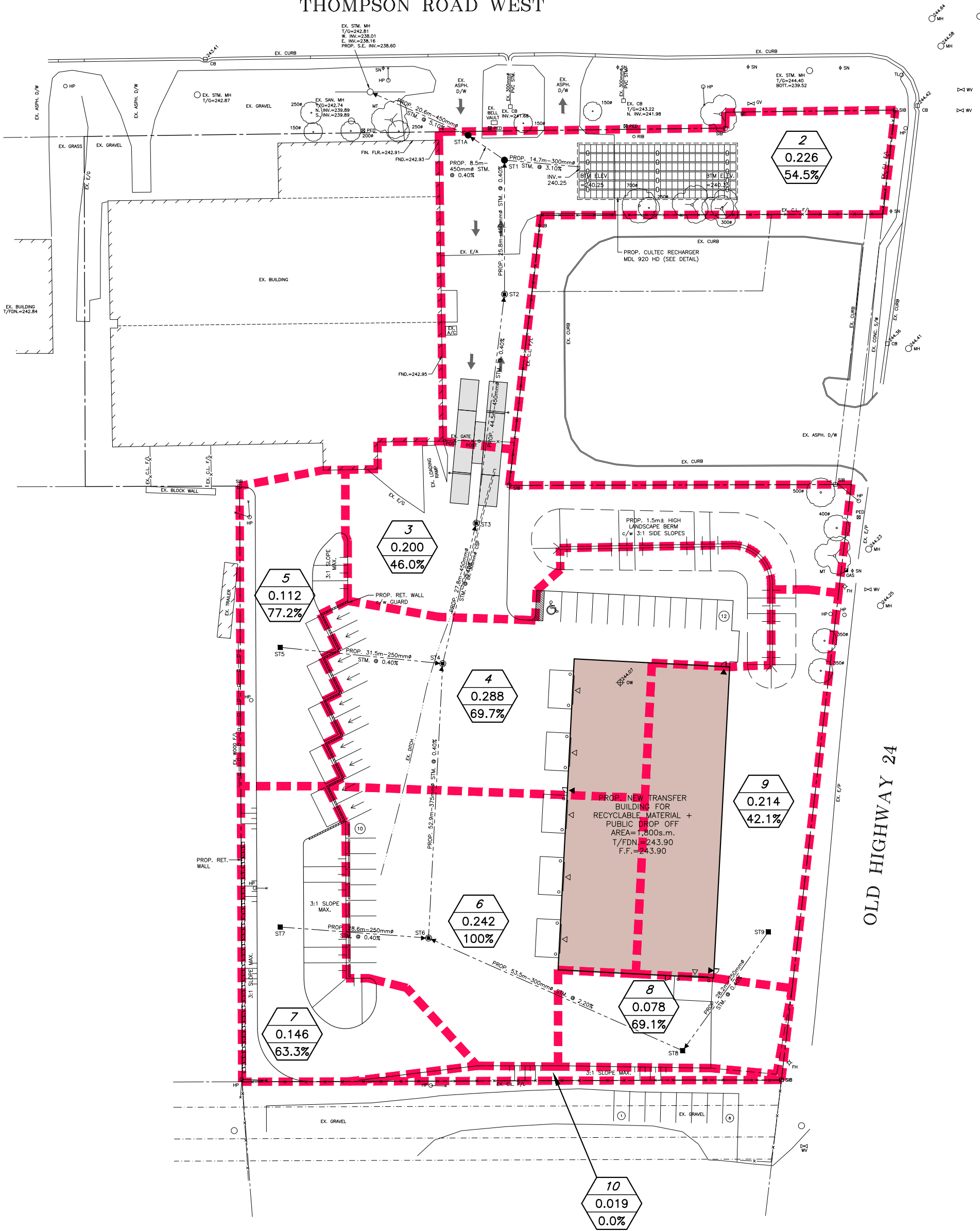
PROJECT
NORFOLK DISPOSAL
NEW TRANSFER STATION
811 OLD HWY 24 , WATERFORD, ON
N0E 1Y0

PROJECT NO: 136731	SCALE: 1:500
DRAWN BY: M. ROJAS	CHECKED BY: T. TUCKER
PROJECT MGR: T. TUCKER	APPROVED BY: J. ARIENS

SHEET TITLE
SITE PLAN

SHEET NUMBER SP 1.0	ISSUE 0
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THOMPSON ROAD WEST



POST DEVELOPMENT
STORM DRAINAGE AREAS

LEGEND

STORM DRAINAGE BOUNDARY

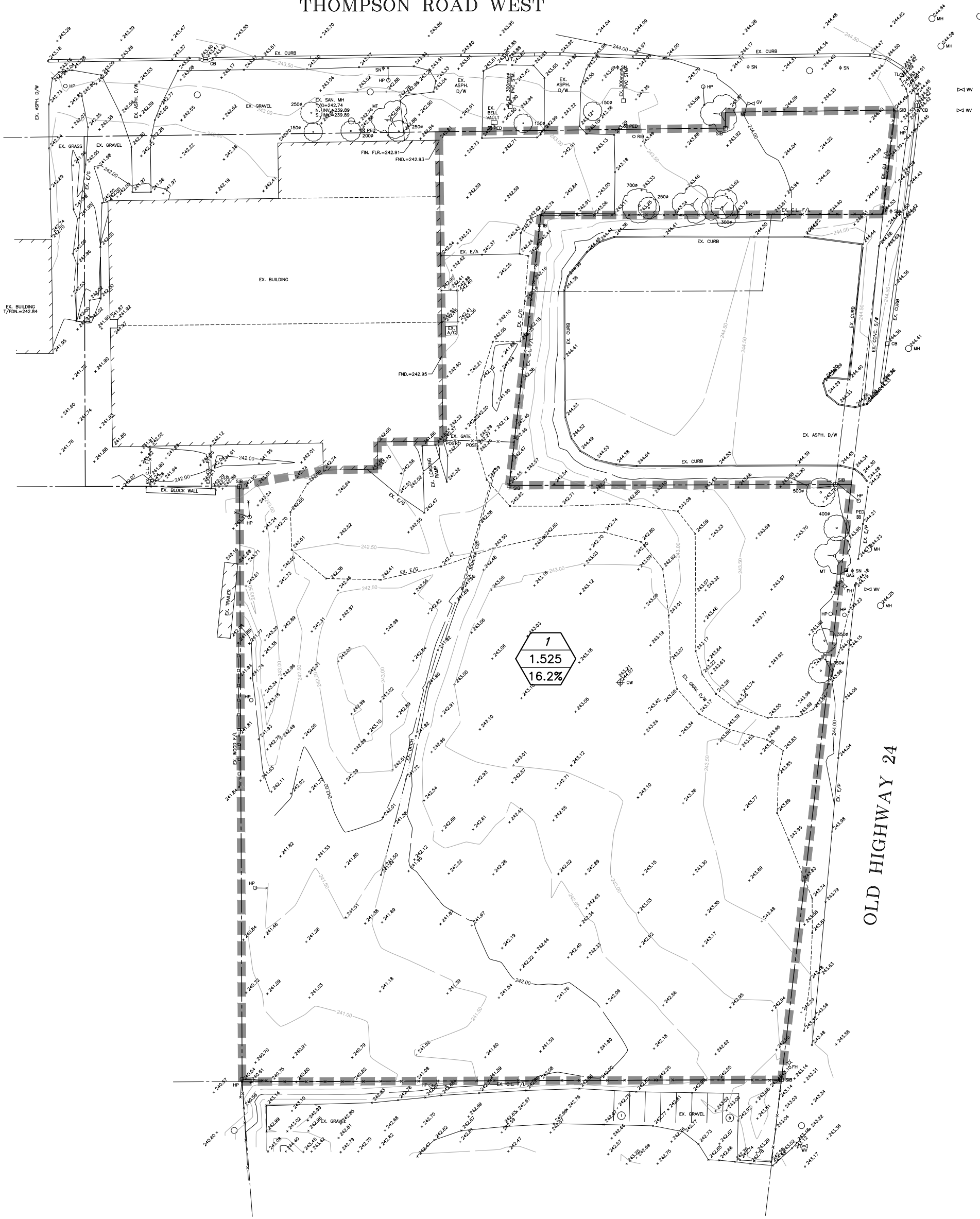
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- 0.53
- 35.0
- STORM DRAINAGE NUMBER
- STORM AREA IN HECTARES
- % IMPERVIOUS

PROPOSED SORTING FACILITY
106 THOMPSON ROAD WEST-NORFOLK

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
BRANTFORD

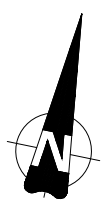
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THOMPSON ROAD WEST



PRE DEVELOPMENT
STORM DRAINAGE AREAS

PROPOSED SORTING FACILITY
106 THOMPSON ROAD WEST-NORFOLK

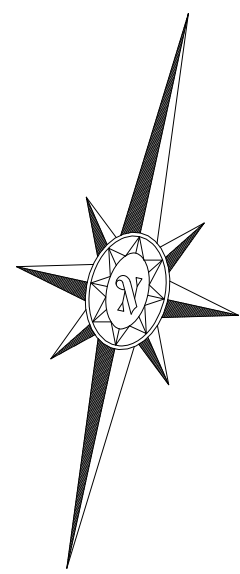


LEGEND

- STORM DRAINAGE BOUNDARY
- STORM DRAINAGE NUMBER
- STORM AREA IN HECTARES
- % IMPERVIOUS

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
BRANTFORD

CLIENT: PK CONSTRUCTION INC. JOB: 15888
SCALE: 1:750



TOPOGRAPHIC SITE PLAN
OF PART OF
LOT 7
CONCESSION 9
IN THE GEOGRAPHIC
TOWNSHIP OF TOWNSEND
IN
NORFOLK COUNTY

SCALE: 1 : 400

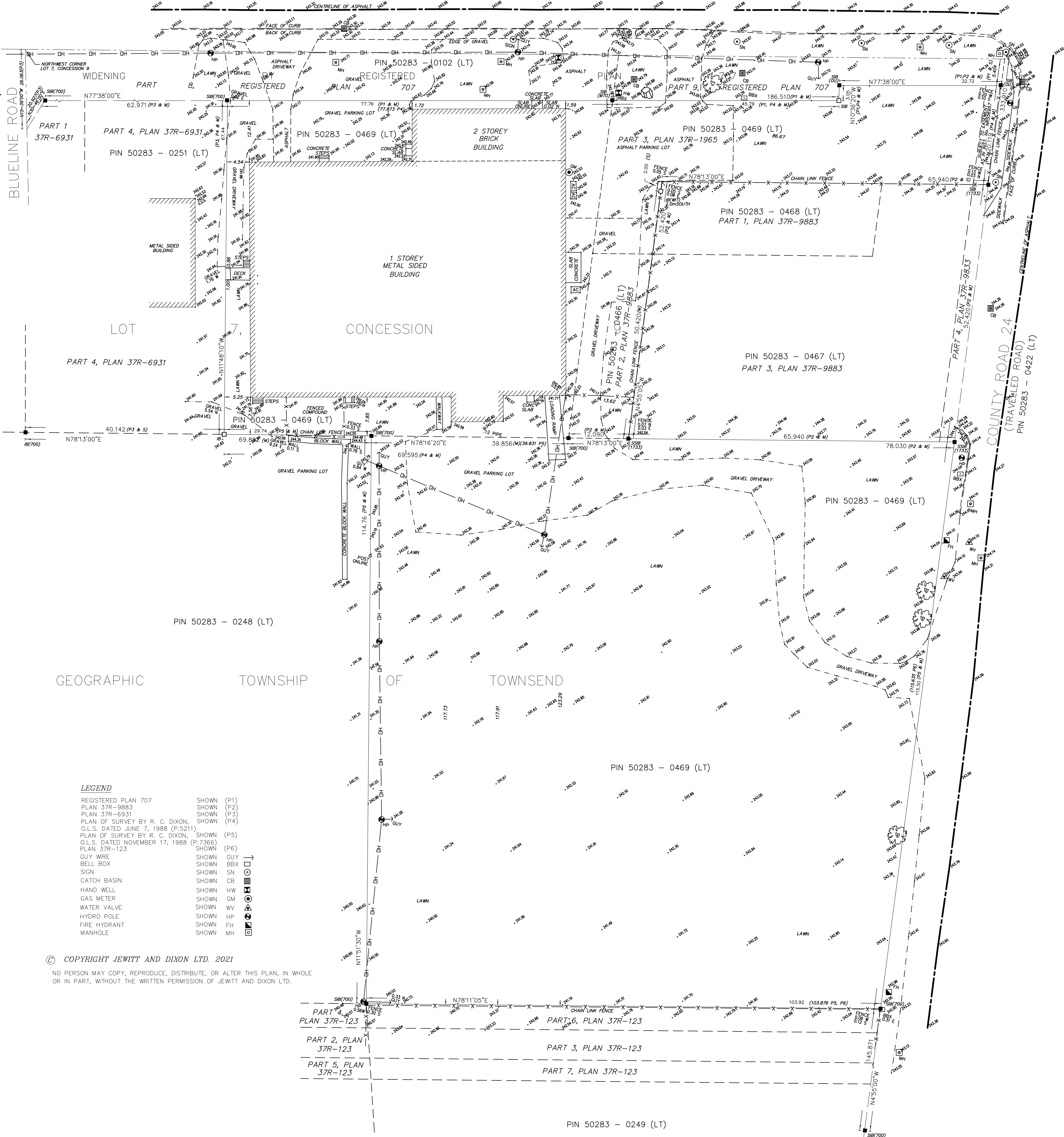
4 0 16 METRES

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METRIC NOTE:

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND
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THOMPSON ROAD WEST
ROAD ALLOWANCE BETWEEN CONCESSIONS 8 AND 9
WIDENED BY REGISTERED PLAN 707



LEGEND

REGISTERED PLAN 707	SHOWN (P1)
PLAN 37R-9883	SHOWN (P2)
PLAN 37R-6931	SHOWN (P3)
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FIRE HYDRANT	SHOWN FH
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SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

- THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, AND THE LAND TITLES ACT, AND THE REGULATIONS MADE UNDER THEM.
- THE SURVEY WAS COMPLETED ON THE 4TH DAY OF JUNE, 2021

DATED: JULY 15, 2021

R. C. DIXON, O.L.S.
FOR JEWITT & DIXON LTD.

LEGEND

2.5cm X 2.5cm X 1.2m STANDARD	IRON BARS	SHOWN	-□-	SIB
1.6cm X 1.6cm X 0.6m	IRON BARS	SHOWN	-□-	IB
1.6cm ROUND X 0.6m	IRON BARS	SHOWN	-□-	IB g
LOT LINES	SHOWN	---	---	---
DEED LINES	SHOWN	---	---	---
FENCE LINES	SHOWN	-X-	-X-	-X-
CENTRE LINES	SHOWN	---	---	---
ROAD LINES	SHOWN	---	---	---
FOUND IRON BARS	SHOWN	■	PLANTED IRON BARS	SHOWN -□-

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SHOWN (1733)
SHOWN (WTO)
SHOWN (1582)
SHOWN (WIT)
SHOWN (OU)

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	-	21-3015-TOP0

Final Report

Transportation Impact Study – 811 Old Highway 24, Waterford, ON



IBI GROUP

Prepared for the Norfolk Disposal Services Ltd.
by Arcadis IBI Group
March 31, 2023

Document Control Page

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Appendix B: 2023 Existing Conditions Synchro Reports

Appendix C: 2024 Future Background Conditions Synchro Reports

Appendix D: 2029 Future Background Conditions Synchro Reports

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Appendix H: 2034 Future Total Conditions Synchro Reports

Appendix I: Vehicle Swept Path Analysis

Appendix J: Pavement Marking and Signage Plan

1 Introduction

Arcadis IBI Group was retained by Norfolk Disposal Services Ltd. (the “proponent”) to undertake a Transportation Impact Study (TIS) for a proposed development, located at 811 Old Highway 24 in the Waterford community of the County of Norfolk.

The proponent intends to expand the existing disposal services to accommodate a new transfer building for recyclable materials and a public drop-off area. The proposed development consists of a single building for recyclable materials and public drop-off space with a ground floor area of 1,800 m². The development proposes to provide 21 parking spaces, of which one is an accessible parking space.

Primary access to the site is proposed via Thompson Road West, approximately opposite Leamon Street.

The impact that the proposed development may have on the surrounding transportation network have been analyzed in this report. This report takes into consideration future road configuration, background traffic growth, and other proposed developments in the area. The study also examines heavy vehicle circulation and swept paths and presents a justification for the proposed parking supply.

This report is outlined with the following sections:

- **Sections 2 to 10** discuss the Transportation Impact Study (TIS);
- **Section 11** discuss traffic analysis summary;
- **Section 12** discusses the vehicle swept paths analysis;
- **Section 13** discusses the pavement marking and signage plan;
- **Section 14** discusses the turning lane warrants;
- **Section 15** discusses the parking analysis; and
- **Section 16** discusses the conclusions made based on the preceding sections.

This report references the ***Appendix J (TIS Guidelines) of the Norfolk County Integrated Sustainable Master Plan (ISMP) (September 2016)***, also referenced as ***2016 Norfolk County TIS Guidelines***.

1.1 Study Area

The proposed development is located southeast of the Old Highway 24 / Main Street South & Thompson Road West / Thompson Road East intersection in the Town of Waterford, as illustrated in **Exhibit 1-1**.

Exhibit 1-1: Development Study Area



Base Map Source: Google Maps. Retrieved March 14, 2023 from <https://earth.google.com/web>

The area immediately surrounding the proposed development primarily consists of commercial uses at the north, west and south. Existing fast-food restaurant and residential area are located northeast from the site.

The study area intersections included in the analysis consist of the following locations:

1. Old Highway 24 / Main Street South & Thompson Road West / Thompson Road East (signalized); and
2. Thompson Road West & Leamon Street / Site Access (unsignalized).

1.2 Analysis Periods

Based on the proposed development's land use, related to processing the recyclable materials, the following analysis periods were used in this study:

- AM Peak Period – 7:00 a.m. to 9:00 a.m. on a typical weekday; and

- PM Peak Period – 4:00 p.m. to 6:00 p.m. on a typical weekday; and
- Saturday Peak Period – 11:00 a.m. to 3:00 p.m. on a typical weekend.

1.3 Proposed Development

The proponent is seeking to construct a single building to accommodate recyclable materials and to provide a public drop-off space.

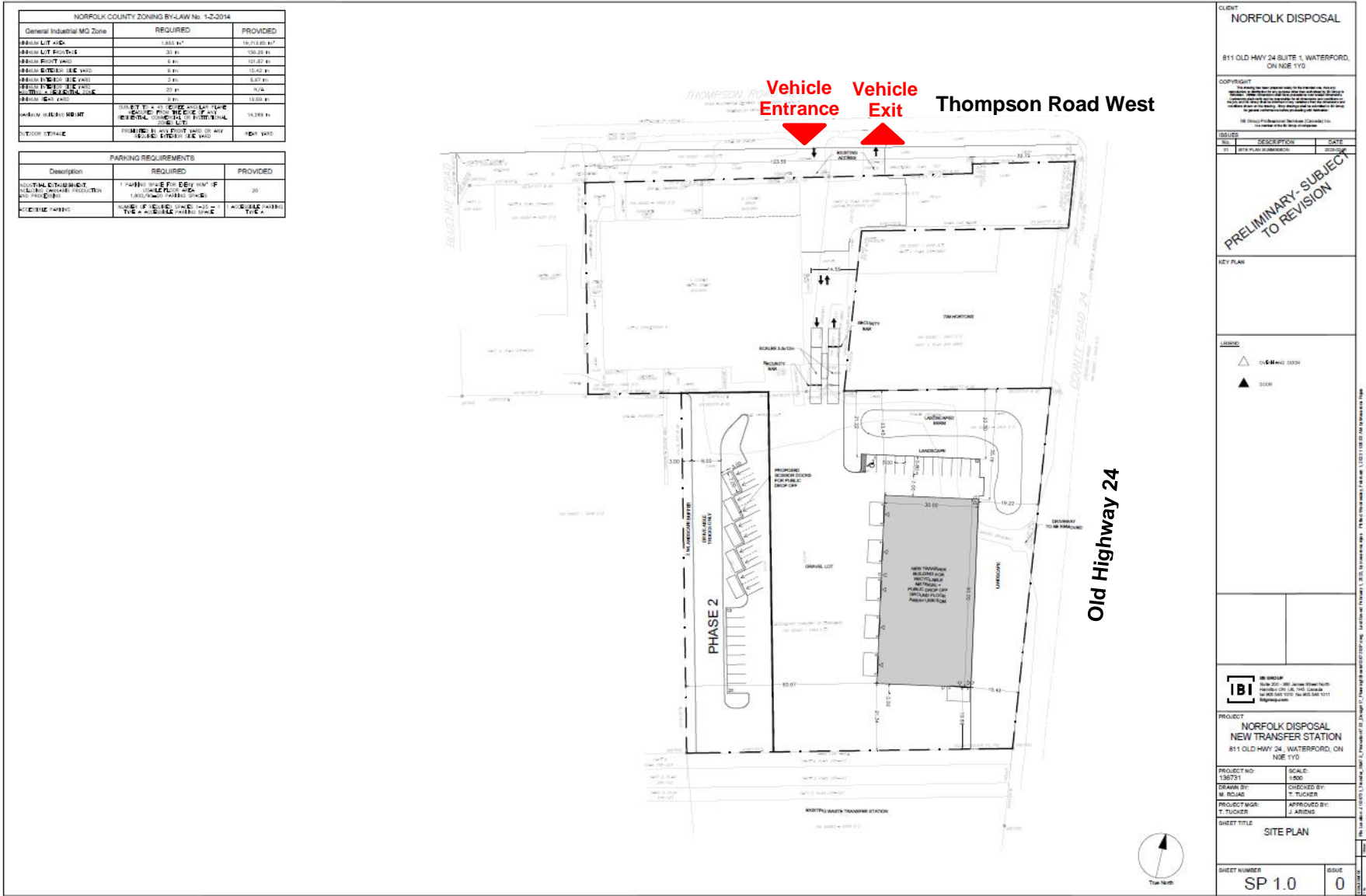
The proposed parking supply consists of 21 at-grade parking spaces, of which one is an accessible parking space. The development would provide the vehicle ingress/egress via existing accesses off Thompson Road West. The western part of the existing driveway will serve as the vehicle entrance while the eastern part would provide vehicle egress from the site (**Exhibit 1-2**).

Exhibit 1-2: Site Driveways



The proposed site plan is illustrated in **Exhibit 1-3**. It should be noted that small changes in building statistics may occur as this development moves through the approval process. However, the assumptions in this report are conservative, and differences in traffic operations from these changes are expected to be negligible.

Exhibit 1-3: Proposed Site Plan



2 2023 Existing Conditions

This section documents the transportation network in the study area in 2023, including existing roadways, traffic control measures, intersection performance, walking and cycling facilities, and transit operations.

2.1 Existing Road Network

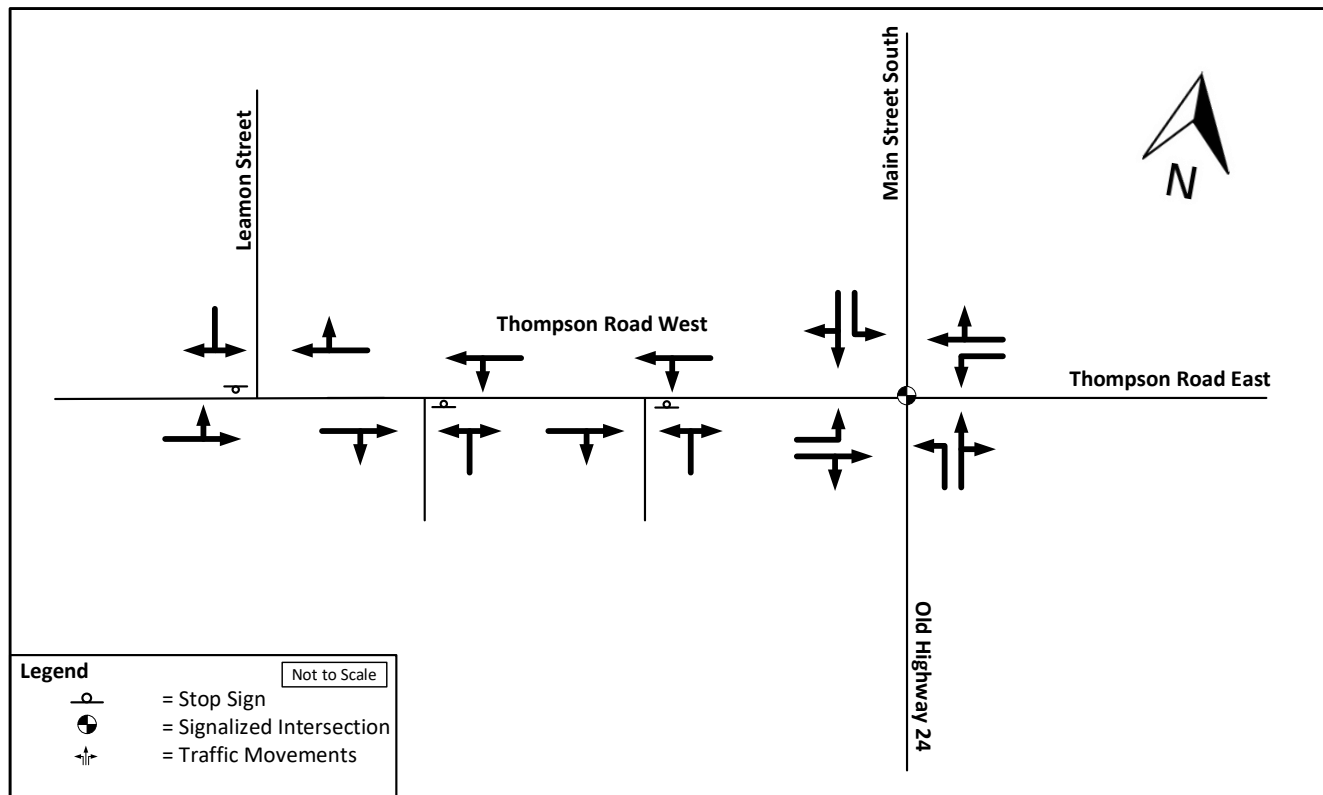
Exhibit 2-1 below summarizes the characteristics of the study area roadways.

Exhibit 2-1: Study Area Existing Road Network

Street Name	Class.	Orientation	Road Width (Lanes)	Traffic Direction	From	To	On-Street Parking	Speed Limit
Thompson Road West	Arterial Road	East / West	2	Two-way	Highway 24	Old Highway 24	Prohibited	50 km/h
Thompson Road East	Arterial Road	East / West	2	Two-way	Old Highway 24	Highway 20	Prohibited	50 km/h
Old Highway 24	Arterial Road	North / South	2	Two-way	Colborne Street West	Highway 24	Prohibited	50 km/h
Main Street South	Arterial Road	North / South	2	Two-way	Gibbson Street / Woodley Road	Thompson Road West / Thompson Road East	Prohibited	50 km/h

Lane configurations for study area roadways are illustrated in **Exhibit 2-2**.

Exhibit 2-2: Study Area Lane Configurations



2.2 Study Area Transit Network

The study area is located within the Waterford Community, which is served by the public transit service called Ride Norfolk, that operates a Monday to Friday bus service with a daily Brantford route, providing connection to other services such as GO Transit. The service is available five times a day on Mondays and three times a day between Tuesday and Friday.

Transit service in the development area is illustrated in **Exhibit 2-3**.

Exhibit 2-3: Existing Transit Network

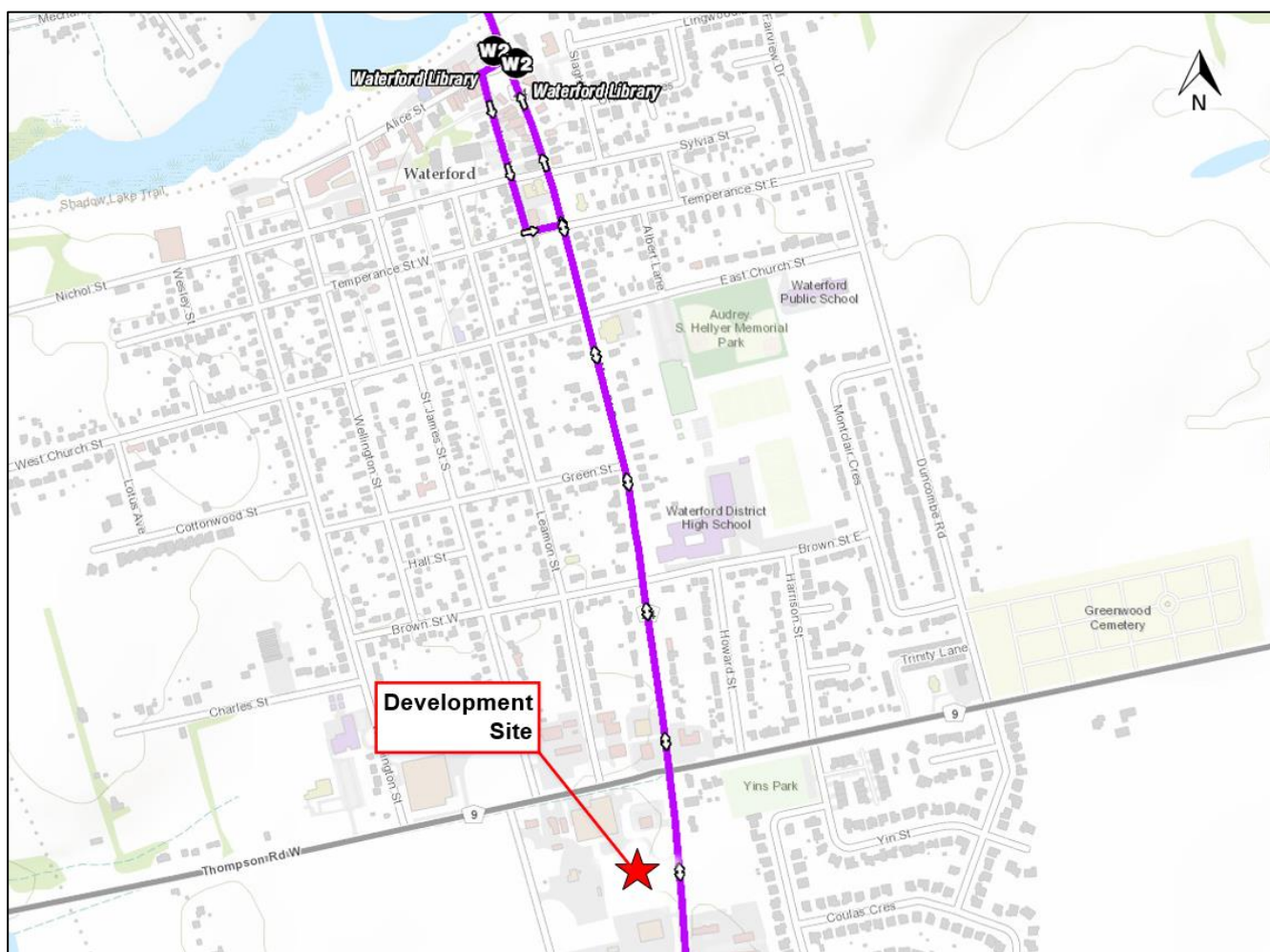


Image Source: County of Norfolk. Retrieved March 20, 2023 from
<https://www.norfolkcounty.ca/transit/schedulesandmaps/>

2.3 Study Area Active Transportation Network

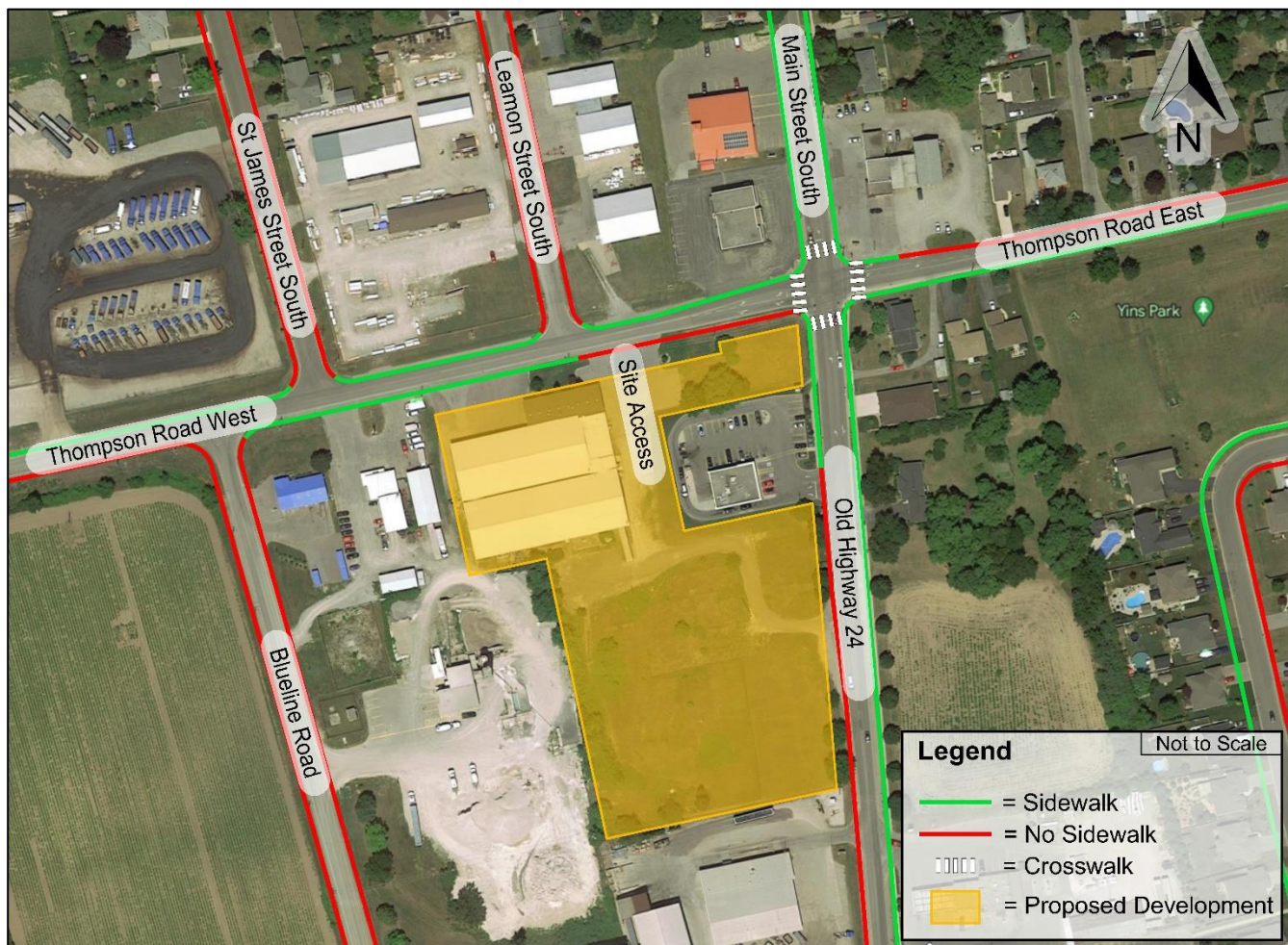
2.3.1 Walking

Pedestrian sidewalks are provided throughout the study area on:

- Thompson Road West: Sidewalks are provided on the north side of the roadway and partly on south side of the roadway;
- Thompson Road East: Sidewalk is provided on the south side of the roadway;
- Main Street South: Sidewalks are provided on both sides of the roadway; and
- Old Highway 24: Sidewalks are provided on the east side of the roadway and partly on west side of the roadway.

Exhibit 2-4 depicts existing pedestrian facilities in the study area.

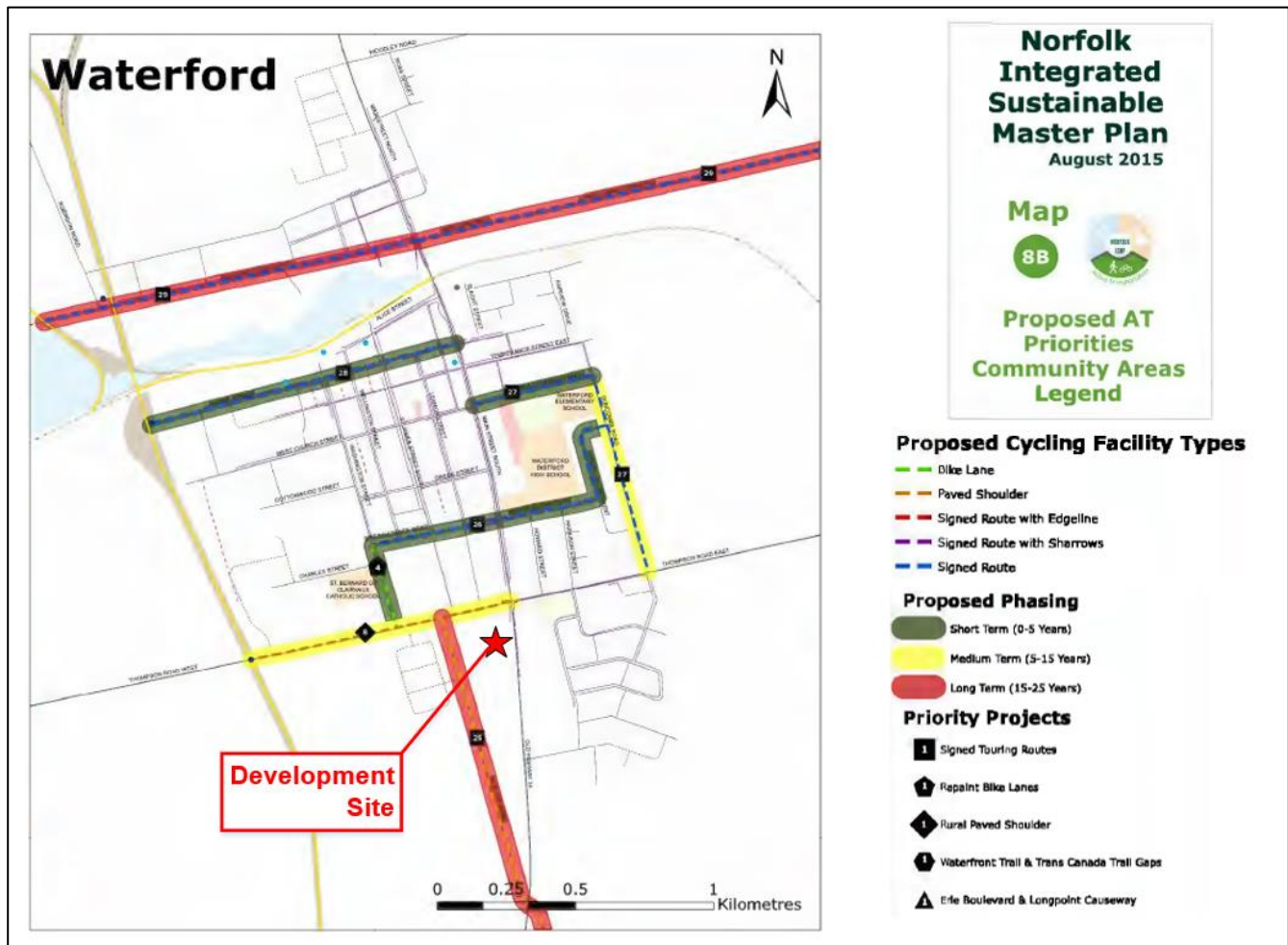
Exhibit 2-4: Existing Pedestrian Facilities



2.3.1 Cycling

As noted in the **2016 Norfolk County Integrated Sustainable Master Plan**, cycling facilities in proximity to the site have been considered as medium term and long-term priority projects, as depicted in **Exhibit 2-5**.

Exhibit 2-5: Norfolk County Integrated Sustainable Master Plan



2.4 Turning Movement Counts

Turning movement counts (TMCs) for the study area intersections were collected by Horizon Data Services Ltd. on March 23, 2023 (Thursday), and March 25, 2023 (Saturday). The TMCs were conducted from 7:00 AM to 9:00 AM (Weekday AM period), from 4:00 PM to 6:00 PM (Weekday PM period) and from 11:00 AM to 3:00 PM (Saturday peak period). A summary of the observed vehicle volumes is presented in **Exhibit 2-6** with full turning movement count data presented in **Appendix A**.

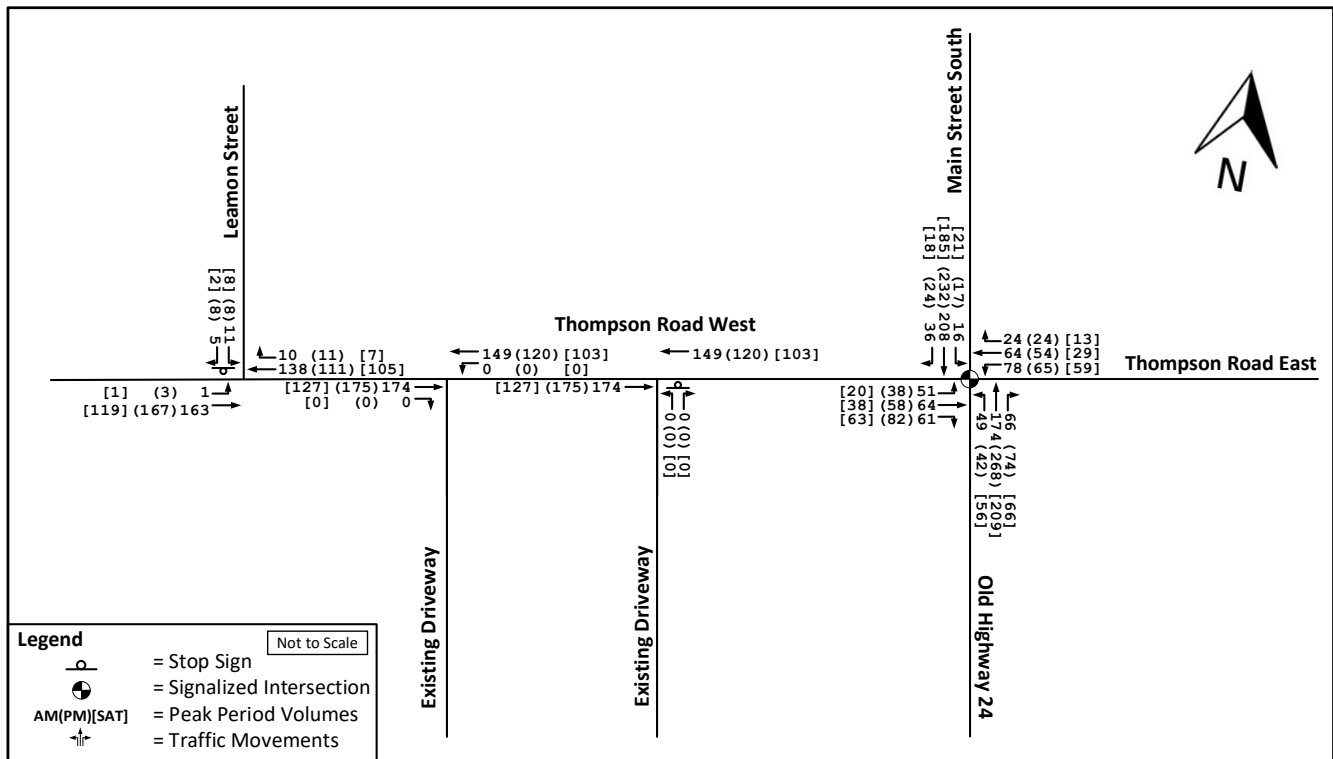
Given that the trip generation rates for the proposed land use are not available in the publication *Trip Generation Manual, 11th Edition* (Institute of Transportation Engineers, September 2021), TMC data was also collected at the Old Highway 24 & Access to the Solid Waste Transfer Station / Access to Esso Petrol Station intersection. The west leg of this intersection serves as an access to the existing Solid Waste Transfer Station affiliated with the proposed development. As a result, this location represents a context-appropriate proxy site. Based on the traffic volumes observed at the west leg of the intersection, trip generation rates for the proposed development were calculated. This is discussed in **Section 7.2.1**.

Exhibit 2-6: 2023 Traffic Data Information

Intersection	Data Source	Dates	Peak Hour		
			AM	PM	Saturday
Old Highway 24 / Main Street South & Thompson Road West / Thompson Road East	Horizon Data Services Ltd.	Thursday, March 23, 2023 (a.m. & p.m.) & Saturday, March 25, 2023	8:00 a.m. – 9:00 a.m.	4:15 p.m. – 5:15 p.m.	11:15 a.m. – 12:15 p.m.
Thompson Road West & Leamon Street					1:45 p.m. – 2:45 p.m.
Old Highway 24 & Access to the Solid Waste Transfer Station / Access to Esso Petrol Station					11:00 a.m. – 12:00 p.m.

A summary of the 2024 existing conditions vehicle volumes at study intersections is presented in **Exhibit 2-7**.

Exhibit 2-7: Existing Conditions Traffic Volumes



2.5 Signal Timing Plans

Signal timing plan data for the Old Highway 24 / Main Street South & Thompson Road West / Thompson Road East signalized intersection was obtained via video captured on Thursday, March 23, 2023. The cycle and phase length information was then developed based on the manual review of the video records.

2.6 2023 Existing Conditions Analysis

Using the turning movement counts described in **Section 2.4** and signal timing plans described in **Section 2.5** the study area intersections were analyzed using the software package **Synchro 11**,

which is based on the **Highway Capacity Manual** methodology. Based on the **2016 Norfolk County TIS Guidelines** the movements with v/c ratio greater than 0.85 are deemed to be “critical” in terms of operations at signalized intersections.

2.6.1 Signalized Intersection

The results of the 2023 Existing Conditions traffic operations analysis for signalized intersection are presented in **Exhibit 2-8**. Full Highway Capacity Manual analysis for the 2023 Existing Conditions scenario is presented in **Appendix B**.

Exhibit 2-8: 2023 Existing Conditions Traffic Operations – Signalized Intersection

Intersection	Intersection			Movement	LOS	Delay (s)	v/c Ratio	95th Percentile Queue (m)	Storage Length (m)
	LOS	Delay (s)	v/c Ratio						
AM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.1	0.27	EBL	B	11.3	0.09	10	15
				EBT	B	11.6	0.14	14	-
				WBL	B	11.9	0.16	14	25
				WBT	B	11.4	0.11	13	-
				NBL	B	18.4	0.18	13	120
				NBT	C	20.8	0.40	45	-
				SBL	B	16.7	0.05	6	35
				SBT	C	20.9	0.41	48	-
PM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.9	0.28	EBL	B	11.0	0.06	8	15
				EBT	B	11.5	0.12	14	-
				WBL	B	11.5	0.11	12	25
				WBT	B	11.1	0.08	11	-
				NBL	B	17.7	0.13	11	120
				NBT	C	22.3	0.50	65	-
				SBL	B	16.9	0.06	6	35
				SBT	C	20.2	0.37	49	-
SAT Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.1	0.22	EBL	B	10.7	0.03	5	15
				EBT	B	11.1	0.08	11	-
				WBL	B	11.3	0.09	11	25
				WBT	B	10.8	0.04	7	-
				NBL	B	17.6	0.14	14	120
				NBT	C	20.5	0.39	50	-
				SBL	B	16.8	0.06	7	35
				SBT	B	19.1	0.29	38	-

As shown in **Exhibit 2-8** the signalized study intersection was observed to be operating below overall capacity limits during the weekday AM and PM peak hours, and during Saturday peak hour.

2.6.2 Unsignalized Intersection

The results of the 2023 Existing Conditions traffic operations analysis for unsignalized intersection are presented in **Exhibit 2-9**.

Exhibit 2-9: 2023 Existing Conditions Traffic Operations – Unsignalized Intersection

Intersection	Intersection Delay (s)	Lane	Lane LOS	Lane Delay (s)	Lane v/c Ratio	Lane 95 th Percentile Queue (m)	Lane Storage Capacity (m)
AM Peak Hour							
Thompson Road West & Leamon Street South	0.6	EB 1	A	0.1	0.00	0	-
		SB 1	B	11.6	0.05	1	-
PM Peak Hour							
Thompson Road West & Leamon Street South	0.6	EB 1	A	0.1	0.00	0	-
		SB 1	A	9.8	0.02	1	-
SAT Peak Hour							
Thompson Road West & Leamon Street South	0.4	EB 1	A	0.1	0.00	0	-
		SB 1	A	9.7	0.01	0	-

As shown in **Exhibit 2-9** the study intersection was found to be operating at acceptable level of service in the weekday AM and PM peak hours, and during Saturday peak hour.

3 Future Background Conditions

This section discusses the proposed development horizon years, the background growth rate, the anticipated future road network improvements, the proposed background developments, and the future background traffic conditions without the proposed development.

3.1 Horizon Years

As per the **2016 Norfolk County TIS Guidelines**, the opening date of the development, 5 and 10 years from the opening date horizons was analyzed. This corresponds to the years 2024, 2029 and 2034 for the Future Background Conditions and Future Total Conditions analysis.

3.2 Growth Rate

A review of The Ministry of Transportation (MTO)'s Historical Provincial Highways Traffic Volumes data noted a growth rate of 1.3% per annum for provincial highways in Norfolk County broadly. As these facilities (Highway 3, Highway 6, and Highway 24) form a significant portion of the major road network within the County, it can serve as a proxy for County-wide traffic growth. As a result, this growth rate of 1.3% per annum was applied to the through movements at study intersections.

3.3 Future Transportation Network Improvements

Based on a review of the Norfolk County's Construction Projects / Public Information Centres website, no road network improvements in the study area are anticipated.

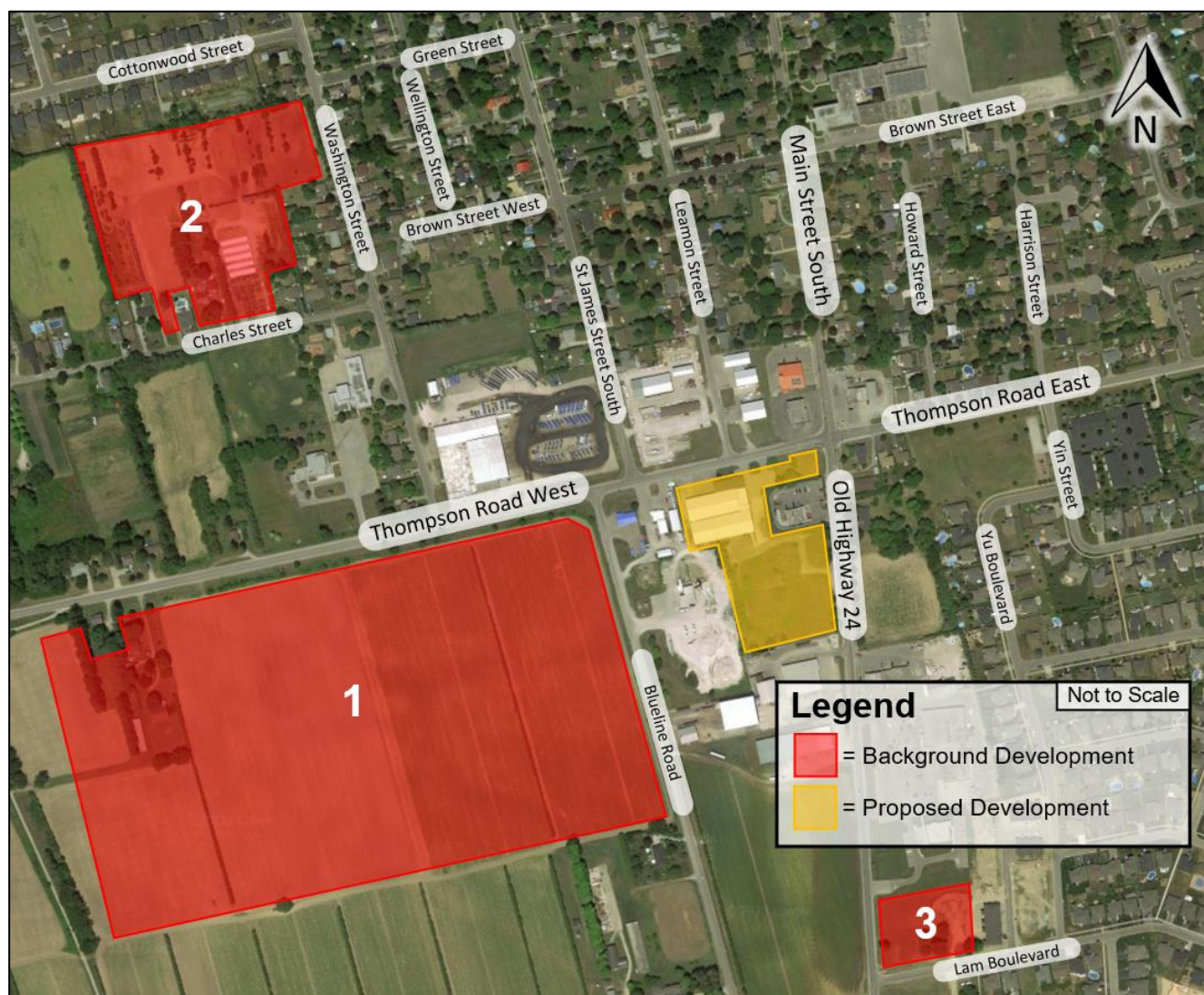
3.4 Background Developments

A review of Norfolk County's Pending Development Applications website identified three other proposed developments in the vicinity of the proposed site with a potential for generating additional traffic, as summarized below:

1. An application for a Draft Plan of Subdivision to establish a 101-unit Plan of Subdivision;
2. An application for a Draft Plan of Subdivision with a total of 68 residential units in the form of single-detached and street townhouse dwellings; and
3. An application to amend the Official Plan designation from 'Commercial' to 'Urban Residential', to permit 40 back-to-back townhouse units.

The locations of the proposed background developments are illustrated geographically in **Exhibit 3-1**.

Exhibit 3-1: Background Developments



Base Map Source: Google Maps. Retrieved March 21, 2023 from <https://earth.google.com/web>

For the background developments, trip generation rates from the publication ***Trip Generation Manual, 11th Edition*** (Institute of Transportation Engineers, September 2021) were used to estimate future automobile trips associated with the background developments. Based on the nature of the background developments and its location context, General Urban/Suburban setting was used.

As a conservative scenario it was assumed that 50% of the trips generated by the background developments will passing through study area intersections.

The estimated net new inbound and outbound vehicle trips for the identified background developments are presented in the **Exhibit 3-2**.

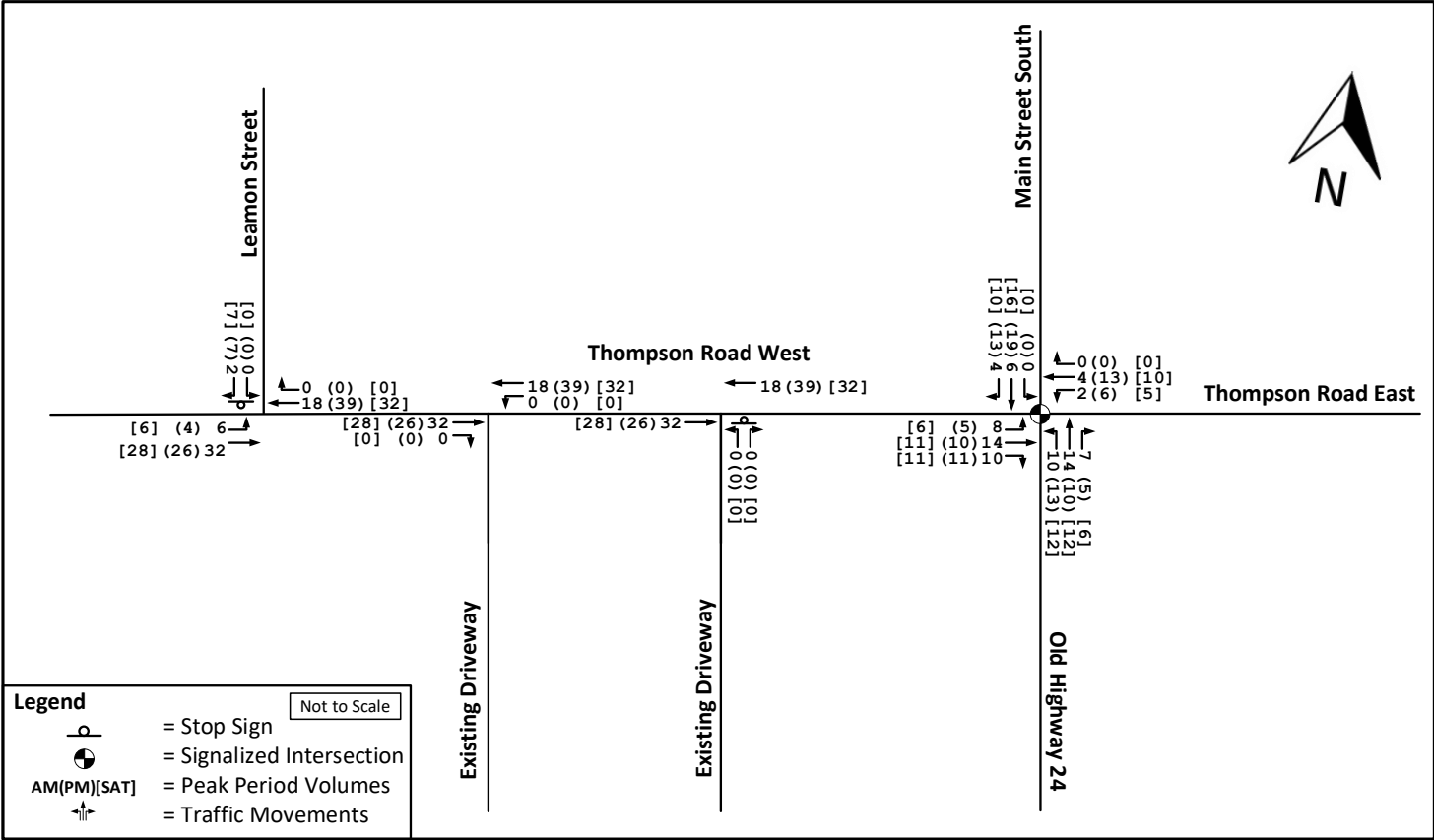
Exhibit 3-2: Background Developments Trip Generation

1. 101-unit Plan of Subdivision										
LUC 210: Single-Family Detached Housing - General Urban/Suburban - 101 units										
Term	Unit	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekend SAT Peak Hour		
		Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
Trip Generation Equation	vehicle trips / unit	$\ln(T) = 0.91\ln(X) + (0.12)$			$\ln(T) = 0.94\ln(X) + (0.27)$			$T = 0.86(X) + (9.72)$		
Directional Distribution	percentage	25%	75%	100%	63%	37%	100%	54%	46%	100%
Trip Generation Rate	vehicle trips / unit	0.19	0.55	0.74	0.62	0.37	0.99	0.52	0.44	0.96
Total Trips	vehicle trips / hour	19	56	75	63	37	100	52	45	97
2. 68 residential units										
LUC 210: Single-Family Detached Housing - General Urban/Suburban - 68 units										
Term	Unit	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekend SAT Peak Hour		
		Inbound	Outbound	Total			Inbound	Outbound	Total	
Trip Generation Equation	vehicle trips / unit	$\ln(T) = 0.91\ln(X) + (0.12)$			$\ln(T) = 0.94\ln(X) + (0.27)$			$T = 0.86(X) + (9.72)$		
Directional Distribution	percentage	25%	75%	100%	63%	37%	100%	54%	46%	100%
Trip Generation Rate	vehicle trips / unit	0.19	0.57	0.76	0.64	0.37	1.01	0.54	0.46	1
Total Trips	vehicle trips / hour	13	39	52	43	26	69	37	31	68
3. 40 back-to back townhouse units										
LUC 215: Single-Family Attached Housing - General Urban/Suburban - 40 units										
Term	Unit	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekend SAT Peak Hour		
		Inbound	Outbound	Total			Inbound	Outbound	Total	
Trip Generation Equation	vehicle trips / unit	$T = 0.52(X) + (-5.7)$			$T = 0.6(X) + (-3.93)$			$\ln(T) = 0.82\ln(X) + (0.43)$		
Directional Distribution	percentage	25%	75%	100%	59%	41%	100%	48%	52%	100%
Trip Generation Rate	vehicle trips / unit	0.1	0.28	0.38	0.3	0.2	0.5	0.38	0.42	0.8
Total Trips	vehicle trips / hour	4	11	15	12	8	20	15	17	32

Overall Background Developments										
Term	Unit	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekend SAT Peak Hour		
		Inbound	Outbound	Total			Inbound	Outbound	Total	
Net New Auto Trips	vehicle trips / hour	36	106	142	118	71	189	104	93	197
Passing through study area intersections	percentage	50%	50%	50%	50%	50%	50%	50%	50%	50%
	vehicle trips / hour	18	53	71	59	36	95	52	47	99

Site trips from all background developments were assigned to study area roads based on existing travel patterns, as illustrated in **Exhibit 3-3**.

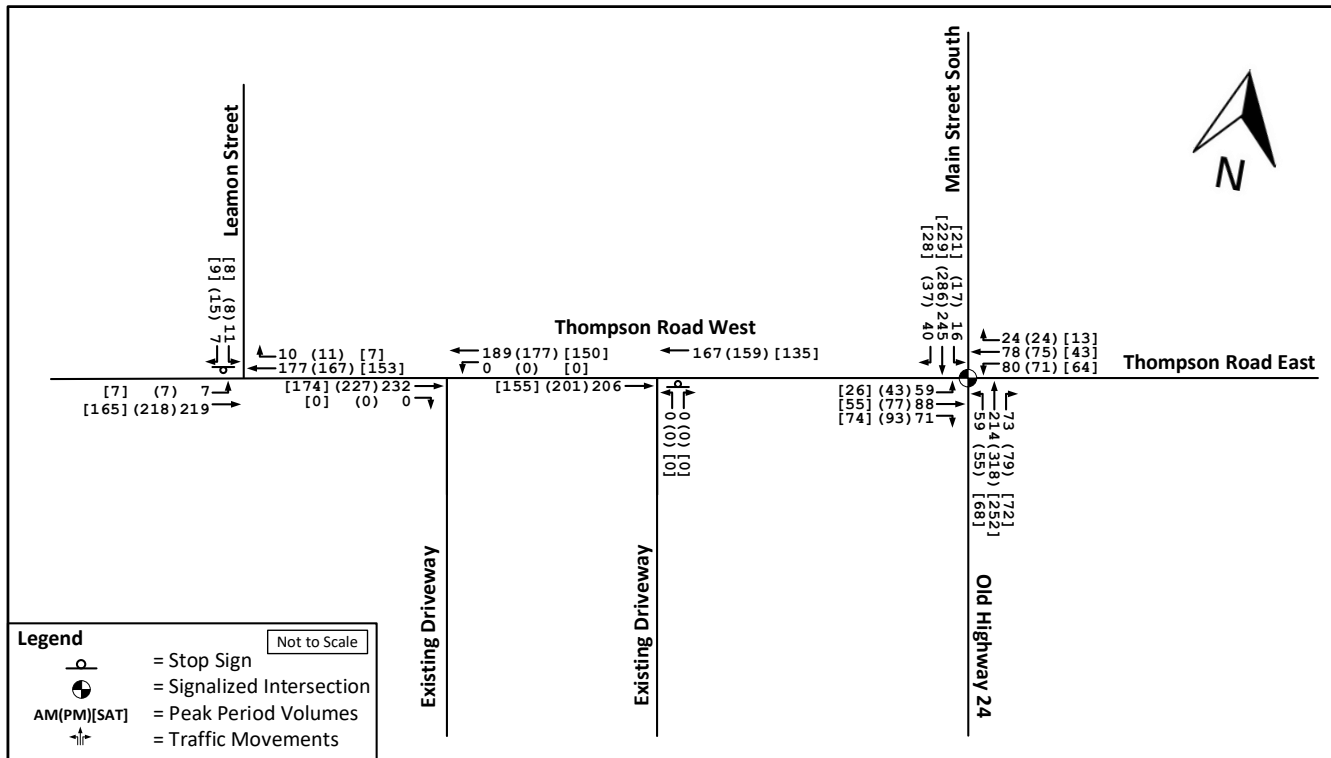
Exhibit 3-3: Background Developments Trip Assignment



4 2024 Future Background Conditions Analysis

The trips resulting from background developments and growth were added to the existing conditions scenario, producing the 2024 background traffic volumes illustrated in **Exhibit 4-1**.

Exhibit 4-1: 2024 Future Background Conditions Traffic Volumes



The results of the 2024 future background analysis are summarized in the following subsections. Full Highway Capacity Manual analysis based on Synchro outputs for the 2024 Future Background Conditions scenario is presented in **Appendix C**.

4.1 Signalized Intersection

The results of the 2034 future background conditions traffic operations analysis for signalized intersection are presented in **Exhibit 4-2**.

Exhibit 4-2: 2024 Future Background Conditions Traffic Operations - Signalized Intersection

Intersection	Intersection			Movement	LOS	Delay (s)	v/c Ratio	95th Percentile Queue (m)	Storage Length (m)
	LOS	Delay (s)	v/c Ratio						
AM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.4	0.29	EBL	B	11.4	0.11	11	15
				EBT	B	11.9	0.17	17	-
				WBL	B	12.0	0.16	15	25
				WBT	B	11.4	0.11	13	-
				NBL	B	19.1	0.22	16	120
				NBT	C	21.4	0.44	50	-
				SBL	B	16.8	0.06	6	35
				SBT	C	21.2	0.43	50	-
PM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	18.2	0.31	EBL	B	11.1	0.07	9	15
				EBT	B	11.6	0.14	16	-
				WBL	B	11.6	0.12	13	25
				WBT	B	11.2	0.10	13	-
				NBL	B	18.6	0.19	14	120
				NBT	C	22.9	0.52	69	-
				SBL	B	16.9	0.06	6	35
				SBT	C	20.9	0.42	55	-
SAT Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.3	0.24	EBL	B	10.8	0.04	6	15
				EBT	B	11.3	0.10	12	-
				WBL	B	11.4	0.11	12	25
				WBT	B	10.9	0.05	9	-
				NBL	B	18.2	0.18	16	120
				NBT	C	20.9	0.41	54	-
				SBL	B	16.8	0.06	7	35
				SBT	B	19.6	0.32	43	-

As shown in **Exhibit 4-2**, signalized intersection is expected to operate below capacity limits during the weekday AM and PM peak hours, and during Saturday peak hour, and no critical movements were noted.

4.2 Unsignalized Intersection

The results of the 2034 Future Background conditions traffic operations analysis for unsignalized intersection are presented in **Exhibit 4-3**.

Exhibit 4-3: 2024 Future Background Conditions Traffic Operations - Unsignalized Intersection

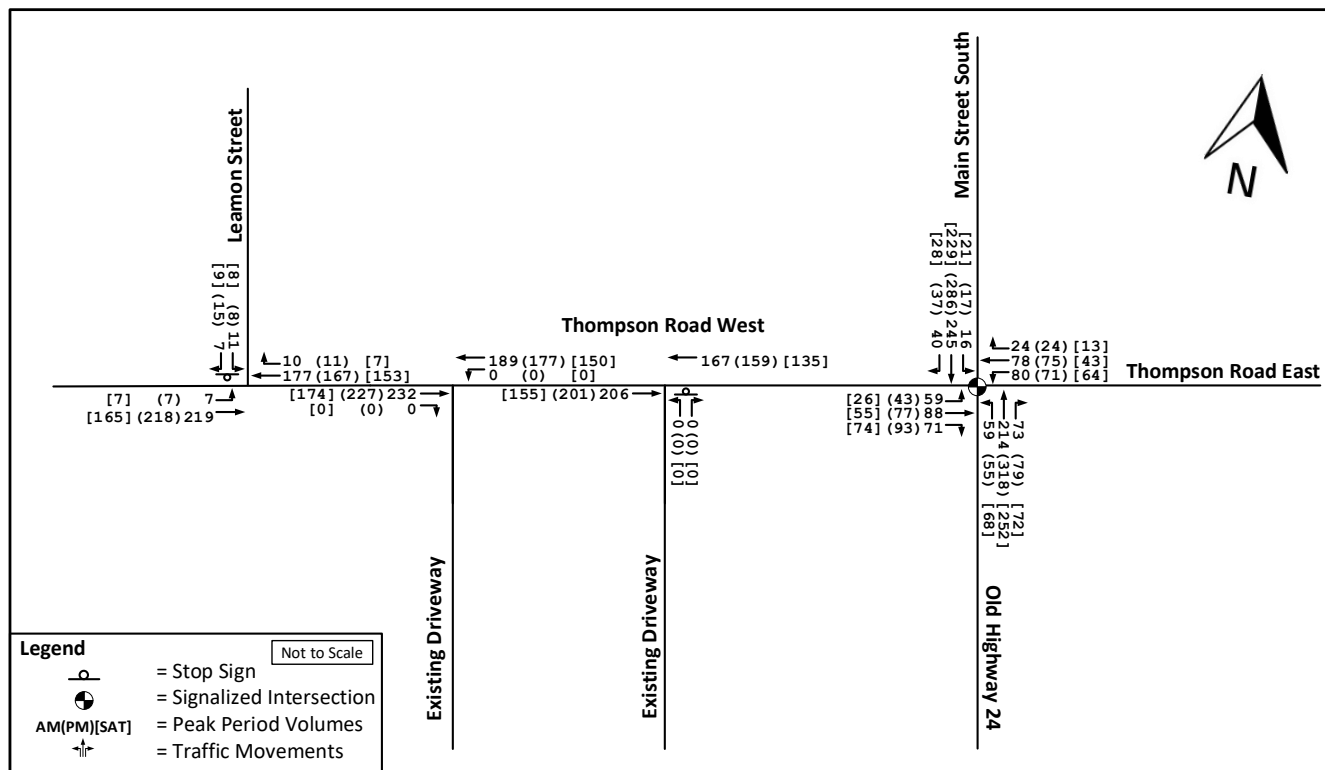
Intersection	Intersection Delay (s)	Lane	Lane LOS	Lane Delay (s)	Lane v/c Ratio	Lane 95 th Percentile Queue (m)	Lane Storage Capacity (m)
AM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	12.3	0.06	1	-
PM Peak Hour							
Thompson Road West & Leamon Street South	0.8	EB 1	A	0.3	0.01	0	-
		SB 1	B	10.0	0.03	1	-
SAT Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.4	0.01	0	-
		SB 1	A	9.8	0.02	1	-

As shown in **Exhibit 4-3** the study intersection was found to be operating at acceptable level of service in the weekday AM and PM peak hours, and during Saturday peak hour.

5 2029 Future Background Conditions Analysis

New trips resulting from background developments and growth were added to the existing conditions scenario, producing the 2029 background traffic volumes illustrated in **Exhibit 5-1**.

Exhibit 5-1: 2029 Future Background Conditions Traffic Volumes



The results of the 2029 future background analysis are summarized in the following subsections. Full Highway Capacity Manual analysis based on Synchro outputs for the 2029 Future Background Conditions scenario is presented in **Appendix D**.

5.1 Signalized Intersection

The results of the 2029 future background conditions traffic operations analysis for signalized intersection are presented in **Exhibit 5-2**.

Exhibit 5-2: 2029 Future Background Conditions Traffic Operations - Signalized Intersection

Intersection	Intersection			Movement	LOS	Delay (s)	v/c Ratio	95th Percentile Queue (m)	Storage Length (m)
	LOS	Delay (s)	v/c Ratio						
AM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.7	0.3	EBL	B	11.4	0.11	11	15
				EBT	B	12.0	0.18	18	-
				WBL	B	12.0	0.16	15	25
				WBT	B	11.5	0.12	14	-
				NBL	B	19.4	0.23	16	120
				NBT	C	21.8	0.46	53	-
				SBL	B	16.8	0.06	6	35
				SBT	C	21.6	0.46	53	-
PM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	18.6	0.32	EBL	B	11.1	0.07	9	15
				EBT	B	11.7	0.15	16	-
				WBL	B	11.6	0.12	13	25
				WBT	B	11.3	0.10	14	-
				NBL	B	18.8	0.19	15	120
				NBT	C	23.5	0.55	74	-
				SBL	B	17.0	0.07	6	35
				SBT	C	21.3	0.44	59	-
SAT Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.6	0.25	EBL	B	10.8	0.04	6	15
				EBT	B	11.3	0.11	13	-
				WBL	B	11.4	0.11	12	25
				WBT	B	10.9	0.05	9	-
				NBL	B	18.3	0.18	17	120
				NBT	C	21.4	0.44	57	-
				SBL	B	16.9	0.07	7	35
				SBT	B	19.9	0.35	46	-

As shown in **Exhibit 5-2**, signalized intersection is expected to operate below capacity limits during the weekday AM and PM peak hours, and during Saturday peak hour. No critical movements were noted.

5.2 Unsignalized Intersection

The results of the 2029 Future Background conditions traffic operations analysis for unsignalized intersection are presented in **Exhibit 5-3**.

Exhibit 5-3: 2029 Future Background Conditions Traffic Operations - Unsignalized Intersection

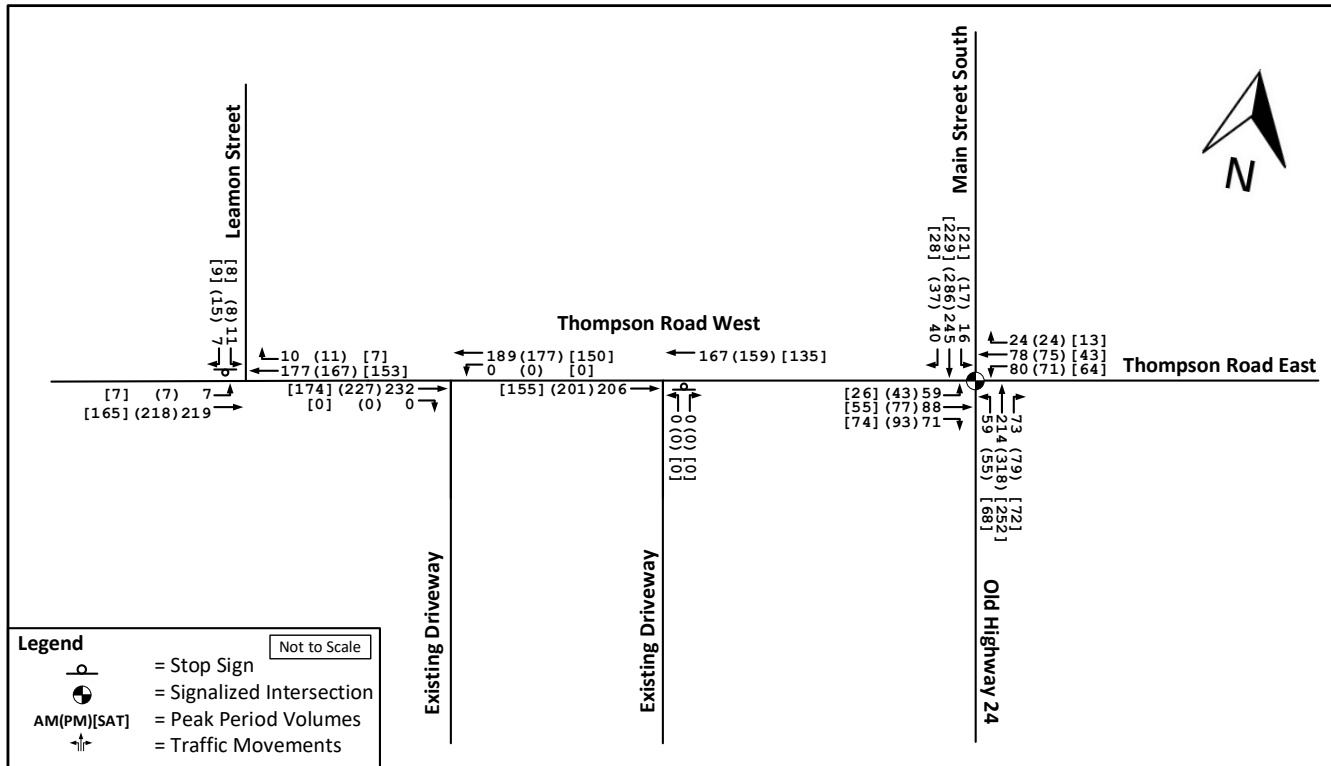
Intersection	Intersection Delay (s)	Lane	Lane LOS	Lane Delay (s)	Lane v/c Ratio	Lane 95 th Percentile Queue (m)	Lane Storage Capacity (m)
AM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	12.6	0.06	1	-
PM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	10.1	0.04	1	-
SAT Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.4	0.01	0	-
		SB 1	A	9.9	0.03	1	-

As shown in **Exhibit 5-3** the study intersection was found to be operating at acceptable level of service in the weekday AM and PM peak hours, and during Saturday peak hour.

6 2034 Future Background Conditions Analysis

The trips resulting from background developments and growth were added to the existing conditions scenario, producing the 2034 background traffic volumes illustrated in **Exhibit 6-1**.

Exhibit 6-1: 2034 Future Background Conditions Traffic Volumes



The results of the 2034 future background analysis are summarized in the following subsections. Full Highway Capacity Manual analysis based on Synchro outputs for the 2034 Future Background Conditions scenario is presented in **Appendix E**.

6.1 Signalized Intersection

The results of the 2034 future background conditions traffic operations analysis for signalized intersection are presented in **Exhibit 6-2**.

Exhibit 6-2: 2034 Future Background Conditions Traffic Operations - Signalized Intersection

Intersection	Intersection			Movement	LOS	Delay (s)	v/c Ratio	95th Percentile Queue (m)	Storage Length (m)
	LOS	Delay (s)	v/c Ratio						
AM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	18	0.32	EBL	B	11.5	0.11	11	15
				EBT	B	12.1	0.19	19	-
				WBL	B	12.1	0.17	15	25
				WBT	B	11.5	0.13	15	-
				NBL	B	19.6	0.24	16	120
				NBT	C	22.2	0.48	55	-
				SBL	B	16.9	0.06	6	35
				SBT	C	22.1	0.48	56	-
PM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	19	0.33	EBL	B	11.1	0.07	9	15
				EBT	B	11.7	0.15	17	-
				WBL	B	11.6	0.13	13	25
				WBT	B	11.3	0.10	14	-
				NBL	B	19.0	0.20	15	120
				NBT	C	24.1	0.58	78	-
				SBL	B	17.1	0.07	6	35
				SBT	C	21.8	0.47	62	-
SAT Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.9	0.26	EBL	B	10.8	0.04	6	15
				EBT	B	11.4	0.11	13	-
				WBL	B	11.4	0.11	12	25
				WBT	B	10.9	0.06	9	-
				NBL	B	18.4	0.19	17	120
				NBT	C	21.7	0.46	60	-
				SBL	B	17.0	0.07	7	35
				SBT	C	20.1	0.37	48	-

As shown in **Exhibit 6-2**, signalized intersection is expected to operate below capacity limits during the weekday AM and PM peak hours, and during Saturday peak hour, and no critical movements were noted.

6.2 Unsignalized Intersection

The results of the 2034 Future Background conditions traffic operations analysis for unsignalized intersection are presented in **Exhibit 6-3**.

Exhibit 6-3: 2034 Future Background Conditions Traffic Operations - Unsignalized Intersection

Intersection	Intersection Delay (s)	Lane	Lane LOS	Lane Delay (s)	Lane v/c Ratio	Lane 95 th Percentile Queue (m)	Lane Storage Capacity (m)
AM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	12.9	0.06	1	-
PM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	10.2	0.04	1	-
SAT Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.4	0.01	0	-
		SB 1	A	10.0	0.03	1	-

As shown in **Exhibit 6-3** the study intersection was found to be operating at acceptable level of service in the weekday AM and PM peak hours, and during Saturday peak hour.

7 Future Total Conditions

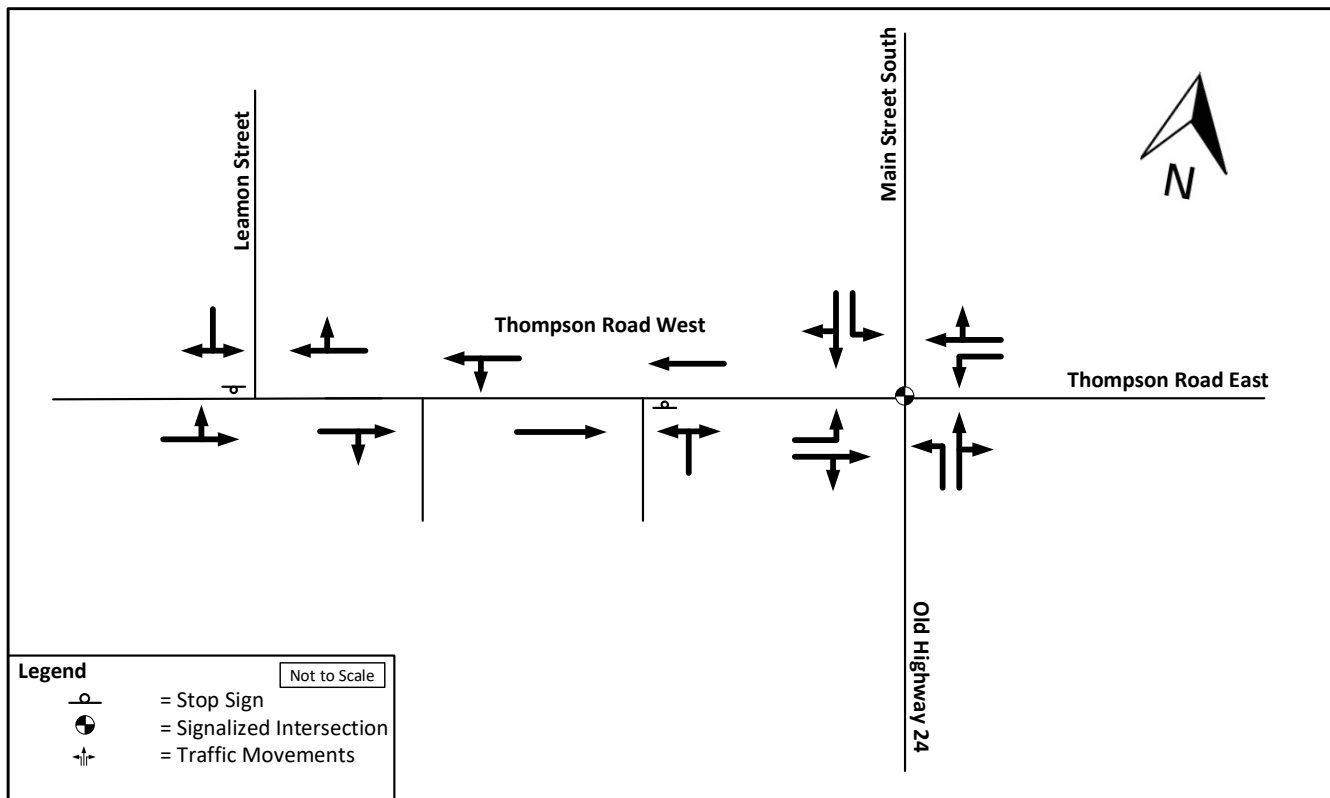
This section of the report analyzes the impact of the proposed development on the future background traffic conditions. This analysis includes the impacts on the traffic conditions including the site traffic associated with the proposed development.

7.1 Future Site Accesses

Vehicular traffic will enter the proposed development via the western part of the existing access at Thompson Road West, and exit the site via the eastern part of the existing access.

The proposed full build-out lane configurations are illustrated in **Exhibit 7-1**.

Exhibit 7-1: Future Total Lane Configurations



7.2 Trip Generation and Trip Distribution

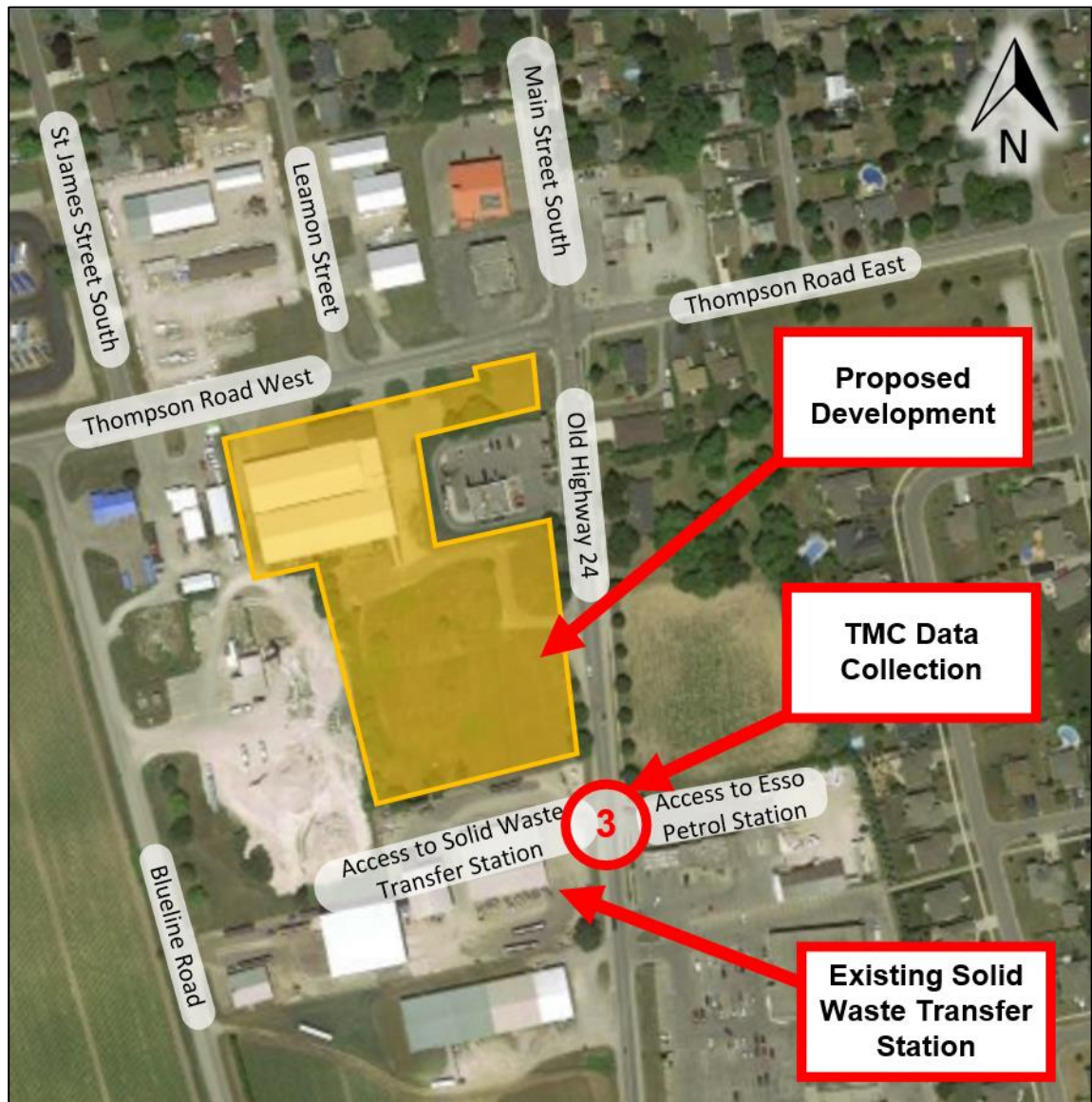
The trips expected to be generated by the proposed development are examined in this section. The trips generated are then assigned and distributed to the study area road network.

7.2.1 Trip Generation

Given that the trip generation rates for the proposed land use are not available in the publication **Trip Generation Manual, 11th Edition** (Institute of Transportation Engineers, September 2021), TMC data was collected at the Old Highway 24 & Access to the Solid Waste Transfer Station / Access to Esso Petrol Station intersection. The west leg of this intersection serves as an access to the existing Solid Waste Transfer Station affiliated with the proposed development. This is illustrated in **Exhibit 7-2**.

This location represents a context-appropriate proxy site. Based on the traffic volumes observed at the west leg of the intersection, trip generation rates for the proposed development were calculated based on the existing Solid Waste Transfer Station's gross floor area (GFA) of 2,803.9 m².

Exhibit 7-2: Existing Solid Waste Transfer Station Location



Based on the existing Solid Waste Transfer Station utilization, the trip generation rates were observed to be:

- During Weekday AM Peak Hour: 0.32 vehicle trips / 100 m²;
- During Weekday PM Peak Hour: 0.57 vehicle trips / 100 m²; and
- During Saturday Peak Hour: 1.82 vehicle trips / 100 m²

Considering the trip generation rates at proxy site, trip generation for the proposed development is determined as shown in **Exhibit 7-3**.

Exhibit 7-3: Proposed Development Trip Generation

Proposed Development Site										
Proxy Site Trip Generation Data: Recyclable Materials Transfer Station - 1,800 m ²										
Term	Unit	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekend SAT Peak Hour		
		Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
Directional Distribution	percentage	56%	44%	100%	63%	37%	100%	54%	46%	100%
Trip Generation Rate	vehicle trips / 100 m ²	0.18	0.14	0.32	0.36	0.21	0.57	0.98	0.84	1.82
Total Trips	vehicle trips / hour	3	3	6	6	4	10	18	15	33

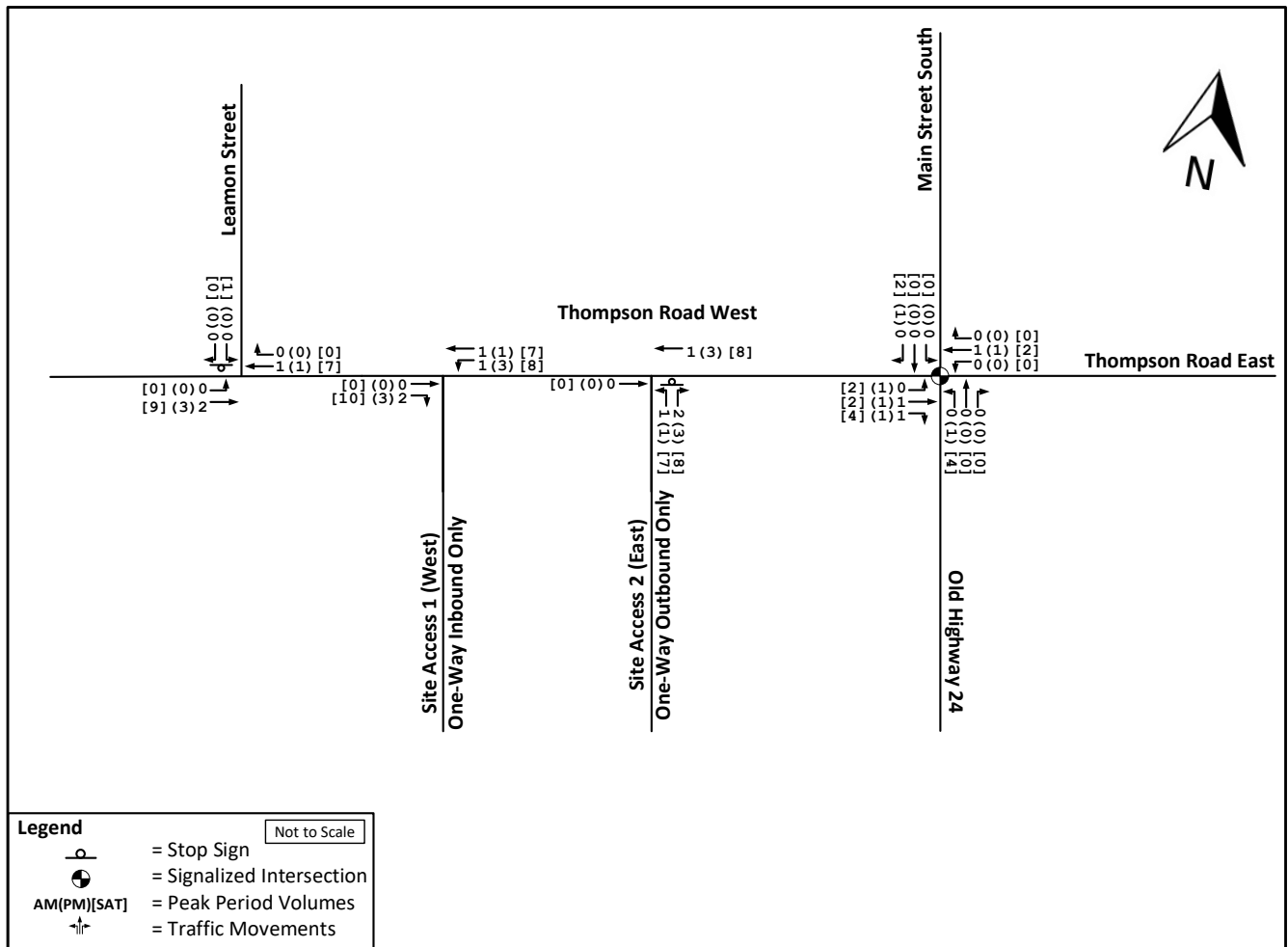
7.2.2 Trip Distribution and Assignment

The trip distribution and assignment for site trips was determined based on the existing and logical traffic patterns at study area intersections. The trip distribution is presented in **Exhibit 7-4** and the resulting site-generated trips assigned to the road network for the weekday AM and PM peak hours are illustrated in **Exhibit 7-5**.

Exhibit 7-4: Site Trip Distribution

To / From	Inbound Trips			Outbound Trips		
	AM Peak Hour	PM Peak Hour	SAT Peak Hour	AM Peak Hour	PM Peak Hour	SAT Peak Hour
Main Street South (north)	11	8	8	16	13	9
Leamon Street (north)	3	3	3	3	4	3
Old Highway 24 (south)	15	14	24	19	27	27
Thompson Road West (west)	50	57	52	43	37	45
Thompson Road East (east)	20	18	13	20	19	16
Total	100%	100%	100%	100%	100%	100%

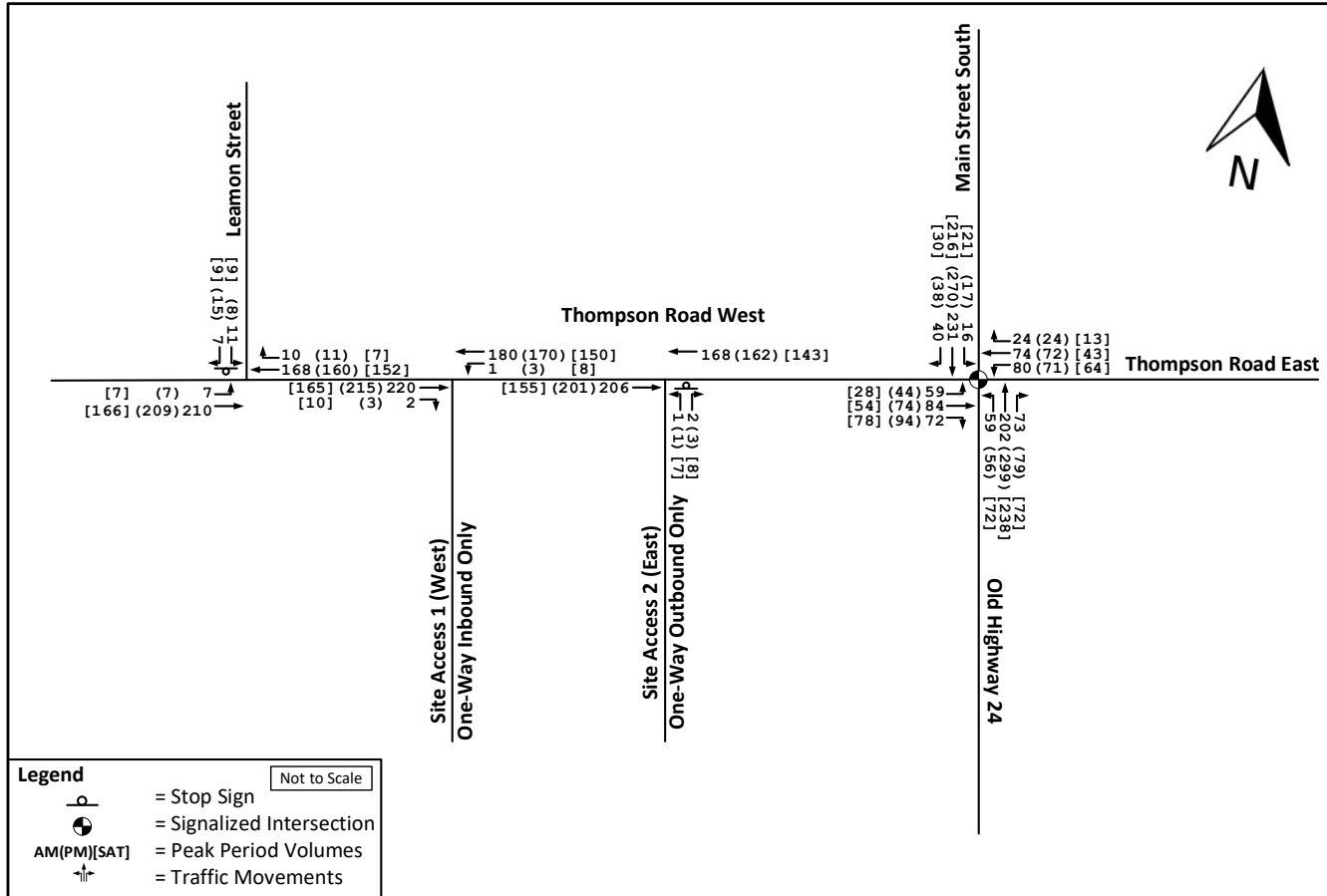
Exhibit 7-5: Site-Generated Traffic Volumes



8 2024 Future Total Conditions Analysis

New trips resulting from the construction of the proposed development were added to the 2024 Future Background Conditions scenario, producing the 2024 Future Total Condition traffic volumes illustrated in **Exhibit 8-1**.

Exhibit 8-1: 2024 Future Total Conditions Traffic Volumes



Using these 2024 future total traffic volumes, traffic operations analysis was conducted to determine future intersection performance with the impact of the proposed development. The results of the traffic operations analysis are presented in the following subsections. Full Highway Capacity Manual analysis for the 2024 Future Total Conditions scenario is presented in **Appendix F**.

8.1 Signalized Intersection

The results of the 2024 future total conditions traffic operations analysis for signalized intersections are presented in **Exhibit 8-2**.

Exhibit 8-2: 2024 Future Total Conditions Traffic Operations - Signalized Intersection

Intersection	Intersection			Movement	LOS	Delay (s)	v/c Ratio	95th Percentile Queue (m)	Storage Length (m)
	LOS	Delay (s)	v/c Ratio						
AM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.4	0.29	EBL	B	11.4	0.11	11	15
				EBT	B	12.0	0.18	17	-
				WBL	B	12.0	0.16	15	25
				WBT	B	11.4	0.12	13	-
				NBL	B	19.1	0.22	16	120
				NBT	C	21.4	0.44	50	-
				SBL	B	16.8	0.06	6	35
				SBT	C	21.2	0.43	50	-
PM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	18.2	0.31	EBL	B	11.1	0.07	9	15
				EBT	B	11.7	0.14	16	-
				WBL	B	11.6	0.12	13	25
				WBT	B	11.3	0.10	13	-
				NBL	B	18.7	0.19	15	120
				NBT	C	22.9	0.52	69	-
				SBL	B	16.9	0.06	6	35
				SBT	C	21.0	0.42	55	-
SAT Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.3	0.24	EBL	B	10.8	0.04	6	15
				EBT	B	11.3	0.11	13	-
				WBL	B	11.4	0.11	12	25
				WBT	B	10.9	0.05	9	-
				NBL	B	18.3	0.19	17	120
				NBT	C	20.9	0.41	54	-
				SBL	B	16.8	0.06	7	35
				SBT	B	19.6	0.33	43	-

As shown in **Exhibit 8-2** no critical movements are identified in comparison to 2024 Future Background Condition during weekday AM and PM peak hours, and during Saturday peak hour.

8.2 Unsignalized Intersection

The results of the 2024 future total conditions traffic operations analysis for unsignalized intersection is presented in **Exhibit 8-3**.

Exhibit 8-3: 2024 Future Total Conditions Traffic Operations - Unsignalized Intersection

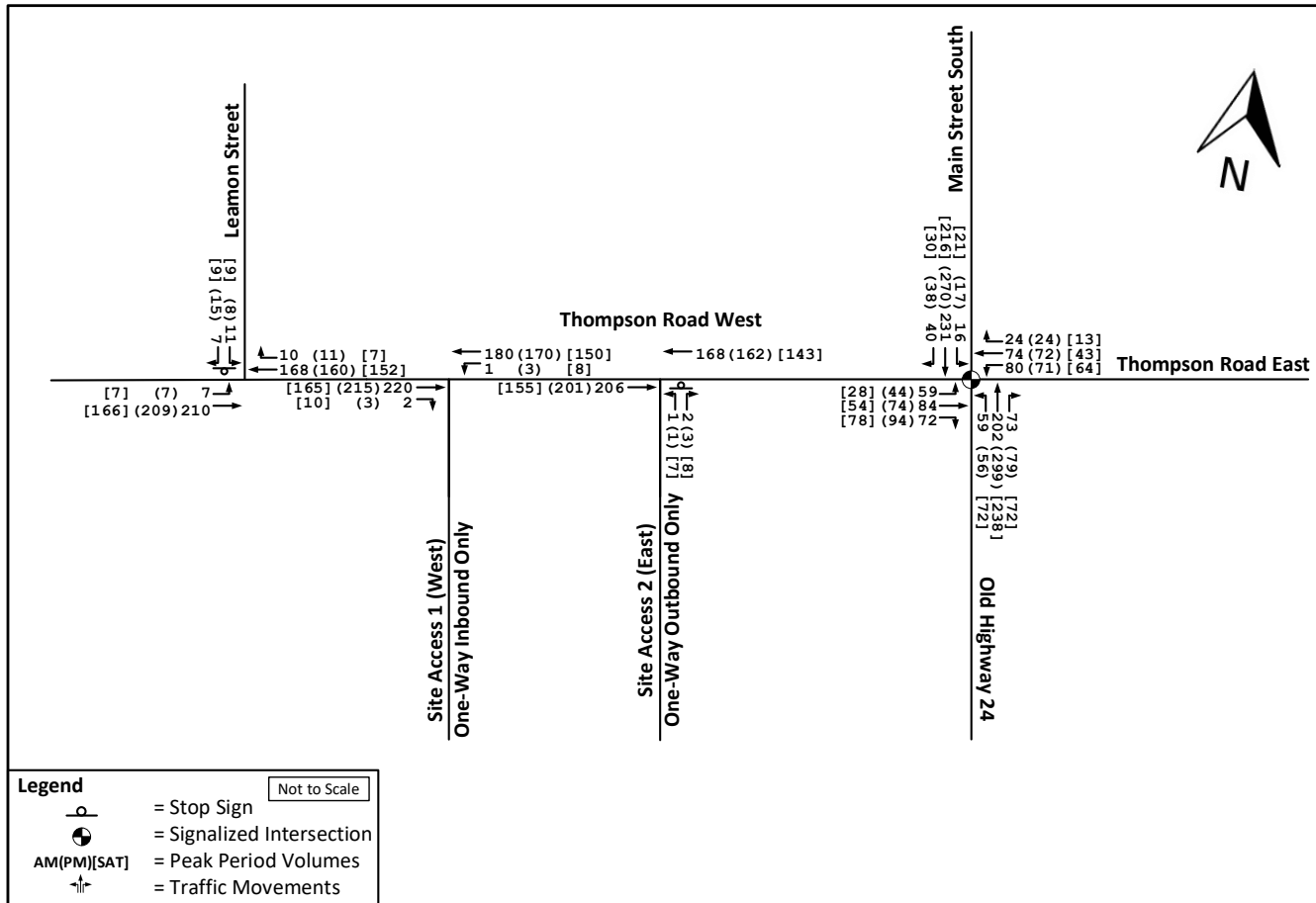
Intersection	Intersection Delay (s)	Lane	Lane LOS	Lane Delay (s)	Lane v/c Ratio	Lane 95 th Percentile Queue (m)	Lane Storage Capacity (m)
AM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	12.3	0.06	1	-
Site Access 1 (West) & Thompson Road West	0.0	WB 1	A	0.1	0.00	0	-
Site Access 2 (East) & Thompson Road West	0.1	NB 1	B	11.2	0.01	0	-
PM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	10.0	0.03	1	-
Site Access 1 (West) & Thompson Road West	0.1	WB 1	A	0.1	0.00	0	-
Site Access 2 (East) & Thompson Road West	0.1	NB 1	A	9.8	0.01	0	-
SAT Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.4	0.01	0	-
		SB 1	A	9.9	0.03	1	-
Site Access 1 (West) & Thompson Road West	0.2	WB 1	A	0.5	0.01	0	-
Site Access 2 (East) & Thompson Road West	0.5	NB 1	A	9.8	0.02	1	-

As shown in **Exhibit 8-3** no capacity concerns were observed at the unsignalized study intersection during the weekday AM and PM peak hours, and during Saturday peak hour.

9 2029 Future Total Conditions Analysis

New trips resulting from the construction of the proposed development were added to the 2029 Future Background Conditions scenario, producing the 2029 Future Total Condition traffic volumes illustrated in **Exhibit 9-1**.

Exhibit 9-1: 2029 Future Total Conditions Traffic Volumes



Using these 2029 future total traffic volumes, traffic operations analysis was conducted to determine future intersection performance with the impact of the proposed development. The results of the traffic operations analysis are presented in the following subsections. Full Highway Capacity Manual analysis for the 2029 Future Total Conditions scenario is presented in **Appendix G**.

9.1 Signalized Intersection

The results of the 2029 future total conditions traffic operations analysis for signalized intersections are presented in **Exhibit 9-2**.

Exhibit 9-2: 2029 Future Total Conditions Traffic Operations - Signalized Intersection

Intersection	Intersection			Movement	LOS	Delay (s)	v/c Ratio	95th Percentile Queue (m)	Storage Length (m)
	LOS	Delay (s)	v/c Ratio						
AM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.7	0.3	EBL	B	11.4	0.11	11	15
				EBT	B	12.1	0.18	18	-
				WBL	B	12.0	0.16	15	25
				WBT	B	11.5	0.12	14	-
				NBL	B	19.4	0.23	16	120
				NBT	C	21.8	0.46	53	-
				SBL	B	16.8	0.06	6	35
				SBT	C	21.6	0.46	53	-
PM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	18.6	0.32	EBL	B	11.1	0.07	9	15
				EBT	B	11.7	0.15	16	-
				WBL	B	11.6	0.12	13	25
				WBT	B	11.3	0.10	14	-
				NBL	B	18.9	0.20	15	120
				NBT	C	23.5	0.55	74	-
				SBL	B	17.0	0.07	6	35
				SBT	C	21.4	0.44	59	-
SAT Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.6	0.25	EBL	B	10.8	0.04	6	15
				EBT	B	11.4	0.11	13	-
				WBL	B	11.4	0.11	12	25
				WBT	B	10.9	0.06	9	-
				NBL	B	18.5	0.19	17	120
				NBT	C	21.4	0.44	57	-
				SBL	B	16.9	0.07	7	35
				SBT	B	19.9	0.35	46	-

As shown in **Exhibit 9-2** no critical movements are identified in comparison to 2029 Future Background Condition during weekday AM and PM peak hours, and during Saturday peak hour.

9.2 Unsignalized Intersection

The results of the 2029 future total conditions traffic operations analysis for unsignalized intersection is presented in **Exhibit 9-3**.

Exhibit 9-3: 2029 Future Total Conditions Traffic Operations - Unsignalized Intersection

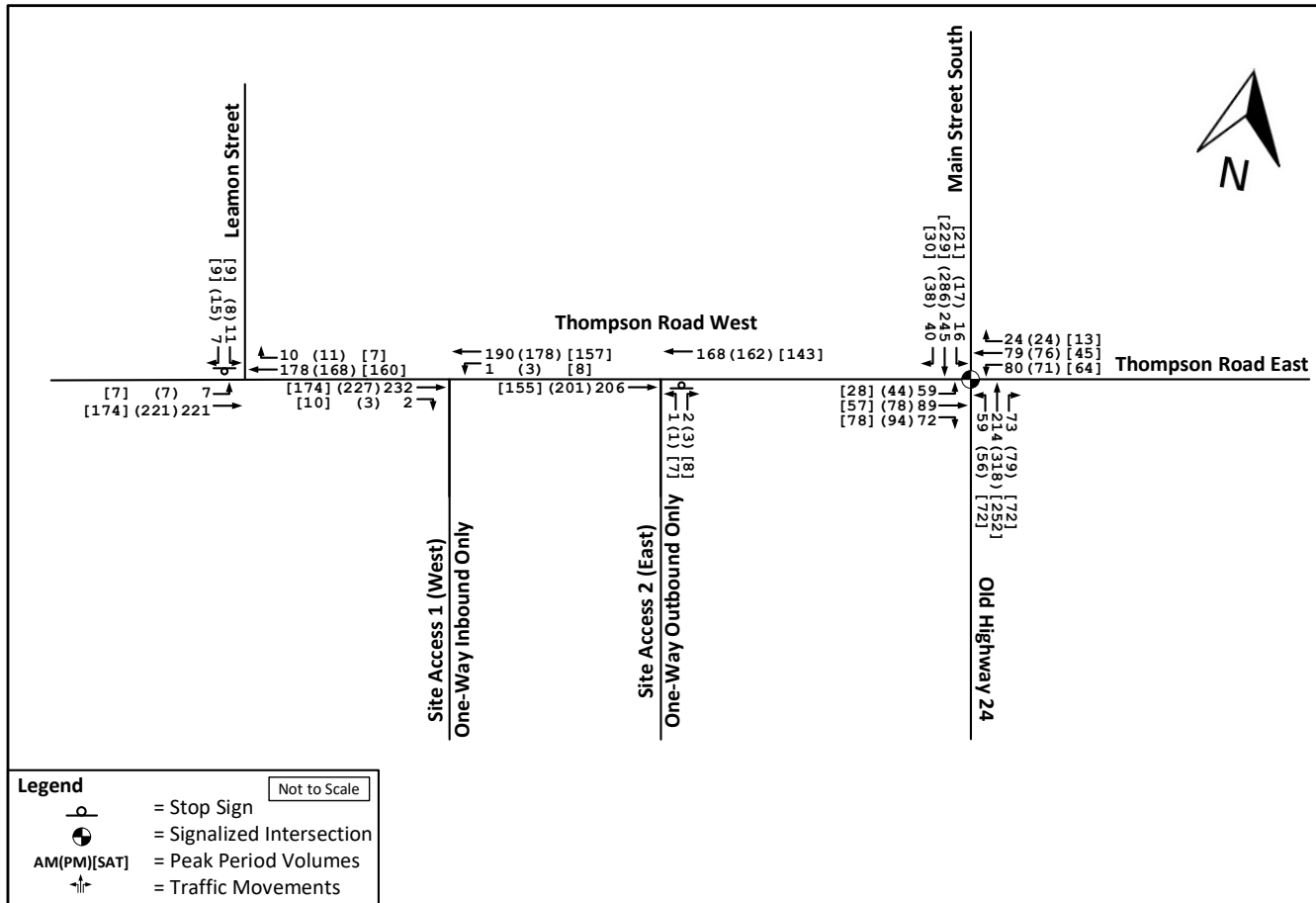
Intersection	Intersection Delay (s)	Lane	Lane LOS	Lane Delay (s)	Lane v/c Ratio	Lane 95 th Percentile Queue (m)	Lane Storage Capacity (m)
AM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	12.6	0.06	1	-
Site Access 1 (West) & Thompson Road West	0.0	WB 1	A	0.1	0.00	0	-
Site Access 2 (East) & Thompson Road West	0.1	NB 1	B	11.2	0.01	0	-
PM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	10.1	0.04	1	-
Site Access 1 (West) & Thompson Road West	0.1	WB 1	A	0.1	0.00	0	-
Site Access 2 (East) & Thompson Road West	0.1	NB 1	A	9.8	0.01	0	-
SAT Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.4	0.01	0	-
		SB 1	B	10.0	0.03	1	-
Site Access 1 (West) & Thompson Road West	0.2	WB 1	A	0.4	0.01	0	-
Site Access 2 (East) & Thompson Road West	0.5	NB 1	A	9.8	0.02	1	-

As shown in **Exhibit 9-3** no capacity concerns were observed at the unsignalized study intersection during the weekday AM and PM peak hours, and during Saturday peak hour.

10 2034 Future Total Conditions Analysis

New trips resulting from the construction of the proposed development were added to the 2034 Future Background Conditions scenario, producing the 2034 Future Total Condition traffic volumes illustrated in **Exhibit 10-1**.

Exhibit 10-1: 2034 Future Total Conditions Traffic Volumes



Using these 2034 future total traffic volumes, traffic operations analysis was conducted to determine future intersection performance with the impact of the proposed development. The results of the traffic operations analysis are presented in the following subsections. Full Highway Capacity Manual analysis for the 2034 Future Total Conditions scenario is presented in **Appendix H**.

10.1 Signalized Intersection

The results of the 2034 future total conditions traffic operations analysis for signalized intersections are presented in **Exhibit 10-2**.

Exhibit 10-2: 2034 Future Total Conditions Traffic Operations - Signalized Intersection

Intersection	Intersection			Movement	LOS	Delay (s)	v/c Ratio	95th Percentile Queue (m)	Storage Length (m)
	LOS	Delay (s)	v/c Ratio						
AM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	18	0.32	EBL	B	11.5	0.11	11	15
				EBT	B	12.1	0.19	19	-
				WBL	B	12.1	0.17	15	25
				WBT	B	11.5	0.13	15	-
				NBL	B	19.6	0.24	16	120
				NBT	C	22.2	0.48	55	-
				SBL	B	16.9	0.06	6	35
				SBT	C	22.1	0.48	56	-
PM Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	19	0.34	EBL	B	11.1	0.07	9	15
				EBT	B	11.7	0.15	17	-
				WBL	B	11.6	0.13	13	25
				WBT	B	11.3	0.10	14	-
				NBL	B	19.1	0.21	15	120
				NBT	C	24.1	0.58	78	-
				SBL	B	17.1	0.07	6	35
				SBT	C	21.8	0.47	62	-
SAT Peak Hour									
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	B	17.9	0.26	EBL	B	10.8	0.04	6	15
				EBT	B	11.4	0.11	13	-
				WBL	B	11.4	0.11	12	25
				WBT	B	10.9	0.06	10	-
				NBL	B	18.6	0.20	17	120
				NBT	C	21.7	0.46	60	-
				SBL	B	17.0	0.07	7	35
				SBT	C	20.2	0.37	48	-

As shown in **Exhibit 10-2** no critical movements are identified in comparison to 2034 Future Background Condition during weekday AM and PM peak hours, and during Saturday peak hour.

10.2 Unsignalized Intersection

The results of the 2034 future total conditions traffic operations analysis for unsignalized intersection is presented in **Exhibit 10-3**.

Exhibit 10-3: 2034 Future Total Conditions Traffic Operations - Unsignalized Intersection

Intersection	Intersection Delay (s)	Lane	Lane LOS	Lane Delay (s)	Lane v/c Ratio	Lane 95 th Percentile Queue (m)	Lane Storage Capacity (m)
AM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	13.0	0.06	2	-
Site Access 1 (West) & Thompson Road West	0.0	WB 1	A	0.1	0.00	0	-
Site Access 2 (East) & Thompson Road West	0.1	NB 1	B	11.2	0.01	0	-
PM Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.3	0.01	0	-
		SB 1	B	10.2	0.04	1	-
Site Access 1 (West) & Thompson Road West	0.1	WB 1	A	0.1	0.00	0	-
Site Access 2 (East) & Thompson Road West	0.1	NB 1	A	9.8	0.01	0	-
SAT Peak Hour							
Thompson Road West & Leamon Street South	0.7	EB 1	A	0.4	0.01	0	-
		SB 1	B	10.1	0.03	1	-
Site Access 1 (West) & Thompson Road West	0.2	WB 1	A	0.4	0.01	0	-
Site Access 2 (East) & Thompson Road West	0.5	NB 1	A	9.8	0.02	1	-

As shown in **Exhibit 10-3** no capacity concerns were observed at the unsignalized study intersection during the weekday AM and PM peak hours, and during Saturday peak hour.

11 Traffic Analysis Summary

A comparison of signalized intersection operations under 2034 Future Background traffic conditions and 2034 Future Total traffic conditions is presented in **Exhibit 11-1**.

The traffic operations analysis indicates that the addition of development site traffic to the study intersection is expected to have a negligible impact on the study area roads. In comparison to future background traffic conditions, the v/c ratio under future total conditions increase by up to 0.01.

Exhibit 11-1: 2034 Signalized Intersection Traffic Operations Comparison

Intersection	Peak Hour	Movement	2034 Future Background Conditions			2034 Future Total Conditions			Comparison		
			Delay (s)	v/c Ratio	95 th Percentile Queue Length (m)	Delay (s)	v/c Ratio	95 th Percentile Queue Length (m)	Delay (s)	v/c Ratio	95 th Percentile Queue Length (m)
Old Highway 24/Main Street South & Thompson Road West/Thompson Road East	AM	EBL	11.5	0.11	11	11.5	0.11	11	0	0	0
		EBT	12.1	0.19	19	12.1	0.19	19	0	0	0
		WBL	12.1	0.17	15	12.1	0.17	15	0	0	0
		WBT	11.5	0.13	15	11.5	0.13	15	0	0	0
		NBL	19.6	0.24	16	19.6	0.24	16	0	0	0
		NBT	22.2	0.48	55	22.2	0.48	55	0	0	0
		SBL	16.9	0.06	6	16.9	0.06	6	0	0	0
		SBT	22.1	0.48	56	22.1	0.48	56	0	0	0
	PM	EBL	11.1	0.07	9	11.1	0.07	9	0	0	0
		EBT	11.7	0.15	17	11.7	0.15	17	0	0	0
		WBL	11.6	0.13	13	11.6	0.13	13	0	0	0
		WBT	11.3	0.1	14	11.3	0.1	14	0	0	0
		NBL	19	0.2	15	19.1	0.21	15	0.1	0.01	0
		NBT	24.1	0.58	78	24.1	0.58	78	0	0	0
		SBL	17.1	0.07	6	17.1	0.07	6	0	0	0
		SBT	21.8	0.47	62	21.8	0.47	62	0	0	0
	SAT	EBL	10.8	0.04	6	10.8	0.04	6	0	0	0
		EBT	11.4	0.11	13	11.4	0.11	13	0	0	0
		WBL	11.4	0.11	12	11.4	0.11	12	0	0	0
		WBT	10.9	0.06	9	10.9	0.06	10	0	0	1
		NBL	18.4	0.19	17	18.6	0.2	17	0.2	0.01	0
		NBT	21.7	0.46	60	21.7	0.46	60	0	0	0
		SBL	17	0.07	7	17	0.07	7	0	0	0
		SBT	20.1	0.37	48	20.2	0.37	48	0.1	0	0

12 Vehicle Swept Path Analysis

A vehicle swept path analysis was conducted using AutoTURN to demonstrate that vehicles can enter and exit the site, and that access to the internal road network and parking is functional. The following vehicles and their respective paths were analyzed:

- Emergency response fire truck maneuvering through internal driveways;
- Front-loading waste collection truck maneuvering through internal driveways;
- Rear-loading delivery truck (Medium Single Unit type, MSU) accessing the loading area; and
- Passenger vehicle maneuverers accessing the surface parking area.

The vehicle swept path analysis is presented in **Appendix I** and demonstrate that truck traffic and emergency vehicles can enter and exit the site in a forward motion, and that passenger vehicles are able to access the surface parking area.

13 Pavement Marking and Signage Plan

A pavement marking and signage plan is prepared in accordance with Ontario Traffic Manual (OTM) Book 5, 6, 11, and 15. The plan is consistent with the intended lane configuration at the Thompson Road West and Site Access intersection, to provide site ingress at western driveway and site egress at eastern driveway. The plan is enclosed in **Appendix J**. Note that this plan is considered functional drawings and should not be used as construction drawings.

14 Turning Lane Warrants

The need for exclusive left turn and right turn lanes at the proposed development access is analyzed in this section.

14.1 Left Turn Lane Warrants

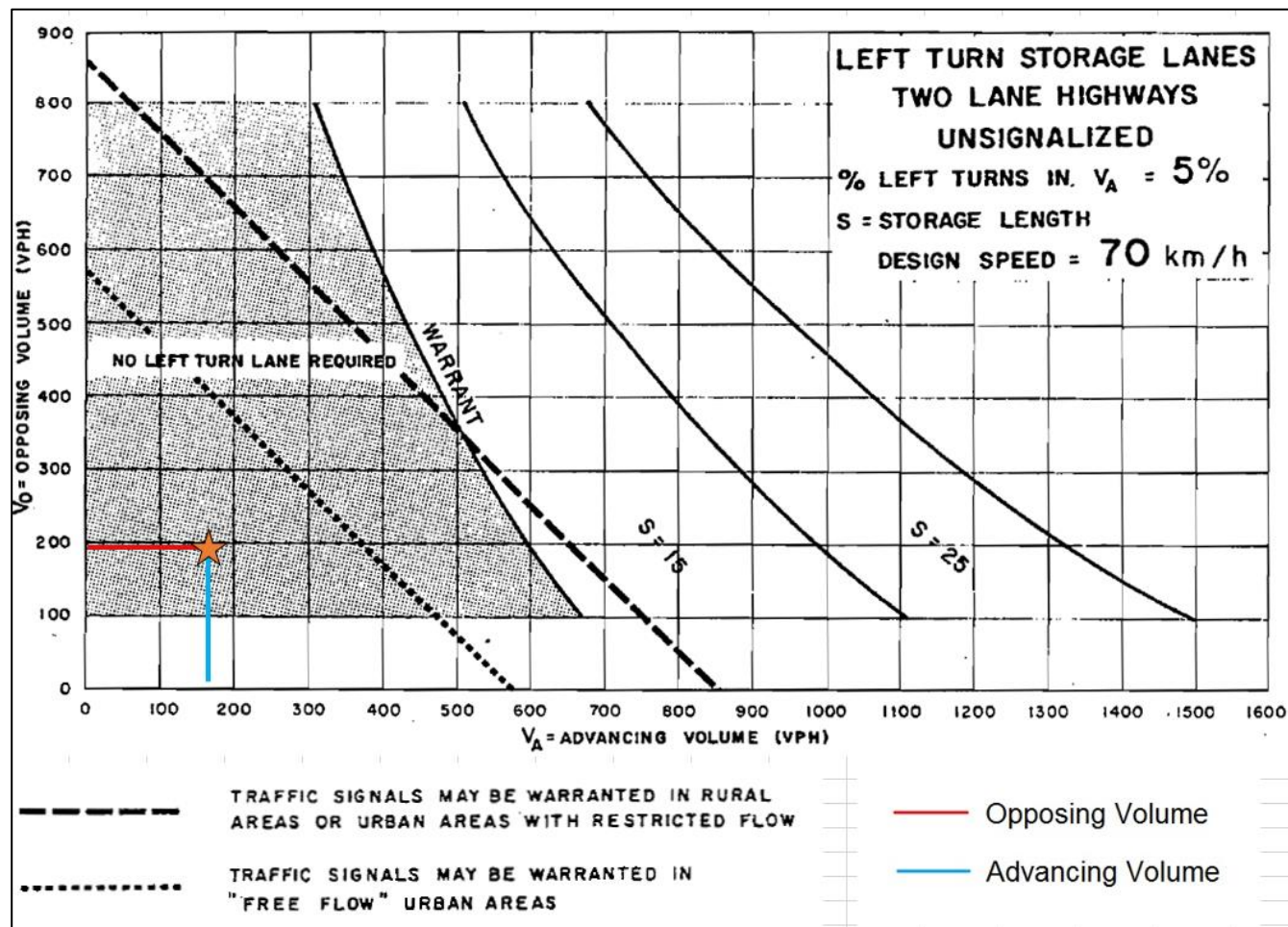
The need for an exclusive westbound left turn lane with suitable storage space was being considered for left-turning vehicles at the Site Access 1 (West) & Thompson Road West intersection based on the ***Geometric Design Standards for Ontario Highways*** (GDSOH).

The following data from 2034 Combined Traffic Volumes form the basis of the left-turn warrant analysis:

- Number of Lanes = 2
- Design Speed Limit = 70 km/h (20 km/h above the posted speed limit)
- Advancing Traffic Volume = 165
- Opposing Traffic Volume = 184
- Left Turn Traffic Volume = 8

Based on the above data and the Figure EA-10-1 of the GDSOH (illustrated in **Exhibit 14-1**) the left turn lane is not warranted.

Exhibit 14-1: Left Turn Warrant Chart



14.2 Right Turn Lane Warrants

Based on relatively low through traffic volume along Thompson Road West, the posted speed limit, and the surrounding area characteristics, right turn lane into the site is not required. Therefore, the Site Access 1 (West) can operate without auxiliary right-turn lane.

15 Parking Analysis

In order to determine if the proposed parking supply of 21 parking spaces is appropriate, the proposed supply was reviewed against the requirements of the Norfolk County Zoning By-law 1-Z-2014. As the proposed development would be categorized as an *Industrial Establishment Including Cannabis Production and Processing*., a summary of applicable rates and an assessment of compliance is illustrated in **Exhibit 15-1**.

Exhibit 15-1: Norfolk County By-law 1-Z-2014 Parking Requirements

Land Use	Proposed GFA	Parking Rate Requirement	Minimum Required Spaces
Industrial Establishment			
Transfer Building for Recyclable Material	1,800.00 m2	Min. 1.0 for every 90 m2 of usable floor area	20
Accessible Parking Requirements			
Transfer Building for Recyclable Material	-	If the number of parking spaces is 1 to 25 – 1 Type A parking space	1
Total			
Minimum Required Parking Spaces (Required Accessible Parking Spaces)			20 (1)
Proposed Parking Spaces (Proposed Accessible Parking Spaces)			20 (1)
Surplus/Deficiency			0 (0)

Based on this assessment, the proposed development is expected to comply with Norfolk County Zoning By-law 1-Z-2014 requirements.

16 Conclusions

This section summarizes the key findings of this transportation impact study (TIS).

16.1 TIS Findings

The proposed development intends to expand the existing disposal services to accommodate a new transfer building for recyclable materials and a public drop-off area. Primary access to the site is proposed via Thompson Road West, approximately opposite Leamon Street.

In addition to a 1.3% annual growth rate, the future background conditions review identified three proposed developments with a potential for generating additional traffic.

Trip generation rates for the proposed land use are not available in the publication ***Trip Generation Manual, 11th Edition*** (Institute of Transportation Engineers, September 2021). Therefore, trip generation rates were based on a review of the existing Solid Waste Transfer Station, just south of the proposed development site.

Following scenarios were analyzed traffic operation at the study intersections:

- 2023 Existing Conditions;
- 2024 Future Background Conditions;
- 2029 Future Background Conditions;
- 2034 Future Background Conditions;
- 2024 Future Total Conditions;
- 2029 Future Total Conditions; and
- 2034 Future Total Conditions.

The traffic operations analysis indicate that study area intersections presently operate below capacity limits during the weekday AM and PM peak hours, and during Saturday peak hour. As well, analysis indicates that the addition of development site traffic to the study area intersections is expected to have a negligible impact on traffic operations in Waterford. In comparison to future background traffic conditions, the v/c ratio under future total conditions increase by up to 0.01.

16.2 Vehicle Swept Path Analysis

A vehicle swept path analysis was conducted using AutoTURN to demonstrate that the internal driveways are functional, that the rear-loading delivery truck can access the loading area, and that passenger vehicles are able to access the surface parking area.

16.3 Pavement Marking and Signage Plan

A pavement marking and signage plan was prepared in accordance with Ontario Traffic Manual (OTM) Book 5, 6, 11, and 15. The plan is consistent with the intended lane configuration at the Thompson Road West and Site Access intersection, to provide site ingress at western driveway and site egress at eastern driveway.

16.4 Turning Lane Warrants

The left turn lane and right turn lane warrant analysis have been undertaken at the Site Access 1 (West) & Thompson Road West intersection. Based on the ***Geometric Design Standards for Ontario Highways*** (GDSOH) the left turn lane is not warranted.

Based on relatively low through traffic volume along Thompson Road West, the posted speed limit, and the surrounding area characteristics, right turn lane into the site is not required.

16.5 Parking Analysis

In order to determine if the proposed parking supply of 21 parking spaces is appropriate, the proposed supply was reviewed against the requirements of the Norfolk County Zoning By-law 1-Z-2014. Based on this assessment, the proposed development is expected to comply with Norfolk County Zoning By-law 1-Z-2014 requirements.

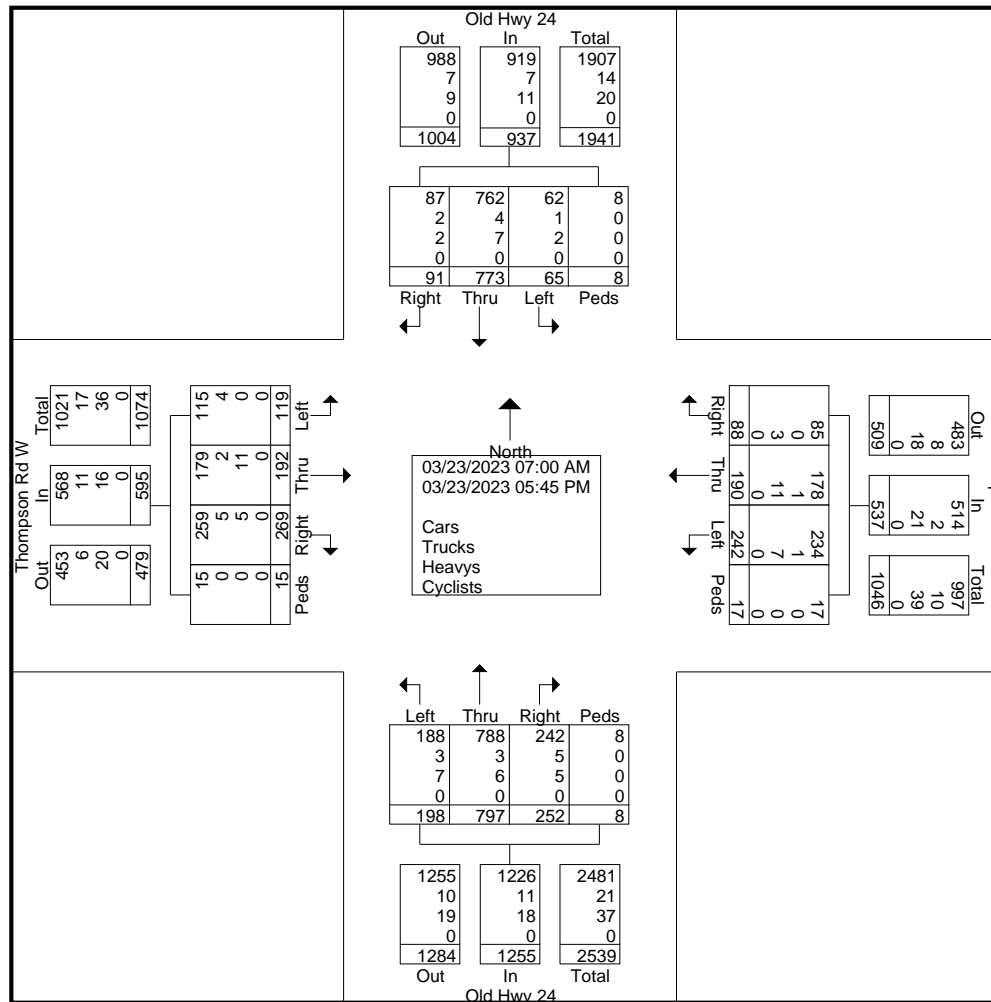
Appendix A

Turning Movement Counts

Horizon Data Services Ltd

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Phone: (416) 840-6619 Fax: (416) 840-5297
"Your Traffic Count Specialist"

File Name : Old Highway 24 at Thompson Road
Site Code : 00000000
Start Date : 03/23/2023
Page No : 2



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"Your Traffic Count Specialist"

File Name : Old Highway 24 at Thompson Road

Site Code : 00000000

Start Date : 03/23/2023

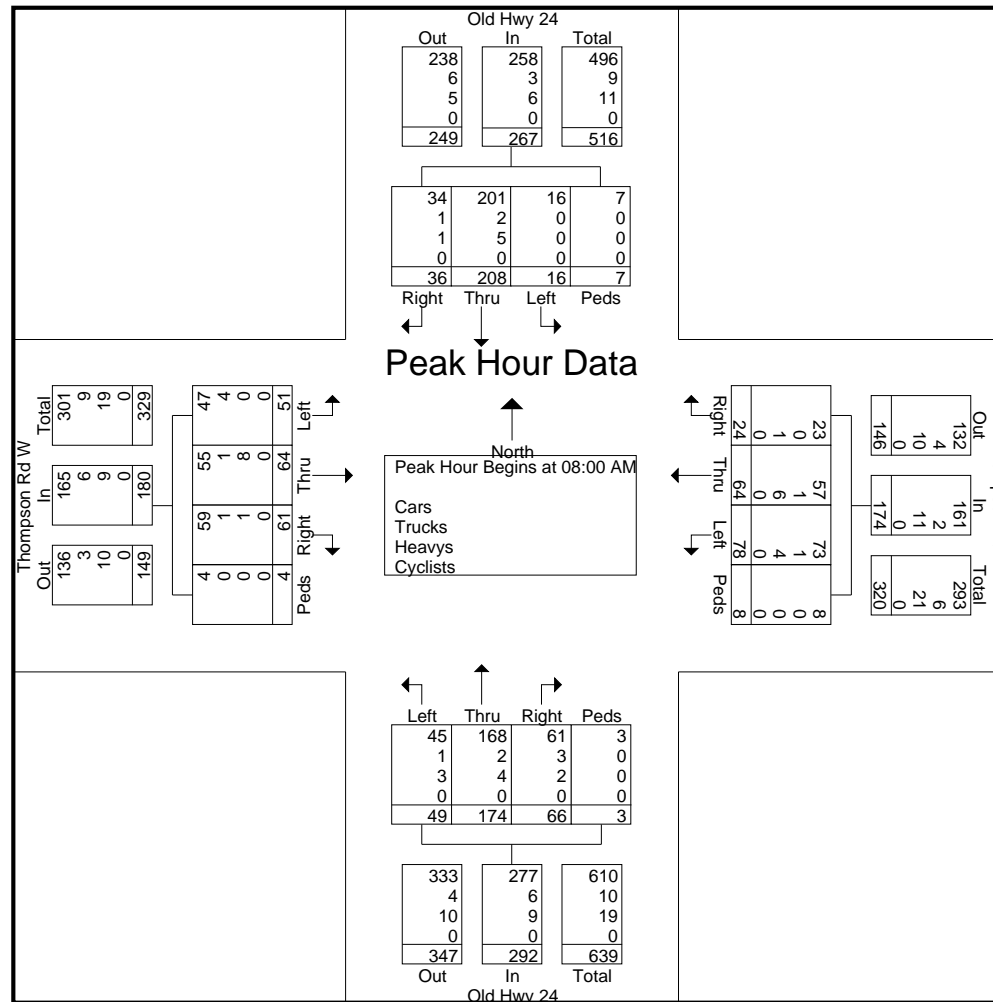
Page No : 3

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"Your Traffic Count Specialist"

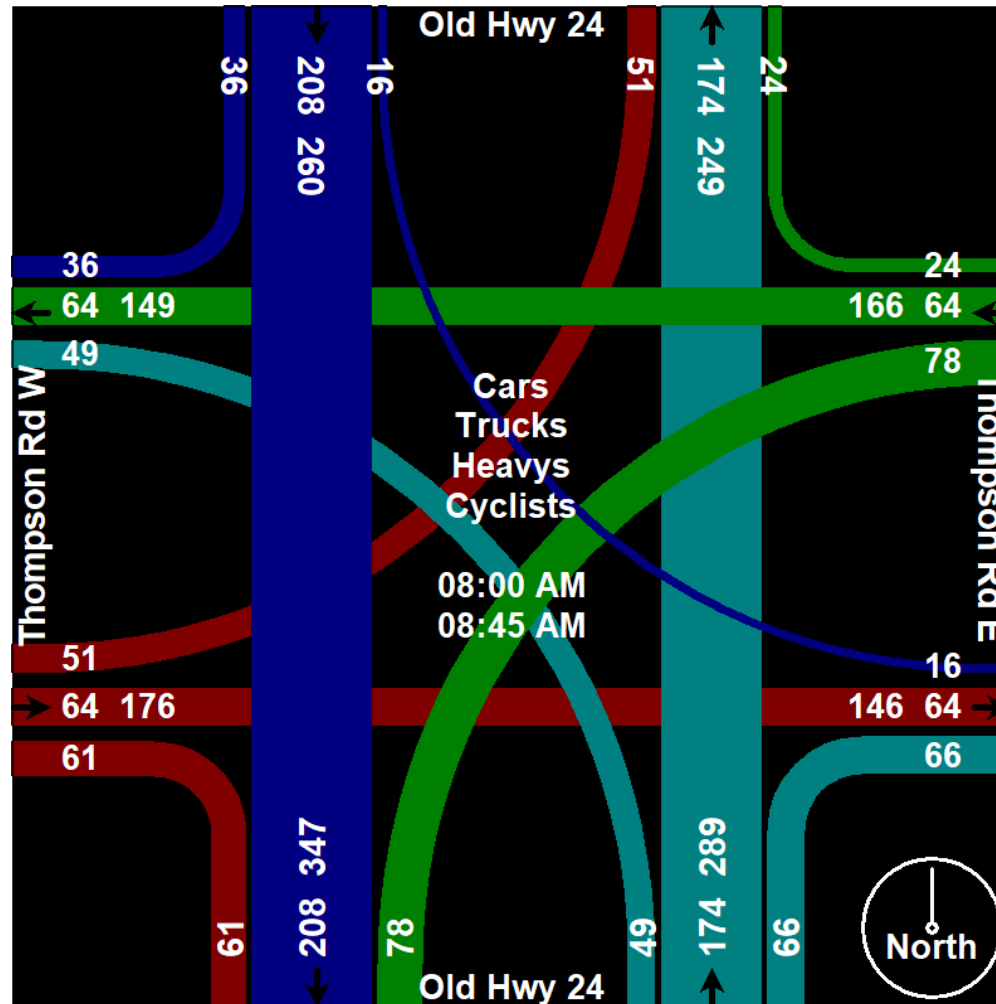
File Name : Old Highway 24 at Thompson Road
Site Code : 00000000
Start Date : 03/23/2023
Page No : 4



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File Name : Old Highway 24 at Thompson Road
Site Code : 00000000
Start Date : 03/23/2023
Page No : 5



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"Your Traffic Count Specialist"

File Name : Old Highway 24 at Thompson Road

Site Code : 00000000

Start Date : 03/23/2023

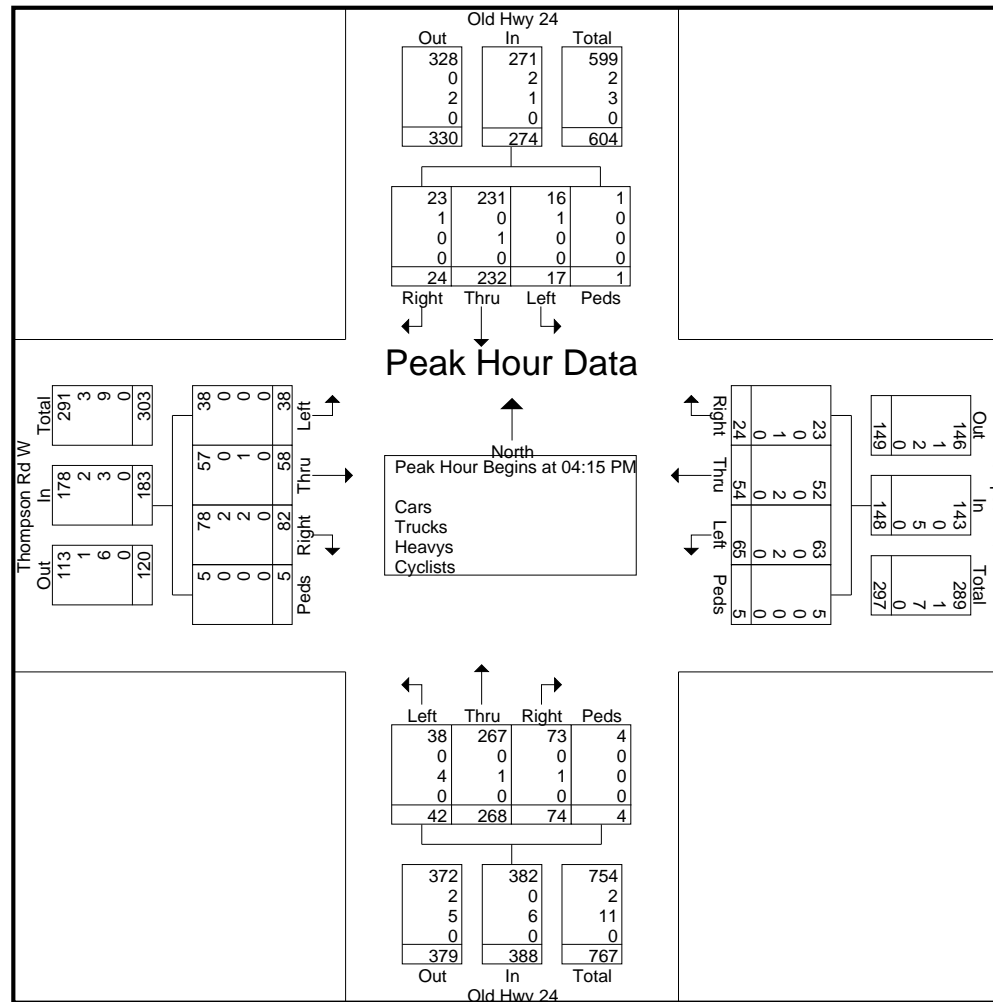
Page No : 6

[illegible]

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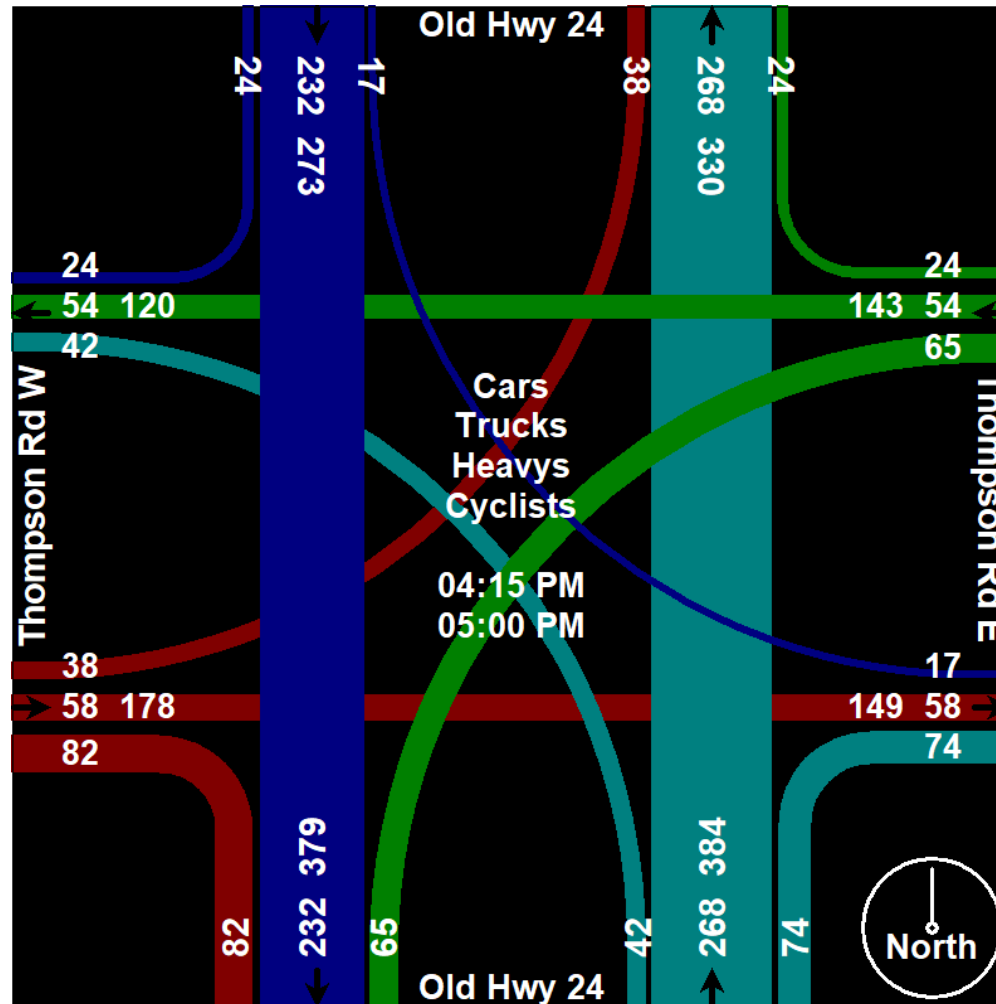
File Name : Old Highway 24 at Thompson Road
Site Code : 00000000
Start Date : 03/23/2023
Page No : 7



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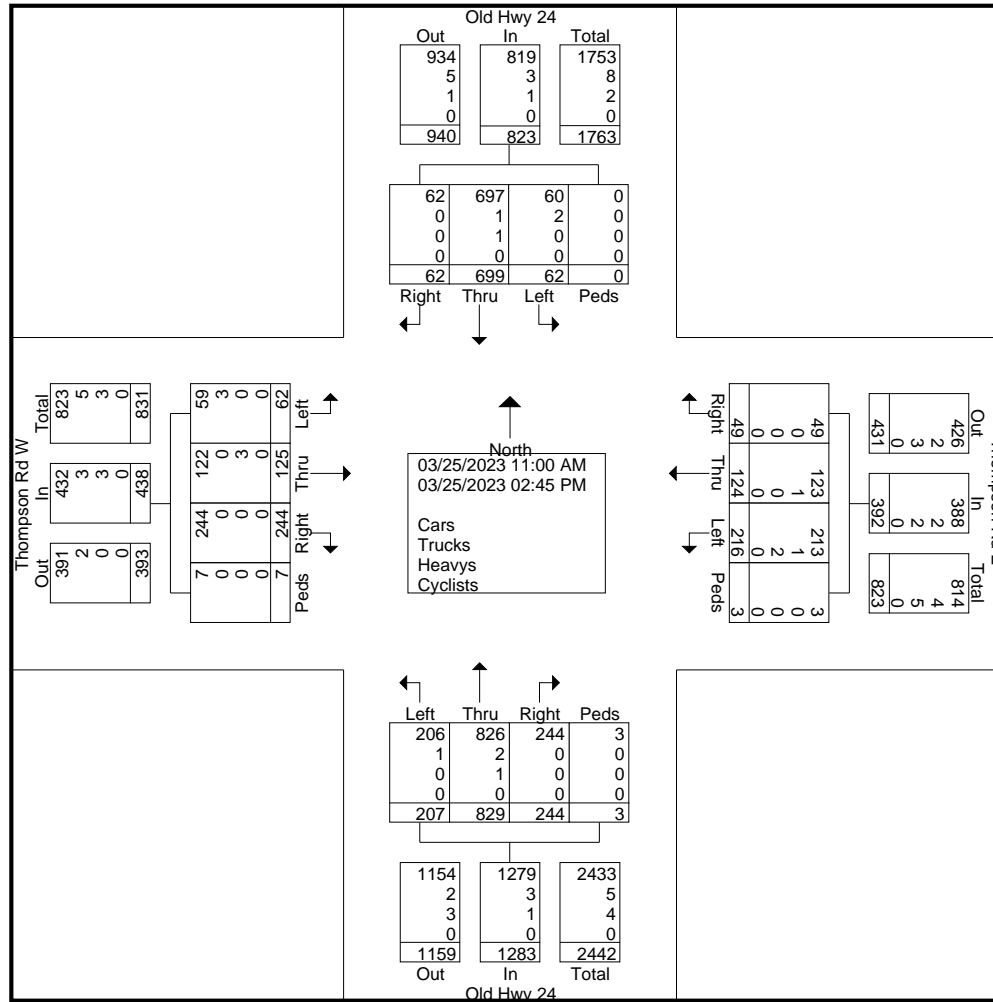
File Name : Old Highway 24 at Thompson Road
Site Code : 00000000
Start Date : 03/23/2023
Page No : 8



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File Name : Old Highway 24 at Thompson Road-SAT
Site Code : 00000000
Start Date : 03/25/2023
Page No : 2



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File Name : Old Highway 24 at Thompson Road-SAT

Site Code : 00000000

Start Date : 03/25/2023

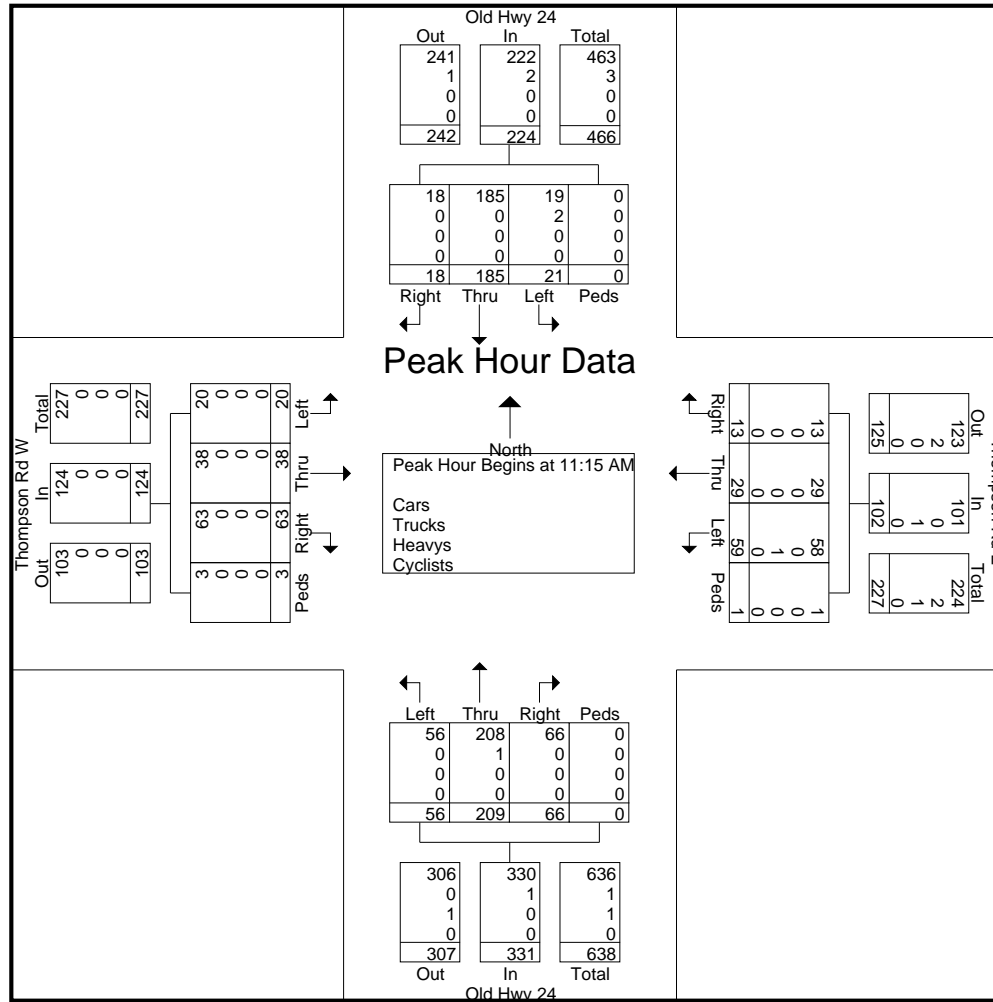
Page No : 3

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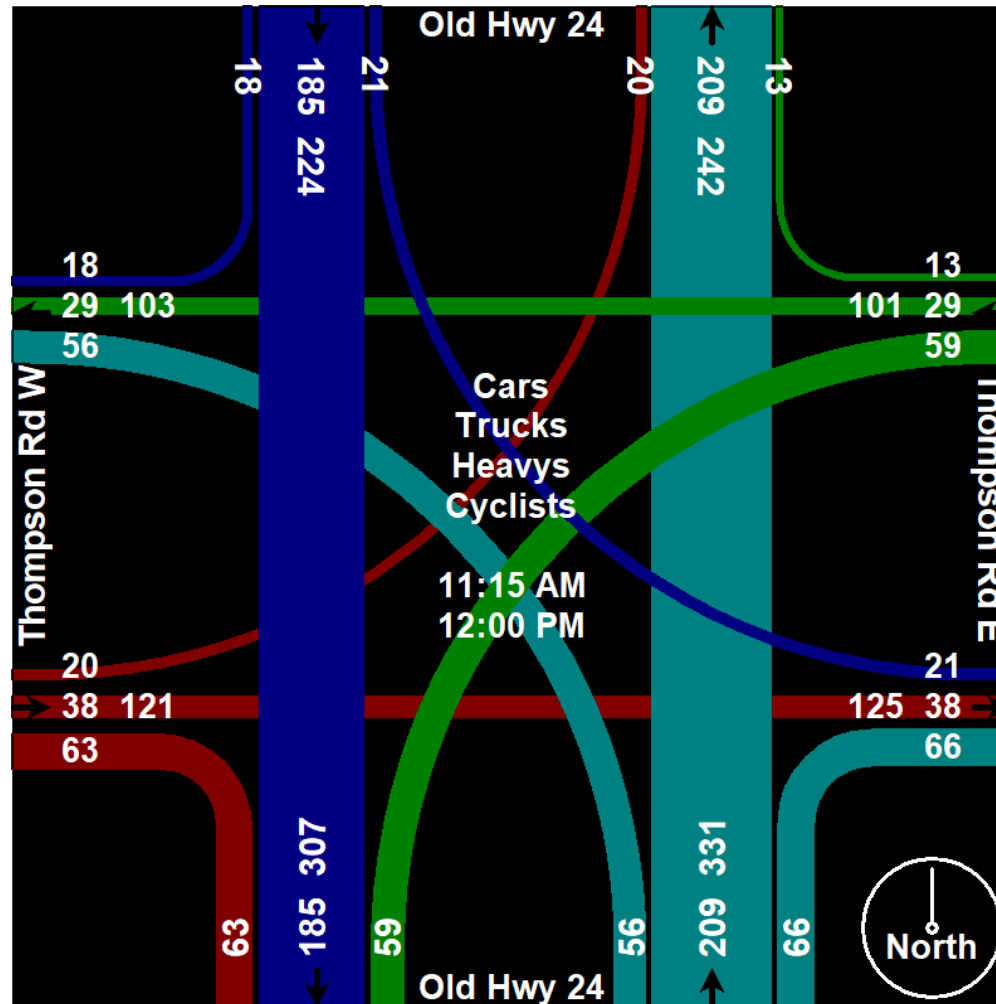
File Name : Old Highway 24 at Thompson Road-SAT
Site Code : 00000000
Start Date : 03/25/2023
Page No : 4



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Start Date : 03/25/2023
Page No : 5



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File Name : Thompson Road W at Leamon Street
Site Code : 00000000
Start Date : 03/23/2023
Page No : 1

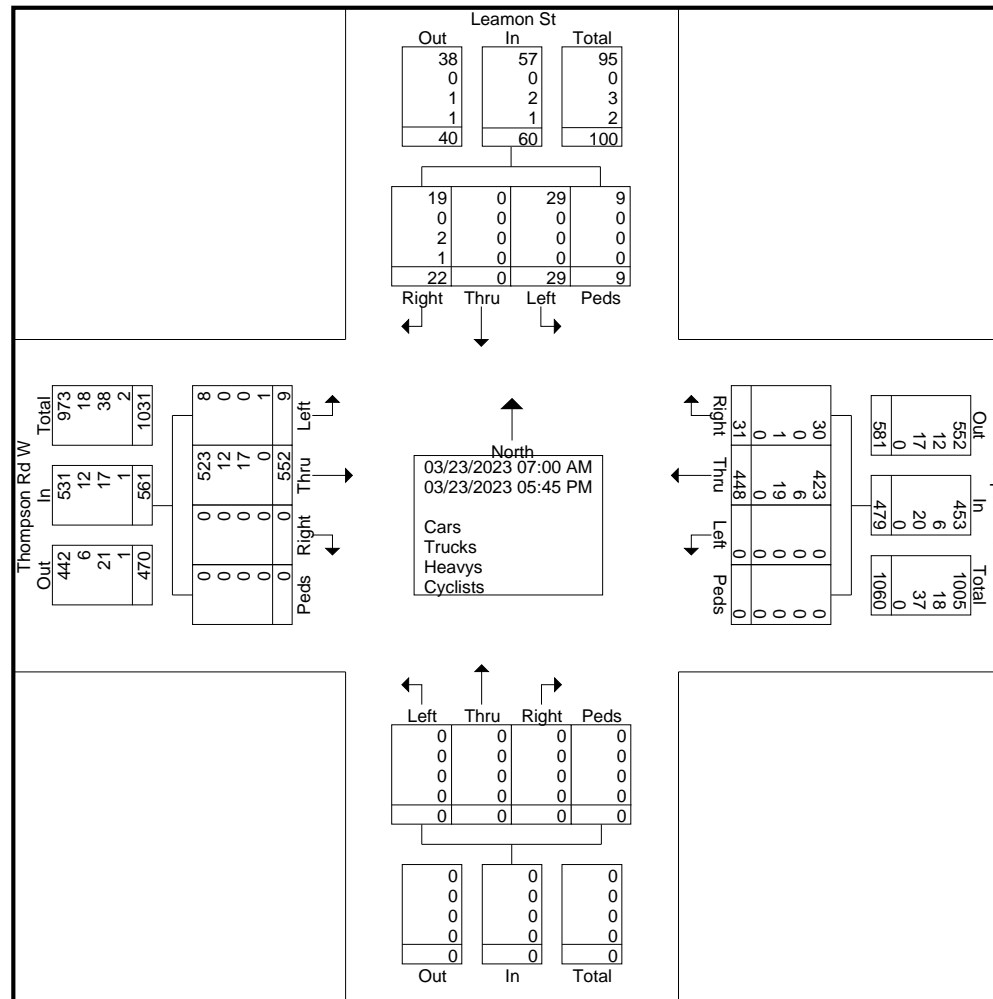
Groups Printed- Cars - Trucks - Heavys - Cyclists

	Leamon St From North					Thompson Rd W From East					From South					Thompson Rd W From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	1	0	0	0	1	0	13	0	0	13	0	0	0	0	0	0	13	0	0	13	27
07:15 AM	1	0	2	0	3	2	18	0	0	20	0	0	0	0	0	0	28	2	0	30	53
07:30 AM	0	0	0	0	0	3	29	0	0	32	0	0	0	0	0	0	33	0	0	33	65
07:45 AM	1	0	5	0	6	3	34	0	0	37	0	0	0	0	0	0	23	1	0	24	67
Total	3	0	7	0	10	8	94	0	0	102	0	0	0	0	0	0	97	3	0	100	212
08:00 AM	2	0	0	1	3	1	16	0	0	17	0	0	0	0	0	0	30	0	0	30	50
08:15 AM	0	0	2	6	8	2	31	0	0	33	0	0	0	0	0	0	31	0	0	31	72
08:30 AM	2	0	5	0	7	3	62	0	0	65	0	0	0	0	0	0	65	0	0	65	137
08:45 AM	1	0	4	0	5	4	29	0	0	33	0	0	0	0	0	0	37	1	0	38	76
Total	5	0	11	7	23	10	138	0	0	148	0	0	0	0	0	0	163	1	0	164	335
04:00 PM	2	0	1	0	3	1	22	0	0	23	0	0	0	0	0	0	30	0	0	30	56
04:15 PM	1	0	1	0	2	2	22	0	0	24	0	0	0	0	0	0	40	1	0	41	67
04:30 PM	0	0	3	2	5	5	27	0	0	32	0	0	0	0	0	0	49	1	0	50	87
04:45 PM	1	0	3	0	4	2	39	0	0	41	0	0	0	0	0	0	42	1	0	43	88
Total	4	0	8	2	14	10	110	0	0	120	0	0	0	0	0	0	161	3	0	164	298
05:00 PM	6	0	1	0	7	2	23	0	0	25	0	0	0	0	0	0	36	0	0	36	68
05:15 PM	2	0	0	0	2	0	27	0	0	27	0	0	0	0	0	0	33	1	0	34	63
05:30 PM	2	0	1	0	3	1	25	0	0	26	0	0	0	0	0	0	30	0	0	30	59
05:45 PM	0	0	1	0	1	0	31	0	0	31	0	0	0	0	0	0	32	1	0	33	65
Total	10	0	3	0	13	3	106	0	0	109	0	0	0	0	0	0	131	2	0	133	255
Grand Total	22	0	29	9	60	31	448	0	0	479	0	0	0	0	0	0	552	9	0	561	1100
Apprch %	36.7	0	48.3	15		6.5	93.5	0	0		0	0	0	0		0	98.4	1.6	0		
Total %	2	0	2.6	0.8	5.5	2.8	40.7	0	0	43.5	0	0	0	0	0	0	50.2	0.8	0	51	
Cars	19	0	29	9	57	30	423	0	0	453	0	0	0	0	0	0	523	8	0	531	1041
% Cars	86.4	0	100	100	95	96.8	94.4	0	0	94.6	0	0	0	0	0	0	94.7	88.9	0	94.7	94.6
Trucks	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	12	0	0	12	18
% Trucks	0	0	0	0	0	0	1.3	0	0	1.3	0	0	0	0	0	0	2.2	0	0	2.1	1.6
Heavys	2	0	0	0	2	1	19	0	0	20	0	0	0	0	0	0	17	0	0	17	39
% Heavys	9.1	0	0	0	3.3	3.2	4.2	0	0	4.2	0	0	0	0	0	0	3.1	0	0	3	3.5
Cyclists	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
% Cyclists	4.5	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0	11.1	0	0.2	0.2

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"Your Traffic Count Specialist"

File Name : Thompson Road W at Leamon Street
Site Code : 00000000
Start Date : 03/23/2023
Page No : 2



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Start Date : 03/23/2023

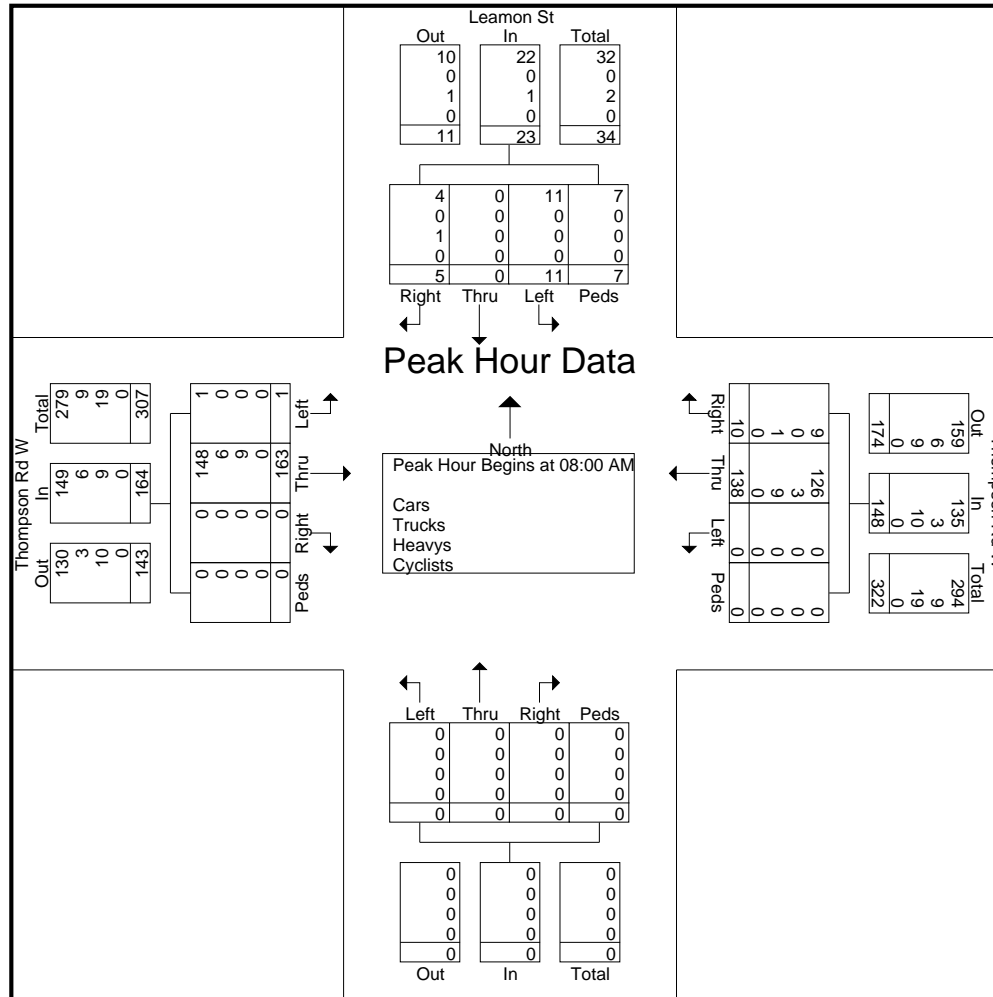
Page No : 3

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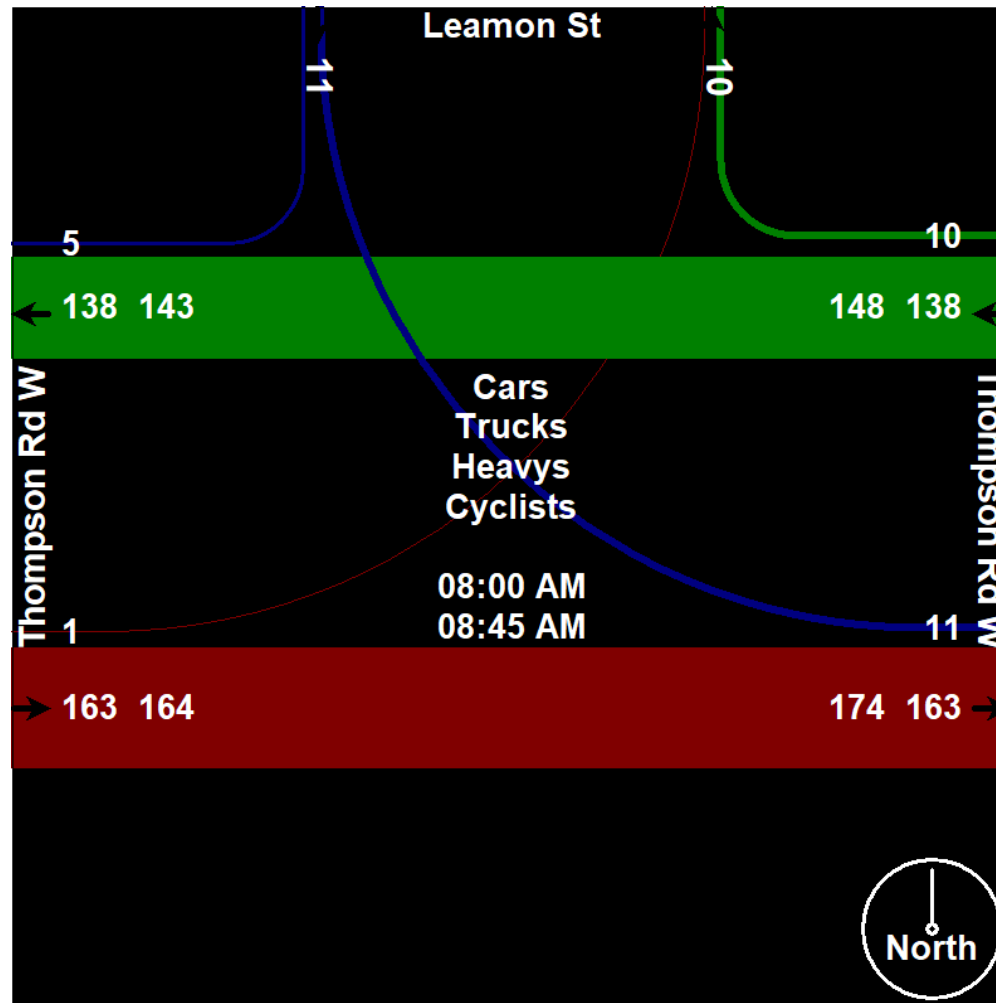
File Name : Thompson Road W at Leamon Street
 Site Code : 00000000
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 Page No : 4



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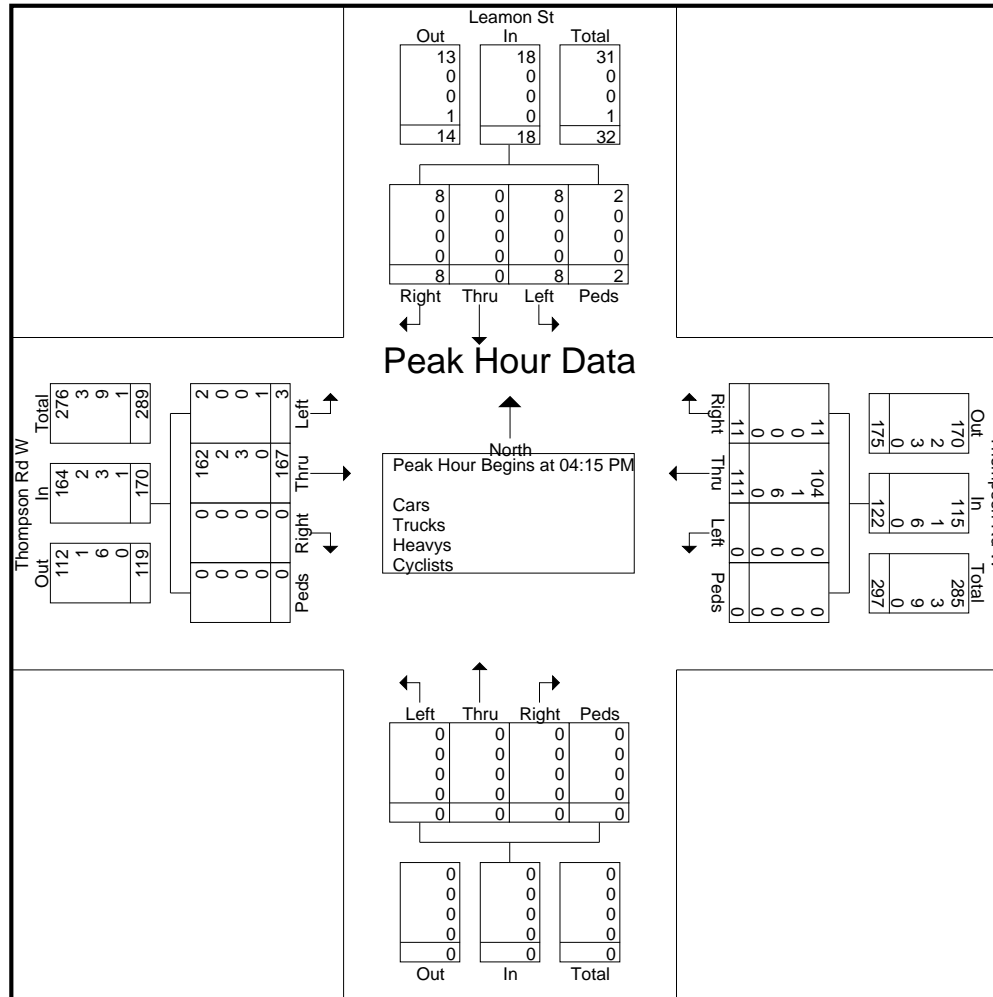
File Name : Thompson Road W at Leamon Street
Site Code : 00000000
Start Date : 03/23/2023
Page No : 6

	Leamon St From North					Thompson Rd W From East					From South					Thompson Rd W From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	1	0	1	0	2	2	22	0	0	24	0	0	0	0	0	0	40	1	0	41	67
04:30 PM	0	0	3	2	5	5	27	0	0	32	0	0	0	0	0	0	49	1	0	50	87
04:45 PM	1	0	3	0	4	2	39	0	0	41	0	0	0	0	0	0	42	1	0	43	88
05:00 PM	6	0	1	0	7	2	23	0	0	25	0	0	0	0	0	0	36	0	0	36	68
Total Volume	8	0	8	2	18	11	111	0	0	122	0	0	0	0	0	0	167	3	0	170	310
% App. Total	44.4	0	44.4	11.1		9	91	0	0		0	0	0	0	0	0	98.2	1.8	0		
PHF	.333	.000	.667	.250	.643	.550	.712	.000	.000	.744	.000	.000	.000	.000	.000	.000	.852	.750	.000	.850	.881
Cars	8	0	8	2	18	11	104	0	0	115	0	0	0	0	0	0	162	2	0	164	297
% Cars	100	0	100	100	100	100	93.7	0	0	94.3	0	0	0	0	0	0	97.0	66.7	0	96.5	95.8
Trucks	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
% Trucks	0	0	0	0	0	0	0.9	0	0	0.8	0	0	0	0	0	0	1.2	0	0	1.2	1.0
Heavys	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	3	0	0	3	9
% Heavys	0	0	0	0	0	0	5.4	0	0	4.9	0	0	0	0	0	0	1.8	0	0	1.8	2.9
Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
% Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.3	0	0.6	0.3

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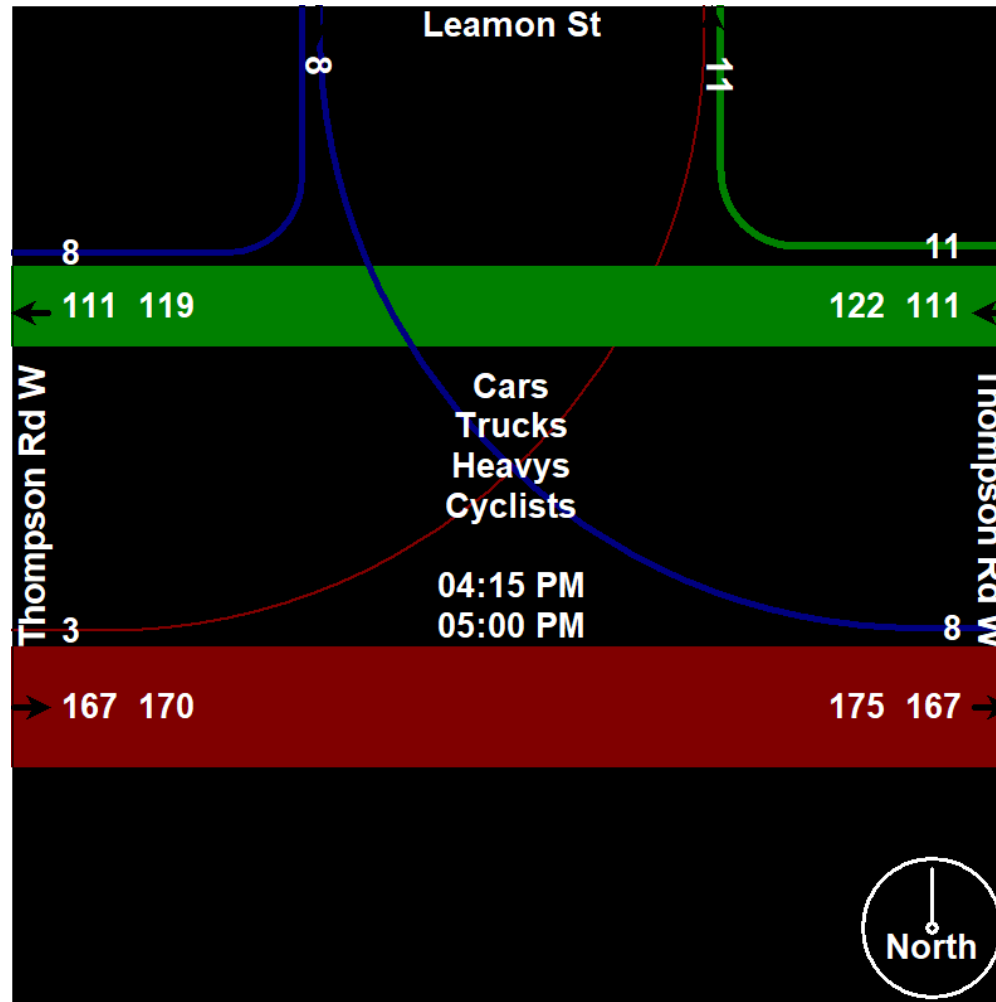
File Name : Thompson Road W at Leamon Street
Site Code : 00000000
Start Date : 03/23/2023
Page No : 7



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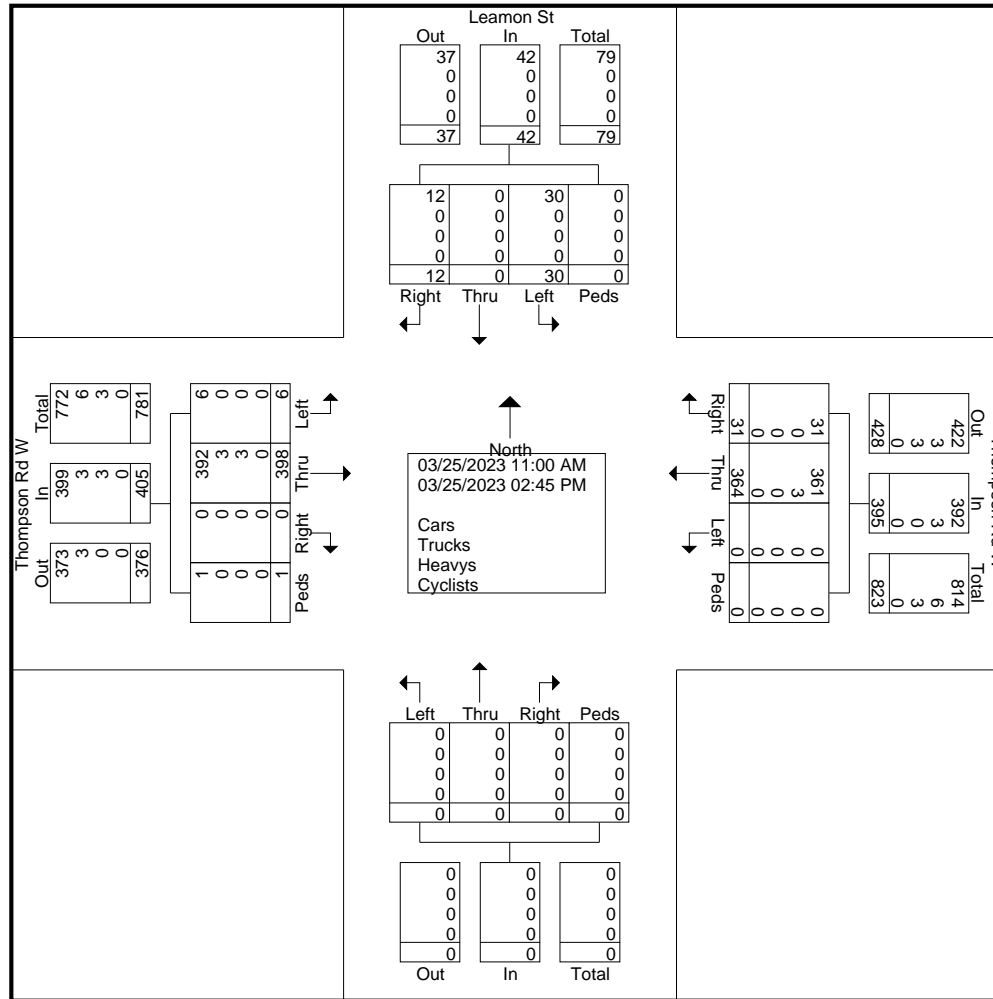
Groups Printed- Cars - Trucks - Heavys - Cyclists

	Leamon St From North					Thompson Rd W From East					Thompson Rd W From South					Thompson Rd W From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	0	0	1	0	1	1	20	0	0	21	0	0	0	0	0	0	18	0	0	18	40
11:15 AM	1	0	2	0	3	3	24	0	0	27	0	0	0	0	0	0	27	1	0	28	58
11:30 AM	1	0	4	0	5	3	21	0	0	24	0	0	0	0	0	0	25	1	0	26	55
11:45 AM	1	0	0	0	1	1	25	0	0	26	0	0	0	0	0	0	33	0	0	33	60
Total	3	0	7	0	10	8	90	0	0	98	0	0	0	0	0	0	103	2	0	105	213
12:00 PM	1	0	2	0	3	6	21	0	0	27	0	0	0	0	0	0	30	1	0	31	61
12:15 PM	2	0	2	0	4	2	26	0	0	28	0	0	0	0	0	0	18	0	0	18	50
12:30 PM	1	0	2	0	3	2	20	0	0	22	0	0	0	0	0	0	23	1	0	24	49
12:45 PM	0	0	2	0	2	0	26	0	0	26	0	0	0	0	0	0	15	0	0	15	43
Total	4	0	8	0	12	10	93	0	0	103	0	0	0	0	0	0	86	2	0	88	203
01:00 PM	1	0	0	0	1	1	17	0	0	18	0	0	0	0	0	0	23	0	0	23	42
01:15 PM	0	0	2	0	2	0	25	0	0	25	0	0	0	0	0	0	28	1	0	29	56
01:30 PM	1	0	3	0	4	5	22	0	0	27	0	0	0	0	0	0	19	0	0	19	50
01:45 PM	0	0	2	0	2	3	27	0	0	30	0	0	0	0	0	0	30	0	1	31	63
Total	2	0	7	0	9	9	91	0	0	100	0	0	0	0	0	0	100	1	1	102	211
02:00 PM	2	0	4	0	6	1	20	0	0	21	0	0	0	0	0	0	29	0	0	29	56
02:15 PM	0	0	0	0	0	1	30	0	0	31	0	0	0	0	0	0	36	0	0	36	67
02:30 PM	0	0	2	0	2	2	28	0	0	30	0	0	0	0	0	0	24	1	0	25	57
02:45 PM	1	0	2	0	3	0	12	0	0	12	0	0	0	0	0	0	20	0	0	20	35
Total	3	0	8	0	11	4	90	0	0	94	0	0	0	0	0	0	109	1	0	110	215
Grand Total	12	0	30	0	42	31	364	0	0	395	0	0	0	0	0	0	398	6	1	405	842
Apprch %	28.6	0	71.4	0		7.8	92.2	0	0		0	0	0	0		0	98.3	1.5	0.2		
Total %	1.4	0	3.6	0	5	3.7	43.2	0	0	46.9	0	0	0	0	0	0	47.3	0.7	0.1	48.1	
Cars	12	0	30	0	42	31	361	0	0	392	0	0	0	0	0	0	392	6	1	399	833
% Cars	100	0	100	0	100	100	99.2	0	0	99.2	0	0	0	0	0	0	98.5	100	100	98.5	98.9
Trucks	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	6
% Trucks	0	0	0	0	0	0	0.8	0	0	0.8	0	0	0	0	0	0	0.8	0	0	0.7	0.7
Heavys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
% Heavys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0.7	0.4
Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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File Name : Thompson Road W at Leamon Street-SAT
 Site Code : 00000000
 Start Date : 03/25/2023
 Page No : 2



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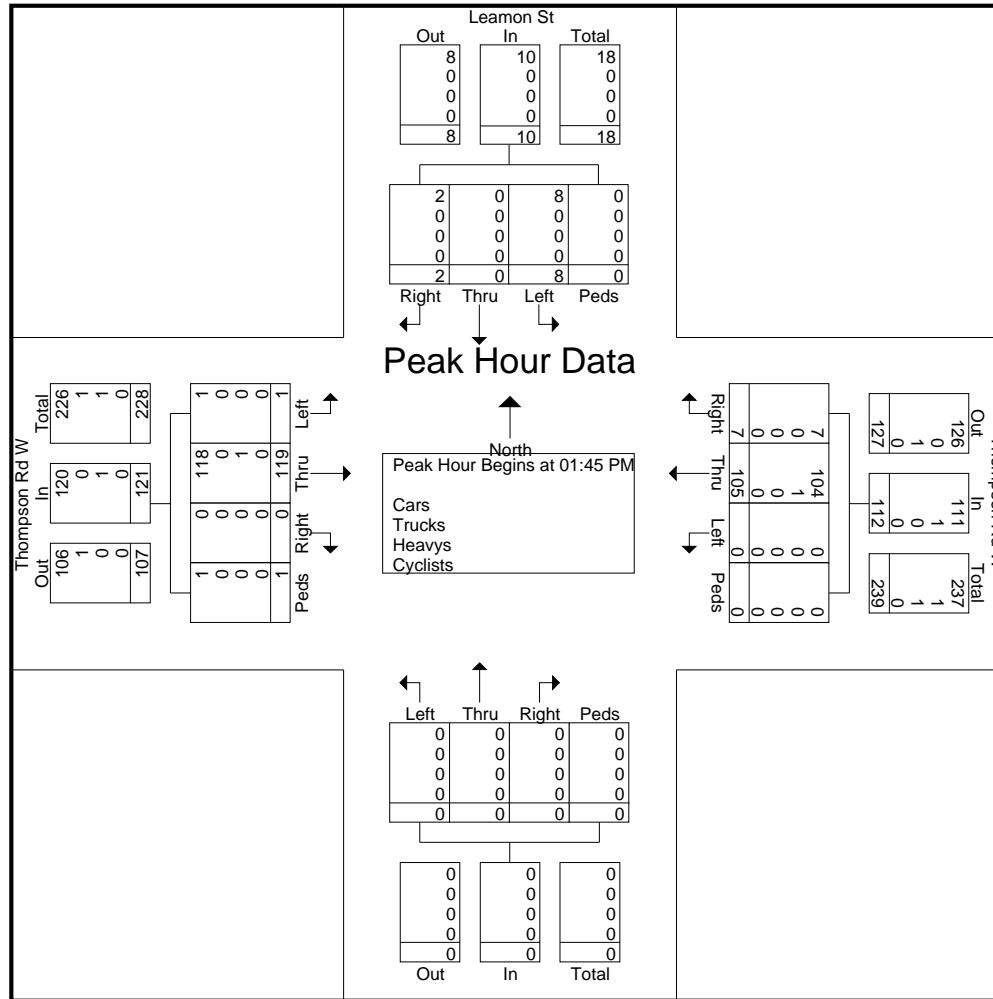
Page No : 3

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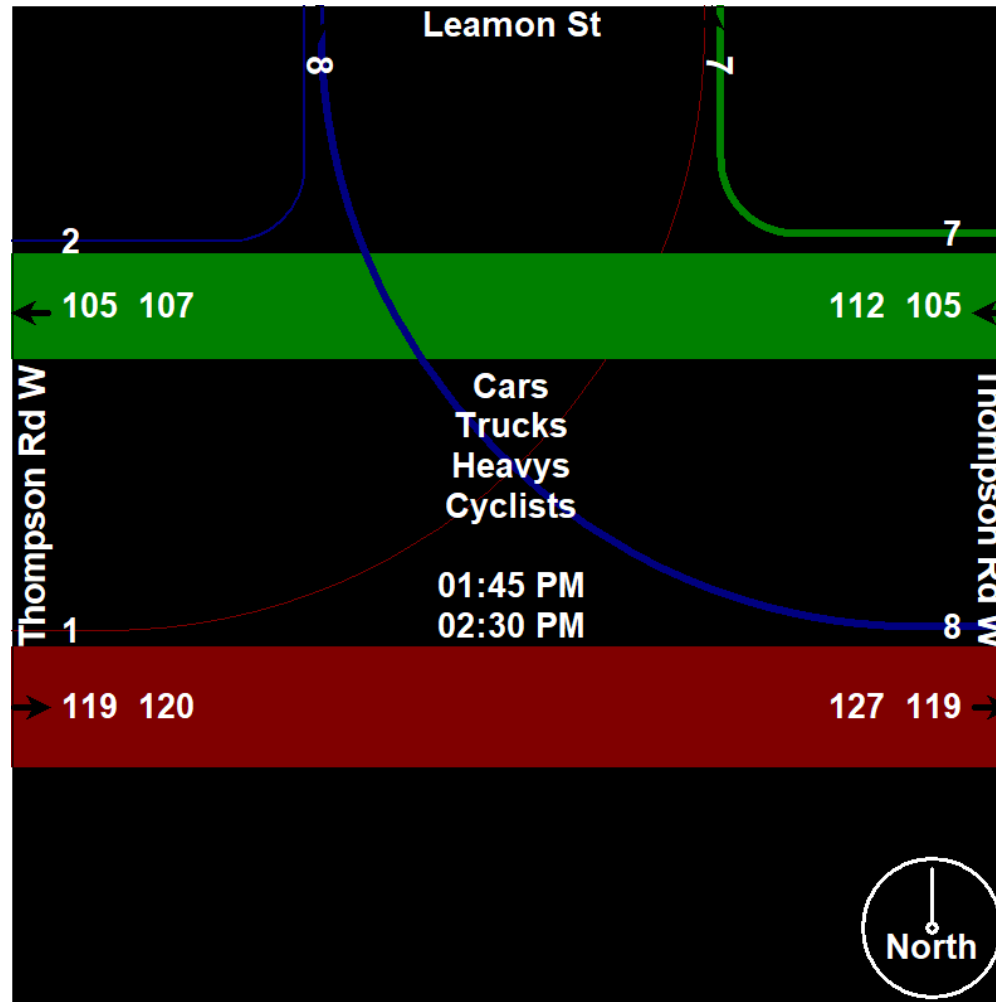
File Name : Thompson Road W at Leamon Street-SAT
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File Name : Old Highway 24 at Site Access
Site Code : 00000000
Start Date : 03/23/2023
Page No : 1

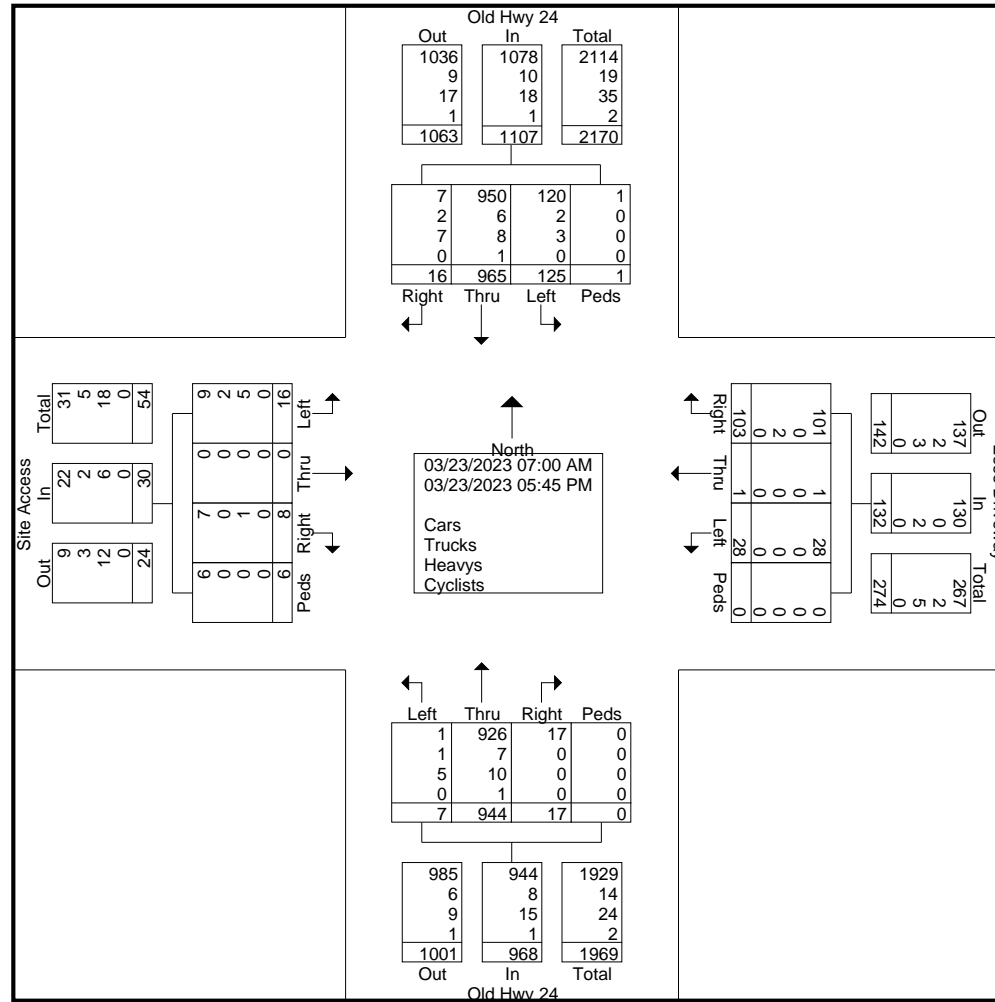
Groups Printed- Cars - Trucks - Heavys - Cyclists

	Old Hwy 24 From North					Esso Driveway From East					Old Hwy 24 From South					Site Access From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	1	26	5	0	32	3	0	0	0	3	0	22	0	0	22	0	0	1	0	1	58
07:15 AM	1	30	2	0	33	5	0	1	0	6	1	25	0	0	26	0	0	0	2	2	67
07:30 AM	2	50	8	0	60	5	0	2	0	7	1	36	0	0	37	0	0	0	1	1	105
07:45 AM	1	46	8	1	56	7	0	0	0	7	2	48	0	0	50	0	0	1	0	1	114
Total	5	152	23	1	181	20	0	3	0	23	4	131	0	0	135	0	0	2	3	5	344
08:00 AM	2	44	9	0	55	7	1	4	0	12	2	36	1	0	39	0	0	0	0	0	106
08:15 AM	3	45	7	0	55	4	0	3	0	7	1	59	0	0	60	1	0	1	0	2	124
08:30 AM	2	69	9	0	80	5	0	0	0	5	1	46	1	0	48	0	0	1	0	1	134
08:45 AM	0	81	8	0	89	11	0	2	0	13	1	67	1	0	69	0	0	1	0	1	172
Total	7	239	33	0	279	27	1	9	0	37	5	208	3	0	216	1	0	3	0	4	536
04:00 PM	1	64	7	0	72	3	0	2	0	5	0	76	0	0	76	0	0	1	1	2	155
04:15 PM	2	90	13	0	105	8	0	1	0	9	2	66	0	0	68	1	0	0	0	1	183
04:30 PM	0	79	11	0	90	6	0	2	0	8	1	83	1	0	85	1	0	3	0	4	187
04:45 PM	0	74	8	0	82	8	0	1	0	9	1	98	1	0	100	1	0	1	0	2	193
Total	3	307	39	0	349	25	0	6	0	31	4	323	2	0	329	3	0	5	1	9	718
05:00 PM	1	64	9	0	74	10	0	4	0	14	3	79	1	0	83	2	0	1	1	4	175
05:15 PM	0	62	6	0	68	4	0	3	0	7	0	78	1	0	79	0	0	2	0	2	156
05:30 PM	0	71	8	0	79	4	0	1	0	5	1	60	0	0	61	1	0	2	0	3	148
05:45 PM	0	70	7	0	77	13	0	2	0	15	0	65	0	0	65	1	0	1	1	3	160
Total	1	267	30	0	298	31	0	10	0	41	4	282	2	0	288	4	0	6	2	12	639
Grand Total	16	965	125	1	1107	103	1	28	0	132	17	944	7	0	968	8	0	16	6	30	2237
Apprch %	1.4	87.2	11.3	0.1		78	0.8	21.2	0		1.8	97.5	0.7	0		26.7	0	53.3	20		
Total %	0.7	43.1	5.6	0	49.5	4.6	0	1.3	0	5.9	0.8	42.2	0.3	0	43.3	0.4	0	0.7	0.3	1.3	
Cars	7	950	120	1	1078	101	1	28	0	130	17	926	1	0	944	7	0	9	6	22	2174
% Cars	43.8	98.4	96	100	97.4	98.1	100	100	0	98.5	100	98.1	14.3	0	97.5	87.5	0	56.2	100	73.3	97.2
Trucks	2	6	2	0	10	0	0	0	0	0	0	7	1	0	8	0	0	2	0	2	20
% Trucks	12.5	0.6	1.6	0	0.9	0	0	0	0	0	0	0.7	14.3	0	0.8	0	0	12.5	0	6.7	0.9
Heavys	7	8	3	0	18	2	0	0	0	2	0	10	5	0	15	1	0	5	0	6	41
% Heavys	43.8	0.8	2.4	0	1.6	1.9	0	0	0	1.5	0	1.1	71.4	0	1.5	12.5	0	31.2	0	20	1.8
Cyclists	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
% Cyclists	0	0.1	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1

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File Name : Old Highway 24 at Site Access
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Start Date : 03/23/2023
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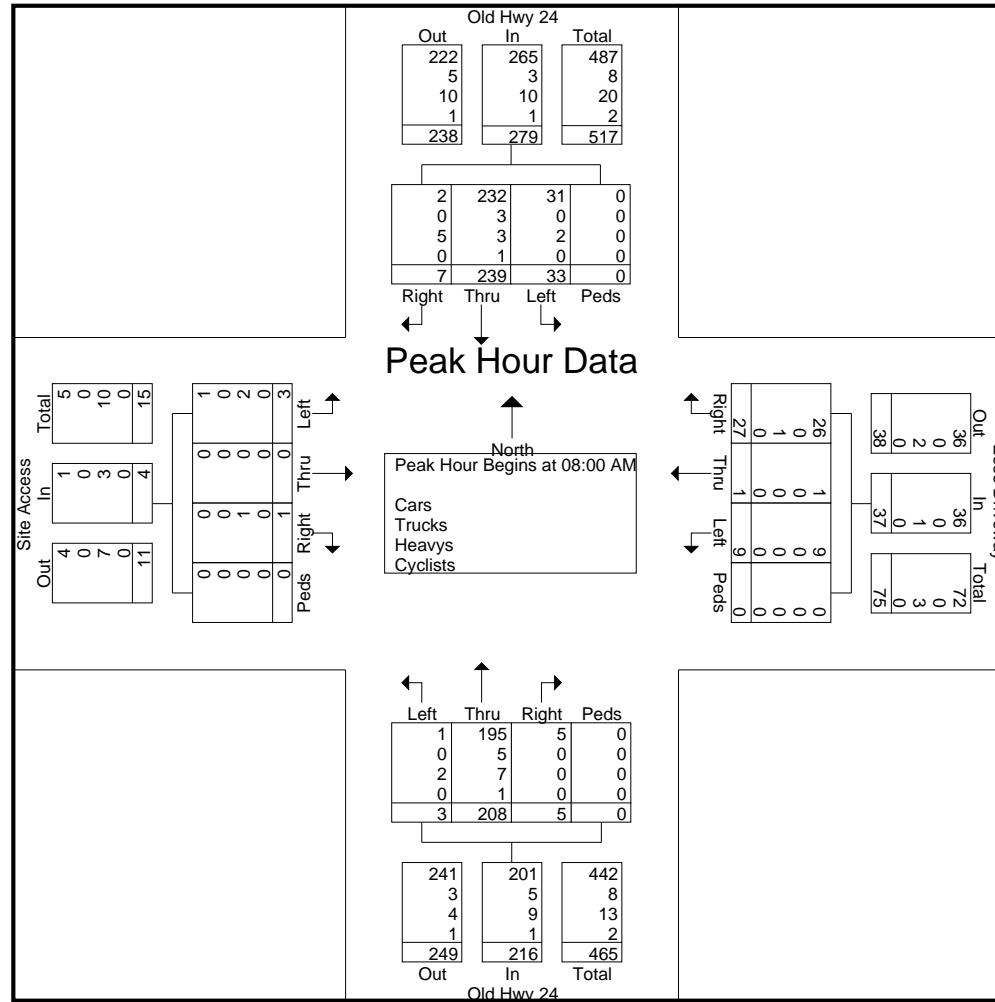
File Name : Old Highway 24 at Site Access
 Site Code : 00000000
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	Old Hwy 24 From North					Esso Driveway From East					Old Hwy 24 From South					Site Access From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	2	44	9	0	55	7	1	4	0	12	2	36	1	0	39	0	0	0	0	0	106
08:15 AM	3	45	7	0	55	4	0	3	0	7	1	59	0	0	60	1	0	1	0	2	124
08:30 AM	2	69	9	0	80	5	0	0	0	5	1	46	1	0	48	0	0	1	0	1	134
08:45 AM	0	81	8	0	89	11	0	2	0	13	1	67	1	0	69	0	0	1	0	1	172
Total Volume	7	239	33	0	279	27	1	9	0	37	5	208	3	0	216	1	0	3	0	4	536
% App. Total	2.5	85.7	11.8	0		73	2.7	24.3	0		2.3	96.3	1.4	0		25	0	75	0		
PHF	.583	.738	.917	.000	.784	.614	.250	.563	.000	.712	.625	.776	.750	.000	.783	.250	.000	.750	.000	.500	.779
Cars	2	232	31	0	265	26	1	9	0	36	5	195	1	0	201	0	0	1	0	1	503
% Cars	28.6	97.1	93.9	0	95.0	96.3	100	100	0	97.3	100	93.8	33.3	0	93.1	0	0	33.3	0	25.0	93.8
Trucks	0	3	0	0	3	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	8
% Trucks	0	1.3	0	0	1.1	0	0	0	0	0	0	2.4	0	0	2.3	0	0	0	0	0	1.5
Heavys	5	3	2	0	10	1	0	0	0	1	0	7	2	0	9	1	0	2	0	3	23
% Heavys	71.4	1.3	6.1	0	3.6	3.7	0	0	0	2.7	0	3.4	66.7	0	4.2	100	0	66.7	0	75.0	4.3
Cyclists	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
% Cyclists	0	0.4	0	0	0.4	0	0	0	0	0	0	0.5	0	0	0.5	0	0	0	0	0	0.4

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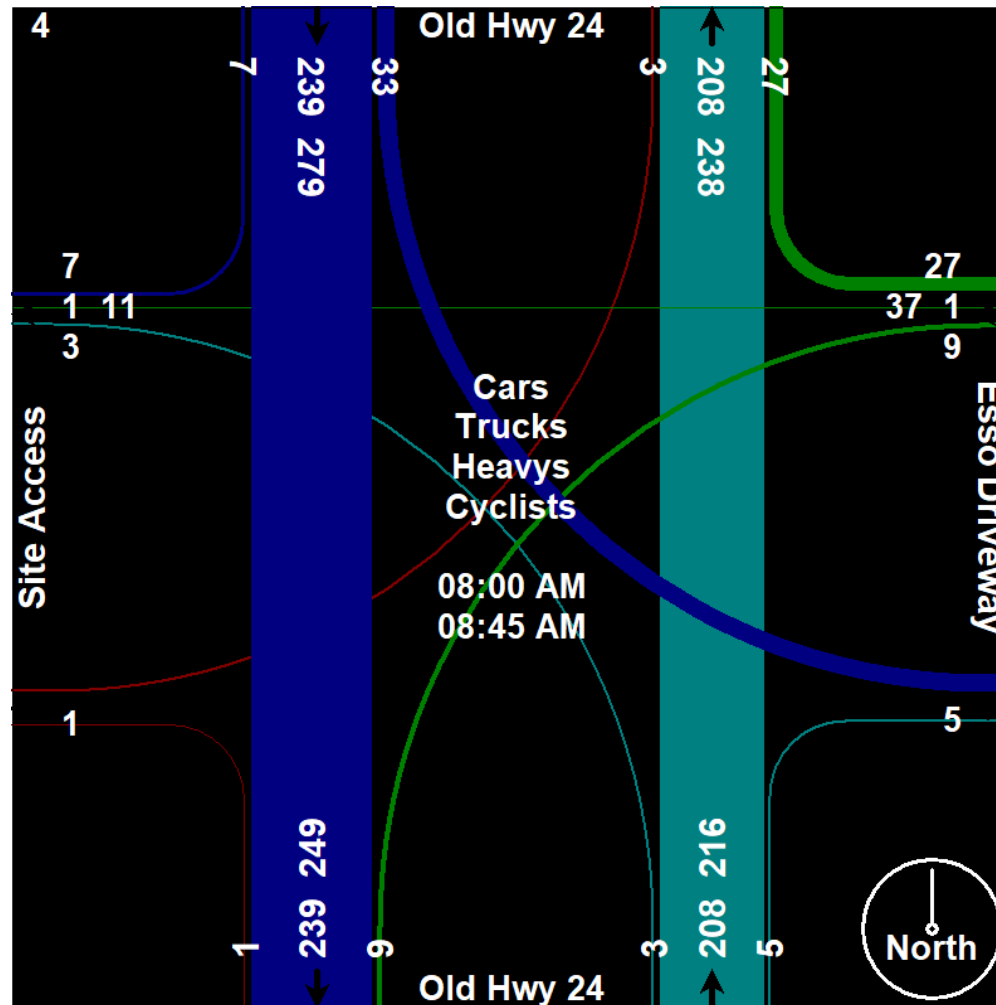
File Name : Old Highway 24 at Site Access
Site Code : 00000000
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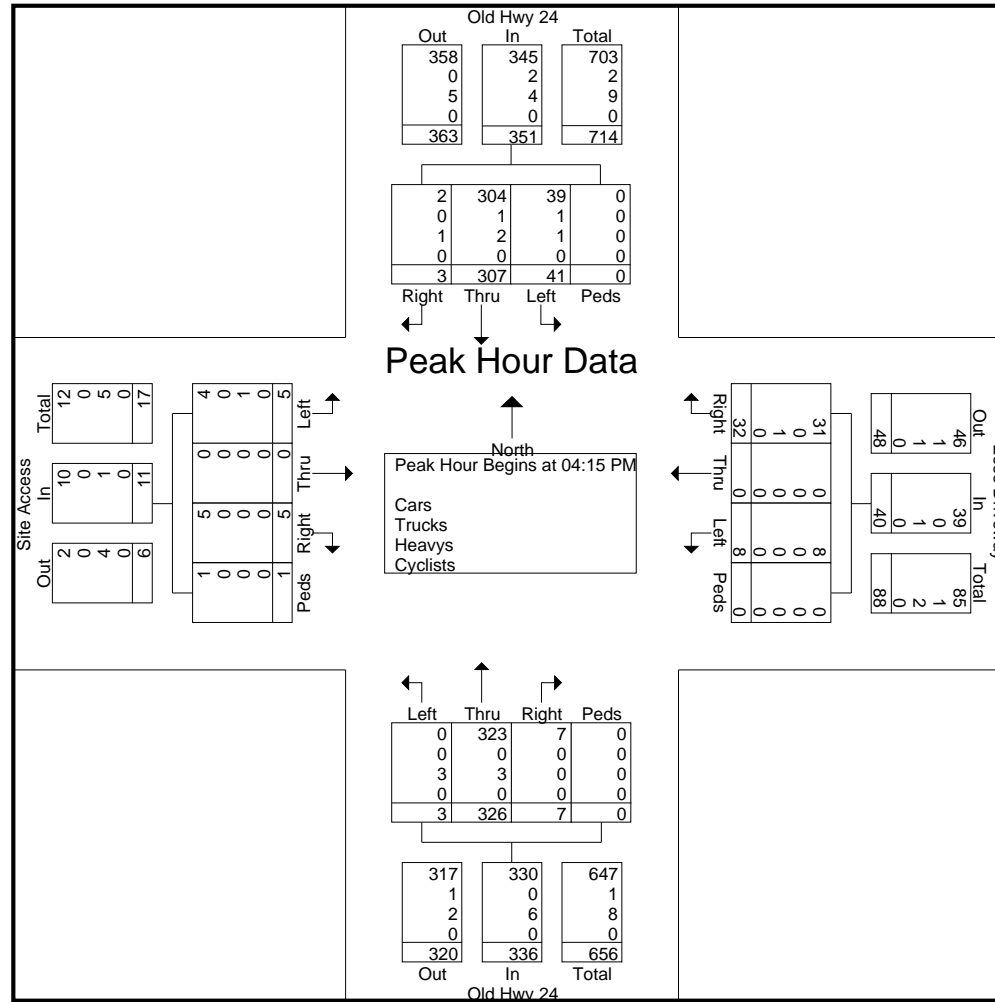
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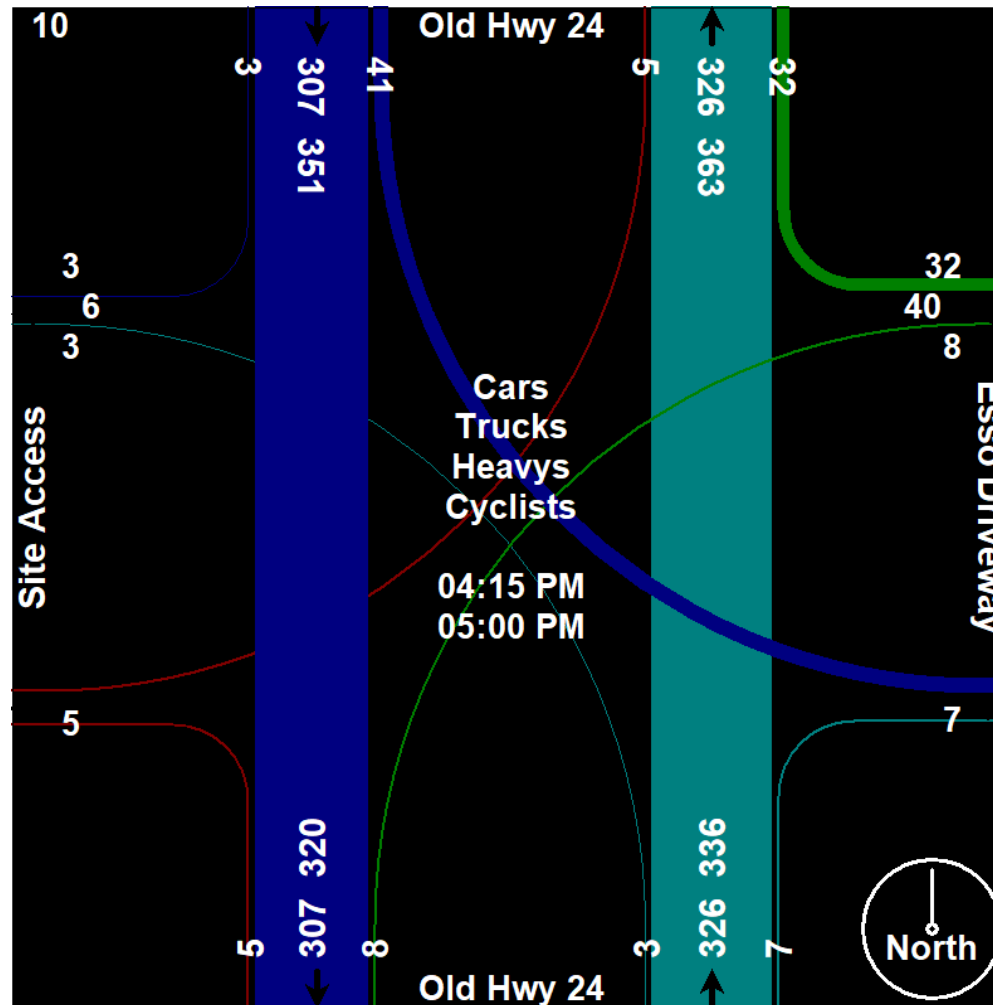
File Name : Old Highway 24 at Site Access
Site Code : 00000000
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File Name : Old Highway 24 at Site Access-SAT

Site Code : 00000000

Start Date : 03/25/2023

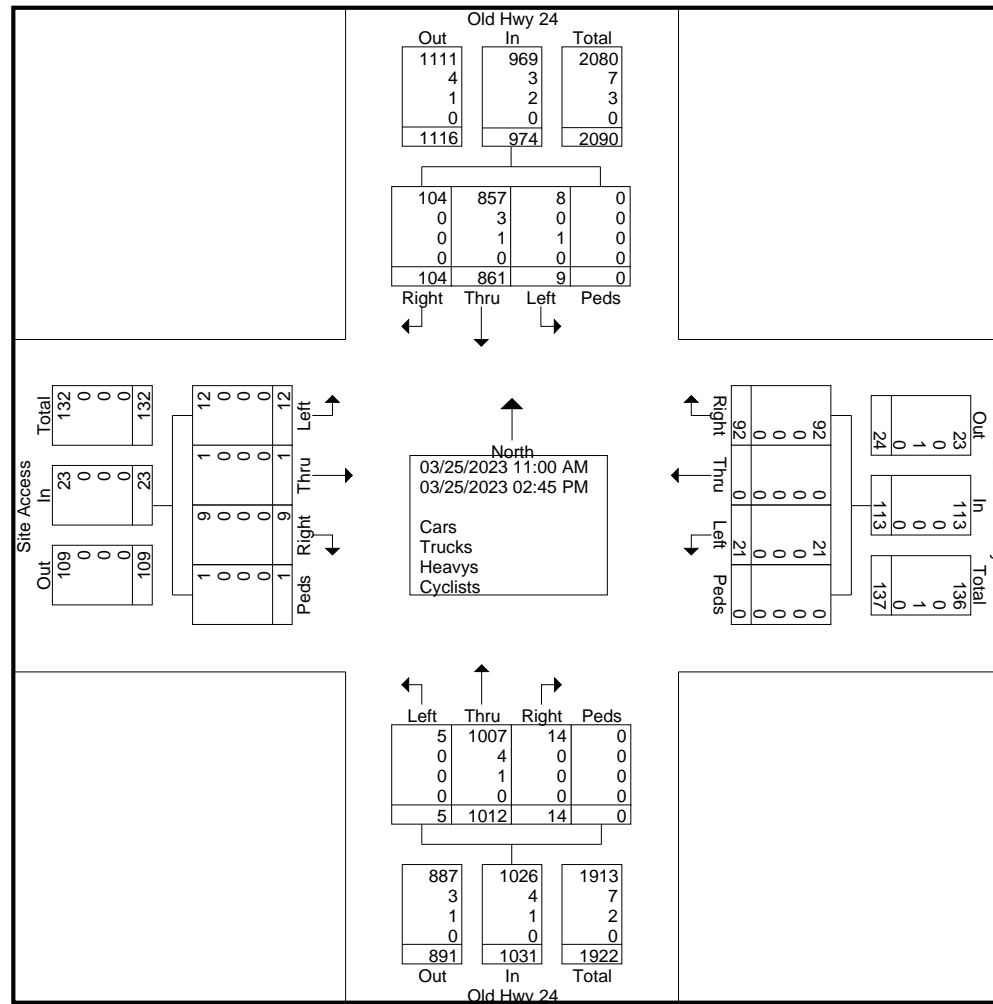
Page No : 1

	Groups Printed- Cars - Trucks - Heavys - Cyclists																				
	Old Hwy 24 From North					Esso Driveway From East					Old Hwy 24 From South					Site Access From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	8	49	4	0	61	5	0	0	0	5	0	72	1	0	73	1	0	3	0	4	143
11:15 AM	6	58	1	0	65	3	0	4	0	7	0	54	1	0	55	2	0	2	0	4	131
11:30 AM	8	52	2	0	62	3	0	2	0	5	1	64	1	0	66	1	0	1	0	2	135
11:45 AM	10	60	2	0	72	12	0	1	0	13	1	76	2	0	79	3	0	1	0	4	168
Total	32	219	9	0	260	23	0	7	0	30	2	266	5	0	273	7	0	7	0	14	577
12:00 PM	10	51	0	0	61	8	0	2	0	10	3	53	0	0	56	2	1	4	0	7	134
12:15 PM	4	53	0	0	57	5	0	1	0	6	0	64	0	0	64	0	0	1	1	2	129
12:30 PM	6	48	0	0	54	8	0	0	0	8	1	66	0	0	67	0	0	0	0	0	129
12:45 PM	5	62	0	0	67	4	0	2	0	6	0	68	0	0	68	0	0	0	0	0	141
Total	25	214	0	0	239	25	0	5	0	30	4	251	0	0	255	2	1	5	1	9	533
01:00 PM	5	58	0	0	63	1	0	1	0	2	0	55	0	0	55	0	0	0	0	0	120
01:15 PM	8	46	0	0	54	5	0	0	0	5	0	64	0	0	64	0	0	0	0	0	123
01:30 PM	7	47	0	0	54	8	0	1	0	9	2	64	0	0	66	0	0	0	0	0	129
01:45 PM	1	62	0	0	63	9	0	0	0	9	1	52	0	0	53	0	0	0	0	0	125
Total	21	213	0	0	234	23	0	2	0	25	3	235	0	0	238	0	0	0	0	0	497
02:00 PM	7	66	0	0	73	6	0	2	0	8	2	66	0	0	68	0	0	0	0	0	149
02:15 PM	7	53	0	0	60	6	0	3	0	9	2	73	0	0	75	0	0	0	0	0	144
02:30 PM	5	51	0	0	56	5	0	2	0	7	0	59	0	0	59	0	0	0	0	0	122
02:45 PM	7	45	0	0	52	4	0	0	0	4	1	62	0	0	63	0	0	0	0	0	119
Total	26	215	0	0	241	21	0	7	0	28	5	260	0	0	265	0	0	0	0	0	534
Grand Total	104	861	9	0	974	92	0	21	0	113	14	1012	5	0	1031	9	1	12	1	23	2141
Apprch %	10.7	88.4	0.9	0		81.4	0	18.6	0		1.4	98.2	0.5	0		39.1	4.3	52.2	4.3		
Total %	4.9	40.2	0.4	0	45.5	4.3	0	1	0	5.3	0.7	47.3	0.2	0	48.2	0.4	0	0.6	0	1.1	
Cars	104	857	8	0	969	92	0	21	0	113	14	1007	5	0	1026	9	1	12	1	23	2131
% Cars	100	99.5	88.9	0	99.5	100	0	100	0	100	100	99.5	100	0	99.5	100	100	100	100	100	99.5
Trucks	0	3	0	0	3	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	7
% Trucks	0	0.3	0	0	0.3	0	0	0	0	0	0	0.4	0	0	0.4	0	0	0	0	0	0.3
Heavys	0	1	1	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
% Heavys	0	0.1	11.1	0	0.2	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1
Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Start Date : 03/25/2023
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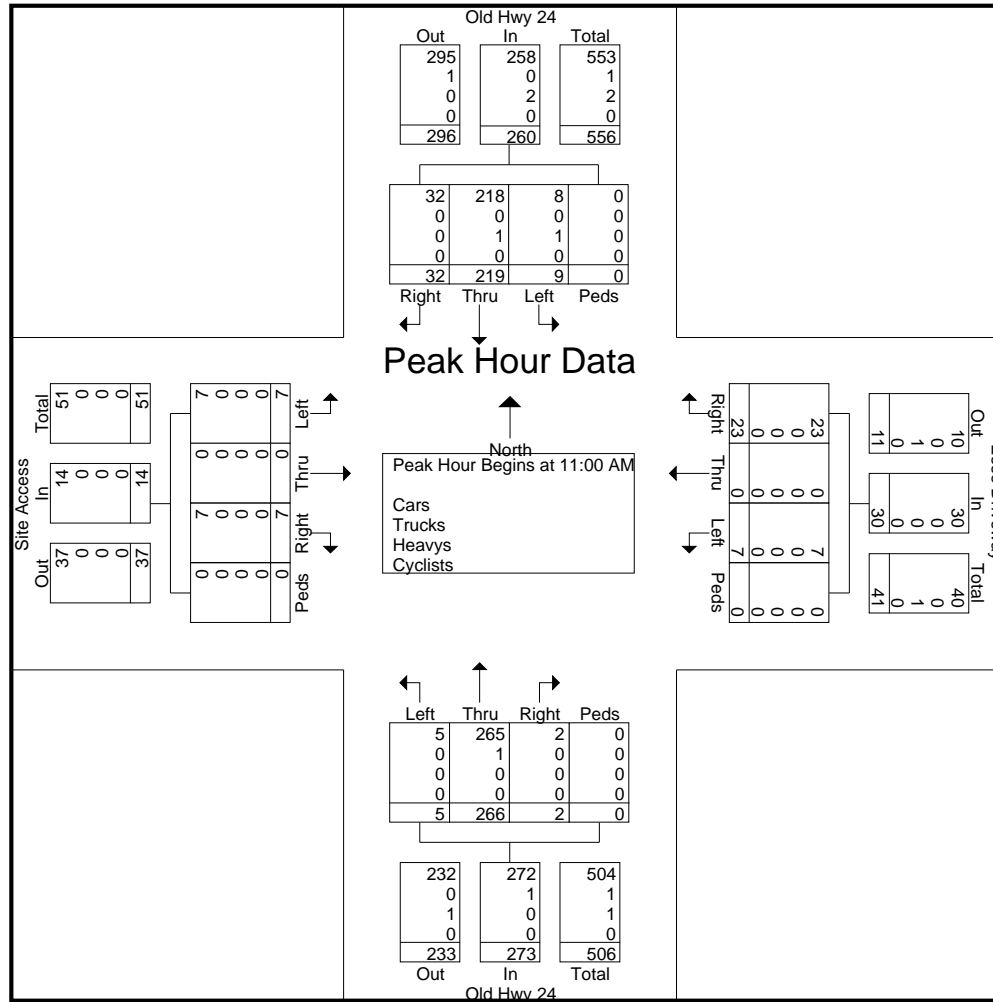
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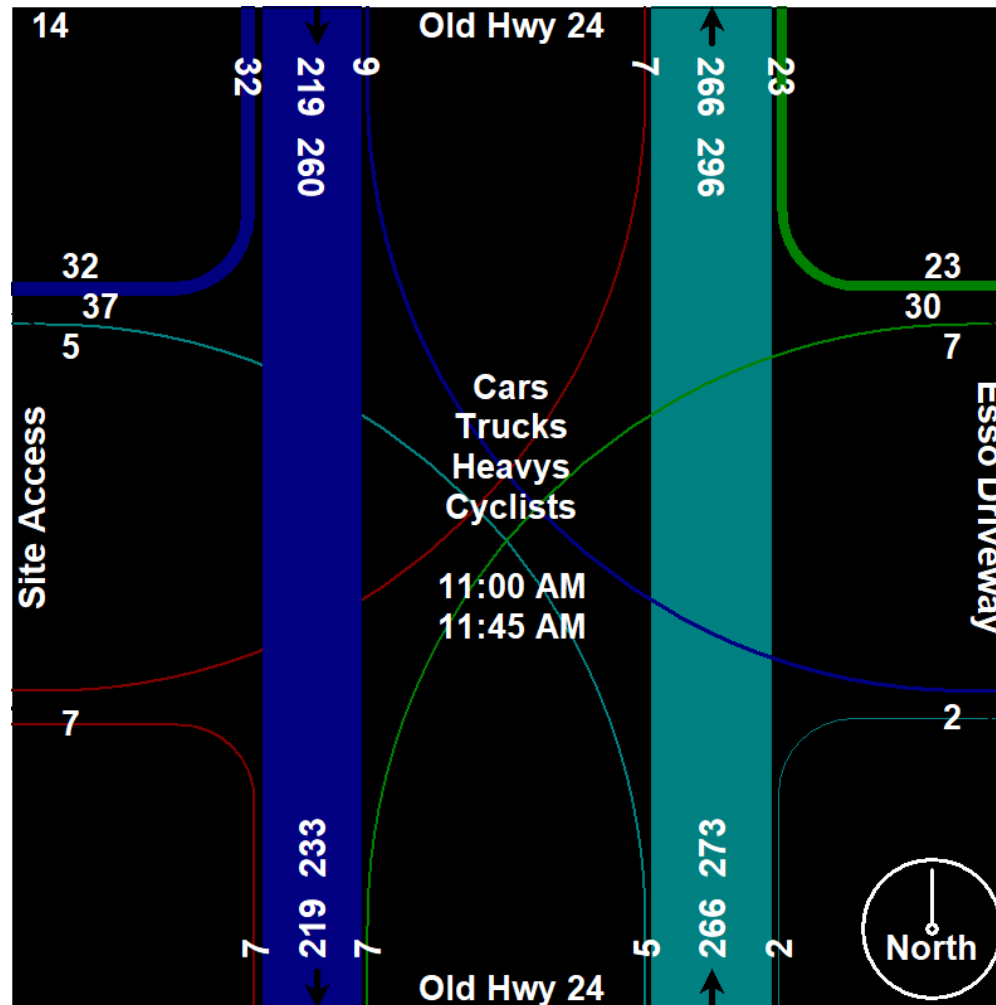
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Appendix B

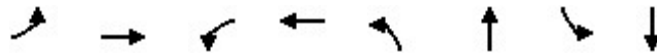
2023 Existing Conditions
Synchro Reports

Queues

AM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

5:15 - 6:00 AM Weekday AM



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	61	150	94	106	59	290	19	294
v/c Ratio	0.09	0.17	0.16	0.12	0.18	0.42	0.05	0.42
Control Delay	11.6	6.7	12.3	8.7	19.1	19.6	17.1	20.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	6.7	12.3	8.7	19.1	19.6	17.1	20.5
Queue Length 50th (m)	4.9	6.1	7.8	6.2	6.2	30.2	1.9	32.5
Queue Length 95th (m)	10.1	13.6	14.4	12.6	13.3	45.2	5.7	47.7
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	658	858	604	864	335	696	357	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.17	0.16	0.12	0.18	0.42	0.05	0.42
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

AM Peak Period

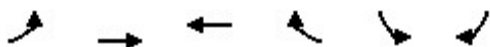
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Weekday AM




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	64	61	78	64	24	49	174	66	16	208	36
Future Volume (vph)	51	64	61	78	64	24	49	174	66	16	208	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1814	1644		1734	1699		1716	1786		1813	1833	
Flt Permitted	0.69	1.00		0.66	1.00		0.49	1.00		0.49	1.00	
Satd. Flow (perm)	1315	1644		1208	1699		879	1786		938	1833	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	61	77	73	94	77	29	59	210	80	19	251	43
RTOR Reduction (vph)	0	37	0	0	15	0	0	16	0	0	7	0
Lane Group Flow (vph)	61	114	0	94	92	0	59	274	0	19	287	0
Confl. Peds. (#/hr)	7		3	3		7	4		8	8		4
Heavy Vehicles (%)	0%	12%	2%	5%	9%	4%	6%	2%	3%	0%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	657	822		604	849		334	680		357	698	
v/s Ratio Prot		0.07			0.05			0.15			c0.16	
v/s Ratio Perm	0.05			c0.08			0.07			0.02		
v/c Ratio	0.09	0.14		0.16	0.11		0.18	0.40		0.05	0.41	
Uniform Delay, d1	11.0	11.3		11.4	11.1		17.3	19.0		16.4	19.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.4		0.5	0.3		1.2	1.8		0.3	1.8	
Delay (s)	11.3	11.6		11.9	11.4		18.4	20.8		16.7	20.9	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.5			11.6			20.4			20.6	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			17.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.27									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			86.8%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Thompson Road West & Leamon Street South

AM Peak Period
Existing Condition - Weekday AM



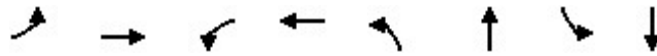
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	163	138	10	11	5
Future Volume (Veh/h)	1	163	138	10	11	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	2	267	226	16	18	8
Pedestrians					7	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	249				512	241
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	249				512	241
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	100				97	99
cM capacity (veh/h)	1319				521	750
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	269	242	26			
Volume Left	2	0	18			
Volume Right	0	16	8			
cSH	1319	1700	575			
Volume to Capacity	0.00	0.14	0.05			
Queue Length 95th (m)	0.0	0.0	1.1			
Control Delay (s)	0.1	0.0	11.6			
Lane LOS	A		B			
Approach Delay (s)	0.1	0.0	11.6			
Approach LOS			B			
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			19.4%		ICU Level of Service	
Analysis Period (min)			15		A	

Queues

PM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

5:15 PM - 6:00 PM Weekday PM























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	40	147	68	82	44	360	18	269
v/c Ratio	0.06	0.16	0.11	0.09	0.13	0.50	0.06	0.37
Control Delay	11.2	5.7	11.8	8.4	18.3	21.8	17.4	20.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	5.7	11.8	8.4	18.3	21.8	17.4	20.1
Queue Length 50th (m)	3.1	4.8	5.5	4.5	4.5	40.9	1.8	29.6
Queue Length 95th (m)	7.9	13.8	12.1	11.3	11.4	65.3	6.1	48.5
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	675	907	616	888	342	713	299	724
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.16	0.11	0.09	0.13	0.50	0.06	0.37
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

PM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

Friday, 6/1/2023 Weekday PM




												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	58	82	65	54	24	42	268	74	17	232	24
Future Volume (vph)	38	58	82	65	54	24	42	268	74	17	232	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.95		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1823	1728		1766	1751		1652	1844		1819	1890	
Flt Permitted	0.70	1.00		0.66	1.00		0.52	1.00		0.41	1.00	
Satd. Flow (perm)	1351	1728		1233	1751		899	1844		784	1890	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	40	61	86	68	57	25	44	282	78	18	244	25
RTOR Reduction (vph)	0	43	0	0	13	0	0	12	0	0	4	0
Lane Group Flow (vph)	40	104	0	68	70	0	44	348	0	18	265	0
Confl. Peds. (#/hr)	1		4	4		1	5		5	5		5
Heavy Vehicles (%)	0%	0%	0%	3%	4%	4%	10%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	675	864		616	875		342	702		298	720	
v/s Ratio Prot		c0.06			0.04			c0.19			0.14	
v/s Ratio Perm	0.03			0.06			0.05			0.02		
v/c Ratio	0.06	0.12		0.11	0.08		0.13	0.50		0.06	0.37	
Uniform Delay, d1	10.8	11.2		11.1	10.9		16.9	19.8		16.5	18.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		0.4	0.2		0.8	2.5		0.4	1.4	
Delay (s)	11.0	11.5		11.5	11.1		17.7	22.3		16.9	20.2	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.4			11.3			21.8			20.0	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.9			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.28									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.6%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Thompson Road West & Leamon Street South

PM Peak Period
Existing Condition - Weekday PM



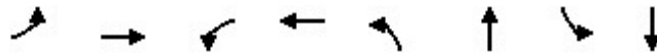
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	167	111	11	8	8
Future Volume (Veh/h)	3	167	111	11	8	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	3	190	126	12	9	9
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	140				330	134
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	140				330	134
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1453				666	919
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	193	138	18			
Volume Left	3	0	9			
Volume Right	0	12	9			
cSH	1453	1700	772			
Volume to Capacity	0.00	0.08	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.1	0.0	9.8			
Lane LOS	A		A			
Approach Delay (s)	0.1	0.0	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization		21.2%		ICU Level of Service	A	
Analysis Period (min)			15			

Queues

Weekend Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

First Road East Weekend SAT



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	21	106	61	44	58	287	22	212
v/c Ratio	0.03	0.12	0.09	0.05	0.14	0.40	0.06	0.29
Control Delay	10.9	5.4	11.6	8.3	18.1	19.5	17.2	18.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.9	5.4	11.6	8.3	18.1	19.5	17.2	18.9
Queue Length 50th (m)	1.6	3.1	4.9	2.3	5.9	30.2	2.2	22.4
Queue Length 95th (m)	5.0	10.6	11.1	7.2	13.8	50.0	6.9	38.2
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	699	904	649	921	428	715	361	725
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.12	0.09	0.05	0.14	0.40	0.06	0.29
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

Weekend Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	38	63	59	29	13	56	209	66	21	185	18
Future Volume (vph)	20	38	63	59	29	13	56	209	66	21	185	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.95		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1742		1789	1829		1820	1842		1824	1891	
Flt Permitted	0.73	1.00		0.69	1.00		0.59	1.00		0.50	1.00	
Satd. Flow (perm)	1399	1742		1297	1829		1125	1842		951	1891	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	21	40	66	61	30	14	58	218	69	22	193	19
RTOR Reduction (vph)	0	33	0	0	7	0	0	14	0	0	4	0
Lane Group Flow (vph)	21	73	0	61	37	0	58	273	0	22	208	0
Confl. Peds. (#/hr)							3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	699	871		648	914		428	701		362	720	
v/s Ratio Prot		0.04			0.02			0.15			0.11	
v/s Ratio Perm	0.02			0.05			0.05			0.02		
v/c Ratio	0.03	0.08		0.09	0.04		0.14	0.39		0.06	0.29	
Uniform Delay, d1	10.7	11.0		11.0	10.7		17.0	18.9		16.5	18.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.3	0.1		0.7	1.6		0.3	1.0	
Delay (s)	10.7	11.1		11.3	10.8		17.6	20.5		16.8	19.1	
Level of Service	B	B		B	B		B	C		B	B	
Approach Delay (s)		11.1			11.1			20.0			18.9	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.22									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			53.3%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Thompson Road West & Leamon Street South

Weekend Peak Period
Existing Condition - Weekend SAT



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	119	105	7	8	2
Future Volume (Veh/h)	1	119	105	7	8	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1	131	115	8	9	2
Pedestrians		1				
Lane Width (m)		3.7				
Walking Speed (m/s)		1.1				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	123				252	120
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	123				252	120
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1477				740	936
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	132	123	11			
Volume Left	1	0	9			
Volume Right	0	8	2			
cSH	1477	1700	770			
Volume to Capacity	0.00	0.07	0.01			
Queue Length 95th (m)	0.0	0.0	0.3			
Control Delay (s)	0.1	0.0	9.7			
Lane LOS	A		A			
Approach Delay (s)	0.1	0.0	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			17.4%		ICU Level of Service	
Analysis Period (min)			15		A	

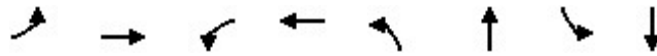
Appendix C

2024 Future Background
Conditions Synchro Reports

Queues

AM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East 03-30-2023























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	181	96	112	71	317	19	308
v/c Ratio	0.11	0.21	0.16	0.13	0.22	0.46	0.06	0.44
Control Delay	11.7	7.3	12.4	8.8	19.9	20.3	17.2	20.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	7.3	12.4	8.8	19.9	20.3	17.2	20.9
Queue Length 50th (m)	5.7	8.4	8.0	6.7	7.5	33.8	1.9	34.2
Queue Length 95th (m)	11.3	16.6	14.9	13.4	15.5	49.8	5.7	50.0
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	654	862	587	865	323	696	334	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.21	0.16	0.13	0.22	0.46	0.06	0.44
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

AM Peak Period

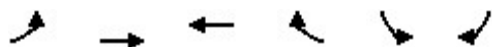
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East 03-30-2023




												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	79	71	80	69	24	59	190	73	16	216	40
Future Volume (vph)	59	79	71	80	69	24	59	190	73	16	216	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1814	1645		1734	1702		1716	1785		1814	1829	
Flt Permitted	0.68	1.00		0.64	1.00		0.47	1.00		0.46	1.00	
Satd. Flow (perm)	1308	1645		1174	1702		849	1785		877	1829	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	71	95	86	96	83	29	71	229	88	19	260	48
RTOR Reduction (vph)	0	39	0	0	15	0	0	17	0	0	8	0
Lane Group Flow (vph)	71	142	0	96	98	0	71	300	0	19	300	0
Confl. Peds. (#/hr)	7		3	3		7	4		8	8		4
Heavy Vehicles (%)	0%	12%	2%	5%	9%	4%	6%	2%	3%	0%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	654	822		587	851		323	680		334	696	
v/s Ratio Prot		c0.09			0.06			c0.17			0.16	
v/s Ratio Perm	0.05			0.08			0.08			0.02		
v/c Ratio	0.11	0.17		0.16	0.11		0.22	0.44		0.06	0.43	
Uniform Delay, d1	11.1	11.5		11.4	11.1		17.6	19.4		16.5	19.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.6	0.3		1.6	2.1		0.3	1.9	
Delay (s)	11.4	11.9		12.0	11.4		19.1	21.4		16.8	21.2	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.8			11.7			21.0			20.9	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			17.4			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.9%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Thompson Road West & Leamon Street South

AM Peak Period
03-30-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	197	157	10	11	7
Future Volume (Veh/h)	7	197	157	10	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	11	323	257	16	18	11
Pedestrians					7	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	280				617	272
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	280				617	272
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	99				96	98
cM capacity (veh/h)	1285				450	720
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	334	273	29			
Volume Left	11	0	18			
Volume Right	0	16	11			
cSH	1285	1700	524			
Volume to Capacity	0.01	0.16	0.06			
Queue Length 95th (m)	0.2	0.0	1.3			
Control Delay (s)	0.3	0.0	12.3			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	12.3			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			26.0%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues

PM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

03-30-2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	45	171	75	97	58	379	18	305
v/c Ratio	0.07	0.19	0.12	0.11	0.18	0.53	0.06	0.42
Control Delay	11.3	5.8	12.0	8.8	19.3	22.4	17.4	20.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	5.8	12.0	8.8	19.3	22.4	17.4	20.8
Queue Length 50th (m)	3.6	5.8	6.1	5.7	6.1	43.7	1.8	34.1
Queue Length 95th (m)	8.7	15.6	13.2	13.2	14.4	69.4	6.1	55.1
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	666	915	603	895	314	713	283	721
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.19	0.12	0.11	0.18	0.53	0.06	0.42






















Intersection Summary

HCM Signalized Intersection Capacity Analysis

PM Peak Period

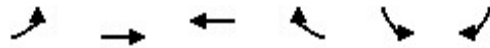
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

03-30-2023

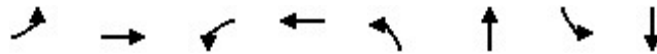
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	69	93	71	68	24	55	281	79	17	253	37
Future Volume (vph)	43	69	93	71	68	24	55	281	79	17	253	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1823	1732		1766	1766		1653	1843		1819	1878	
Flt Permitted	0.69	1.00		0.65	1.00		0.47	1.00		0.39	1.00	
Satd. Flow (perm)	1333	1732		1207	1766		824	1843		743	1878	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	73	98	75	72	25	58	296	83	18	266	39
RTOR Reduction (vph)	0	49	0	0	13	0	0	12	0	0	6	0
Lane Group Flow (vph)	45	122	0	75	85	0	58	367	0	18	299	0
Confl. Peds. (#/hr)	1		4	4		1	5		5	5		5
Heavy Vehicles (%)	0%	0%	0%	3%	4%	4%	10%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	666	866		603	883		313	702		283	715	
v/s Ratio Prot		c0.07			0.05			c0.20			0.16	
v/s Ratio Perm	0.03			0.06			0.07			0.02		
v/c Ratio	0.07	0.14		0.12	0.10		0.19	0.52		0.06	0.42	
Uniform Delay, d1	10.9	11.3		11.2	11.0		17.3	20.1		16.5	19.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		0.4	0.2		1.3	2.8		0.4	1.8	
Delay (s)	11.1	11.6		11.6	11.2		18.6	22.9		16.9	20.9	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.5			11.4			22.3			20.7	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			18.2			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.31									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

PM Peak Period
03-30-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↩	↩		↩	↩
Traffic Volume (veh/h)	7	195	151	11	8	15
Future Volume (Veh/h)	7	195	151	11	8	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	222	172	12	9	17
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	186				418	180
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	186				418	180
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1398				591	866
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	230	184	26			
Volume Left	8	0	9			
Volume Right	0	12	17			
cSH	1398	1700	746			
Volume to Capacity	0.01	0.11	0.03			
Queue Length 95th (m)	0.1	0.0	0.8			
Control Delay (s)	0.3	0.0	10.0			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	10.0			
Approach LOS			B			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			25.9%		ICU Level of Service	A
Analysis Period (min)			15			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	27	128	67	55	71	305	22	238
v/c Ratio	0.04	0.14	0.11	0.06	0.18	0.43	0.06	0.33
Control Delay	11.0	5.6	11.7	8.9	18.8	19.9	17.3	19.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	5.6	11.7	8.9	18.8	19.9	17.3	19.2
Queue Length 50th (m)	2.1	4.0	5.4	3.2	7.4	32.5	2.2	25.2
Queue Length 95th (m)	6.1	12.3	12.0	8.7	16.4	53.5	6.9	42.5
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	692	912	635	931	404	715	346	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.14	0.11	0.06	0.18	0.43	0.06	0.33





















Intersection Summary

HCM Signalized Intersection Capacity Analysis

Weekend Peak Period

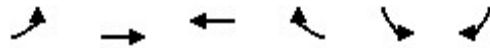
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East




03-30-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	49	74	64	39	13	68	221	72	21	201	28
Future Volume (vph)	26	49	74	64	39	13	68	221	72	21	201	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1748		1789	1848		1820	1841		1824	1881	
Flt Permitted	0.72	1.00		0.67	1.00		0.55	1.00		0.47	1.00	
Satd. Flow (perm)	1385	1748		1271	1848		1063	1841		909	1881	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	27	51	77	67	41	14	71	230	75	22	209	29
RTOR Reduction (vph)	0	39	0	0	7	0	0	14	0	0	6	0
Lane Group Flow (vph)	27	90	0	67	48	0	71	291	0	22	232	0
Confl. Peds. (#/hr)							3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	692	874		635	924		404	701		346	716	
v/s Ratio Prot		0.05			0.03			0.16			0.12	
v/s Ratio Perm	0.02			0.05			0.07			0.02		
v/c Ratio	0.04	0.10		0.11	0.05		0.18	0.41		0.06	0.32	
Uniform Delay, d1	10.7	11.1		11.1	10.8		17.3	19.1		16.5	18.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.3	0.1		0.9	1.8		0.4	1.2	
Delay (s)	10.8	11.3		11.4	10.9		18.2	20.9		16.8	19.6	
Level of Service	B	B		B	B		B	C		B	B	
Approach Delay (s)		11.2			11.2			20.4			19.3	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.3				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.24									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			58.8%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

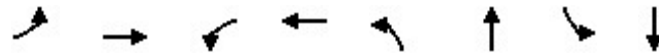
Weekend Peak Period
03-30-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	147	137	7	8	9
Future Volume (Veh/h)	7	147	137	7	8	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	8	162	151	8	9	10
Pedestrians		1				
Lane Width (m)		3.7				
Walking Speed (m/s)		1.1				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	159				333	156
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	159				333	156
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1433				662	894
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	170	159	19			
Volume Left	8	0	9			
Volume Right	0	8	10			
cSH	1433	1700	767			
Volume to Capacity	0.01	0.09	0.02			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	0.4	0.0	9.8			
Lane LOS	A		A			
Approach Delay (s)	0.4	0.0	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		23.8%		ICU Level of Service		A
Analysis Period (min)		15				

Appendix D

2029 Future Background
Conditions Synchro Reports



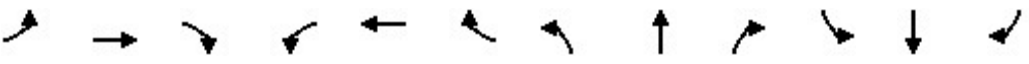








Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	186	96	117	71	331	19	326
v/c Ratio	0.11	0.22	0.16	0.14	0.23	0.47	0.06	0.46
Control Delay	11.7	7.7	12.4	9.0	20.2	20.8	17.2	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	7.7	12.4	9.0	20.2	20.8	17.2	21.4
Queue Length 50th (m)	5.7	9.1	8.0	7.2	7.6	36.2	1.9	36.9
Queue Length 95th (m)	11.4	17.5	14.9	13.9	15.6	52.6	5.7	53.2
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	651	861	584	866	308	697	322	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.22	0.16	0.14	0.23	0.47	0.06	0.46

Intersection Summary

HCM Signalized Intersection Capacity Analysis

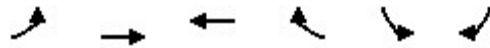
AM Peak Period




1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East
Future Background Condition - Weekday AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	83	71	80	73	24	59	202	73	16	231	40
Future Volume (vph)	59	83	71	80	73	24	59	202	73	16	231	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1814	1647		1734	1705		1717	1789		1814	1832	
Flt Permitted	0.68	1.00		0.64	1.00		0.45	1.00		0.44	1.00	
Satd. Flow (perm)	1302	1647		1169	1705		811	1789		846	1832	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	71	100	86	96	88	29	71	243	88	19	278	48
RTOR Reduction (vph)	0	37	0	0	14	0	0	15	0	0	7	0
Lane Group Flow (vph)	71	149	0	96	103	0	71	316	0	19	319	0
Confl. Peds. (#/hr)	7		3	3		7	4		8	8		4
Heavy Vehicles (%)	0%	12%	2%	5%	9%	4%	6%	2%	3%	0%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	651	823		584	852		308	681		322	697	
v/s Ratio Prot		c0.09			0.06			c0.18			0.17	
v/s Ratio Perm	0.05			0.08			0.09			0.02		
v/c Ratio	0.11	0.18		0.16	0.12		0.23	0.46		0.06	0.46	
Uniform Delay, d1	11.1	11.5		11.4	11.2		17.6	19.5		16.5	19.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.6	0.3		1.7	2.3		0.4	2.2	
Delay (s)	11.4	12.0		12.0	11.5		19.4	21.8		16.8	21.6	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.9			11.7			21.4			21.4	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			17.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			86.9%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

AM Peak Period
Future Background Condition - Weekday AM



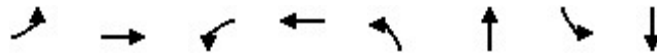
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	208	167	10	11	7
Future Volume (Veh/h)	7	208	167	10	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	11	341	274	16	18	11
Pedestrians					7	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	297				652	289
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	297				652	289
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	99				96	98
cM capacity (veh/h)	1267				429	704
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	352	290	29			
Volume Left	11	0	18			
Volume Right	0	16	11			
cSH	1267	1700	504			
Volume to Capacity	0.01	0.17	0.06			
Queue Length 95th (m)	0.2	0.0	1.4			
Control Delay (s)	0.3	0.0	12.6			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	12.6			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		26.6%		ICU Level of Service	A	
Analysis Period (min)		15				

Queues

PM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

5d11a5b Background Condition - Weekday PM























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	45	175	75	100	58	398	18	323
v/c Ratio	0.07	0.19	0.12	0.11	0.19	0.56	0.07	0.45
Control Delay	11.3	5.9	12.0	8.9	19.6	23.1	17.5	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	5.9	12.0	8.9	19.6	23.1	17.5	21.2
Queue Length 50th (m)	3.6	6.1	6.1	6.0	6.1	46.8	1.8	36.6
Queue Length 95th (m)	8.7	15.9	13.2	13.6	14.6	73.7	6.1	58.6
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	664	917	601	896	300	714	267	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.19	0.12	0.11	0.19	0.56	0.07	0.45

Intersection Summary

HCM Signalized Intersection Capacity Analysis

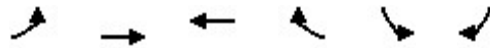
PM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East
 5d First Background Condition - Weekday PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	73	93	71	71	24	55	299	79	17	270	37
Future Volume (vph)	43	73	93	71	71	24	55	299	79	17	270	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1823	1736		1766	1769		1653	1847		1819	1880	
Flt Permitted	0.69	1.00		0.65	1.00		0.45	1.00		0.37	1.00	
Satd. Flow (perm)	1329	1736		1202	1769		787	1847		702	1880	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	77	98	75	75	25	58	315	83	18	284	39
RTOR Reduction (vph)	0	49	0	0	13	0	0	11	0	0	6	0
Lane Group Flow (vph)	45	126	0	75	88	0	58	387	0	18	317	0
Confl. Peds. (#/hr)	1		4	4		1	5		5	5		5
Heavy Vehicles (%)	0%	0%	0%	3%	4%	4%	10%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	664	868		601	884		299	703		267	716	
v/s Ratio Prot		c0.07			0.05			c0.21			0.17	
v/s Ratio Perm	0.03			0.06			0.07			0.03		
v/c Ratio	0.07	0.15		0.12	0.10		0.19	0.55		0.07	0.44	
Uniform Delay, d1	10.9	11.3		11.2	11.0		17.4	20.4		16.5	19.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.4	0.2		1.4	3.1		0.5	2.0	
Delay (s)	11.1	11.7		11.6	11.3		18.8	23.5		17.0	21.3	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.5			11.4			22.9			21.1	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			18.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

PM Peak Period
Future Background Condition - Weekday PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	7	206	159	11	8	15
Future Volume (Veh/h)	7	206	159	11	8	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	234	181	12	9	17
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	195				439	189
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	195				439	189
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1387				575	856
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	242	193	26			
Volume Left	8	0	9			
Volume Right	0	12	17			
cSH	1387	1700	732			
Volume to Capacity	0.01	0.11	0.04			
Queue Length 95th (m)	0.1	0.0	0.8			
Control Delay (s)	0.3	0.0	10.1			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		26.5%	ICU Level of Service	A		
Analysis Period (min)		15				

Queues

Weekend Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

Failure Background Condition - Weekend SAT























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	27	131	67	57	71	323	22	254
v/c Ratio	0.04	0.14	0.11	0.06	0.18	0.45	0.07	0.35
Control Delay	11.0	5.7	11.7	9.0	19.0	20.6	17.3	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	5.7	11.7	9.0	19.0	20.6	17.3	19.6
Queue Length 50th (m)	2.1	4.2	5.4	3.4	7.4	35.2	2.2	27.4
Queue Length 95th (m)	6.1	12.7	12.0	8.9	16.5	57.3	6.9	45.5
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	691	914	634	932	390	715	331	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.14	0.11	0.06	0.18	0.45	0.07	0.35

Intersection Summary

HCM Signalized Intersection Capacity Analysis










Weekend Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Background Condition - Weekend SAT

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	52	74	64	41	13	68	238	72	21	216	28
Future Volume (vph)	26	52	74	64	41	13	68	238	72	21	216	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1752		1789	1850		1820	1845		1824	1883	
Flt Permitted	0.72	1.00		0.67	1.00		0.54	1.00		0.45	1.00	
Satd. Flow (perm)	1383	1752		1268	1850		1025	1845		869	1883	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	27	54	77	67	43	14	71	248	75	22	225	29
RTOR Reduction (vph)	0	39	0	0	7	0	0	13	0	0	6	0
Lane Group Flow (vph)	27	93	0	67	50	0	71	310	0	22	248	0
Confl. Peds. (#/hr)							3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	691	876		634	925		390	702		331	717	
v/s Ratio Prot		0.05			0.03			0.17			0.13	
v/s Ratio Perm	0.02			0.05			0.07			0.03		
v/c Ratio	0.04	0.11		0.11	0.05		0.18	0.44		0.07	0.35	
Uniform Delay, d1	10.7	11.1		11.1	10.8		17.3	19.4		16.5	18.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.3	0.1		1.0	2.0		0.4	1.3	
Delay (s)	10.8	11.3		11.4	10.9		18.3	21.4		16.9	19.9	
Level of Service	B	B		B	B		B	C		B	B	
Approach Delay (s)		11.2			11.2			20.8			19.6	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.6				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.25									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			58.9%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

Weekend Peak Period
Future Background Condition - Weekend SAT

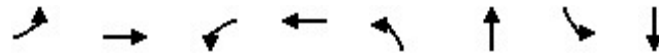
						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	157	145	7	8	9
Future Volume (Veh/h)	7	157	145	7	8	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	8	173	159	8	9	10
Pedestrians		1				
Lane Width (m)		3.7				
Walking Speed (m/s)		1.1				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	167				352	164
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167				352	164
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1423				646	885
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	181	167	19			
Volume Left	8	0	9			
Volume Right	0	8	10			
cSH	1423	1700	753			
Volume to Capacity	0.01	0.10	0.03			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	0.4	0.0	9.9			
Lane LOS	A		A			
Approach Delay (s)	0.4	0.0	9.9			
Approach LOS			A			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		24.3%		ICU Level of Service		A
Analysis Period (min)		15				

Appendix E

2034 Future Background
Conditions Synchro Reports

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

5d11a5b Background Condition - Weekday AM



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	192	96	123	71	346	19	343
v/c Ratio	0.11	0.22	0.17	0.14	0.24	0.50	0.06	0.49
Control Delay	11.8	8.1	12.4	9.4	20.6	21.4	17.3	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	8.1	12.4	9.4	20.6	21.4	17.3	22.0
Queue Length 50th (m)	5.7	10.0	8.0	7.8	7.6	38.4	1.9	39.5
Queue Length 95th (m)	11.4	18.6	14.9	14.8	15.8	55.4	5.7	56.3
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	647	860	581	867	295	697	310	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.22	0.17	0.14	0.24	0.50	0.06	0.49






















Intersection Summary

HCM Signalized Intersection Capacity Analysis

AM Peak Period

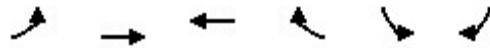
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East




Future Background Condition - Weekday AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	88	71	80	78	24	59	214	73	16	245	40
Future Volume (vph)	59	88	71	80	78	24	59	214	73	16	245	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1814	1650		1734	1708		1717	1793		1815	1835	
Flt Permitted	0.68	1.00		0.64	1.00		0.43	1.00		0.43	1.00	
Satd. Flow (perm)	1295	1650		1162	1708		776	1793		813	1835	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	71	106	86	96	94	29	71	258	88	19	295	48
RTOR Reduction (vph)	0	35	0	0	13	0	0	15	0	0	7	0
Lane Group Flow (vph)	71	157	0	96	110	0	71	331	0	19	336	0
Confl. Peds. (#/hr)	7		3	3		7	4		8	8		4
Heavy Vehicles (%)	0%	12%	2%	5%	9%	4%	6%	2%	3%	0%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	647	825		581	854		295	683		309	699	
v/s Ratio Prot		c0.10			0.06			c0.18			0.18	
v/s Ratio Perm	0.05			0.08			0.09			0.02		
v/c Ratio	0.11	0.19		0.17	0.13		0.24	0.48		0.06	0.48	
Uniform Delay, d1	11.1	11.6		11.4	11.2		17.7	19.7		16.5	19.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.6	0.3		1.9	2.5		0.4	2.4	
Delay (s)	11.5	12.1		12.1	11.5		19.6	22.2		16.9	22.1	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.9			11.8			21.8			21.8	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			18.0			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)				10.0		
Intersection Capacity Utilization			86.9%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

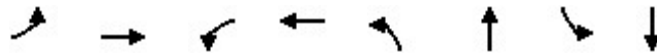
AM Peak Period
Future Background Condition - Weekday AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	219	177	10	11	7
Future Volume (Veh/h)	7	219	177	10	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	11	359	290	16	18	11
Pedestrians					7	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	313				686	305
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	313				686	305
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	99				96	98
cM capacity (veh/h)	1250				410	690
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	370	306	29			
Volume Left	11	0	18			
Volume Right	0	16	11			
cSH	1250	1700	484			
Volume to Capacity	0.01	0.18	0.06			
Queue Length 95th (m)	0.2	0.0	1.4			
Control Delay (s)	0.3	0.0	12.9			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		27.2%		ICU Level of Service		A
Analysis Period (min)		15				

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

5d11a5 Background Condition - Weekday PM



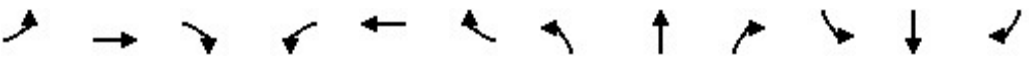








Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	45	179	75	104	58	418	18	340
v/c Ratio	0.07	0.19	0.13	0.12	0.20	0.58	0.07	0.47
Control Delay	11.3	6.1	12.0	9.0	19.9	23.8	17.7	21.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	6.1	12.0	9.0	19.9	23.8	17.7	21.7
Queue Length 50th (m)	3.6	6.5	6.1	6.3	6.1	50.1	1.8	39.1
Queue Length 95th (m)	8.7	16.5	13.2	14.1	14.7	78.1	6.2	62.1
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	662	919	598	898	286	715	251	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.19	0.13	0.12	0.20	0.58	0.07	0.47

Intersection Summary

HCM Signalized Intersection Capacity Analysis

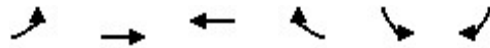
PM Peak Period




1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East
 Future Background Condition - Weekday PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	77	93	71	75	24	55	318	79	17	286	37
Future Volume (vph)	43	77	93	71	75	24	55	318	79	17	286	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1823	1740		1766	1772		1653	1850		1819	1882	
Flt Permitted	0.69	1.00		0.64	1.00		0.43	1.00		0.34	1.00	
Satd. Flow (perm)	1324	1740		1198	1772		753	1850		659	1882	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	81	98	75	79	25	58	335	83	18	301	39
RTOR Reduction (vph)	0	49	0	0	13	0	0	11	0	0	6	0
Lane Group Flow (vph)	45	130	0	75	92	0	58	407	0	18	334	0
Confl. Peds. (#/hr)	1		4	4		1	5		5	5		5
Heavy Vehicles (%)	0%	0%	0%	3%	4%	4%	10%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	662	870		599	886		286	704		251	716	
v/s Ratio Prot		c0.07			0.05			c0.22			0.18	
v/s Ratio Perm	0.03			0.06			0.08			0.03		
v/c Ratio	0.07	0.15		0.13	0.10		0.20	0.58		0.07	0.47	
Uniform Delay, d1	10.9	11.3		11.2	11.1		17.4	20.6		16.5	19.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.4	0.2		1.6	3.5		0.6	2.2	
Delay (s)	11.1	11.7		11.6	11.3		19.0	24.1		17.1	21.8	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.6			11.4			23.5			21.5	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			19.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

PM Peak Period
Future Background Condition - Weekday PM



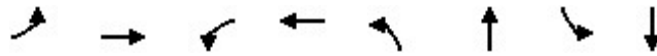
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	218	167	11	8	15
Future Volume (Veh/h)	7	218	167	11	8	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	248	190	12	9	17
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	204				462	198
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	204				462	198
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1377				557	847
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	256	202	26			
Volume Left	8	0	9			
Volume Right	0	12	17			
cSH	1377	1700	718			
Volume to Capacity	0.01	0.12	0.04			
Queue Length 95th (m)	0.1	0.0	0.9			
Control Delay (s)	0.3	0.0	10.2			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	10.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			27.1%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues

Weekend Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

Failure Background Condition - Weekend SAT























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	27	134	67	59	71	338	22	268
v/c Ratio	0.04	0.15	0.11	0.06	0.19	0.47	0.07	0.37
Control Delay	11.0	5.8	11.7	9.0	19.1	21.1	17.4	20.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	5.8	11.7	9.0	19.1	21.1	17.4	20.0
Queue Length 50th (m)	2.1	4.5	5.4	3.5	7.4	37.5	2.2	29.3
Queue Length 95th (m)	6.1	13.0	12.0	9.2	16.6	60.3	7.0	48.2
Internal Link Dist (m)		51.9		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	690	916	632	933	378	716	318	723
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.15	0.11	0.06	0.19	0.47	0.07	0.37
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

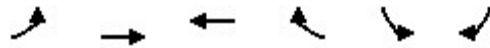
Weekend Peak Period




1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Background Condition - Weekend SAT

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	55	74	64	43	13	68	252	72	21	229	28
Future Volume (vph)	26	55	74	64	43	13	68	252	72	21	229	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1756		1789	1853		1820	1848		1824	1885	
Flt Permitted	0.72	1.00		0.67	1.00		0.52	1.00		0.44	1.00	
Satd. Flow (perm)	1380	1756		1264	1853		993	1848		835	1885	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	27	57	77	67	45	14	71	262	75	22	239	29
RTOR Reduction (vph)	0	39	0	0	7	0	0	12	0	0	5	0
Lane Group Flow (vph)	27	96	0	67	52	0	71	326	0	22	263	0
Confl. Peds. (#/hr)							3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	690	878		632	926		378	704		318	718	
v/s Ratio Prot		c0.05			0.03			c0.18			0.14	
v/s Ratio Perm	0.02			0.05			0.07			0.03		
v/c Ratio	0.04	0.11		0.11	0.06		0.19	0.46		0.07	0.37	
Uniform Delay, d1	10.7	11.1		11.1	10.8		17.3	19.5		16.5	18.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.3		0.3	0.1		1.1	2.2		0.4	1.4	
Delay (s)	10.8	11.4		11.4	10.9		18.4	21.7		17.0	20.1	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.3			11.2			21.1			19.9	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.9			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.26									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			59.1%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

Weekend Peak Period
Future Background Condition - Weekend SAT



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	165	153	7	8	9
Future Volume (Veh/h)	7	165	153	7	8	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	8	181	168	8	9	10
Pedestrians		1				
Lane Width (m)		3.7				
Walking Speed (m/s)		1.1				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	176				369	173
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	176				369	173
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1412				632	875
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	189	176	19			
Volume Left	8	0	9			
Volume Right	0	8	10			
cSH	1412	1700	740			
Volume to Capacity	0.01	0.10	0.03			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	0.4	0.0	10.0			
Lane LOS	A		A			
Approach Delay (s)	0.4	0.0	10.0			
Approach LOS			A			
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		24.7%		ICU Level of Service		A
Analysis Period (min)		15				

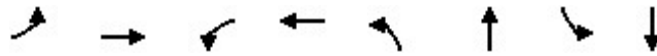
Appendix F

2024 Future Total Conditions
Synchro Reports

Queues

AM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekday AM























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	183	96	113	71	317	19	308
v/c Ratio	0.11	0.21	0.16	0.13	0.22	0.46	0.06	0.44
Control Delay	11.7	7.4	12.4	8.9	19.9	20.3	17.2	20.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	7.4	12.4	8.9	19.9	20.3	17.2	20.9
Queue Length 50th (m)	5.7	8.5	8.0	6.7	7.5	33.8	1.9	34.2
Queue Length 95th (m)	11.4	16.8	14.9	13.4	15.5	49.8	5.7	50.0
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	653	862	586	866	323	696	334	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.21	0.16	0.13	0.22	0.46	0.06	0.44

Intersection Summary

HCM Signalized Intersection Capacity Analysis










AM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekday AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	80	72	80	70	24	59	190	73	16	216	40
Future Volume (vph)	59	80	72	80	70	24	59	190	73	16	216	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1814	1645		1734	1703		1716	1785		1814	1829	
Flt Permitted	0.68	1.00		0.64	1.00		0.47	1.00		0.46	1.00	
Satd. Flow (perm)	1307	1645		1172	1703		849	1785		877	1829	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	71	96	87	96	84	29	71	229	88	19	260	48
RTOR Reduction (vph)	0	39	0	0	15	0	0	17	0	0	8	0
Lane Group Flow (vph)	71	144	0	96	99	0	71	300	0	19	300	0
Confl. Peds. (#/hr)	7		3	3		7	4		8	8		4
Heavy Vehicles (%)	0%	12%	2%	5%	9%	4%	6%	2%	3%	0%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	653	822		586	851		323	680		334	696	
v/s Ratio Prot		c0.09			0.06			c0.17			0.16	
v/s Ratio Perm	0.05			0.08			0.08			0.02		
v/c Ratio	0.11	0.18		0.16	0.12		0.22	0.44		0.06	0.43	
Uniform Delay, d1	11.1	11.5		11.4	11.1		17.6	19.4		16.5	19.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.6	0.3		1.6	2.1		0.3	1.9	
Delay (s)	11.4	12.0		12.0	11.4		19.1	21.4		16.8	21.2	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.8			11.7			21.0			20.9	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			17.4			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.9%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												









HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

AM Peak Period
Future Total Condition - Weekday AM

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	199	158	10	11	7
Future Volume (Veh/h)	7	199	158	10	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	11	326	259	16	18	11
Pedestrians					7	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	282				622	274
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	282				622	274
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	99				96	98
cM capacity (veh/h)	1283				447	719
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	337	275	29			
Volume Left	11	0	18			
Volume Right	0	16	11			
cSH	1283	1700	522			
Volume to Capacity	0.01	0.16	0.06			
Queue Length 95th (m)	0.2	0.0	1.3			
Control Delay (s)	0.3	0.0	12.3			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	12.3			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		26.1%		ICU Level of Service		A
Analysis Period (min)		15				











HCM Unsignalized Intersection Capacity Analysis
3: Site Access 1 (West) & Thompson Road West

AM Peak Period
Future Total Condition - Weekday AM

									
Movement	EBT	EBR	WBL	WBT	NBL	NBR			
Lane Configurations									
Traffic Volume (veh/h)	208	2	1	169	0	0			
Future Volume (Veh/h)	208	2	1	169	0	0			
Sign Control	Free			Free	Stop				
Grade	0%			0%	0%				
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61			
Hourly flow rate (vph)	341	3	2	277	0	0			
Pedestrians									
Lane Width (m)									
Walking Speed (m/s)									
Percent Blockage									
Right turn flare (veh)									
Median type	None		None						
Median storage veh									
Upstream signal (m)				97					
pX, platoon unblocked					1.00				
vC, conflicting volume			344		624	342			
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol			344		622	342			
tC, single (s)			4.1		6.4	6.2			
tC, 2 stage (s)									
tF (s)			2.2		3.5	3.3			
p0 queue free %			100		100	100			
cM capacity (veh/h)			1226		452	705			
Direction, Lane #	EB 1	WB 1							
Volume Total	344	279							
Volume Left	0	2							
Volume Right	3	0							
cSH	1700	1226							
Volume to Capacity	0.20	0.00							
Queue Length 95th (m)	0.0	0.0							
Control Delay (s)	0.0	0.1							
Lane LOS			A						
Approach Delay (s)	0.0	0.1							
Approach LOS									
Intersection Summary									
Average Delay			0.0						
Intersection Capacity Utilization			14.4%	ICU Level of Service	A				
Analysis Period (min)			15						

HCM Unsignalized Intersection Capacity Analysis
4: Site Access 2 (East) & Thompson Road West

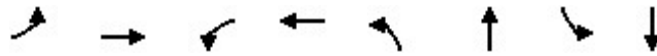
AM Peak Period
Future Total Condition - Weekday AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	206	0	0	168	1	2
Future Volume (Veh/h)	206	0	0	168	1	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	338	0	0	275	2	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					0.99	
vC, conflicting volume			338		613	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			338		605	338
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1232		460	709
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	338	275	5			
Volume Left	0	0	2			
Volume Right	0	0	3			
cSH	1700	1700	583			
Volume to Capacity	0.20	0.16	0.01			
Queue Length 95th (m)	0.0	0.0	0.2			
Control Delay (s)	0.0	0.0	11.2			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			20.8%	ICU Level of Service		A
Analysis Period (min)			15			

Queues

PM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekday PM























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	46	173	75	98	59	379	18	306
v/c Ratio	0.07	0.19	0.12	0.11	0.19	0.53	0.06	0.42
Control Delay	11.3	5.8	12.0	8.8	19.4	22.4	17.4	20.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	5.8	12.0	8.8	19.4	22.4	17.4	20.8
Queue Length 50th (m)	3.6	5.9	6.1	5.8	6.2	43.7	1.8	34.2
Queue Length 95th (m)	8.8	15.8	13.2	13.4	14.7	69.4	6.1	55.3
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	666	915	602	896	313	713	283	720
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.19	0.12	0.11	0.19	0.53	0.06	0.42

Intersection Summary

HCM Signalized Intersection Capacity Analysis

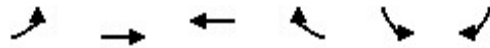
PM Peak Period




1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekday PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	70	94	71	69	24	56	281	79	17	253	38
Future Volume (vph)	44	70	94	71	69	24	56	281	79	17	253	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1823	1732		1766	1767		1653	1843		1819	1877	
Flt Permitted	0.69	1.00		0.65	1.00		0.47	1.00		0.39	1.00	
Satd. Flow (perm)	1331	1732		1205	1767		822	1843		743	1877	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	46	74	99	75	73	25	59	296	83	18	266	40
RTOR Reduction (vph)	0	50	0	0	13	0	0	12	0	0	6	0
Lane Group Flow (vph)	46	124	0	75	86	0	59	367	0	18	300	0
Confl. Peds. (#/hr)	1		4	4		1	5		5	5		5
Heavy Vehicles (%)	0%	0%	0%	3%	4%	4%	10%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	665	866		602	883		313	702		283	715	
v/s Ratio Prot		c0.07			0.05			c0.20			0.16	
v/s Ratio Perm	0.03			0.06			0.07			0.02		
v/c Ratio	0.07	0.14		0.12	0.10		0.19	0.52		0.06	0.42	
Uniform Delay, d1	10.9	11.3		11.2	11.0		17.3	20.1		16.5	19.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		0.4	0.2		1.3	2.8		0.4	1.8	
Delay (s)	11.1	11.7		11.6	11.3		18.7	22.9		16.9	21.0	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.5			11.4			22.3			20.7	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			18.2			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.31									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)				10.0		
Intersection Capacity Utilization			86.7%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South









PM Peak Period
Future Total Condition - Weekday PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	198	152	11	8	15
Future Volume (Veh/h)	7	198	152	11	8	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	225	173	12	9	17
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	187				422	181
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	187				422	181
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1397				588	865
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	233	185	26			
Volume Left	8	0	9			
Volume Right	0	12	17			
cSH	1397	1700	744			
Volume to Capacity	0.01	0.11	0.03			
Queue Length 95th (m)	0.1	0.0	0.8			
Control Delay (s)	0.3	0.0	10.0			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	10.0			
Approach LOS			B			
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		26.1%		ICU Level of Service		A
Analysis Period (min)		15				











HCM Unsignalized Intersection Capacity Analysis
3: Site Access 1 (West) & Thompson Road West

PM Peak Period
Future Total Condition - Weekday PM

										
Movement	EBT	EBR	WBL	WBT	NBL	NBR				
Lane Configurations										
Traffic Volume (veh/h)	203	3	3	161	0	0				
Future Volume (Veh/h)	203	3	3	161	0	0				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88				
Hourly flow rate (vph)	231	3	3	183	0	0				
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None		None							
Median storage veh										
Upstream signal (m)	97									
pX, platoon unblocked										
vC, conflicting volume			234		422	232				
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol			234		422	232				
tC, single (s)			4.1		6.4	6.2				
tC, 2 stage (s)										
tF (s)			2.2		3.5	3.3				
p0 queue free %			100		100	100				
cM capacity (veh/h)			1345		591	812				
Direction, Lane #	EB 1	WB 1								
Volume Total	234	186								
Volume Left	0	3								
Volume Right	3	0								
cSH	1700	1345								
Volume to Capacity	0.14	0.00								
Queue Length 95th (m)	0.0	0.1								
Control Delay (s)	0.0	0.1								
Lane LOS		A								
Approach Delay (s)	0.0	0.1								
Approach LOS										
Intersection Summary										
Average Delay			0.1							
Intersection Capacity Utilization			14.2%	ICU Level of Service	A					
Analysis Period (min)			15							

HCM Unsignalized Intersection Capacity Analysis
4: Site Access 2 (East) & Thompson Road West









PM Peak Period
Future Total Condition - Weekday PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	201	0	0	162	1	3
Future Volume (Veh/h)	201	0	0	162	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	228	0	0	184	1	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					1.00	
vC, conflicting volume				228	412	228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				228	411	228
tC, single (s)				4.1	6.4	6.2
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	100	100
cM capacity (veh/h)				1352	600	816
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	228	184	4			
Volume Left	0	0	1			
Volume Right	0	0	3			
cSH	1700	1700	749			
Volume to Capacity	0.13	0.11	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS						
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			20.6%		ICU Level of Service	
Analysis Period (min)			15		A	

Queues

Weekend Peak Period

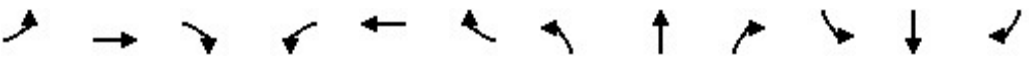








1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekend SAT

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	134	67	57	75	305	22	240
v/c Ratio	0.04	0.15	0.11	0.06	0.19	0.43	0.06	0.33
Control Delay	11.0	5.5	11.7	9.0	19.0	19.9	17.3	19.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	5.5	11.7	9.0	19.0	19.9	17.3	19.2
Queue Length 50th (m)	2.3	4.2	5.4	3.4	7.9	32.5	2.2	25.4
Queue Length 95th (m)	6.3	12.7	12.0	8.9	17.1	53.5	6.9	42.8
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	691	913	632	932	403	715	346	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.15	0.11	0.06	0.19	0.43	0.06	0.33
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

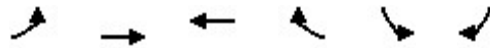
Weekend Peak Period




1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekend SAT

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	51	78	64	41	13	72	221	72	21	201	30
Future Volume (vph)	28	51	78	64	41	13	72	221	72	21	201	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1747		1789	1850		1820	1841		1824	1878	
Flt Permitted	0.72	1.00		0.67	1.00		0.55	1.00		0.47	1.00	
Satd. Flow (perm)	1383	1747		1264	1850		1058	1841		909	1878	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	29	53	81	67	43	14	75	230	75	22	209	31
RTOR Reduction (vph)	0	41	0	0	7	0	0	14	0	0	6	0
Lane Group Flow (vph)	29	94	0	67	50	0	75	291	0	22	234	0
Confl. Peds. (#/hr)							3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	691	873		632	925		403	701		346	715	
v/s Ratio Prot		c0.05			0.03			c0.16			0.12	
v/s Ratio Perm	0.02			0.05			0.07			0.02		
v/c Ratio	0.04	0.11		0.11	0.05		0.19	0.41		0.06	0.33	
Uniform Delay, d1	10.7	11.1		11.1	10.8		17.3	19.1		16.5	18.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.3	0.1		1.0	1.8		0.4	1.2	
Delay (s)	10.8	11.3		11.4	10.9		18.3	20.9		16.8	19.6	
Level of Service	B	B		B	B		B	C		B	B	
Approach Delay (s)		11.3			11.2			20.4			19.4	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.3			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.24									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			59.1%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South









Weekend Peak Period
Future Total Condition - Weekend SAT



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	156	144	7	9	9
Future Volume (Veh/h)	7	156	144	7	9	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	8	171	158	8	10	10
Pedestrians		1				
Lane Width (m)		3.7				
Walking Speed (m/s)		1.1				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	166				349	163
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	166				349	163
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1424				649	886
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	179	166	20			
Volume Left	8	0	10			
Volume Right	0	8	10			
cSH	1424	1700	749			
Volume to Capacity	0.01	0.10	0.03			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	0.4	0.0	9.9			
Lane LOS	A		A			
Approach Delay (s)	0.4	0.0	9.9			
Approach LOS			A			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		24.2%		ICU Level of Service	A	
Analysis Period (min)		15				











HCM Unsignalized Intersection Capacity Analysis
3: Site Access 1 (West) & Thompson Road West

Weekend Peak Period
Future Total Condition - Weekend SAT

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	155	10	8	142	0	0
Future Volume (Veh/h)	155	10	8	142	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	170	11	9	156	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				97		
pX, platoon unblocked					0.99	
vC, conflicting volume				181	350	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				181	343	176
tC, single (s)				4.1	6.4	6.2
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				99	100	100
cM capacity (veh/h)				1407	650	873
Direction, Lane #	EB 1	WB 1				
Volume Total	181	165				
Volume Left	0	9				
Volume Right	11	0				
cSH	1700	1407				
Volume to Capacity	0.11	0.01				
Queue Length 95th (m)	0.0	0.1				
Control Delay (s)	0.0	0.5				
Lane LOS		A				
Approach Delay (s)	0.0	0.5				
Approach LOS						
Intersection Summary						
Average Delay				0.2		
Intersection Capacity Utilization				17.3%	ICU Level of Service	A
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis
4: Site Access 2 (East) & Thompson Road West

Weekend Peak Period
Future Total Condition - Weekend SAT

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	155	0	0	143	7	8
Future Volume (Veh/h)	155	0	0	143	7	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	170	0	0	157	8	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					0.99	
vC, conflicting volume				170	327	170
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				170	312	170
tC, single (s)				4.1	6.4	6.2
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	99	99
cM capacity (veh/h)				1420	676	879
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	170	157	17			
Volume Left	0	0	8			
Volume Right	0	0	9			
cSH	1700	1700	770			
Volume to Capacity	0.10	0.09	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS						
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS						
Intersection Summary						
Average Delay						
			0.5			
Intersection Capacity Utilization			18.2%	ICU Level of Service		A
Analysis Period (min)			15			

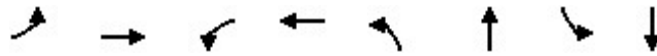
Appendix G

2029 Future Total Conditions
Synchro Reports

Queues

AM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekday AM
























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	188	96	118	71	331	19	326
v/c Ratio	0.11	0.22	0.16	0.14	0.23	0.47	0.06	0.46
Control Delay	11.7	7.7	12.4	9.0	20.2	20.8	17.2	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	7.7	12.4	9.0	20.2	20.8	17.2	21.4
Queue Length 50th (m)	5.7	9.3	8.0	7.2	7.6	36.2	1.9	36.9
Queue Length 95th (m)	11.4	17.8	14.9	14.1	15.6	52.6	5.7	53.2
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	650	861	583	866	308	697	322	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.22	0.16	0.14	0.23	0.47	0.06	0.46
Intersection Summary								

HCM Signalized Intersection Capacity Analysis










AM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekday AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	84	72	80	74	24	59	202	73	16	231	40
Future Volume (vph)	59	84	72	80	74	24	59	202	73	16	231	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1814	1647		1734	1706		1717	1789		1814	1832	
Flt Permitted	0.68	1.00		0.64	1.00		0.45	1.00		0.44	1.00	
Satd. Flow (perm)	1301	1647		1167	1706		811	1789		846	1832	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	71	101	87	96	89	29	71	243	88	19	278	48
RTOR Reduction (vph)	0	37	0	0	14	0	0	15	0	0	7	0
Lane Group Flow (vph)	71	151	0	96	104	0	71	316	0	19	319	0
Confl. Peds. (#/hr)	7		3	3		7	4		8	8		4
Heavy Vehicles (%)	0%	12%	2%	5%	9%	4%	6%	2%	3%	0%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	650	823		583	853		308	681		322	697	
v/s Ratio Prot		c0.09			0.06			c0.18			0.17	
v/s Ratio Perm	0.05			0.08			0.09			0.02		
v/c Ratio	0.11	0.18		0.16	0.12		0.23	0.46		0.06	0.46	
Uniform Delay, d1	11.1	11.6		11.4	11.2		17.6	19.5		16.5	19.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.6	0.3		1.7	2.3		0.4	2.2	
Delay (s)	11.4	12.1		12.0	11.5		19.4	21.8		16.8	21.6	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.9			11.7			21.4			21.4	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			17.7			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.9%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												









HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

AM Peak Period
Future Total Condition - Weekday AM

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	210	168	10	11	7
Future Volume (Veh/h)	7	210	168	10	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	11	344	275	16	18	11
Pedestrians					7	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	298				656	290
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	298				656	290
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	99				96	98
cM capacity (veh/h)	1266				427	704
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	355	291	29			
Volume Left	11	0	18			
Volume Right	0	16	11			
cSH	1266	1700	502			
Volume to Capacity	0.01	0.17	0.06			
Queue Length 95th (m)	0.2	0.0	1.4			
Control Delay (s)	0.3	0.0	12.6			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	12.6			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			26.7%	ICU Level of Service		A
Analysis Period (min)			15			











HCM Unsignalized Intersection Capacity Analysis
3: Site Access 1 (West) & Thompson Road West

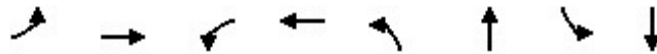
AM Peak Period
Future Total Condition - Weekday AM

										
Movement	EBT	EBR	WBL	WBT	NBL	NBR				
Lane Configurations										
Traffic Volume (veh/h)	220	2	1	180	0	0				
Future Volume (Veh/h)	220	2	1	180	0	0				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61				
Hourly flow rate (vph)	361	3	2	295	0	0				
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None		None							
Median storage veh										
Upstream signal (m)				97						
pX, platoon unblocked					1.00					
vC, conflicting volume			364		662	362				
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol			364		660	362				
tC, single (s)			4.1		6.4	6.2				
tC, 2 stage (s)										
tF (s)			2.2		3.5	3.3				
p0 queue free %			100		100	100				
cM capacity (veh/h)			1206		430	687				
Direction, Lane #	EB 1	WB 1								
Volume Total	364	297								
Volume Left	0	2								
Volume Right	3	0								
cSH	1700	1206								
Volume to Capacity	0.21	0.00								
Queue Length 95th (m)	0.0	0.0								
Control Delay (s)	0.0	0.1								
Lane LOS		A								
Approach Delay (s)	0.0	0.1								
Approach LOS										
Intersection Summary										
Average Delay				0.0						
Intersection Capacity Utilization				15.0%	ICU Level of Service	A				
Analysis Period (min)				15						

HCM Unsignalized Intersection Capacity Analysis
4: Site Access 2 (East) & Thompson Road West

AM Peak Period
Future Total Condition - Weekday AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	206	0	0	168	1	2
Future Volume (Veh/h)	206	0	0	168	1	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	338	0	0	275	2	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					0.99	
vC, conflicting volume			338		613	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			338		604	338
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1232		460	709
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	338	275	5			
Volume Left	0	0	2			
Volume Right	0	0	3			
cSH	1700	1700	583			
Volume to Capacity	0.20	0.16	0.01			
Queue Length 95th (m)	0.0	0.0	0.2			
Control Delay (s)	0.0	0.0	11.2			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			20.8%	ICU Level of Service		A
Analysis Period (min)			15			























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	46	177	75	101	59	398	18	324
v/c Ratio	0.07	0.19	0.12	0.11	0.20	0.56	0.07	0.45
Control Delay	11.3	6.0	12.0	8.9	19.7	23.1	17.5	21.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	6.0	12.0	8.9	19.7	23.1	17.5	21.3
Queue Length 50th (m)	3.6	6.2	6.1	6.0	6.2	46.8	1.8	36.8
Queue Length 95th (m)	8.8	16.1	13.2	13.6	14.9	73.7	6.1	58.7
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	664	917	600	897	299	714	267	721
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.19	0.13	0.11	0.20	0.56	0.07	0.45

Intersection Summary

HCM Signalized Intersection Capacity Analysis

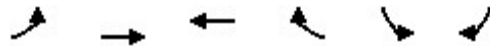
PM Peak Period




1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekday PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	74	94	71	72	24	56	299	79	17	270	38
Future Volume (vph)	44	74	94	71	72	24	56	299	79	17	270	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1823	1736		1766	1769		1653	1847		1819	1879	
Flt Permitted	0.69	1.00		0.65	1.00		0.45	1.00		0.37	1.00	
Satd. Flow (perm)	1328	1736		1200	1769		785	1847		702	1879	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	46	78	99	75	76	25	59	315	83	18	284	40
RTOR Reduction (vph)	0	50	0	0	13	0	0	11	0	0	6	0
Lane Group Flow (vph)	46	128	0	75	89	0	59	387	0	18	318	0
Confl. Peds. (#/hr)	1		4	4		1	5		5	5		5
Heavy Vehicles (%)	0%	0%	0%	3%	4%	4%	10%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	664	868		600	884		299	703		267	715	
v/s Ratio Prot		c0.07			0.05			c0.21			0.17	
v/s Ratio Perm	0.03			0.06			0.08			0.03		
v/c Ratio	0.07	0.15		0.12	0.10		0.20	0.55		0.07	0.44	
Uniform Delay, d1	10.9	11.3		11.2	11.1		17.4	20.4		16.5	19.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.4	0.2		1.5	3.1		0.5	2.0	
Delay (s)	11.1	11.7		11.6	11.3		18.9	23.5		17.0	21.4	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.6			11.4			22.9			21.1	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			18.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South

PM Peak Period
Future Total Condition - Weekday PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	209	160	11	8	15
Future Volume (Veh/h)	7	209	160	11	8	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	238	182	12	9	17
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	196				444	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	196				444	190
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1386				571	855
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	246	194	26			
Volume Left	8	0	9			
Volume Right	0	12	17			
cSH	1386	1700	729			
Volume to Capacity	0.01	0.11	0.04			
Queue Length 95th (m)	0.1	0.0	0.8			
Control Delay (s)	0.3	0.0	10.1			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		26.7%		ICU Level of Service	A	
Analysis Period (min)		15				











HCM Unsignalized Intersection Capacity Analysis
3: Site Access 1 (West) & Thompson Road West

PM Peak Period
Future Total Condition - Weekday PM









	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱		
Traffic Volume (veh/h)	215	3	3	170	0	0
Future Volume (Veh/h)	215	3	3	170	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	244	3	3	193	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				97		
pX, platoon unblocked						
vC, conflicting volume			247		444	246
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			247		444	246
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1331		573	798
Direction, Lane #	EB 1	WB 1				
Volume Total	247	196				
Volume Left	0	3				
Volume Right	3	0				
cSH	1700	1331				
Volume to Capacity	0.15	0.00				
Queue Length 95th (m)	0.0	0.1				
Control Delay (s)	0.0	0.1				
Lane LOS		A				
Approach Delay (s)	0.0	0.1				
Approach LOS						
Intersection Summary						
Average Delay		0.1				
Intersection Capacity Utilization		14.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
4: Site Access 2 (East) & Thompson Road West

PM Peak Period
Future Total Condition - Weekday PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	201	0	0	162	1	3
Future Volume (Veh/h)	201	0	0	162	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	228	0	0	184	1	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					1.00	
vC, conflicting volume				228	412	228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				228	411	228
tC, single (s)				4.1	6.4	6.2
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	100	100
cM capacity (veh/h)				1352	600	816
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	228	184	4			
Volume Left	0	0	1			
Volume Right	0	0	3			
cSH	1700	1700	749			
Volume to Capacity	0.13	0.11	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS						
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS						
A						
Intersection Summary						
Average Delay						
			0.1			
Intersection Capacity Utilization			20.6%	ICU Level of Service		A
Analysis Period (min)			15			






















1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekend SAT

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	137	67	59	75	323	22	256
v/c Ratio	0.04	0.15	0.11	0.06	0.19	0.45	0.07	0.35
Control Delay	11.0	5.6	11.7	9.0	19.1	20.6	17.3	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	5.6	11.7	9.0	19.1	20.6	17.3	19.6
Queue Length 50th (m)	2.3	4.4	5.4	3.5	7.9	35.2	2.2	27.5
Queue Length 95th (m)	6.3	13.0	12.0	9.2	17.2	57.3	6.9	45.7
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	690	915	630	933	388	715	331	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.15	0.11	0.06	0.19	0.45	0.07	0.35
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

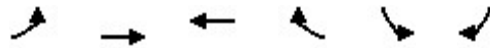
Weekend Peak Period




1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Future Total Condition - Weekend SAT

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	54	78	64	43	13	72	238	72	21	216	30
Future Volume (vph)	28	54	78	64	43	13	72	238	72	21	216	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1751		1789	1853		1820	1845		1824	1881	
Flt Permitted	0.72	1.00		0.67	1.00		0.53	1.00		0.45	1.00	
Satd. Flow (perm)	1380	1751		1261	1853		1021	1845		869	1881	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	29	56	81	67	45	14	75	248	75	22	225	31
RTOR Reduction (vph)	0	41	0	0	7	0	0	13	0	0	6	0
Lane Group Flow (vph)	29	97	0	67	52	0	75	310	0	22	250	0
Confl. Peds. (#/hr)							3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	690	875		630	926		388	702		331	716	
v/s Ratio Prot		c0.06			0.03			c0.17			0.13	
v/s Ratio Perm	0.02			0.05			0.07			0.03		
v/c Ratio	0.04	0.11		0.11	0.06		0.19	0.44		0.07	0.35	
Uniform Delay, d1	10.7	11.1		11.1	10.8		17.4	19.4		16.5	18.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.3		0.3	0.1		1.1	2.0		0.4	1.3	
Delay (s)	10.8	11.4		11.4	10.9		18.5	21.4		16.9	19.9	
Level of Service	B	B		B	B		B	C		B	B	
Approach Delay (s)		11.3			11.2			20.8			19.7	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.6			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.25									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			59.3%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: Thompson Road West & Leamon Street South









Weekend Peak Period
Future Total Condition - Weekend SAT



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	166	152	7	9	9
Future Volume (Veh/h)	7	166	152	7	9	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	8	182	167	8	10	10
Pedestrians		1				
Lane Width (m)		3.7				
Walking Speed (m/s)		1.1				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	175				369	172
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	175				369	172
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1414				632	876
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	190	175	20			
Volume Left	8	0	10			
Volume Right	0	8	10			
cSH	1414	1700	734			
Volume to Capacity	0.01	0.10	0.03			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	0.4	0.0	10.0			
Lane LOS	A		B			
Approach Delay (s)	0.4	0.0	10.0			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		24.7%		ICU Level of Service	A	
Analysis Period (min)		15				










HCM Unsignalized Intersection Capacity Analysis
3: Site Access 1 (West) & Thompson Road West

Weekend Peak Period
Future Total Condition - Weekend SAT

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	165	10	8	150	0	0
Future Volume (Veh/h)	165	10	8	150	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	181	11	9	165	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				97		
pX, platoon unblocked					0.99	
vC, conflicting volume				192	370	186
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				192	363	186
tC, single (s)				4.1	6.4	6.2
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				99	100	100
cM capacity (veh/h)				1394	633	861
Direction, Lane #	EB 1	WB 1				
Volume Total	192	174				
Volume Left	0	9				
Volume Right	11	0				
cSH	1700	1394				
Volume to Capacity	0.11	0.01				
Queue Length 95th (m)	0.0	0.1				
Control Delay (s)	0.0	0.4				
Lane LOS		A				
Approach Delay (s)	0.0	0.4				
Approach LOS						
Intersection Summary						
Average Delay				0.2		
Intersection Capacity Utilization				17.8%	ICU Level of Service	A
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis
4: Site Access 2 (East) & Thompson Road West

Weekend Peak Period
Future Total Condition - Weekend SAT

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	155	0	0	143	7	8
Future Volume (Veh/h)	155	0	0	143	7	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	170	0	0	157	8	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					0.99	
vC, conflicting volume			170		327	170
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		312	170
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	99
cM capacity (veh/h)			1420		676	879
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	170	157	17			
Volume Left	0	0	8			
Volume Right	0	0	9			
cSH	1700	1700	770			
Volume to Capacity	0.10	0.09	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			18.2%	ICU Level of Service		A
Analysis Period (min)			15			

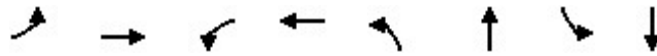
Appendix H

2034 Future Total Conditions
Synchro Reports

Queues

AM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Weekday AM












Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	194	96	124	71	346	19	343
v/c Ratio	0.11	0.23	0.17	0.14	0.24	0.50	0.06	0.49
Control Delay	11.8	8.2	12.4	9.4	20.6	21.4	17.3	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	8.2	12.4	9.4	20.6	21.4	17.3	22.0
Queue Length 50th (m)	5.7	10.2	8.0	7.9	7.6	38.4	1.9	39.5
Queue Length 95th (m)	11.4	18.9	15.0	15.0	15.8	55.4	5.7	56.3
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	646	860	579	867	295	697	310	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.23	0.17	0.14	0.24	0.50	0.06	0.49
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

AM Peak Period

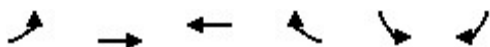
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Weekday AM




												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	89	72	80	79	24	59	214	73	16	245	40
Future Volume (vph)	59	89	72	80	79	24	59	214	73	16	245	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1814	1649		1734	1708		1717	1793		1815	1835	
Flt Permitted	0.68	1.00		0.63	1.00		0.43	1.00		0.43	1.00	
Satd. Flow (perm)	1294	1649		1158	1708		776	1793		813	1835	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	71	107	87	96	95	29	71	258	88	19	295	48
RTOR Reduction (vph)	0	35	0	0	13	0	0	15	0	0	7	0
Lane Group Flow (vph)	71	159	0	96	111	0	71	331	0	19	336	0
Confl. Peds. (#/hr)	7		3	3		7	4		8	8		4
Heavy Vehicles (%)	0%	12%	2%	5%	9%	4%	6%	2%	3%	0%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	647	824		579	854		295	683		309	699	
v/s Ratio Prot		c0.10			0.06			c0.18			0.18	
v/s Ratio Perm	0.05			0.08			0.09			0.02		
v/c Ratio	0.11	0.19		0.17	0.13		0.24	0.48		0.06	0.48	
Uniform Delay, d1	11.1	11.6		11.4	11.2		17.7	19.7		16.5	19.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.6	0.3		1.9	2.5		0.4	2.4	
Delay (s)	11.5	12.1		12.1	11.5		19.6	22.2		16.9	22.1	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		12.0			11.8			21.8			21.8	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			18.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.9%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Thompson Road West & Leamon Street South

AM Peak Period
Future Total Condition - Weekday AM











Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	221	178	10	11	7
Future Volume (Veh/h)	7	221	178	10	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	11	362	292	16	18	11
Pedestrians					7	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	315				691	307
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	315				691	307
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	99				96	98
cM capacity (veh/h)	1248				407	688
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	373	308	29			
Volume Left	11	0	18			
Volume Right	0	16	11			
cSH	1248	1700	482			
Volume to Capacity	0.01	0.18	0.06			
Queue Length 95th (m)	0.2	0.0	1.5			
Control Delay (s)	0.3	0.0	13.0			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	13.0			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			27.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Site Access 1 (West) & Thompson Road West











AM Peak Period
Future Total Condition - Weekday AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	232	2	1	190	0	0
Future Volume (Veh/h)	232	2	1	190	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	380	3	2	311	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				97		
pX, platoon unblocked					1.00	
vC, conflicting volume			383		696	382
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			383		695	382
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1187		410	670
Direction, Lane #	EB 1	WB 1				
Volume Total	383	313				
Volume Left	0	2				
Volume Right	3	0				
cSH	1700	1187				
Volume to Capacity	0.23	0.00				
Queue Length 95th (m)	0.0	0.0				
Control Delay (s)	0.0	0.1				
Lane LOS		A				
Approach Delay (s)	0.0	0.1				
Approach LOS						
Intersection Summary						
Average Delay		0.0				
Intersection Capacity Utilization		15.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

4: Site Access 2 (East) & Thompson Road West

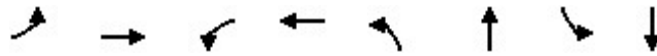
AM Peak Period
Future Total Condition - Weekday AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	206	0	0	168	1	2
Future Volume (Veh/h)	206	0	0	168	1	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	338	0	0	275	2	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					0.99	
vC, conflicting volume			338		613	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			338		600	338
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1232		460	709
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	338	275	5			
Volume Left	0	0	2			
Volume Right	0	0	3			
cSH	1700	1700	583			
Volume to Capacity	0.20	0.16	0.01			
Queue Length 95th (m)	0.0	0.0	0.2			
Control Delay (s)	0.0	0.0	11.2			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			20.8%	ICU Level of Service		A
Analysis Period (min)			15			

Queues

PM Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Weekday PM























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	46	181	75	105	59	418	18	341
v/c Ratio	0.07	0.20	0.13	0.12	0.21	0.58	0.07	0.47
Control Delay	11.3	6.1	12.0	9.0	19.9	23.8	17.7	21.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	6.1	12.0	9.0	19.9	23.8	17.7	21.8
Queue Length 50th (m)	3.6	6.6	6.1	6.4	6.2	50.1	1.8	39.3
Queue Length 95th (m)	8.8	16.6	13.2	14.2	15.0	78.1	6.2	62.3
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	661	920	598	898	286	715	251	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.20	0.13	0.12	0.21	0.58	0.07	0.47
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

PM Peak Period

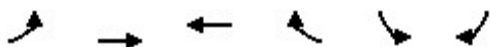
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East Weekday PM




												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	78	94	71	76	24	56	318	79	17	286	38
Future Volume (vph)	44	78	94	71	76	24	56	318	79	17	286	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1823	1740		1766	1772		1653	1850		1819	1881	
Flt Permitted	0.69	1.00		0.64	1.00		0.43	1.00		0.34	1.00	
Satd. Flow (perm)	1323	1740		1196	1772		751	1850		659	1881	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	46	82	99	75	80	25	59	335	83	18	301	40
RTOR Reduction (vph)	0	50	0	0	13	0	0	11	0	0	6	0
Lane Group Flow (vph)	46	132	0	75	93	0	59	407	0	18	335	0
Confl. Peds. (#/hr)	1		4	4		1	5		5	5		5
Heavy Vehicles (%)	0%	0%	0%	3%	4%	4%	10%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	661	870		598	886		286	704		251	716	
v/s Ratio Prot		c0.08			0.05			c0.22			0.18	
v/s Ratio Perm	0.03			0.06			0.08			0.03		
v/c Ratio	0.07	0.15		0.13	0.10		0.21	0.58		0.07	0.47	
Uniform Delay, d1	10.9	11.4		11.2	11.1		17.5	20.6		16.5	19.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.4	0.2		1.6	3.5		0.6	2.2	
Delay (s)	11.1	11.7		11.6	11.3		19.1	24.1		17.1	21.8	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.6			11.4			23.5			21.6	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			19.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.34									
Actuated Cycle Length (s)			84.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			86.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Thompson Road West & Leamon Street South

PM Peak Period
Future Total Condition - Weekday PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	221	168	11	8	15
Future Volume (Veh/h)	7	221	168	11	8	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	251	191	12	9	17
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	205				466	199
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	205				466	199
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1376				554	845
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	259	203	26			
Volume Left	8	0	9			
Volume Right	0	12	17			
cSH	1376	1700	715			
Volume to Capacity	0.01	0.12	0.04			
Queue Length 95th (m)	0.1	0.0	0.9			
Control Delay (s)	0.3	0.0	10.2			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	10.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			27.3%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Site Access 1 (West) & Thompson Road West










PM Peak Period
Future Total Condition - Weekday PM

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱		
Traffic Volume (veh/h)	227	3	3	178	0	0
Future Volume (Veh/h)	227	3	3	178	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	258	3	3	202	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				97		
pX, platoon unblocked						
vC, conflicting volume			261		468	260
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			261		468	260
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1315		556	784
Direction, Lane #	EB 1	WB 1				
Volume Total	261	205				
Volume Left	0	3				
Volume Right	3	0				
cSH	1700	1315				
Volume to Capacity	0.15	0.00				
Queue Length 95th (m)	0.0	0.1				
Control Delay (s)	0.0	0.1				
Lane LOS		A				
Approach Delay (s)	0.0	0.1				
Approach LOS						
Intersection Summary						
Average Delay		0.1				
Intersection Capacity Utilization		15.5%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

4: Site Access 2 (East) & Thompson Road West

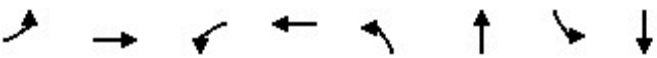
PM Peak Period
Future Total Condition - Weekday PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	201	0	0	162	1	3
Future Volume (Veh/h)	201	0	0	162	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	228	0	0	184	1	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					1.00	
vC, conflicting volume			228		412	228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			228		411	228
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1352		600	816
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	228	184	4			
Volume Left	0	0	1			
Volume Right	0	0	3			
cSH	1700	1700	749			
Volume to Capacity	0.13	0.11	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			20.6%	ICU Level of Service		A
Analysis Period (min)			15			

Queues

Weekend Peak Period

1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	140	67	61	75	338	22	270
v/c Ratio	0.04	0.15	0.11	0.07	0.20	0.47	0.07	0.37
Control Delay	11.0	5.7	11.7	9.1	19.3	21.1	17.4	20.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	5.7	11.7	9.1	19.3	21.1	17.4	20.0
Queue Length 50th (m)	2.3	4.6	5.4	3.7	7.9	37.5	2.2	29.5
Queue Length 95th (m)	6.3	13.3	12.0	9.5	17.3	60.3	7.0	48.4
Internal Link Dist (m)		52.1		65.1		133.7		66.4
Turn Bay Length (m)	15.0		25.0		120.0		35.0	
Base Capacity (vph)	688	917	629	935	376	716	318	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.15	0.11	0.07	0.20	0.47	0.07	0.37
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

Weekend Peak Period

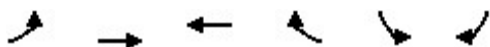
1: Old Highway 24/Main Street South & Thompson Road West/Thompson Road East




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	57	78	64	45	13	72	252	72	21	229	30
Future Volume (vph)	28	57	78	64	45	13	72	252	72	21	229	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.97		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1754		1789	1855		1820	1848		1824	1883	
Flt Permitted	0.72	1.00		0.67	1.00		0.52	1.00		0.44	1.00	
Satd. Flow (perm)	1378	1754		1257	1855		988	1848		835	1883	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	29	59	81	67	47	14	75	262	75	22	239	31
RTOR Reduction (vph)	0	41	0	0	7	0	0	12	0	0	6	0
Lane Group Flow (vph)	29	100	0	67	54	0	75	326	0	22	264	0
Confl. Peds. (#/hr)							3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.38	0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	689	877		628	927		376	704		318	717	
v/s Ratio Prot		c0.06			0.03			c0.18			0.14	
v/s Ratio Perm	0.02			0.05			0.08			0.03		
v/c Ratio	0.04	0.11		0.11	0.06		0.20	0.46		0.07	0.37	
Uniform Delay, d1	10.7	11.1		11.1	10.8		17.4	19.5		16.5	18.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.3		0.3	0.1		1.2	2.2		0.4	1.5	
Delay (s)	10.8	11.4		11.4	10.9		18.6	21.7		17.0	20.2	
Level of Service	B	B		B	B		B	C		B	C	
Approach Delay (s)		11.3			11.2			21.2			19.9	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			17.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.26									
Actuated Cycle Length (s)			84.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			59.4%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Thompson Road West & Leamon Street South

Weekend Peak Period
Future Total Condition - Weekend SAT



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	174	160	7	9	9
Future Volume (Veh/h)	7	174	160	7	9	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	8	191	176	8	10	10
Pedestrians		1				
Lane Width (m)		3.7				
Walking Speed (m/s)		1.1				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			112			
pX, platoon unblocked						
vC, conflicting volume	184				387	181
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	184				387	181
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1403				617	866
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	199	184	20			
Volume Left	8	0	10			
Volume Right	0	8	10			
cSH	1403	1700	720			
Volume to Capacity	0.01	0.11	0.03			
Queue Length 95th (m)	0.1	0.0	0.7			
Control Delay (s)	0.4	0.0	10.1			
Lane LOS	A		B			
Approach Delay (s)	0.4	0.0	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			25.2%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Site Access 1 (West) & Thompson Road West










Weekend Peak Period
Future Total Condition - Weekend SAT

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱		
Traffic Volume (veh/h)	174	10	8	157	0	0
Future Volume (Veh/h)	174	10	8	157	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	191	11	9	173	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				97		
pX, platoon unblocked					0.99	
vC, conflicting volume			202		388	196
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			202		381	196
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1382		618	850
Direction, Lane #	EB 1	WB 1				
Volume Total	202	182				
Volume Left	0	9				
Volume Right	11	0				
cSH	1700	1382				
Volume to Capacity	0.12	0.01				
Queue Length 95th (m)	0.0	0.1				
Control Delay (s)	0.0	0.4				
Lane LOS		A				
Approach Delay (s)	0.0	0.4				
Approach LOS						
Intersection Summary						
Average Delay		0.2				
Intersection Capacity Utilization		18.1%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

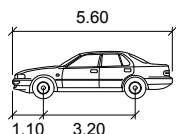
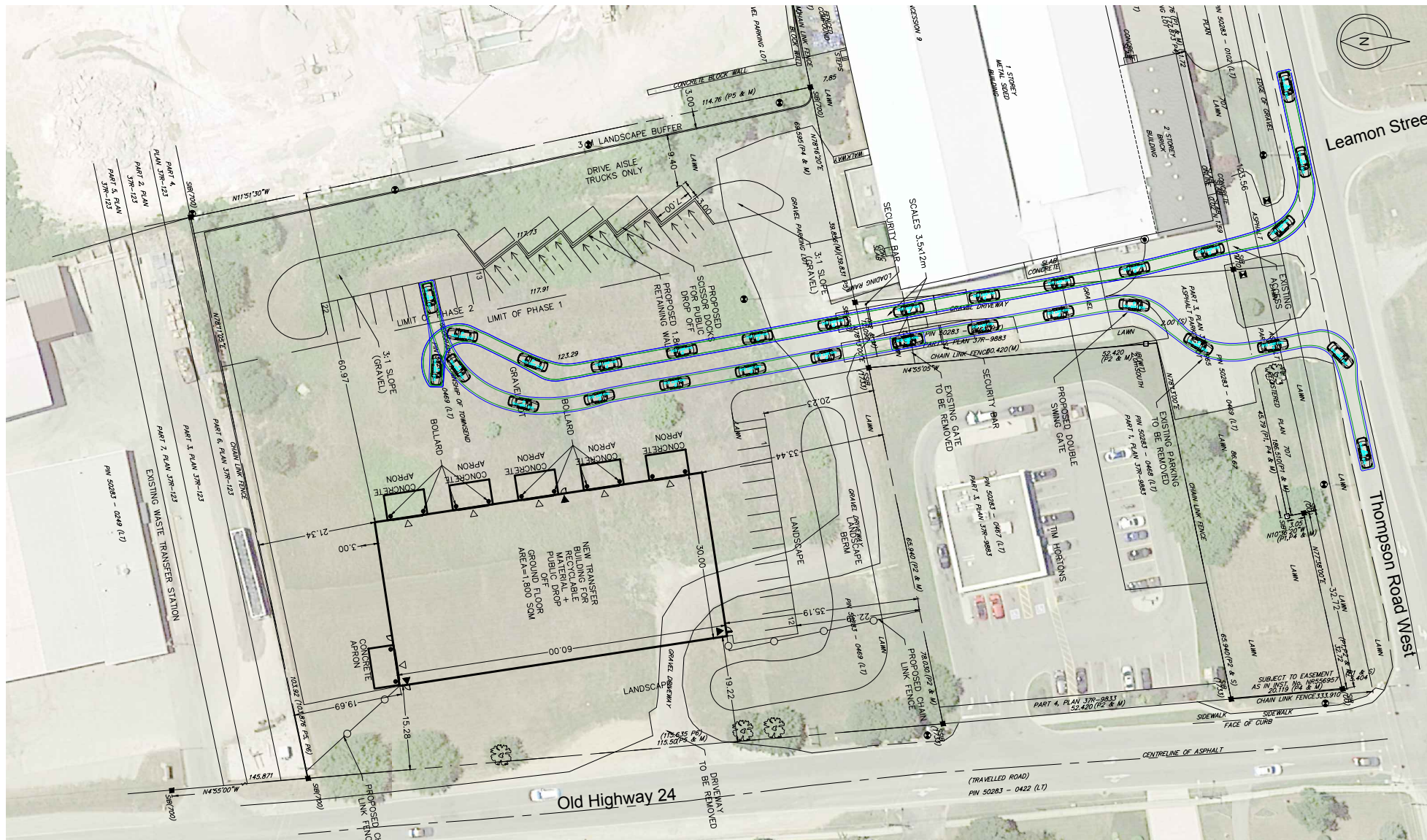
4: Site Access 2 (East) & Thompson Road West

Weekend Peak Period
Future Total Condition - Weekend SAT

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	155	0	0	143	7	8
Future Volume (Veh/h)	155	0	0	143	7	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	170	0	0	157	8	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				76		
pX, platoon unblocked					0.99	
vC, conflicting volume			170		327	170
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		312	170
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	99
cM capacity (veh/h)			1420		676	879
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	170	157	17			
Volume Left	0	0	8			
Volume Right	0	0	9			
cSH	1700	1700	770			
Volume to Capacity	0.10	0.09	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			18.2%	ICU Level of Service		A
Analysis Period (min)			15			


Appendix I

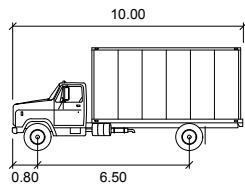
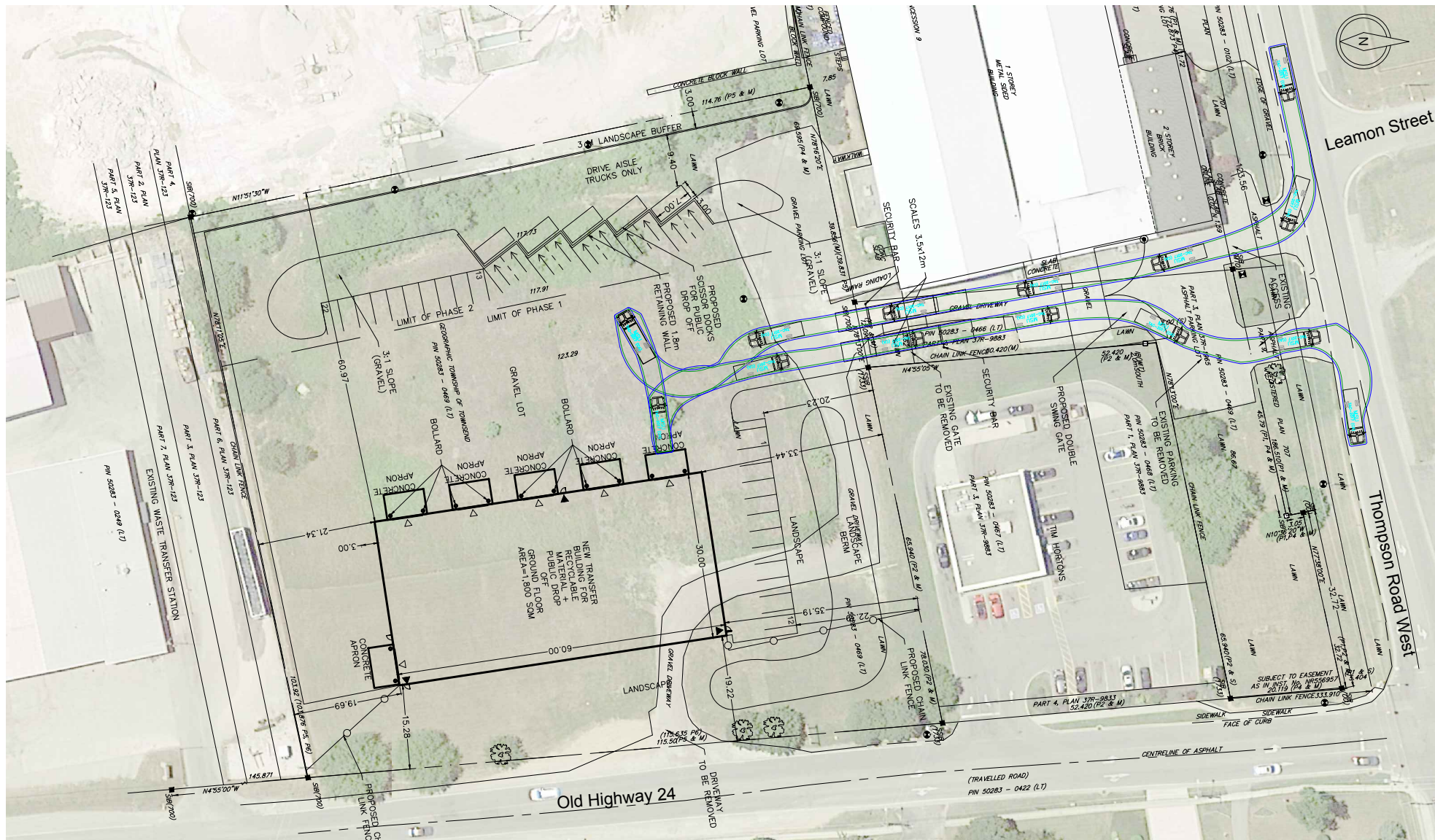
Vehicle Swept Path Analysis



P


	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

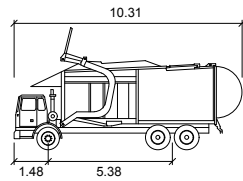
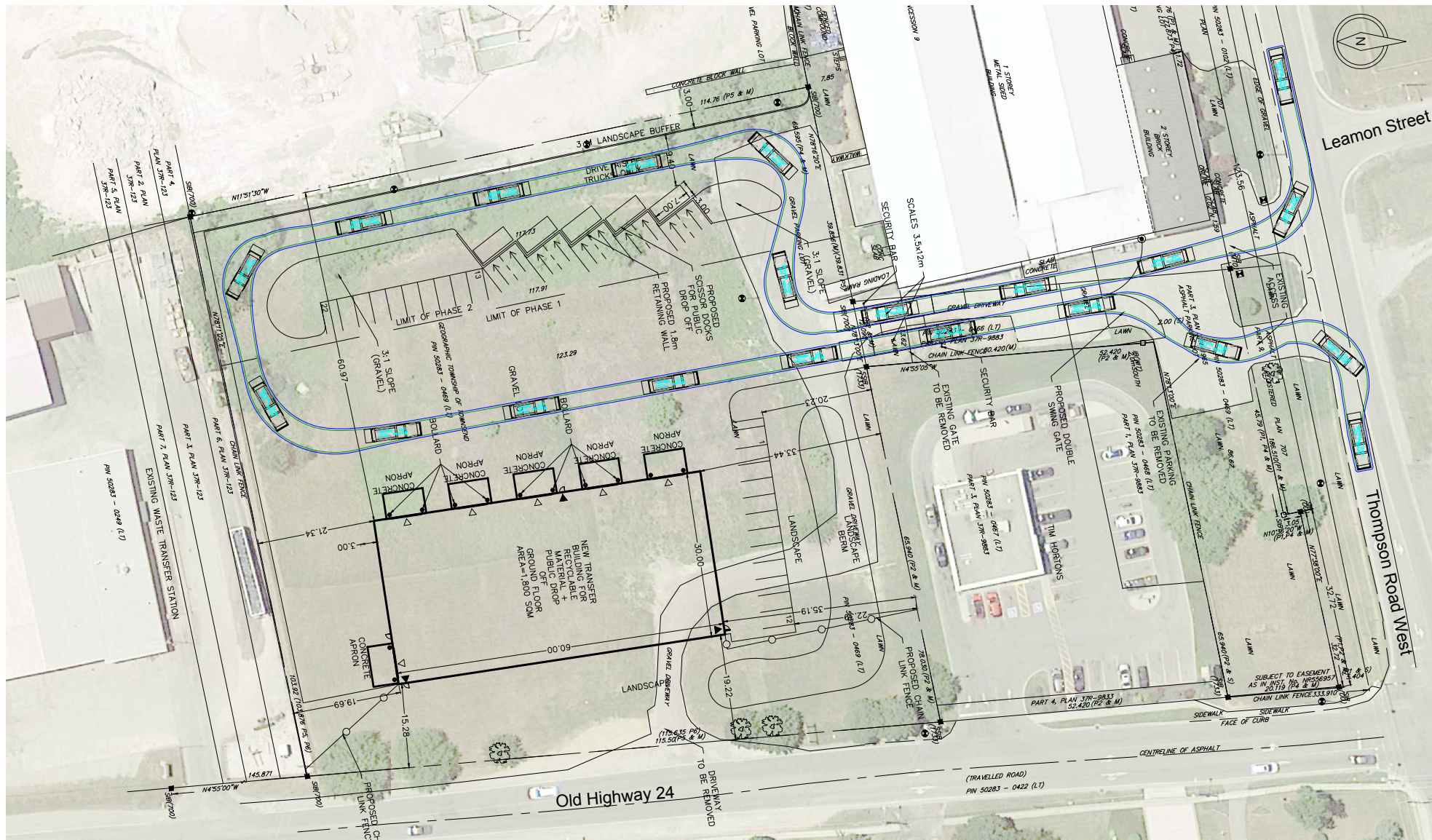
<div>CLIENT</div> <div>Norfolk Disposal Services Ltd.</div> <div>811 Old Highway 24, Waterford, ON N0E 1Y0</div>	<div>PROJECT NAME</div> <div>811 Old Highway 24, Waterford</div> <div>811 Old Highway 24, Waterford, ON</div>		<div> ARCADIS IBI GROUP</div>	
	<div>SCALE:</div> <div>1:900</div>	<div>DATE:</div> <div>2023-03-31</div>	<div><div>FIGURE NAME</div><div>Vehicle Maneuvering Diagram</div></div> <div><div>FIGURE NO.</div><div>AT-1</div></div> <div><div>REVISION</div><div>0.1</div></div>	
	<div>PROJECT ENG:</div> <div>-</div>	<div>DRAWN BY:</div> <div>I.D.</div>		
	<div>CHECKED BY:</div> <div>H.C.</div>	<div>APPROVED BY:</div> <div>T.T.</div>		
	<div>PROJECT NO:</div> <div>136731</div>			



MSU


	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.2

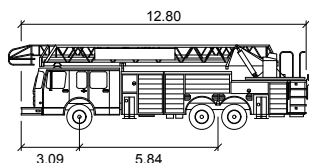
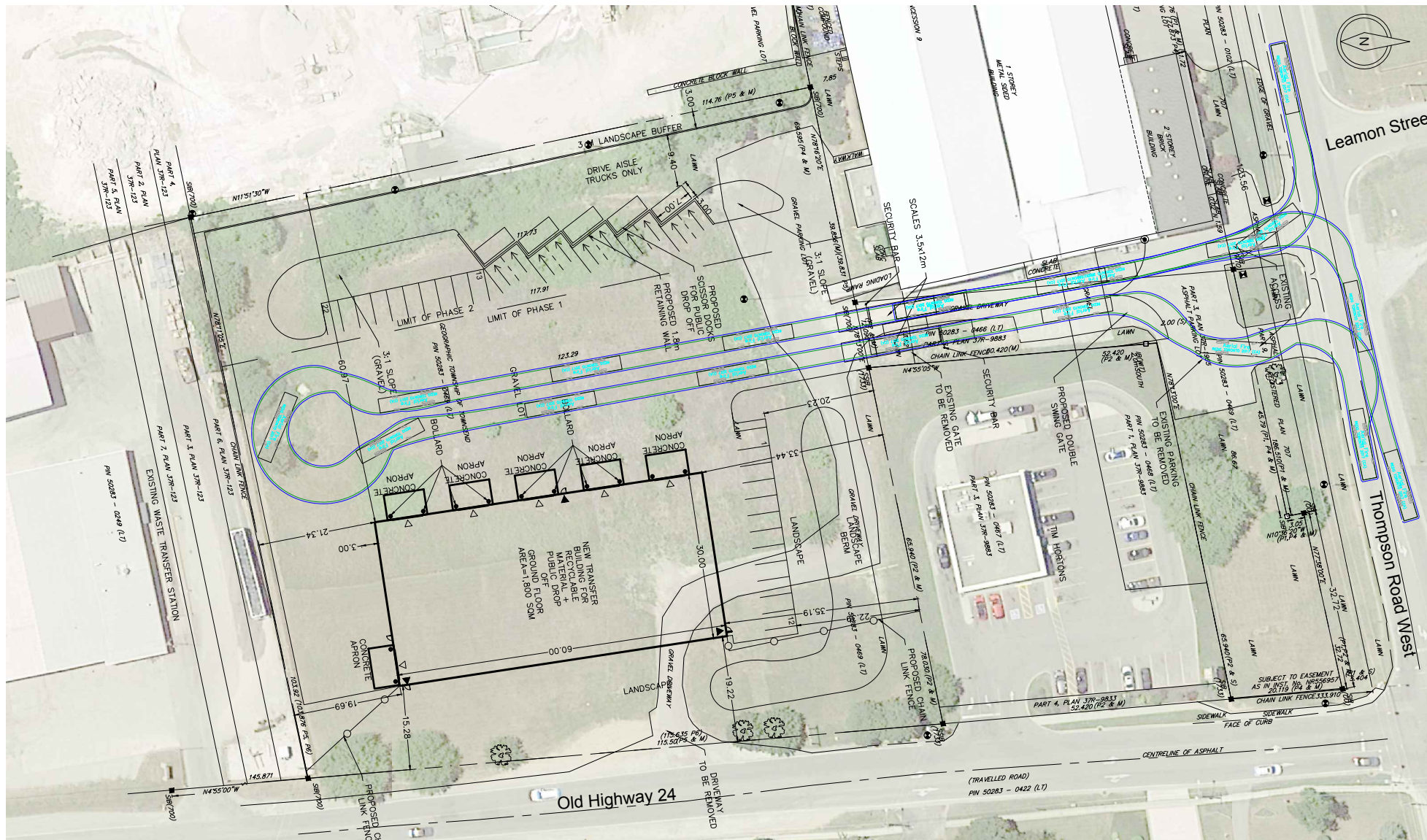
<div>CLIENT</div> <div>Norfolk Disposal Services Ltd.</div> <div>811 Old Highway 24, Waterford, ON N0E 1Y0</div>	<div>PROJECT NAME</div> <div>811 Old Highway 24, Waterford</div> <div>811 Old Highway 24, Waterford, ON</div>		<div> ARCADIS IBI GROUP</div>		
	<div>SCALE:</div> <div>1:900</div>	<div>DATE:</div> <div>2023-03-31</div>	<div>FIGURE NAME</div> <div>Vehicle Maneuvering Diagram</div>	<div>FIGURE NO.</div> <div>AT-3</div>	<div>REVISION</div> <div>0.1</div>
	<div>PROJECT ENG:</div> <div>-</div>	<div>DRAWN BY:</div> <div>I.D.</div>			
	<div>CHECKED BY:</div> <div>H.C.</div>	<div>APPROVED BY:</div> <div>T.T.</div>			
	<div>PROJECT NO:</div> <div>136731</div>				



Wayne Titan


	meters
Width	: 2.58
Track	: 2.44
Lock to Lock Time	: 6.0
Steering Angle	: 45.0

<div>CLIENT</div> <div>Norfolk Disposal Services Ltd.</div> <div>811 Old Highway 24, Waterford, ON N0E 1Y0</div>	<div>PROJECT NAME</div> <div>811 Old Highway 24, Waterford</div> <div>811 Old Highway 24, Waterford, ON</div>		<div> ARCADIS IBI GROUP</div>			
	<div>SCALE:</div> <div>1:900</div>	<div>DATE:</div> <div>2023-03-31</div>	<div><div>FIGURE NAME</div><div>Vehicle Maneuvering Diagram</div></div>		<div>FIGURE NO.</div> <div>AT-4</div>	<div>REVISION</div> <div>0.1</div>
	<div>PROJECT ENG:</div> <div>-</div>	<div>DRAWN BY:</div> <div>I.D.</div>				
	<div>CHECKED BY:</div> <div>H.C.</div>	<div>APPROVED BY:</div> <div>T.T.</div>				
	<div>PROJECT NO:</div> <div>136731</div>					



Aerial Fire

	metres
Width	: 2.54
Track	: 2.54
Lock to Lock Time	: 6.0
Steering Angle	: 37.0

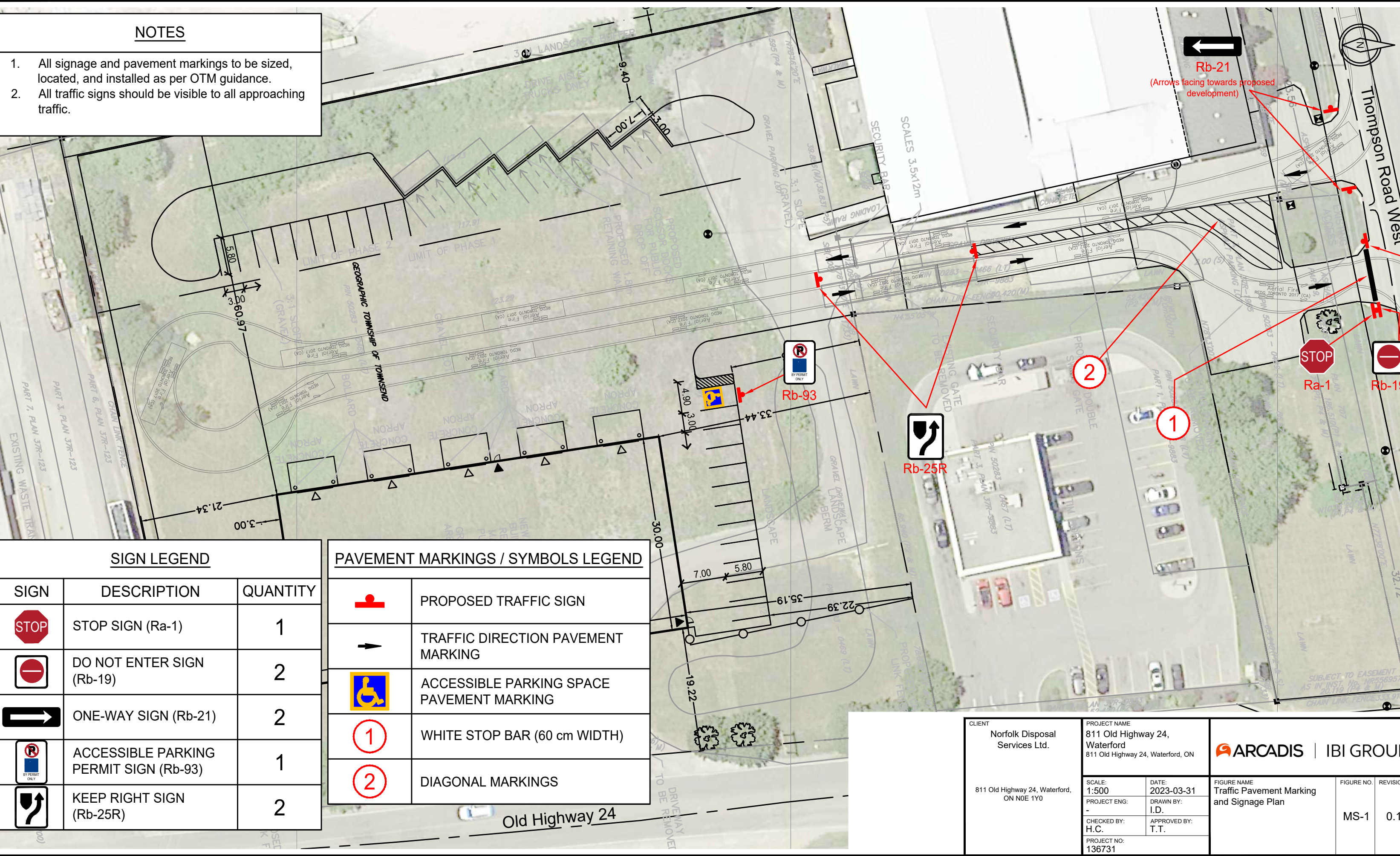
CLIENT Norfolk Disposal Services Ltd. 811 Old Highway 24, Waterford, ON N0E 1Y0	PROJECT NAME 811 Old Highway 24, Waterford 811 Old Highway 24, Waterford, ON		 ARCADIS IBI GROUP				
	SCALE: 1:900	DATE: 2023-03-31			FIGURE NAME Vehicle Maneuvering Diagram	FIGURE NO. AT-5	REVISION 0.1
	PROJECT ENG: -	DRAWN BY: I.D.					
	CHECKED BY: H.C.	APPROVED BY: T.T.					
	PROJECT NO: 136731						

Appendix J

Pavement Marking and Signage
Plan

NOTES

- 1. All signage and pavement markings to be sized, located, and installed as per OTM guidance.
- 2. All traffic signs should be visible to all approaching traffic.



SIGN LEGEND		
SIGN	DESCRIPTION	QUANTITY
	STOP SIGN (Ra-1)	1
	DO NOT ENTER SIGN (Rb-19)	2
	ONE-WAY SIGN (Rb-21)	2
	ACCESSIBLE PARKING PERMIT SIGN (Rb-93)	1
	KEEP RIGHT SIGN (Rb-25R)	2

PAVEMENT MARKINGS / SYMBOLS LEGEND	
	PROPOSED TRAFFIC SIGN
	TRAFFIC DIRECTION PAVEMENT MARKING
	ACCESSIBLE PARKING SPACE PAVEMENT MARKING
	WHITE STOP BAR (60 cm WIDTH)
	DIAGONAL MARKINGS

CLIENT Norfolk Disposal Services Ltd. 811 Old Highway 24, Waterford, ON N0E 1Y0	PROJECT NAME 811 Old Highway 24, Waterford 811 Old Highway 24, Waterford, ON		ARCADIS IBI GROUP	
	SCALE: 1:500	DATE: 2023-03-31		
	PROJECT ENG: -	DRAWN BY: I.D.	FIGURE NAME Traffic Pavement Marking and Signage Plan	
	CHECKED BY: H.C.	APPROVED BY: T.T.		
PROJECT NO: 136731			FIGURE NO. MS-1	REVISION 0.1