THE CORPORATION OF THE TOWNSHIP OF PUSLINCH
March 22, 2023 PUBLIC INFORMATION MEETING
VIRTUAL MEETING BY ELECTRONIC PARTICIPATION
& IN-PERSON AT THE PUSLINCH COMMUNITY CENTRE 23 BROCK ROAD S

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A G E N D A

DATE: March 22, 2023
PUBLIC INFORMATION MEETING: 7:00 P.M.

Order of Business:

1. **Call the Meeting to Order**
2. **Roll Call**
3. **Disclosure of Conflict of Interest**
4. **Purpose of Public Meeting**
5. **Reports/Applications**

5.1 Zoning By-law Application D14/WEL - 2795848 ONTARIO INC – Wellington Motor Freight - Concession 7 Concession 8 Part Lot; 24 Part Road known as 128 Brock Rd S., Township of Puslinch

5.1.1 Application and supporting documents

5.1.2 Report Wellington Motor Freight Zoning By-law Amendment Application D14/WEL Puslinch Concession 7 Concession 8 Part Lot; 24 Part Road 128 Brock Road South

5.1.3 Public Comments Received

6. Adjournment

TOWNSHIP OF
PUSLINCH
EST. 1850

Township of Puslinch
7404 Wellington Road 34,
Puslinch, ON, N0B 2J0
T: (519) 763 – 1226
F: (519) 763 – 5846
www.puslinch.ca

Zoning By-law Amendment Application

Date submitted:_

The Amendment:

Type of amendment:

Site specific: ☑

Other (specify): ☐

Purpose of and reasons for the proposed amendment(s):

Re-zoning the property from 'Highway Commercial' to 'Industrial' zone.

General Information:

1. Applicant Information:

Registered Owner's Name(s): _

Address: 61 Beaconhill Drive

City: BRAMPTON

Postal Code: L6X 1H7

Email Address: [redacted]

Telephone Number:

Fax:

Applicant (Agent) Name(s): MHBC Planning

Address: 540 Bingemans Centre Drive

City: Kitchener, ON

Postal Code: N2B 3X9

Email Address: [redacted]

Telephone Number:

Fax:

Other Name(s):

Address:

City:

Postal Code:

Email Address:

Telephone Number:

Fax:

Name, address, and phone number of all persons having any mortgages, charges, or encumbrances on the property.

Send correspondence to: Owner: ☐ Agent: ☑ Other: ______

When did the current owner acquire the subject land? Date: unknown

4. What does the amendment cover?

The "entire" property: ☑

A "portion" of the property: ☐

(This information should be illustrated on the required drawing under item 24 of this application)

5. Provide a description of the "entire" property:

Municipal address: 128 Brock Road South

Concession: 7 Lot: 24

Registered Plan Number: ____________________

Area: 6.5 ha Depth: 226 m Frontage: 387 m

15 ac 741 ft. 1302 ft.

6. Provide a description of the area to be amended if only a "portion" of the property:

Area: ________ ha Depth: ________ m Frontage: ________ m

________ ac ________ ft. ________ ft.

7. Is the application to amend the zoning by-law consistent with the Provincial Policy Statement?

Yes: ☑ No: ☐

8. Is the subject land within an area of land designated under any provincial plan or plans?

Greenbelt Plan: ☐ Places to Grow: ☑ Other: (specify): ____________

If yes, does the application conform to and not conflict with the application provincial plan or plans?

Yes: ☑ No: ☐

9. County Official Plan

What is the current County Official Plan designation of the subject property?

Secondary Agricultural and are within Special Policy Area PA7-1 identified as Puslinch Economic Development Area

List land uses permitted by the current Official Plan designation:

This is an area intended to service the Township by providing locations for economic activity and employment opportunities. This area is the predominant location for business and industry in the Township.

How does the application conform to the Official Plan?

The proposed use is in accordance with the land use policies of the PA7-1 Economic Development Area.

Please refer to the Planning Report for more detailed analysis.

If the application is to implement an alteration to the boundary of an area of settlement or to implement a new area of settlement, provide details of the Official Plan or Official Plan amendment that deals with the matter.

If the application is to remove land from an area of employment, provide details of the Official Plan or Official Plan amendment that deals with the matter.

If the subject land is within an area where zoning with conditions may apply, provide an explanation of how the application conforms to the Official Plan policies relating to zoning with conditions.

10. Zoning:

What is the current zoning of the property? Highway Commercial special 89

What uses are permitted? commercial uses

If the subject land is within an area where zoning with conditions may apply, provide an explanation of how the application conforms to the Official Plan policies relating to zoning with conditions.

If the subject land is within an area where the municipality has pre-determined minimum and maximum density requirements or the minimum and maximum height requirements provide a statement of these requirements.

Existing and Proposed Land Uses and Buildings:

11. What is the "existing" use(s) of the subject land?

Vacant. There are two unoccupied residential buildings proposed to be demolished.

12. How long has the "existing" use(s) continued on the subject land?

Unknown

13. What is the "proposed" use(s) of the subject land?

Warehouse and Transportation Terminal

14. Provide the following details for all buildings or structures on the subject land:

Building Details	Existing		Proposed	
Type of Building(s) or structures	dwelling		warehouse & office	
Date of construction	unknown			
Building height	unknown m	ft	m	ft
Number of floors	2 storeys		3 storey	
* Total floor area	unknown m^2	ft^2	20,232 m^2	217,777 ft^2
Ground floor area (exclude basement)	unknown m^2	ft^2	m^2	ft^2
Distance from building structure to the:				
Front lot line	17 m	59 ft	6 m	19 ft
Side lot line	182 m	600 ft	11 m	36 ft
Other side lot line	152 m	500 ft	137 m	449 ft
Rear lot line	46 m	153 ft	68 m	223 ft

Building Details	Existing		Proposed	
*Percentage lot coverage	unknown		33%	
*Number of parking spaces	n/a		165	
*Number of loading spaces	n/a		21	

Existing and Proposed Services:

15. What is the access to the subject property?

Provincial Highway: ☐

Continually maintained municipal road: ☑

Right-of-way: ☐

Seasonally maintained municipal road: ☐

Water access: ☐

Other (please specify): ☐

16. What is the name of the road or street that provides access to the subject property.

Brock Road South and Gilmour Road

17. If access is by water only, please describe the parking and docking facilities used or to be used and the approximate distance of these facilities from subject land to the nearest public road.

(This information should be illustrated on the required drawing under item 24 of this application)

18. Indicate the applicable water supply and sewage disposal:

Water Supply	Existing		Proposed	
Municipal water		☐		☐

Water Supply	Existing	Proposed
Communal water		
Private well		✓
Other water supply		
Water sewers		
Municipal sewers		
Communal sewers		
Private septic		✓
Other sewage disposal		

19. If the application would permit development on privately owned and operated individual or communal septic systems, would more than 4500 litres of effluent be produced per day as a result of the development being completed?

Yes: ☑ No: ☐

If yes, the following reports are required:

Servicing options report

A hydrogeological report

20. How is storm drainage provided?

Storm Sewers: ☐

Ditches: ☑

Swales: ☐

Other: ☐ (explain below)

Other Related Planning Applications:

21. Has the current owner (or any previous owner) made application for any of the following, either on the subject property or within 120 metres of the subject lands?

Planning Application	Yes	No	*File Number	Approval Authority	Subject Lands	Purpose	*Status
Official Plan Amendment		✓					
Zoning By-Law Amendment		✓					
Minor Variance		✓					
Plan of Subdivision		✓					
Consent (Severance)		✓					
Site Plan Control		✓					

22. Has the subject land ever been the subject of a Minister's Zoning Order?

Yes: ☐ No: ☑

If yes, provide the Ontario Regulation number of that order, if known: ______________

Other Supporting Information

23. Please list the titles of any supporting documents: (e.g. Environmental Impacts Study, Hydrogeological Report, Servicing Options Report, Traffic Study, Market Area Study, Aggregate Licence Report, Stormwater Management Report, etc.)

Planning justification report, Environmental Impact Study, Functional Servicing and Stormwater Management Report, Traffic Impact Study

Application Drawing

24. Please provide an accurate drawing of the proposal, preferably prepared by a qualified professional. In some cases, it may be more appropriate to submit additional drawings at varying scales a lot better illustrate the proposal. The drawing must include the following information (see on following page):

- Owner/applicant's names;
- Legal description of the property;
- Boundaries and dimensions of the subject and its current land use;
- Dimensions of area of amendment (if not, the entire property);
- The size and use of all abutting land;
- All existing and proposed parking and loading areas, driveways, and lanes;
- The location and nature of any easements or restrictive covenants on the property;
- The location of any existing drains or award drains;
- Woodlots, forested areas, ANSIs, ESAs, wetlands, floodplain, and all natural watercourses (rivers, stream banks, etc.);

The location, size , and type of all existing and proposed buildings and structures on the subject land , indicating their distance from the front lot line, rear lot line, and side lot lines;

The name, location, and width of each abutting public or private road, unopened road allowance or right-of-way;

- If access to the subject land is by water only, provide the location of the parking and docking facilities to be used;
- Other features both on site or nearby that in the opinion of the applicant will have an effect on the application (such as bridges, railways, airports, roads, drainage ditches, wells, septic systems, springs, slopes, gravel pits); and
- The drawing should also include the scale, north arrow, and date when the drawing was prepared.

Authorization for Agent/Solicitor to act for Owner

(If affidavit is signed by an Agent/Solicitor on Owner's behalf, the Owner's written authorization below shall be completed)

I (we) SAM MANN of the

2795848 ONTARIO INC of BRAMPTON County/Region of

Peel do hereby authorize

MHBC PLANNING to act as my agent in this application.

[redacted]
Signature of Owner(s)

Friday December 16, 2022
Date

Affidavit

I (we) Pierre Chauvin of the

Township of Centre Wellington County/Region of

Wellington solemnly declare that all the statements

contained in this application are true, and I, (we), 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 the City of Kitchener in the

County/Region of Waterloo this 6th day of

January 20 23.

[redacted]

Signature of Owner or authorized solicitor or agent

Jan. 6, 2023

Date

[redacted]

Signature of Commissioner

Paul Ronald Britton, a Commissioner, etc.,
Regional Municipality of Waterloo, for
MacNaughton Hermsen Britton Clarkson
Planning Limited.
Expires April 24, 2025.

January 6, 2023

Date

Agreement to Post Sign and Permit Site Visits

For the purpose of public notification and staff identification, I agree to erect a sign in accordance with the Township of Puslinch's sign requirements within one week of the date Township staff has deemed that the application is complete, and remove the sign when the application has been given final approval.

Furthermore, for the purposes of processing this application, I permit staff/representatives of the Township of Puslinch to enter onto my lands and inspect my property at the following times (please check one of the following boxes):

Any and all times: ☐ Certain days as specified: ☐ By appointment only: ☐

[redacted]

Signature

Friday December 16, 2022

Date

For Administrative Purposes Only:

Application fee of $____________ received by the municipality

Date Fee Received: ____________

Date Application Filed: ____________

File Number: ____________

Application deemed complete: ☐

____________________________ ____________________________

Signature of Municipal Employee Date

Personal information on this form is collected under the authority of the Planning Act. The information is used for the purpose of processing this application and administering the legislation and is maintained in accordance with the Municipal Freedom of Information and Protection of Privacy Act. Questions regarding the collection of this information may be directed to the Township Clerk's office.

The Township of Puslinch is committed to providing accessible formats and communication supports for people with a disability. If another format would work better for you, please contact the Township Clerkâ€™s office for assistance.

MHBC
PLANNING
URBAN DESIGN
& LANDSCAPE
ARCHITECTURE

KITCHENER
WOODBRIDGE
LONDON
KINGSTON
BARRIE
BURLINGTON

January 9, 2023

Lynne Banks
Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Road 34, Puslinch ON N0B 2J0
lbanks@puslinch.ca

Dear Ms. Banks,

RE: Zoning By-law Amendment Application
128 Brock Road South, Township of Puslinch
OUR FILE 2230A

On behalf of our client, Wellington Motor Freight, MHBC Planning is pleased to submit a Zoning By-law Amendment application in support of a development proposal for the property located at 128 Brock Road South, Puslinch (the subject lands). Our client is proposing to develop the subject lands with a warehouse and transportation terminal.

The subject lands are located on the south-east corner of Brock Road South and Gilmour Road. The subject lands are situated north of McLean Road, south of Gilmour Road, east of Brock Road South and west of Victoria Road South. The lands contain two single detached dwellings with the remainder of the property vacant with vegetation. The lands have approximately 387m of frontage on Brock Road S, 70m of frontage on Gilmour Road, and are approximately 62,991.1m^2 (6.2ha) in area.

Wellington Motor Freight is proposing to demolish the existing structures and develop the site with one warehouse building and one office building, with surface parking. The proposed development includes the following as described on the site plan:

- One storey warehouse building 19,282m^2 in area with an office area mezzanine;
- Three storey office building 2,790m^2 in area;
- Overhead walkway connecting the warehouse mezzanine to the office building;
- Two driveway accesses: a tractor entrance from Brock Road, and an employee entrance from Gilmour Road;
- 170 employee surface parking spaces;
- 123 tractor and trailer parking spaces;
    - tractor parking spaces
    - 73 trailer parking spaces

- 21 loading spaces;
- Septic bed 600m^2 in area with septic tanks oriented in the front yard; and
- Landscape/planting buffer along the front yard and side yard.

The subject lands are designated 'Secondary Agricultural' and are within 'Special Policy Area PA7-1' identified as Puslinch Economic Development Area in the County of Wellington Official Plan. The proposed warehouse and transportation terminal use would conform to the permitted uses of the Official Plan. However, the subject lands are zoned 'Highway Commercial special 89' (HCsp.89) in the Township of Puslinch Zoning By-law No. 023-18. The Highway Commercial zone is intended to provide commercial uses serving the traveling public, or uses not considered compatible with the Central Business District of Aberfoyle. The special provision (89) applied to the lands further restricts permitted uses. The 'Industrial' zone permits a range of land uses, including a transportation terminal and warehouse. Therefore, a Zoning By-law Amendment is required in order to re-zone the property to 'Industrial' and facilitate the proposed development.

We are of the opinion that the proposed use and zoning is consistent with the provincial legislation including the Provincial Policy Statement, as well as the A Place to Grow legislation. The proposed development would conform to all the zoning requirements of the Industrial zone and would better implement the Official Plan Special Policy Area PA7-1.

In support of our application, please find enclosed the following materials:

- A copy of the signed Application form;
- A copy of the Planning Justification Report prepared by MHBC Planning;
- A copy of the Servicing and Stormwater Management Report prepared by Meritech Engineering, as well as the Wastewater Servicing Assessment prepared by SpecFlow;
- A copy of the Geotechnical Investigation Report prepared by CVD Engineering;
- A copy of the Environmental Impact Study prepared by NRSI,
- A copy of the Transportation Impact Study prepared by Paradigm Engineering; and
- A copy of the Site Plan and Elevations.

Please note that a representative from Wellington Motor Freight will be paying the application fee of $2,500, in person at the Township Office.

We look forward to working with staff on the review of this application. Should you have any questions pertaining to the submission, please do not hesitate to contact the undersigned.

Yours truly,
MHBC

[redacted]

Pierre Chauvin, MA, MCIP, RPP
Partner

KITCHENER
WOODBRIDGE
LONDON
KINGSTON
BARRIE
BURLINGTON

PLANNING JUSTIFICATION **REPORT**

ZONING BY-LAW AMENDMENT

128 Brock Road South
Township of Puslinch

Date:

January 2023

Prepared for:

Wellington Motor Freight

Prepared by:

MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC)
540 Bingemans Centre Drive, Suite 200
Kitchener, Ontario
T: 519.576.3650
F: 519.576.0121

Our File 2230A

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List of Figures

Appendices

1.0 INTRODUCTION

MHBC has been retained by Wellington Motor Freight to coordinate the Zoning By-law Amendment application for the lands municipally addressed as 128 Brock Road South, Puslinch (the subject lands). The owner, Wellington Motor Freight, is a freight logistics company, with truck depots across Ontario. The owner is proposing to re-locate their main logistics hub to the subject lands and develop a warehouse, office and truck parking. In order to facilitate the proposed use of the lands, a Zoning By-law Amendment is required to re-zone the lands to permit industrial use.

The subject lands are located on the south-east corner of the Gilmour Road and Brock Road South intersection (**Figure 1**). The subject lands are located north of McLean Road, south of Gilmour Road, east of Brock Road South and west of Victoria Road South. The subject lands contain two single detached dwellings with the remainder of the lands vacant with vegetation. The lands have +/-387m of frontage on Brock Road South, +/-70m of frontage on Gilmour Road, and are approximately 62,991.1m^2 (6.2ha) in area.

The owner of the subject lands is proposing to demolish the existing structures and develop the site with one warehouse building and one office building, with surface parking. The lands will be used as a warehouse and transportation hub. This Planning Report assesses the development proposal in the context of the applicable planning framework and includes:

- An introduction and general description of the development lands, surrounding uses and existing conditions;
- An overview of the proposed development;
- A description of the proposed Zoning By-law Amendment;
- A review of the existing policy framework and assessment of consistency with the Provincial Policy Statement, conformity with A Place to Grow, the County of Wellington Official Plan, and the Township of Puslinch Zoning By-law; and
- Consideration and integration of recommendations from the supporting studies and reports.

A pre-consultation request was submitted in September 2022 with circulation for agency comments. The Township identified the following requirements in support of the requested amendment:

- Planning Justification Report
- Functional Servicing, Grading and Stormwater Management Report
- Environmental Impact Study
- Traffic Impact Study
- Site Plan and Elevations

The required reports and studies have been prepared and are summarized in Section 5.0 of this report. A copy of each report and study is included as part of the complete application package.

2.0 CONTEXT

The subject lands are located in the Township of Puslinch addressed as 128 Brock Road South and are situated on the south-east corner of Brock Road South and Gilmour Road. There is an existing detached dwelling oriented at the intersection of Gilmour Road and Brock Road South. A second detached dwelling is located along the Brock Road South frontage. The remainder of the lands are vacant, consisting of trees and vegetation. The site was previously approved and used as a fill operation, which resulted in the disturbance and ground alteration to almost the entirety of the site. As part of the proposed development, a number of studies have been completed, including a geotechnical investigation to provide site grading and fill recommendations.

As illustrated on **Figure 2**, the surrounding area is characterized by aggregate activities, industrial uses, commercial uses, and residential uses. A Significant woodland is located to the northeast and unevaluated wetlands are located along the eastern property boundary. The subject lands are located within *Policy Area PA7-7 Puslinch Economic Development Area* as identified in the County of Wellington Official Plan. This area is intended to be the predominant location for business and industry in Puslinch. The area is generally comprised of various commercial and industrial land uses. The immediate surrounding context is described in detail below.

North: Gilmour Road abuts the lands to the north. On the opposite side of Gilmour Road is the Hamlet of Aberfoyle and a small residential subdivision. Past the residential development is open space and the mini lakes subdivision.

East: A single detached dwelling abuts the subject lands to the north-east. Beyond the dwelling is rural/open space lands. South east of the lands is industrial land uses. Past the industrial park is rural and agricultural lands.

South: The area south of the subject lands consists predominantly of industrial, aggregate, and commercial uses along Brock Road South, which leads to Highway 401. Past the Highway 401 interchange is the Hamlet of Morriston.

West: On the opposite side of Brock Road South is industrial and aggregate land uses. Dufferin aggregates have a large aggregate operation west of the subject lands. Beyond Dufferin Aggregates is rural and agricultural lands.

The subject lands are located on a County Road, being Brock Road South and are within an area intended to accommodate a large proportion of employment type uses. Brock Road is considered to be a major roadway in the County intended to serve high volumes of traffic including truck traffic, with direct access to Highway 401. The development lands are well situated within an area planned to accommodate industrial and employment type uses, and are in close proximity to major roadways, as well as the provincial highway 401. Generally the proposed development is similar to existing and planned land uses in the immediate area.

3.0 PROPOSED DEVELOPMENT

3.1 Overview of Proposed Development

The owner is proposing a freight transportation logistics hub. Wellington Motor Freight is a logistics company that specializes in the transportation of cargo. The subject lands are proposed to be the main location for the company and will consist of a warehouse, truck terminal and office space. This will serve as the new location of the existing Puslinch Office and will also accommodate employees from the Campbellville location. It is expected that the new facility will have over 100 employees in the office and warehouse, with an additional 50 drivers. The employees will operate on one shift. Warehouse workers work from 7:00am to 4:30pm and office workers work from 8:00am to 5:00pm. On average, it is anticipated that the volume of trucks coming and going is 30 per day (15 trucks in and 15 trucks out).

The proposal includes the demolition of the two detached dwellings in order to accommodate the development concept. A large portion of the lands will be used for parking of the tractors and trailers. Two driveways are proposed to provide access to the site, including one driveway from Brock Road South and another from Gilmour Road. The Brock Road South driveway is intended for the trucks, while the Gilmour Road driveway will be for employees and lead to the employee parking area. An area for tractor (truck) parking is located north of the proposed warehouse building, and trailer parking is proposed to be located to the rear of the warehouse.

The concept plan and elevations are included as **Appendix A** to this report. The concept plan describes the following details:

- One storey warehouse building 19,282m^2 in area with an office area mezzanine;
- Three storey office building 2,790m^2 in area;
- Overhead walkway connecting the warehouse mezzanine to the office building;
- Two driveway accesses, (1) tractor entrance from Brock Road South; and (2) employee entrance from Gilmour Road;
- 170 employee parking surface parking spaces
- 123 tractor and trailer parking spaces
    - 50 tractor parking spaces
    - 73 trailer parking spaces
- 21 loading spaces
- Septic bed 600m^2 in area with septic tanks oriented in the front yard;
- Landscape/planting buffer along the front yard and board fence along the side yard.

3.2 Planning Applications

Zoning By-law Amendment

The proposed development is for a warehouse use consisting of a warehouse, office and a parking area. The subject lands are currently zoned 'Highway Commercial', which does not permit the proposed use. In order to facilitate the proposed warehouse use, a Zoning By-law Amendment is required to re-zone the lands to the 'Industrial' zone. This Zoning By-law Amendment application is being submitted with technical studies and reports in support of the application.

Site Plan Application

A site plan application is required and will be filed separately with the Township following the approval of this Zoning By-law Amendment. The site plan application will address matters of landscaping, lighting, building materials/colours, parking layout and detailed site servicing details.

4.0 PLANNING ANALYSIS

The proposed development must be assessed in terms of applicable policies prescribed by the Province, County and Township. The following is a review of the applicable land use policy framework related to the subject lands, and how the proposal will meet the applicable policy considerations.

4.1 Provincial Policy Statement, 2020

The Provincial Policy Statement (the "PPS") was issued under Section 3 of the Planning Act and applies to planning decisions made on or after May 1, 2020. As a result, the 2020 PPS is applicable to the proposed development.

The PPS outlines policy for Ontario's long term prosperity, economic health, and social well-being. These directives depend on the efficient use of land and development patterns that support strong, sustainable, and resilient communities that protect the environment and public health and safety, and facilitate economic growth. One of the key considerations of the PPS is that planning decisions *"shall be consistent with"* the Policy Statement. The following is an analysis of the development in the context of the policies in the PPS.

4.1.1 *Rural Areas*

Policy 1.1.4 of PPS provides direction on Rural Areas, which are systems of lands that include rural settlement areas, rural lands, natural heritage, agricultural areas, or other resource areas. Ontario's rural areas consist of diverse geographies, physical characteristics, and economies. Policy 1.1.4.1 provides that healthy, integrated and viable rural areas should be supported by building upon: rural character, leveraging rural amenities, promoting regeneration, accommodating a range of housing in the rural settlement areas, encouraging the conservation of rural housing, using rural infrastructure efficiently, diversifying the economic base, and conserving biodiversity. Generally, development will be directed to rural settlement areas, however, growth can be accommodated on rural lands.

The proposed development is located within the rural area of the County of Wellington and is designated 'Secondary Agricultural' as well as 'Puslinch Economic Development Area'. The Brock Road South corridor is a major transportation route for the County that has a range of industrial and commercial uses on either side. The subject lands are adjacent to the settlement area of Aberfoyle and the land use designations of the County Official Plan permit and encourage employment type land uses. The proposed development will diversify the economic base of the County, provide jobs, and is permitted in accordance with the rural areas policies of the PPS.

4.1.2 *Land Use Compatibility*

Policy 1.2.6 of the PPS speaks to land use compatibility between major facilities and sensitive land uses. Major facilities are defined as facilities which may require separation from sensitive land uses and can include industrial land uses. Development between major facilities and sensitive land uses is to avoid or minimize potential adverse impacts such as noise or odour. Where avoidance is not possible, the long term viability of planned industrial uses is to be protected from encroachment of sensitive land uses.

The proposed development is identified as an area planned for major facilities and is surrounded by industrial, commercial and aggregate land uses. There are surrounding residential land uses which are considered to be sensitive land uses. While the Puslinch Zoning By-law makes a distinction between industrial uses and warehouse uses, there is potential for nuisances associated with a warehouse and transportation hub. In order to ensure land use compatibility between the proposed use and the adjacent residential property to the north, the proposed buildings have been oriented away from the residential property towards the Brock Road South frontage. The truck entrance/exit has been located on Brock Road South, away from the residential property on Gilmour Road. Further, the parking lot that will be closest to the residential property will be fenced and screened along the perimeter of the property line. The proposed use of the subject lands will be for the storing and movement of goods. No manufacturing, production, processing, or outdoor storage is proposed on the lands. Nuisances associated with the warehouse are expected to be limited to the movement of vehicles. Additionally, the land use designation of the property permits the proposed use, as well as land uses which would be considered higher class industrial uses. Land use compatibility will be adequately addressed through site design measures.

4.1.3 *Employment*

The PPS makes a number of provisions under policy 1.3 for promoting economic development. Such provisions include providing opportunities for a diversified economic base by maintaining suitable sites for employment uses, facilitating conditions for economic investment by identifying strategic sites and ensuring infrastructure is provided to support planned needs, as well as protect employment areas in proximity to major corridors for employment uses.

The subject lands are designated by the County as an economic development area intended for employment uses. The location of the lands is adjacent to a County road, considered to be a major corridor for the County's transportation network, and is in close proximity to the Provincial Highway 401. The subject lands are intended for employment use and are proposed to be used in accordance with their planned function.

4.1.4 *Sewage, Water and Stormwater*

As per policy 1.6.6.2 of the PPS, municipal sewage services and municipal water services are the preferred form of servicing for settlement areas. Where municipal services are not available, private services are permissible.

A servicing and stormwater management report, as well as a wastewater servicing report have been prepared for the proposed development. The Reports prepared in support of the proposed development assesses the feasibility of servicing the subject lands and conclude that the proposed development can be adequately serviced through private services. Water will be provided to the site via an on-site well, and wastewater will be treated on-site with a waste water treatment system. Stormwater will be managed through parking lot storage and an oil/grit separator, as well as an underground infiltration gallery. Summary of both reports is included in Section 6.0 of this report.

4.1.5 *Transportation*

Policy 1.6.7 of the PPS provides that transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods and are appropriate to address projected needs.

The proposed development will be appropriately connected to the existing road network. The subject lands will be accessed from both Brock Road South and Gilmour Road, which provide access to other key corridors including Highway 401, Highway 6 (both North and South), Highway 34, and Victoria Road South. This section of the Brock Road corridor is planned for employment type land uses and has been planned to accommodate high volumes of traffic. The proposed development supports the overall objectives for the surrounding transportation network and will ultimately maintain the use of major transit corridors for the movement of goods. Additionally, a Traffic Impact Study has been prepared, which is summarized in Section 5.0 of this report. The TIS concludes that additional traffic generated by the development is acceptable and will not result in significant delay of vehicular movement.

4.1.6 *Energy Conservation, Air Quality and Climate Change*

Policy 1.8 of the PPS provides that municipalities are to prepare for the impacts of a changing climate. Relevant policies for this development include: promoting compact development, focusing major employment commercial and other travel intensive land uses in areas well served by transit, focus freight intensive land uses to areas well served by major highways, airports, rail and marine facilities, encourage transit supportive development, and promote designs which are energy efficient.

The proposed development provides an opportunity for development in a location well situated relative to existing and planned commercial, industrial and aggregate development. The subject lands are oriented to Brock Road South and will be well served by major roads and highways. The intent of the proposed development is to construct a modern, state of the art facility that is energy efficient. The subject lands will serve as a centralized location for the company, and will be the new location of the Puslinch warehouse and head office. The new facility will be designed with more sustainable materials and energy efficient elements.

4.1.7 *Natural Heritage*

Policy 2.1 provides direction on Natural Heritage features, which are to be protected for the long term. Development and site alteration are not permitted in or adjacent to significant wetlands, woodlands, or valleylands in Ecoregions 6E and 7E, or significant wildlife habitat unless it has been demonstrated that there will be no negative impacts on the natural features or functions.

The subject lands are located in Ecoregion 6E, and contain a significant woodland as well as two unevaluated wetlands. No development is proposed within the woodland or wetland area, and a buffer of 37m has been provided to these environmental features. The subject lands were previously evaluated through an EIS by the past owner, which was subsequently approved. A new Scoped Environmental Impact Study has been completed for the proposed development as an update to the previous study. The scoped EIS provides recommendation measures for the proposed development and anticipates that no significant negative environmental impacts will occur as long as the recommendations are followed. The EIS is summarized in Section 6.0 of this report.

4.1.8 *PPS Summary*

The 2020 PPS seeks to achieve healthy, livable and safe communities by promoting efficient development and land use patterns. Given the above assessment, in our opinion the proposed development plan is consistent with the broad vision of land use planning in Ontario. In this respect, the intended use of the lands:

- Represents efficient development and will diversify the economic base of the County,
- Proposes a warehouse use in accordance with the Employment policies and will be located along a major road with access to a major highway;
- Promotes a scale and type of development appropriate for the neighborhood that will utilize existing infrastructure where possible and support the safe movement of people.

In light of these considerations, it is our opinion that the proposed development is consistent with the PPS.

4.2 Growth Plan for the Greater Golden Horseshoe

The 2020 A Place to Grow – Growth Plan for the Greater Golden Horseshoe ('A Place to Grow') came into effect on August 26, 2020. This Plan is the framework for implementing the Provincial Government's initiative to plan for growth and development in a way that supports the economic prosperity, protects the environment, and helps communities achieve a high quality of life.

Policy 1.2.1 of A Place to Grow sets out the guiding principles of the Plan. These principles include: supporting the achievement of complete communities that are designed to support healthy, active living and meet the needs of daily living; prioritizing intensification and higher densities to make efficient use of land and infrastructure and support transit viability; providing flexibility to capitalize on employment opportunities; supporting a range and mix of housing options; improving the integration of land use planning with planning and investment in infrastructure and public service facilities, and providing for different approaches to manage growth that recognize the diversity of communities in the Greater Golden Horseshoe.

The subject lands are located within the Outer Ring Growth Plan Area, however, are not a delineated Built-up Area as per Schedule 2 of the Plan. The subject lands are located within the Rural Area of the County of Wellington and are considered to be within a Rural Settlement Area. In accordance with policy 2.2.9 of A Place to Grow, municipalities are encouraged to plan for a variety of economic opportunities within rural settlements. The Growth Plan forecasts population and employment projections to 2051. The County of Wellington is forecast to have a resident population of 160,000 and an employment population of 70,000 by 2051.

Policy 2.2.5 of the Growth Plan provides direction on employment and economic development, which is to be promoted by:

- Making more efficient use of existing employment areas and vacant employment lands and increasing employment densities;
- Ensuring the availability of sufficient land in appropriate locations for a variety of employment to accommodate forecasted employment growth
- Integrating and aligning land use planning and economic development goals to attract investment and employment.

Other relevant policies include the designation and preservation of lands within settlement areas located near major goods movement facilities and corridors for warehousing and logistics, as well as the designation of employment areas in official plans to protect them over the long-term.

The subject lands are in a Municipality slated for growth and are designated in the Official Plan for industrial land use. In accordance with the Growth Plan policies, the Official Plan has planned for this corridor of Brock Road South to accommodate a large portion of employment uses. The proposed development will be for warehousing and logistics, and is located in area convenient for the transportation and movement of goods near the Highway 401 and County Roads.

Based on the above, it is concluded that the proposed Zoning By-law Amendment conforms to the policies of A Place to Grow.

4.3 County of Wellington Official Plan

The County of Wellington Official Plan was approved by the Minister of Municipal Affairs on April 13 1999. The Plan pre-dates the 2020 PPS and 2020 Growth Plan. As of the date of this report, the County was undertaking a Municipal Comprehensive Review of their Official Plan to implement the 2020 PPS and Growth Plan.

The Plan outlines a vision and establishes a number of general policies to plan and manage growth and implement provincial land use policy. The County Official Plan provides a policy framework that establishes the goals and objectives, statements, land use designations, and policies intended to guide physical, social, and economic development within the County while protecting the natural environment.

The development lands are designated Secondary Agricultural and are within Special Policy Area PA7-1 identified as Puslinch Economic Development Area (see **Figure 3**).

4.3.1 *Economic Development*

The County Official Plan provides a range of general policies in Part 4. Included in section 4.2 are policies related to economic development, which direct the County to ensure that sufficient land is available to accommodate a range and mix of employment opportunities, including industrial uses. The policies of the Official Plan also encourage a variety of employment opportunities at various locations. Urban areas in the County are intended to accommodate a large portion of employment lands, however, rural opportunities are also encouraged. The rural system can contribute lands for employment uses based on the ability to provide larger sites and access to major roads.

The proposed use of the lands will be a warehouse and freight logistics hub. The subject lands are located within the rural system, along a major County road and are adjacent to the settlement area of Aberfoyle. Further, the lands are located in the Puslinch Economic Development Area, which is intended for employment uses. The proposed development will support economic development by providing employment opportunities, encourage investment in the municipality, and will generate tax revenue. The proposal will diversify the economic base of the County and is consistent with the intent of the economic development policies.

4.3.2 *Rural System*

Part 6 of the Official Plan provides policies for the rural system, which is comprised of agricultural lands, aggregate lands, recreational uses, rural housing, rural employment, waste management, and special use areas. Rural employment lands are intended to provide locations for business activities that may be better served by sites outside urban areas.

The subject lands are designated Secondary Agricultural Area, which comprises the Rural System. Secondary Agricultural lands are non-prime agricultural areas, however, can sustain agricultural activities. Permitted uses may include all uses permitted in prime agricultural areas, small scale commercial, industrial and institutional uses, as well as public service facilities.

Commercial, industrial and institutional uses are only permitted when: sewage and water systems can be established, the proposed use is compatible with surrounding uses, the use requires a non-urban location, the use will not preclude agricultural or mineral aggregate operations, and the use will be small scale and take place on one lot.

Additionally, the subject lands are within a special policy area (PA7-1): Puslinch Economic Development Area. This area is intended to provide economic activity and employment opportunities and is the predominant location for business and industry in the Township. The proposal will be adequately serviced via the establishment of private services, including sewage, water, and stormwater management. The proposal will take place on one lot, and will not preclude the use of adjacent lands for permitted uses.

4.3.3 *Environmental Services*

Part 11 of the Official Provides policies on water and waste water services, storm water management facilities and waste management services. For rural system servicing, development in the rural system is to be on individual on-site systems where soil conditions are suitable.

A stormwater management report, and a wastewater servicing report have been prepared for the proposed development. The Reports prepared in support of the proposed development assesses the feasibility of servicing the subject lands and conclude that the proposed development can be adequately serviced through private services. Water will be provided to the site via an on-site well, and wastewater will be treated on-site with a waste water treatment system. Stormwater will be managed through parking lot storage and an oil/grit separator, as well as an underground infiltration gallery. A summary of both reports is included in Section 6.0 of this report.

4.3.4 *Greenlands System*

Part 5 of the Official Plan outlines policies on the County's Greenland System, which comprise natural heritage areas. A portion of the property contains and is adjacent to the 'Core Greenland's' designation and contain Significant Woodlands as well as unevaluated wetlands. The Official Plan provides that development and site alteration are not permitted in provincially significant wetlands and that significant woodlands are to be protected from development or site alterations. Where development is proposed within or adjacent to Greenlands, an Environmental Impact Assessment will be required.

It should be noted that the wetlands on the subject property are not considered to be provincially significant. Nonetheless, no development is proposed within the wetland or woodland areas and a buffer of 37m has been provided between proposed development and the environmental features. Two Environmental Impact Studies have been completed for the subject lands. The most recent EIS has been completed in support of the proposed development. The updated EIS provides recommendations to avoid any conflict with the environmental features and concludes that no significant negative environmental impacts will occur. The EIS is summarized in Section 6.0 of this report.

4.3.5 *Official Plan Summary*

Given the above assessment, it is our opinion the proposed development conforms with the County Official Plan objectives and policies. The proposed development will support the economy and diversify the economic base of the municipality by providing employment, tax revenue, and investment. The proposal is consistent with the land use designations and will support the intended employment use of the lands. Further, the proposal will utilize the existing transportation system and can be adequately serviced via private servicing. The proposal is a beneficial addition to Puslinch and will utilize the lands for their highest and best use.

5.0 Zoning By-law No.023-18

The subject lands are currently zoned Highway Commercial special 89 (HCsp.89) in the Township of Puslinch Zoning By-law No. 023-18. The Highway Commercial zone is intended to provide commercial uses serving the traveling public, or uses not considered compatible with the Central Business District of Aberfoyle (located to the north). The special provision (89) applied to the lands restricts permitted uses. The proposed use of the property as a warehouse is not permitted in the HC zone or by special provision 89. The Industrial zone, however, permits warehouse uses. Therefore, a zone change is proposed to change the zoning of the lands from Highway Commercial to Industrial.

The Industrial zone permits a range of land uses, including a transportation terminal and warehouse. The proposed development of the lands would conform to the permitted land use permissions of the Industrial zone. Additionally, the Industrial zone would be consistent with the Official Plan Special Policy Area (Puslinch Economic Development Area) which encourages a range of employment uses. The proposed zone change would better support the Official Plan in this regard.

The Zoning By-law makes a distinction between industrial use, transport terminal and warehouse use. The Industrial use is defined as: *the processing of goods and materials; the assembly of manufactured goods; the manufacturing of goods; the repair and servicing of goods and similar uses; including any permanent storage facilities or accessory equipment that is in conjunction with the use.*

A transport terminal is defined as: *storing, servicing, washing, repairing, dispatching or loading of trucks and/or transport trailers with materials or goods that are not manufactured, assembled, or processed on the same lot, and which may include a warehouse.*

A warehouse is defined as: *a building which is used primarily for the housing, storage, adapting for sale, packaging or wholesale distribution of goods, wares, merchandise, food stuff substances and articles, but does not include a fuel storage tank.*

While the Zoning by-law clearly distinguishes industrial uses from warehouse uses, the transportation terminal and warehouse use are permitted within the Industrial zone. The proposed development would conform to all the zoning requirements of the Industrial zone and would better implement the Official Plan Special Policy Area policies. Ultimately, the proposed amendment will better align the land use framework by supporting the Official Plan economic development objectives, as well as the land use policies established for the subject lands. A zoning analysis table is included as Appendix A which demonstrates compliance with all Industrial zone provisions.

6.0 TECHNICAL REPORTS

All technical reports have been submitted with the Zoning By-law Amendment application. Below includes a brief summary of each report.

6.1 Functional Servicing and Stormwater Management Report

A Servicing and Stormwater Management Report has been completed by Meritech Engineering to evaluate the proposed servicing of the site. The subject lands will be serviced by a private septic system and construction of a new well. Firefighting water supply will be stored in a reservoir under the building and a hydrant on site. Storm servicing will be managed by catch basins located throughout the site which will capture runoff and lead to an oil/grit separator prior to being discharged into the Brock Road ditch. Stormwater flows will be achieved by rooftop and parking lot storage, and an infiltration gallery for capturing roof runoff. Native soils on-site are conducive to infiltration.

Additionally, FlowSpec Engineering completed an onsite wastewater servicing assessment for the proposed development. FlowSpec recommends a private, Class 4 wastewater treatment system on the northwest corner of the property to service the site.

6.2 Geotechnical Investigation Report

Chung and Vander Doelen Engineering Ltd. (CVD) was retained to complete a Geotechnical Investigation for the proposed development. The purpose of the report is to determine subsurface conditions and make recommendations. As a result of the previous use of the site as a fill operation, portions of the site have been regraded with disruption to fill. The report recommends:

- Construction of engineered fill in areas where non-suitable soil exist and areas to be raised to support the building and pavement areas;
- To salvage inorganic granular based soil excavated and repair and reuse it for site regrading;
- Any engineered fill should be constructed in the summer and early fall when dry warm weather exist;
- Onsite soils are susceptible to softening when exposed to excessive moisture. As a result, grading and filling are to be planned to direct run-off to low points and be drained.

The Geotechnical Investigation was consulted in the preparation of the other engineering reports.

6.3 Environmental Impact Study

Natural Resource Solutions Inc. (NRSI) completed a scoped Environmental Impact Study. The purpose of the study is to provide a characterization of existing natural features, analyze sensitivity of natural heritage, identify natural feature constraints and assess for potential impacts associated with the proposed development. The EIS provides the following recommendations:

- Implement a no-touch buffer of 15m for the wetlands;
- Implement a 5m no-touch buffer for the woodland followed by an additional 5m buffer where grading is permitted;
- Install construction limit fencing along the outer edge of construction/grading/buffer limit prior to any clearing or construction activity;
- Tree Inventory and Preservation Plan be prepared, including details of protection for off-site hedgerow trees;
- All vegetation/tree clearing should be conducted outside of the core bird nesting season (April 1 to August 31);
- Nest searches should be conducted by a qualified biologist where vegetation/tree clearing cannot be maintained outside of the core bird nesting season;
- Implement Stormwater Management Plan and recommendations provided by Meritech;
- Mitigate spring and summer construction noise impacts by restricting activities to between 7:00 am and 7:00 pm during April to August;
- Turn off construction lighting at the end of each day;
- Implement measures to mitigate dust;
- Permanent lighting of the parking lots to be directed away and shielded from shining into the woodland and wetlands;
- Prepare and implement an Erosion and Sediment Control plan.

The study concludes that no adverse impacts are expected as a result of the proposed development, as long as the recommendations outlined are adhered to.

6.4 Transportation Impact Study

Paradigm Transportation Solutions Ltd, completed a Transportation Impact Study (TIS) in support of the proposed development. The TIS forecasts the proposed development to generate 108 to 112 trips during peak hours, which will delay traffic at the Brock Road South and driveway entrance by one second or less, which is not significant. The report concludes that the intersection of Brock Road South and the driveway is forecast to operate at acceptable levels. In order to allow the transport trucks to safely slow down before turning into the site the report recommends that a northbound right turn lane be at the site driveway.

7.0 PUBLIC CONSULTATION STRATEGY

The Planning Act (specifically O. Reg 544/06, amended by O. Reg. 178/16) requires that applicants submit a proposed strategy for consulting with the public with respect to an application as part of the 'complete' application requirements. This section summarizes the proposed Public Consultation Strategy.

We propose that the public consultation process for the proposed Zoning By-law Amendment application follow the Planning Act statutory requirements. Should it be deemed necessary by the Township, an informal public meeting could also be held early in the process, prior to a statutory public meeting.

The following points of public consultation are proposed:

- An informal public meeting organized by MHBC (if deemed required).
- A statutory public meeting advertised by the Township and heard by Council.
- Direct written responses to comments raised through the public consultation process will be provided to Township Staff for their review and consideration in the preparation of a Township Staff Report.
- Preparation of a Township Staff Report, with the Report to be available to the public in advance of Township Council's consideration of the applications. It is understood that Township Staff will post information on the Township's website for public review. This will include the Township Staff Report and may also include technical studies and reports prepared in support of the applications.
- A Council Meeting, at which time the Township Staff Report, all available information, and public input will be considered in Council's final decision.

The consultation strategy proposed will provide members of the public with opportunities to review understand and comment on the proposed Zoning By-law Amendment application. The consultation strategy will be coordinated with Township Staff and additional opportunities for consultation will be considered and may be warranted based on the input received.

8.0 SUMMARY & CONCLUSIONS

In summary, the proposed Zoning By-law Amendment and related development proposal is in the public interest and represents good planning for the following reasons:

- The proposed development will support economic development and employment opportunities for the County and Township;
- The proposed development will optimize the use of available infrastructure, including transit corridors, and can be adequately serviced through private servicing;
- The proposed site and building design will result in an attractive, high quality development which will be compatible with the Brock Road employment corridor;
- The proposed Amendment and development proposal are consistent with the PPS, and conform to A Place to Grow, and County Official Plan policies.

Based on these conclusions, it is our opinion that the application for Zoning By-law Amendment is appropriate and should be considered for approval.

Respectfully submitted,

MHBC

[redacted]

Pierre Chauvin, MA, MCIP, RPP
Partner

[redacted]

Gillian Smith, MSc.
Planner

Figures

Figure 1:

Location Map

LEGEND

Subject Lands (5.768ha/14.253ac)

DATE: December 2022

SCALE: 1:7,500

FILE: 2230A

DRAWN: LC

north

K:\2230A - 128 BROCK RD SOUTH\RPT\LOCATION.DWG

128 Brock Road South
Township of Puslinch
Wellington County

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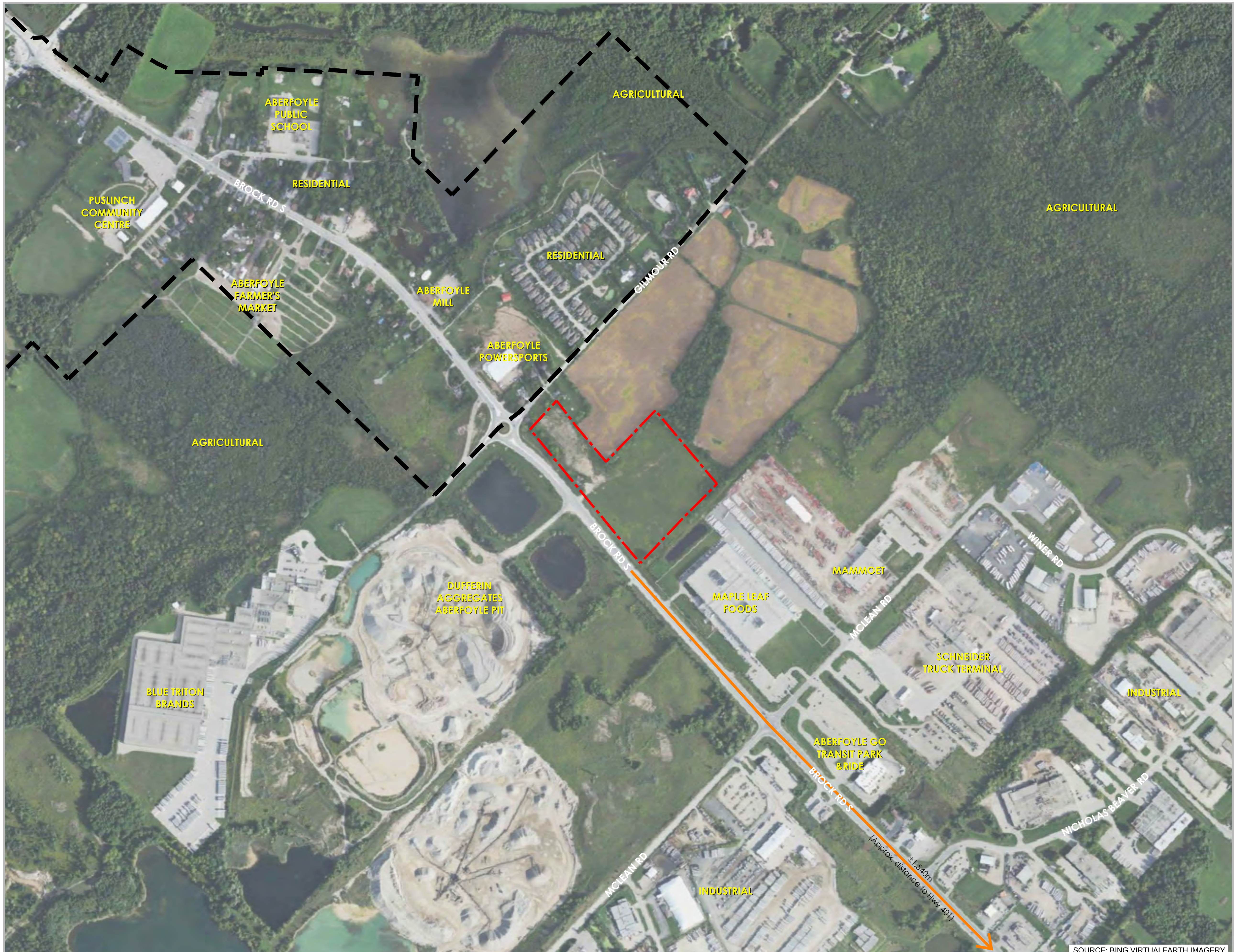
Figure 2:
Context Map

128 Brock Road South
Township of Puslinch
Wellington County

LEGEND

Subject Lands

Aberfoyle Settlement Boundary



DATE: December 2022

SCALE: 1:7,500

FILE: 2230A

DRAWN: LC

north

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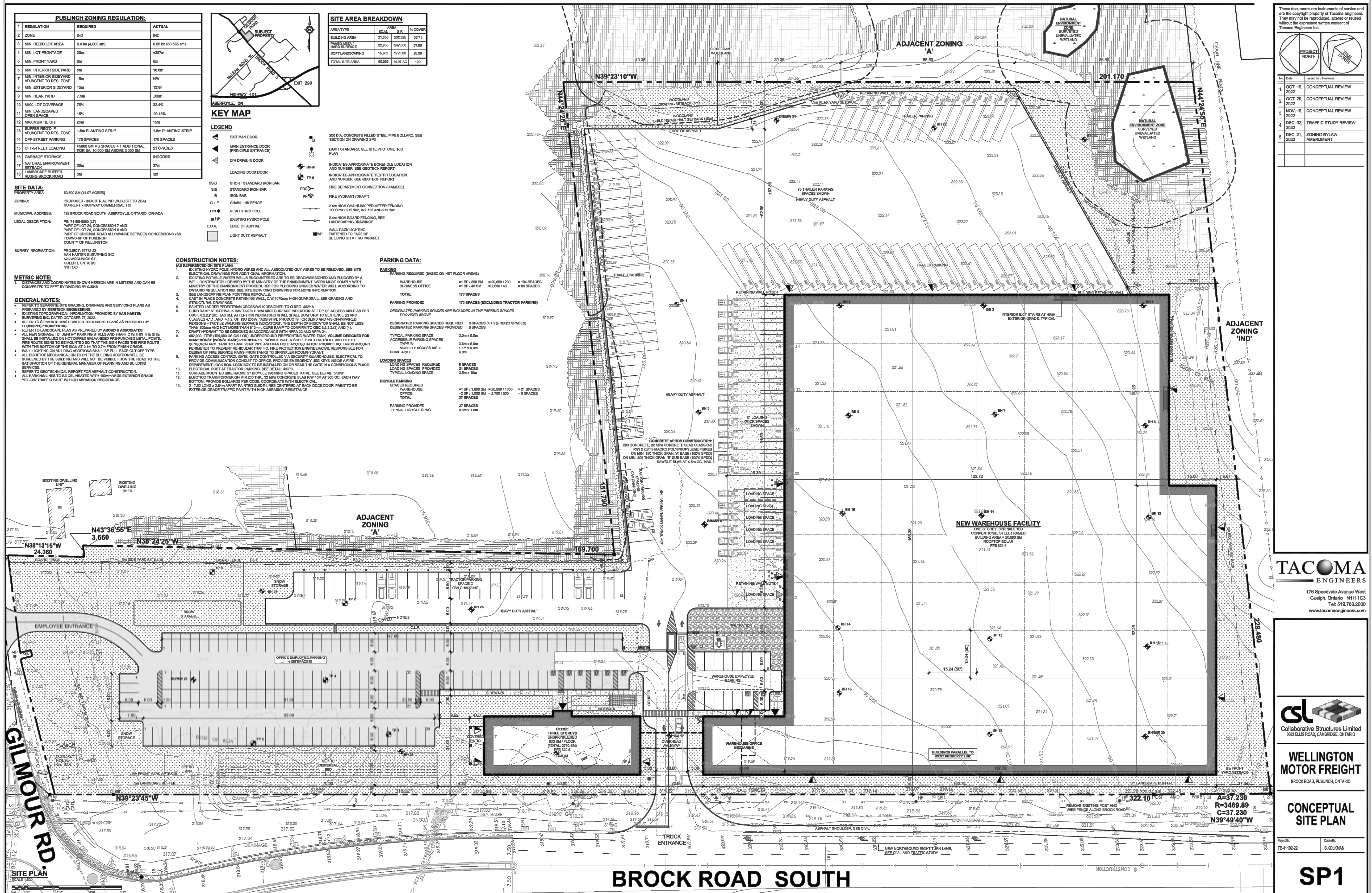
Figure 3:
Site Plan

128 Brock Road South
Township of Puslinch
Wellington County

LEGEND



PUSLINCH ZONING REGULATION:			
1	REGULATION	REQUIRED	ACTUAL
2	ZONE	IND	IND
3	MIN. REQ'D LOT AREA	0.4 ha (4,000 sm)	6.05 ha (60,565 sm)
4	MIN. LOT FRONTAGE	30m	±387m
5	MIN. FRONT YARD	6m	6m
6	MIN. INTERIOR SIDEYARD	5m	10.6m
7	MIN. INTERIOR SIDEYARD ADJACENT TO RES. ZONE	15m	N/A
8	MIN. EXTERIOR SIDEYARD	15m	137m
9	MIN. REAR YARD	7.5m	±68m
10	MAX. LOT COVERAGE	75%	33.4%
11	MIN. LANDSCAPED OPEN SPACE	15%	29.18%
12	MAXIMUM HEIGHT	25m	15m
13	BUFFER REQ'D IF ADJACENT TO RES. ZONE	1.5m PLANTING STRIP	1.5m PLANTING STRIP
14	OFF-STREET PARKING	170 SPACES	170 SPACES
15	OFF-STREET LOADING	>5000 SM = 3 SPACES + 1 ADDITIONAL FOR EA. 10,000 SM ABOVE 5,000 SM	21 SPACES
16	GARBAGE STORAGE		INDOORS
17	NATURAL ENVIRONMENT SETBACK	30m	37m
18	LANDSCAPE BUFFER ALONG BROCK ROAD	3m	3m

SITE AREA BREAKDOWN			
AREA TYPE	AREA SQ.M.	AREA S.F.	% COVER
BUILDING AREA	21,630	232,825	35.71
PAVED AREA / HARD SURFACE	22,953	247,066	37.90
SOFT LANDSCAPING	15,982	172,030	26.39
TOTAL SITE AREA	60,565	14.97 AC	100

DATE: January 2023

SCALE: N.T.S

FILE: 2230A

DRAWN: LC

north

K:\2230A - 128 BROCK RD SOUTH\RPT\SITE PLAN.DWG

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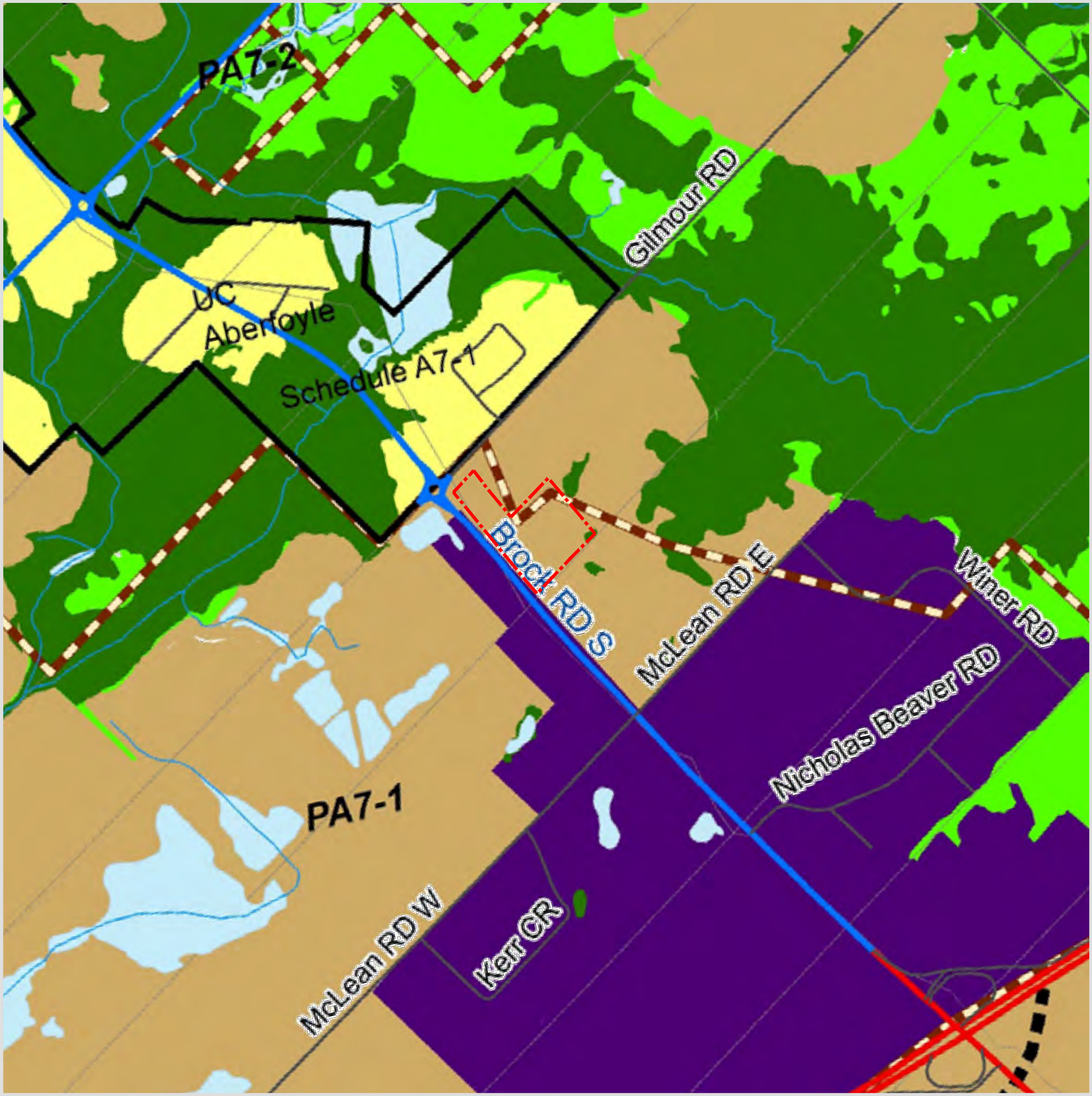

Figure 4:

Wellington County Official Plan- Schedule A7 Puslinch

128 Brock Road South
Township of Puslinch
Wellington County

LEGEND

Subject Lands

The Greenlands System
Core Greenlands
Greenlands
Earth Science ANSI

The Rural System
Prime Agricultural
Secondary Agricultural
Mineral Aggregate Area
Recreational
Rural Employment Area
Country Residential
PA Policy Area

The Urban System
H. Hamlet Area
U.C. Urban Centre

Other
Landfill Site
Proposed Interchange
Proposed Major Roadways
County Roads
Provincial Highways

DATE: December 2022

SCALE: 1:15,000

FILE: 2230A

DRAWN: LC

north

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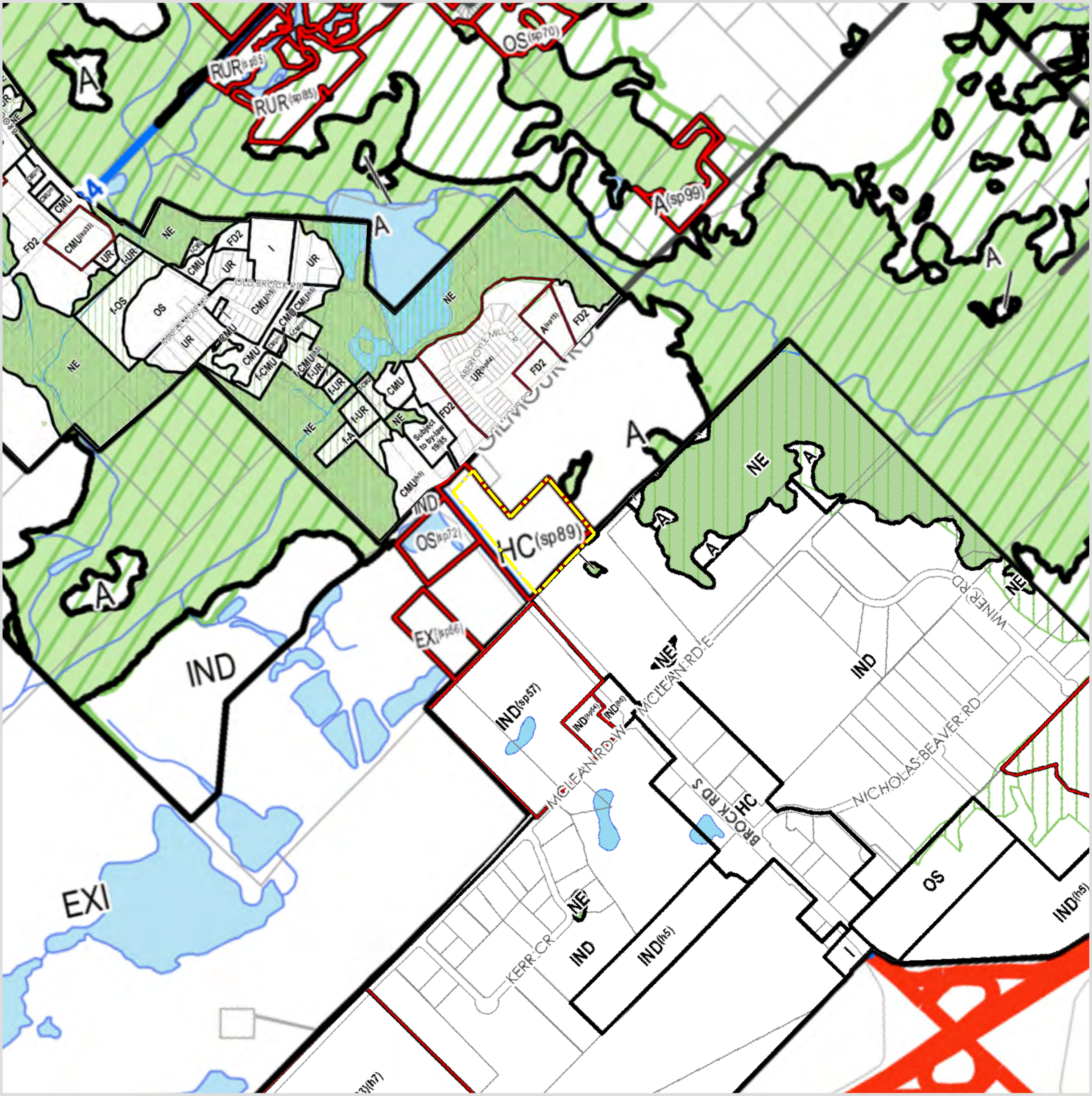

Figure 5:

Puslinch Zoning By-law No. 023-18 Current Zoning

LEGEND

Subject Lands

- Site Specific Exemption
- Zoning Limits
- Environmental Protection Overlay
- Natural Environment

Zone Descriptions

A	Agricultural
AC	Agricultural Commercial
C	Commercial
CMU	Core Mixed Use
DI	Disposal Industrial
EXI	Extractive Industrial
FD	Future Development
FD	Future Development
HC	Highway Commercial
HR	Hamlet Residential
I	Institutional
IND	Industrial
NE	Natural Environment
OS	Open Space
RC	Resort Commercial
RR	Resort Residential
RUR	Rural Residential
UR	Urban Residential
f-	Aberfoyle Flood Plain Overlay
(sp#)	Site Specific Exemption
(h#)	Holding Provision
(t#)	Temporary Zone

DATE: December 2022

SCALE: 1:15,000

FILE: 2230A

DRAWN: LC

north

K:\2230A - 128 BROCK RD SOUTH\RPT\PUSLINCH ZBL.DWG

128 Brock Road South
Township of Puslinch
Wellington County

PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

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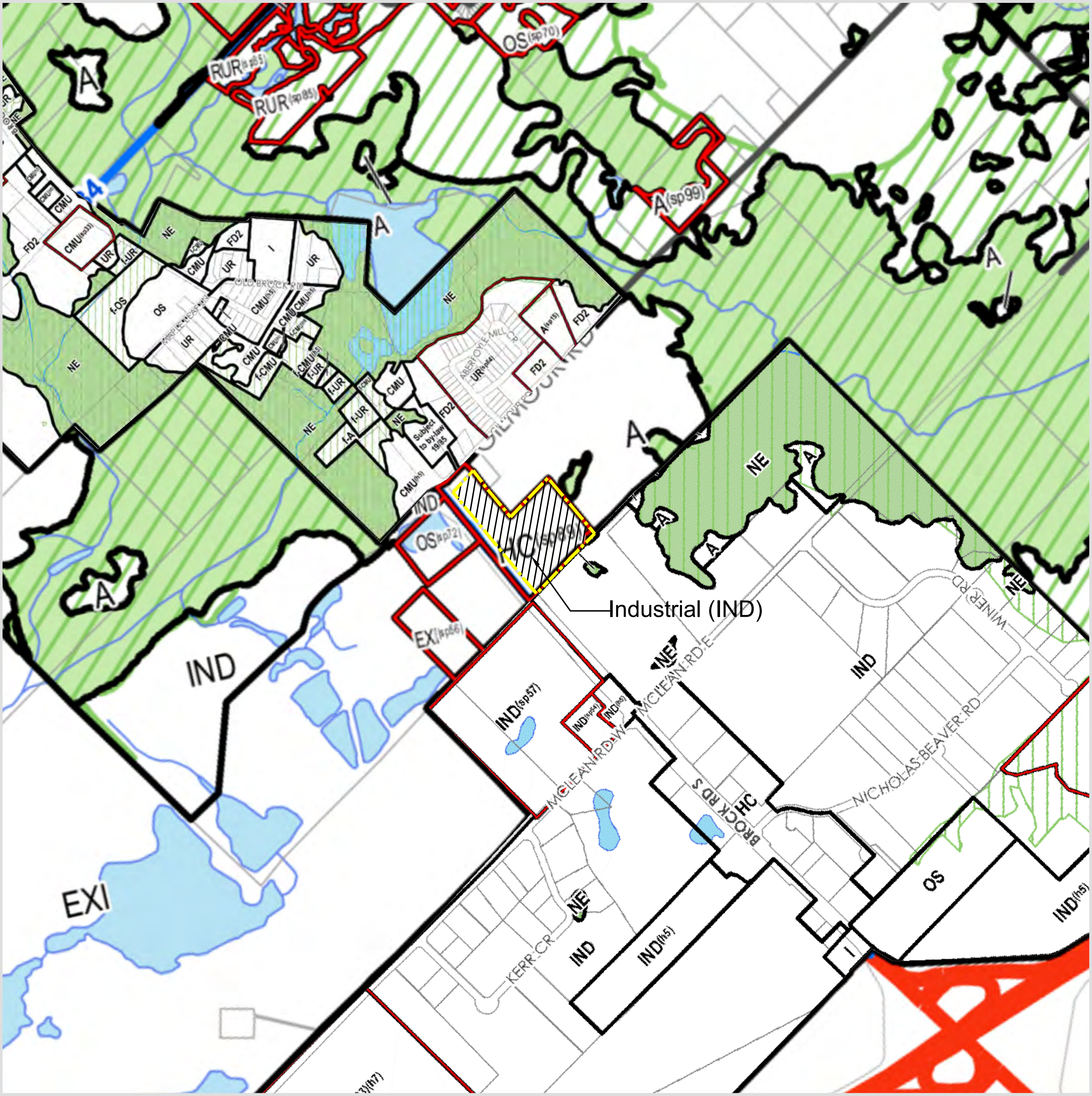

Figure 6:
Proposed Zoning

LEGEND

Subject Lands

Proposed to be rezoned from Highway Commercial special 89 (HC sp.89) to Industrial (IND)

Site Specific Exemption
Zoning Limits
Environmental Protection Overlay
Natural Environment

Zone Descriptions

A	Agricultural
AC	Agricultural Commercial
C	Commercial
CMU	Core Mixed Use
DI	Disposal Industrial
EXI	Extractive Industrial
FD	Future Development
FD	Future Development
HC	Highway Commercial
HR	Hamlet Residential
I	Institutional
IND	Industrial
NE	Natural Environment
OS	Open Space
RC	Resort Commercial
RR	Resort Residential
RUR	Rural Residential
UR	Urban Residential
f-	Aberfoyle Flood Plain Overlay
(sp#)	Site Specific Exemption
(h#)	Holding Provision
(t#)	Temporary Zone

128 Brock Road South
Township of Puslinch
Wellington County

DATE: December 2022

SCALE: 1:15,000

FILE: 2230A

DRAWN: LC

north

K:\2230A - 128 BROCK RD SOUTH\RPT\PROPOSED ZBL.DWG

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Appendix A

Zoning Analysis Table for 'Industrial' Zone			
Provision (Section 9.3)	**Required**	**Proposed**	**Complies (Y/N)**
Min lot area	0.4ha	6ha	Yes
Min frontage	30m	387m	Yes
Min front yard	6m	6m	Yes
Min interior side yard	5m	10m	Yes
Min exterior side yard	15m	137m	Yes
Min rear yard	7.5m	68m	Yes
Max lot coverage	75%	33%	Yes
Min landscaped	15%	29%	Yes
Max building height	25m	15m	Yes
Off-street parking	170	170	Yes
Natural environment setback	30m	37m	Yes
Landscape buffer	3m	3m	Yes

ZONING BY-LAW AMENDMENT to By-law 023/18

for

(Name)
(Address), Puslinch

Township Rezoning Application D14/___

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER ____________

A BY-LAW TO AMEND BY-LAW NUMBER 023/18, AS AMENDED, BEING THE ZONING BY-LAW OF THE TOWNSHIP OF PUSLINCH

WHEREAS, the Council of the Corporation of the Township of Puslinch deem it appropriate and in the public interest to amend By-Law Number 023/18 pursuant to Sections 34 of the Planning Act, R.S.O. 1990 as amended;

NOW THEREFORE THE COUNCIL OF THE CORPORATION OF THE TOWNSHIP OF PUSLINCH ENACTS AS FOLLOWS:

1. That Schedule “A” of By-law 023/18 is hereby amended by rezoning Part Lot 24 Concession 7; Part Lot 24 Concession 8, within the Township of Puslinch, and municipally referred to as 128 Brock Road South, from a Highway Commercial special 89 ZONE to an Industrial ZONE as shown on schedule “A” of this By-law.

2. That Section 14 Site-Specific Special Provisions is amended by adding the following site specific provision:

No.	Zone Designation	Additional Permitted Uses	Prohibited Uses	Site Specific Special Provision
	Industrial	**All uses in the (IND) Zone including: Warehouse and Transport Terminal**	N/A	N/A

3. That the subject land as shown on Schedule “A” to this By-Law shall be subject to all applicable regulations of Zoning By-Law 023/18, as amended.

4. This By-law shall become effective from the date of passage by Council and come into force in accordance with the requirements of the Planning Act, R.S.O. 1990, as amended.

READ A FIRST AND SECOND TIME THIS ______ OF __________________________, 20__.

MAYOR ________________________________ CLERK ________________________________

READ A THIRD TIME AND PASSED THIS ______ OF __________________________, 20__.

MAYOR ________________________________ CLERK ________________________________

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER ____________

Schedule "A"

INSERT MAP

Highlighted area to be rezoned from "**HC.89" Zone** to an **"IND" Zone**

This is Schedule "A" to By-law No.____________

Passed this ____ day of _______________, 20__.

____
MAYOR

____
CLERK

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

EXPLANATION OF BY-LAW NO. __________

By-law Number _________ amends the Township of Puslinch Zoning By-law 23/18 by rezoning Part Lot 24 Concession 7; Part Lot 24 Concession 8, within the Township of Puslinch, and municipally referred to as 128 Brock Road South from a Highway Commercial special 89 (HC.89) ZONE to An Industrial (IND) ZONE to permit Warehouse and Transport Terminal uses.

The subject property is approximately 6.2 hectares (15.3 acres) in size with vegetation and two dwellings on site.

Within the County's Official Plan, the subject lands are designated as Secondary Agricultural lands and are within Special Policy Area 7 (SPA 7). The land use permissions allow for employment uses, including warehouse and transport terminal uses.

Preliminary Servicing and Stormwater Management Report

128 Brock Road South, Aberfoyle
Township of Puslinch

December 2022

1315 Bishop Street North, Suite 202
Cambridge, ON N1R 6Z2

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Project No.: 5228

MERITECH engineering

December 21, 2022

Wellington Group of Companies
c/o Tacoma Engineers
176 Speedvale Avenue West
Guelph, ON N1H 1C3

Attention: Steve Kolkman
Architectural Technologist

Dear Mr. Kolkman,

Re: Preliminary Servicing and Stormwater Management Report
128 Brock Road South, Aberfoyle
Township of Puslinch

Please find our Preliminary Servicing and Stormwater Management Report for the above-noted project for Wellington Motor Freight, in support of rezoning approval.

Our report identifies constraints for sanitary sewerage, water supply, and storm drainage/stormwater management. Our report also considers grading constraints, transportation, and utility availability. Where necessary, reasonable assumptions based on normal industry practices have been used and are described as such.

We understand that there is an open site alteration permit for the site, and that the Township is proceeding with efforts to close the permit. This work is outside of the scope of this report, and it is assumed that there is no interaction between the historical permit and future approvals.

It is our opinion that adequate services exist to support this project. Recommendations from our report shall be incorporated into the detailed design phase of the project (Site Plan Approval).

Yours very truly,

MERITECH ENGINEERING

LICENSED PROFESSIONAL ENGINEER
[redacted]
C. H. TOGERETZ
100147133
12/21/2022
PROVINCE OF ONTARIO

Akshay Anilkumar
Engineer-in-Training

Chris H. Togeretz, P.Eng.
Manager, Design Services

AAK/
Enclosures (1)

cc

Executive Summary

The site is located in the Township of Puslinch on a vacant parcel of land measuring approximately 6 hectares. The site is located at the southeast corner of the intersection of Gilmour Road and Brock Road South, and is proposed to be redeveloped for Wellington Motor Freight.

Servicing objectives include the following:

- Providing an adequate water supply to the site for both domestic and firefighting purposes
- Ensuring that the proposed septic design is adequately sized for the anticipated flows and native soils
- Providing an internal storm water system and stormwater management system in line with Township and County standards

Water is proposed to be provided to the site by a proposed on-site well. The firefighting water supply is proposed to be a large concrete tank under the warehouse.

The proposed development will have an on-site wastewater treatment system. This system will discharge wastewater to the subsurface as treated effluent in accordance with the Ontario Building Code.

The stormwater management approach for the industrial site is that parking lot storage and an oil/grit separator unit provide quantity and quality storage, and that a large underground infiltration gallery infiltrating runoff from the roofs ensures that the pre-development annual infiltration volume is maintained.

Approval agencies shall review and approve this document in support of preliminary planning approvals (e.g. zone change) and provide comments to guide a future site plan application.

Disclaimer

This report was prepared by Meritech Engineering for Tacoma Engineers. The comments, recommendations and materials presented in this report reflect our best judgement in light of the information available at the time of preparation. Except for approval and commenting municipalities and agencies in their review and approval of this project, any use which a third party makes of this report, or any reliance upon, or decisions as a result of, are the responsibility of such third parties. Meritech Engineering accepts no responsibility for damages suffered by any third party, other than an approval or commenting municipality or agency, as a result of decisions made or actions taken based on this report.

Use and Reproduction of This Document

For Further Information

For further information regarding this report please contact the author at the following address:

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f (519) 623-7334
email: norml@meritech.ca

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Introduction

The site is 6.059 hectares and is located at the southeast corner of the intersection of Brock Road South and Gilmour Road in the Township of Puslinch (County of Wellington). The proposed development is a warehouse and truck facility. The site will have two entrances: a main entrance from Brock Road South and a secondary entrance from Gilmour Road for employee parking.

Approach

The preliminary design work presented in this report is in support of rezoning; detailed design will be in support of Site Plan Approval, MECP approval, GRCA fill permit, and building permits.

The following flowchart explains a typical submission and approval process. The sections highlighted in grey indicates the status of this circulation:

Step One
Feasibility of the Development
This circulation establishes the framework for the project and provides a direction for how the site is to develop. This report shows the proposed development is suitable for the proposed zoning and is able to be serviced with standard municipal services.

⇩

Step Two
Preliminary Design
This circulation describes how the plan satisfies the objectives for the site, confirms spatial relationships of the plan within the confines of the site, and provides recommendations to be implemented in the detailed design.

⇩

Step Three
Detailed Design, or Final Design
This circulation integrates the recommendations of the preliminary design into the final site engineering. Approval of this report allows for construction of the proposed development. For site plans, Site Plan Approval and issuance of a Building Permit are contingent on approval of the Detailed Design.

Figure 1: Approach Flowchart

Policy Framework

This chapter outlines the framework upon which the plan is built upon. Previous studies, municipal and provincial standards, as well as any field investigations undertaken to support the project, are examples of information described in this chapter. This background information is then used to build an appropriate plan for the site. The next chapter, Objectives and Targets, describes the site-specific requirements noted from the following sources:

MECP Guidelines

Stormwater Management Planning and Design Manual, Ministry of the Environment, 2003
This manual provides guidelines on the planning and design of stormwater management facilities in Ontario.

Municipal Guidelines

Municipal Development Standards, Town of Puslinch, 2019
This manual provides design guidelines for stormwater management, servicing, and grading.

Conservation Authority Guidelines

Grand River Conservation Authority Preliminary SWM Submission Checklist
This document describes the approaches or content that is required for a preliminary SWM design submission.

Environmental Studies

A Scoped Environmental Impact Study was completed by Aboud and Associates Inc. in 2014 and was approved in 2016. The study was in support of re-grading on part of the site.

In conjunction with the preparation of this report, Natural Resource Solutions Inc. (NRSI) is preparing a report that will describe the potential impacts that could be caused by the proposed development, and recommendations for mitigation.

To date, NRSI has only prepared a higher-level constraints map for the purposes of the EIS. A more detailed inventory and tree preservation plan is required at the Site Plan stage; it is anticipated that a detailed topographic survey of the dripline will be made at a future date.

Geotechnical and Hydrogeological Studies

A report was published in 2014 by MBN Environmental Engineering Inc.

In conjunction with the preparation of this report, Chung & Vander Doelen Engineering (CVD) is preparing reports that will characterize the geotechnical and hydrogeological matters on the property.

Preliminary information received from CVD in advance of the finalization of their reports indicates that:

- The water table is "laterally-discontinuous" due to the variable and layered geological conditions and topography, ranging from primarily low-permeability sand-silt till in the southeast and transitioning to an interlayered granular and sand-silt till in the north and west, which are frequently overlain by fill
- There is a seasonally variable "perched" water table on top of the till deposit in the southeast corner, near the small wetland pocket. The monitoring wells that were installed in 2014 there were not usable in 2022; however, the wetland pockets were observed to be dry in the fall of this 2022 drought year
- There was little evidence of a shallow water table (perched or otherwise) further north and west of the property during the recent drilling program. A somewhat deeper water table was observed at BH21, which is evidence of a transition from the perched water table area in the southeast to a much lower water across the remainder of the property to the north and west (i.e. < 312 masl)
- Based on the data and the elevation of the ponds located west of Brock Road, groundwater flow is interpreted to be directed in a westerly direction across the site and toward these off-site ponds
- The interpreted westerly groundwater flow and westerly topographic slope support the conclusion that the southeast wetland is not influenced whatsoever by any groundwater or surface water runoff originating on the development property, rather the wetland is expected to receive water only from the topographically-higher off site lands to the east and precipitation that falls directly on the wetland itself. These will not change based on developing the property
- Groundwater recharge at the property is expected to move to the west and will ultimately discharge to Mill Creek located about 400m to the west/northwest

CVD recommended that the general area to the north of the warehouse be used for construction of subsurface enhanced recharge facilities for recharging clean rooftop water to meet the water balance: the water table is deep and the silty sand and gravel deposits in the areas is reasonably permeable. A design rate of 25 mm/hr is recommended for the infiltration system which includes a safety factor of 2.

Pre-Consultation/Design Criteria

Pre-Submission Comments from the County of Wellington are dated September 20, 2022. The comments have been included in Appendix E with key items from these comments are included in the following chapter 'Objectives and Criteria'.

Reconnaissance

Meritech staff have visited the site in order to verify existing drainage patterns of the site and adjacent properties, to confirm existing infrastructure surrounding the site, and to make note of some aboveground features on neighbouring properties. Shown in Figure 2 are existing conditions as of November 23, 2022.

Looking south from Brock Road South

Northwest corner of the site (Looking west along Gilmour Road)

Looking south across the site

Looking northwest at an existing depression along Brock Road South

Figure 2: Existing Condition Photographs

Objectives and Criteria

This section outlines the objectives and criteria for the wide variety of issues considered in this report; the following Discussion section will demonstrate how the objectives presented have been achieved and how the criteria are met.

Sanitary Servicing

The primary objective with respect to sanitary servicing is that a sanitary system servicing the site can be constructed as per Ministry of the Environment, Conservation and Parks (MECP), County of Wellington, and Township of Puslinch requirements.

Water Servicing

There are two objectives regarding water servicing: provide domestic water supply as per MECP, County of Wellington, and Township of Puslinch requirements, and ensure that an adequate firefighting water supply is available as per Ontario Building Code and other agency requirements.

Storm Servicing

The primary objective with respect to storm servicing is that a storm sewer system for the site can be constructed as per MECP, County of Wellington, and Township of Puslinch requirements. The development will outlet towards the existing 750mm diameter culvert under Brock Road South. On-site stormwater management features shall be reviewed in conjunction with the storm servicing.

The 750mm diameter culvert was designed to accept flows from the site using a rational runoff 'C' of 0.25 in the 25-year event; refer to Appendix E. Triton Engineering, who completed the recent Brock Road reconstruction project for the County, confirmed via email that the site's flows ought to be directed, as much as possible, to the 750mm culvert rather than the smaller culvert at the intersection of Gilmour Road and Brock Road South.

Stormwater Management

Quantity Control

Brock Road South is a County Road, and thus the Township has deferred to the County for the control requirement. The County has confirmed that the site is subject to quantity (peak flow) control of post-development to pre-development for the 2-year through 100-year design storms.

Quality Control

Quality enhancement is a standard requirement for redevelopment of any site when the level of imperviousness increases.

The MOE SWM Design Manual states that oil/grit separators (OGS) are to be sized to capture and treat at least 90% of the runoff volume that occurs for a site on a long-term average basis for water quality objectives of 'enhanced protection', in addition to the water quality objective of the long-term average removal of 80% of suspended solids in the total runoff volume.

Water Balance & Infiltration

As stated in the pre-submission consultation minutes, and further clarified by the GRCA, maintenance of the pre-development infiltration volumes is important to ensure that downgradient features (i.e. Mill Creek) are not negatively impacted due to development.

The Province's online Source Protection Information Atlas shows that the site is not within a wellhead protection area or intake protection zone; thus, infiltration of clean roof runoff is permitted.

Grading and Drainage

The typical objective is to reduce the cost of the development by minimizing earthworks costs, excessive retaining walls, etc., in addition to meeting the client's requirements related to the grading of drive aisles and parking areas.

Discussion

Site Design

The site is bounded by Gilmour Road to the north and Brock Road South to the west. As a result, the site plan has been laid out with entrances from both streets to provide truck, employee, and fire truck access. Large parking areas for both tractors and trailers, and loading docks at the building, are included. The site plan is attached as Appendix A.

Sanitary Servicing

The proposed on-site wastewater treatment system (WTS) is proposed to be a "Class 4" system as described in the report provided by FlowSpec Engineering included in Appendix F.

The system is comprised of a "moving bed biofilm reactor" and a large septic bed. Coordination with CVD will continue; approval to construct the system will be obtained from the MECP in the form of an ECA.

Details of how flows from the buildings will be conveyed to the WTS facility, whether pumped or by gravity (sewers, manholes) will be included in the detailed design phase.

Water Servicing

The two existing wells in the north of the site will be decommissioned, and a new well will be constructed to meet the water supply demand for domestic flows. Further details are required for the well (confirmation of location; required size and depth; piping to the buildings).

The site will include a one-storey warehouse with a sprinkler system and a three-storey office building with no sprinkler system. The preliminary calculations for the firefighting water supply demands were completed by Spira Fire Protection for Tacoma Engineers, as included in Appendix F.

The firefighting supply requirement for the buildings was calculated to be 159,000 US Gallons (601,880L) for the warehouse and 81,000L for the office building. This is proposed to be provided in a concrete reservoir located underneath the warehouse building.

An emergency fire route to the internal hydrant location, which will be fed from the reservoir, has been provided.

In the detailed design stage it will be confirmed whether the reservoir will be 'topped up' manually; with roof runoff; or with a float mechanism connected to the domestic supply.

Storm Servicing

The site's runoff will be captured in catchbasins located throughout the site, which lead to a controlled outlet and oil/grit separator (OGS) unit prior to being discharged into the roadside ditch along Brock Road South. As the runoff from the site is controlled to pre-development peak flows, the storm sewer system does not operate under free-flowing (gravity) conditions; thus, traditional storm sewer sizing is not applicable.

The peak outflow from the parking lot is able to be conveyed in a 300mm diameter sewer; thus, a mixture of 250mm (catch basin leads) and 300mm diameter sewers are proposed throughout the site.

Details of how the roof drainage will outlet into the infiltration gallery; how an overflow pipe will be configured; and how each of the inlet structures will be connected to the storm sewer system will be provided in support of Site Plan Approval. It is anticipated, as the on-site sewers become shallow at the rear of the site, that long interrupted runs of sewer are preferred over many catch basin manholes in series.

A new culvert under the proposed entrance to the site off Brock Road South is proposed, as shown on the preliminary design included in Appendix B. A culvert on the site under the driveway from Gilmour Road will convey off-site flows to the existing culvert at Gilmour/Brock.

Stormwater Management

The main objective of controlling the post-development peak flows to pre-development flows is achieved with two complimentary measures as shown on the preliminary design in Appendix B:

- Rooftop storage on the warehouse
- Parking lot ponding to a maximum depth of 0.3m and controlled outlet

The additional objectives of quality control and maintaining infiltration are achieved with an oil/grit separator unit and a large infiltration gallery for capture roof runoff.

Minor/Major System Routing

The minor system (5-year storm) and major system (100-year storm) operate in the same manner. Piped flows will be directed towards Brock Road South, up to the capacity of the flow restriction device (an orifice plate or restrictor pipe). In all design storms there will be surface ponding on the parking lots.

In large storm events overland flow routes to the roadside ditches will convey flows. It appears that the elevation of the low point in Gilmour Road is similar to the invert elevation of the existing 750mm diameter culvert under Brock Road South.

Quantity Control

The quantity control target is to attenuate peak flows leaving the site for the 2-year through 100-year events to pre-development peak rates.

Hydrologic Model

Hydrologic modelling was performed using MIDUSS software, which is a widely accepted model for urban developments. It has been used for many years in southern Ontario. A Chicago-type storm was selected and coefficients for the various storm events were taken from the SWM report for the adjacent Aberfoyle Business Park (2004).

Rainfall Data

Storm Event	Definition	a	b	c	r
2-year, 3 hour	Design quality	743	6	0.799	0.4
5-year, 3 hour	Minor system	1593	11	0.879	0.4
10-year, 3 hour		2221	12	0.908	0.4
100-year, 3 hour	Major system	4688	17	0.962	0.4

Table 1: Coefficients for Synthetic Design Storms

Pre-Development

The site was considered as a single pre-development catchment. Suitable modelling parameters for the catchment were chosen, as presented in Table 2, which generated peak flows also summarized in Table 2. Pre-development imperviousness was estimated based on current aerial photography of the site, as the topographic survey did not fully capture the existing gravel driveway/parking areas.

Catchment	Area (ha)			Imper-vious	Slope Length	Slope Gradient	SCS CN	Peak Flow (m^3/s)	
	Controlled	Uncontrolled	Total	(%)	(m)	(%)	(pervious)	5-year	100-year
101		6.059	6.059	4.5	110	2	69	0.093	0.532

Table 2: Pre-Development Modelling Parameters

GM BluePlan Engineering Limited provided several grading plans for neighbouring industrial sites to the south. These plans confirm that minimal external drainage flows onto the property; further, that the catchment area to the culvert under Brock Road South is now smaller than was previously accounted for.

Post-Development

Post-development catchments incorporate the routing of the minor and major storm systems to the proposed stormwater management facilities (rooftop and parking storage). Suitable modelling parameters were selected for each catchment, as presented in Table 3.

Catchment	Area (ha)			Imper-vious	Slope Length	Slope Gradient	SCS CN	Uncontrolled Peak Flow (m^3/s)	
	Controlled	Uncontrolled	Total	(%)	(m)	(%)	(perv)	5-year	100-year
701	2.069		2.069	100	20	0.5	100	0.800	1.377
702	2.900		2.900	85	30	1	69	0.721	1.368
501		1.081	1.081	6	30	5	69	0.034	0.171
Total	4.969	1.081	6.050						

Table 3: Post-Development Modelling Parameters

Performance of the Stormwater Management Facility

Rooftop ponding was estimated based on conservative assumptions. The warehouse roof will be designed so that it can store water up to 6" deep at all the low points in the roof with flow control roof drains. OBC section 7.4.10.4 limits the roof area to 900m² per drain (which will require at least 23 roof drains); 30 roof drains have been assumed at this time. The stage-storage characteristics of the ponding as calculated in MIDUSS are shown below. Specifying the roof drains will be completed in a future design phase, at which time the adequacy of the rooftop storage will be confirmed.

Ponding Depth	Description	Discharge	Live Storage Volume
(m)		(m^3/s)	(m^3)
0.00	Top of roof	0	0
0.05		0.024	200
0.10		0.048	1065
0.15	Maximum storage	0.072	1965

Table 4: Stage Storage Discharge for Rooftop Storage

Parking lot ponding volumes were calculated using the "average end area" method. The resulting stage-storage characteristics are summarized in Table 5.

The outlet structure consists of a 120mm diameter orifice plate designed to create parking lot storage. This storage is up to 0.3m deep. Weir flow will occur once this depth is achieved in the 100-year event.

Elevation	Depth	Description	Orifice	Volumes		
			Discharge	Area	Incr. Volume	Storage
(m)	(m)		(m^3/s)	(m^2)	(m^3)	(m^3)
318.00	0.00	Invert	0.000	0	0	0
320.00	2.00	**Top of Casting**	0.044	0	50	50
320.15	2.15		0.045	7,350	550	600
320.30	2.30	Maximum storage	0.047	11,300	1,400	2,000

Table 5: Stage Storage Discharge for Parking Lot Storage

Table 6 presents the total attenuated peak flow for the range of design storm events. The controlled outflows are less than the allowable.

Event/Condition	2-year (m^3/s)	5-year (m^3/s)	10-year (m^3/s)	100-year (m^3/s)
Pre-development	0.059	0.093	0.163	0.532
Attenuated Post-development	0.059	0.080	0.105	0.217

Table 6: Comparison of Attenuated Peak Flows

Table 7 summarizes the overall performance of the parking lot storage, including volumes and peak discharge.

Description	Elevation (m)	Depth (m)	Volume (m^3)	Discharge (m^3/s)
Outlet (headwall)	317.80	-2.20	-	-
Control structure (orifice plate)	318.00	-2.00	-	0
Catch basin TCs	320.00	0	0	0.044
2-year storm	320.15	0.15	610	0.045
5-year storm	320.19	0.19	968	0.046
10-year storm	320.22	0.22	1,233	0.046
Maximum ponding	320.30	0.30	2,000	0.047
100-year storm	320.301	0.301	2,013	0.108

Table 7: Parking Lot Ponding - Performance Table

In the 100-year storm a portion of the controlled flows is overland over the top of curb.

Quality Control

The water quality requirement provided by the Township is for an "enhanced" level of control (80% TSS removal) which can be attained by providing an OGS unit, to be sized using Imbrium's online sizing program during the detailed design stage.

In support of an ECA with the MECP – necessary due to the industrial uses on the site – a characterization of the site will be required. Generally, the MECP requires to understand what possible pollutants will be present on the site, and what measures will be in place to avoid and mitigate spills.

Water Balance, Infiltration, and Groundwater

An infiltration gallery will be used to maintain the annual pre-development infiltration volume. The gallery has been sized to infiltrate 25mm of runoff from the roofs, as shown on the Thornthwaite-Mather Water Balance calculations in Appendix C.

The pre-development condition is driven by evapotranspiration, due to the existing soils and land cover. Due to the historical presence of multiple low points on the site, the pre-development runoff was conservatively assumed to be 0.

The post-development annual infiltration volume exceeds pre-development conditions.

Site Erosion and Sedimentation Control

Construction activities can cause erosion of native soils, and deposition of sediment on other properties or in receiving watercourses. To avoid these problems siltation control measures, such as silt ponds, silt fencing and construction staging are utilized.

The following issues will be considered in the detailed design stage, in support of Site Plan Approval and GRCA fill permit:

- How disturbed areas will be kept to a minimum and re-vegetated in a reasonable timeframe in order to minimize dust
- Maintenance of the installed E&S measures
- Whether topsoil will be stockpiled on site

Grading and Drainage

The critical input that determines the finished floor elevations (FFEs) for the two buildings is the existing elevation of Brock Road South at the proposed entrance to the site. From the road, the main drive aisle is proposed to be graded at 5% up to a high point between the two buildings; the resulting FFE is 321.5 for the warehouse. Through the detailed design phase the location of the entrances into the building will be confirmed, and there may be opportunity to shift slightly up or down in order to assist in achieving as close to a cut/fill balance for the site as possible.

The site is to be graded away from the buildings so that runoff is be collected at catch basins. Along the south side of the site (i.e. south of the warehouse), surface runoff will be drained via a new swale to the roadside ditch as shown on the preliminary design sketch included in Appendix B. As the existing elevations along the south property line are 2m – 5.5m higher than the proposed FFE, the warehouse wall will be designed as a retaining wall. This allows for the grade outside the building to more closely resemble the existing elevations, and avoiding large retaining walls in the sideyard setback is a benefit to the site and neighbouring properties.

NRSI has delineated preliminary 1m buffers to existing hedgerow trees. If there is fill within those limits, it can be removed, but new fill should not be placed there, nor should it be excavated below natural topography. As the dripline might extend over the proposed parking areas (to be confirmed with a detailed topographic survey), tree removals/mitigation may be required.

Additional environmental issues are discussed in detail by NRSI. Buffers to an adjacent unevaluated wetland and significant woodland are shown on the site plan and have been considered in the grading design for the site.

A depression currently exists along the Brock Road South frontage, straddling property line. As shown on the preliminary design drawing in Appendix B, the depression is proposed to be filled and the property line elevation raised.

Transportation

Paradigm has completed a Transportation Impact Study for the site, principally to determine whether dedicated turn lanes into the site are required. A right-turn lane for northbound traffic has been recommended and is shown on the Site Plan.

In order to construct the turn lane, the existing asphalt surface will be extended and the asphalt and gravel shoulders shifted towards the site. It is proposed that the roadside ditch be moved to a standard location and depth below the road along most of the site's flankage.

Utilities

Utility companies have not yet been contacted to confirm their ability to service the development.

Utilities along Brock Road South – in particular, gas – will have to be located, daylighted, and moved/lowered as needed in order to accommodate the revised ditch location and depth.

Conclusions

A number of reports have been prepared in support of development on the site, including geotechnical and hydrogeological investigations, an Environmental Impact Study, a Transportation Impact Study, and components of this report (e.g. septic, reservoir sizing).

A septic system and well are proposed for the site. Firefighting water supply will be provided by a reservoir under the building and a dry hydrant.

The stormwater management plan includes rooftop and parking lot storage to attenuate the 2-year through 100-year storm events to below pre-development peak flow rates. An oil/grit separator provides quality control.

As native soils are conducive to infiltration, a water balance (i.e. maintaining the pre-development annual infiltration volume) is feasible and infiltration of clean roof runoff in a large infiltration gallery is recommended.

Recommendations

The final design should incorporate the conclusions and recommendations stemming from this report. This report should be updated in support of final Site Plan Approval in order to capture minor design modifications/improvements.

Approval agencies shall review and approve this document in support of preliminary planning approvals (e.g. zone change) and provide comments to guide a future site plan application.

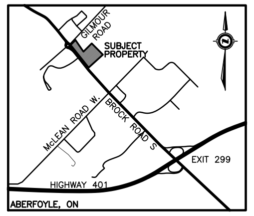
References

Ministry of the Environment, Stormwater Management Planning & Design Manual
March 2003

Appendix A: Site Plan

PUSLINCH ZONING REGULATION:

1	REGULATION	REQUIRED	ACTUAL
2	ZONE	IND	IND
3	MIN. REQ'D LOT AREA	0.4 ha (4,000 sm)	6.05 ha (60,565 sm)
4	MIN. LOT FRONTAGE	30m	±387m
5	MIN. FRONT YARD	6m	6m
6	MIN. INTERIOR SIDEYARD	5m	10.6m
7	MIN. INTERIOR SIDEYARD ADJACENT TO RES. ZONE	15m	N/A
8	MIN. EXTERIOR SIDEYARD	15m	137m
9	MIN. REAR YARD	7.5m	±68m
10	MAX. LOT COVERAGE	75%	33.4%
11	MIN. LANDSCAPED OPEN SPACE	15%	29.18%
12	MAXIMUM HEIGHT	25m	15m
13	BUFFER REQ'D IF ADJACENT TO RES. ZONE	1.5m PLANTING STRIP	1.5m PLANTING STRIP
14	OFF-STREET PARKING	170 SPACES	170 SPACES
15	OFF-STREET LOADING	>5000 SM = 3 SPACES + 1 ADDITIONAL FOR EA. 10,000 SM ABOVE 5,000 SM	21 SPACES
16	GARBAGE STORAGE		INDOORS
17	NATURAL ENVIRONMENT SETBACK	30m	37m
18	LANDSCAPE BUFFER ALONG BROCK ROAD	3m	3m



KEY MAP

SITE AREA BREAKDOWN

AREA TYPE	AREA SQ.M.	AREA S.F.	% COVER
BUILDING AREA	21,630	232,825	35.71
PAVED AREA / HARD SURFACE	22,953	247,066	37.90
SOFT LANDSCAPING	15,982	172,030	26.39
TOTAL SITE AREA	60,565	14.97 AC	100

LEGEND

EXIT MAN DOOR
MAIN ENTRANCE DOOR (PRINCIPLE ENTRANCE)
O/H DRIVE-IN DOOR
LOADING DOCK DOOR
SSIB SHORT STANDARD IRON BAR
SIB STANDARD IRON BAR
IB IRON BAR
C.L.F. CHAIN LINK FENCE
HPL NEW HYDRO POLE
HP EXISTING HYDRO POLE
E.O.A. EDGE OF ASPHALT
LIGHT DUTY ASPHALT
B 200 DIA. CONCRETE FILLED STEEL PIPE BOLLARD. SEE SECTION ON DRAWING SP2
LIGHT STANDARD, SEE SITE PHOTOMETRIC PLAN
BH-# INDICATES APPROXIMATE BOREHOLE LOCATION AND NUMBER. SEE GEOTECH REPORT
TP-# INDICATES APPROXIMATE TESTPIT LOCATION AND NUMBER. SEE GEOTECH REPORT
FDC FIRE DEPARTMENT CONNECTION (SIAMESE)
FH FIRE HYDRANT (DRAFT)
2.4m HIGH CHAINLINK PERIMETER FENCING TO OPSD 972.102, 972.130 AND 972.132
2.4m HIGH BOARD FENCING, SEE LANDSCAPING DRAWINGS
WP WALL PACK LIGHTING FASTENED TO FACE OF BUILDING OR AT T/O PARAPET

SITE DATA:

PROPERTY AREA: 60,590 SM (14.97 ACRES)

ZONING: PROPOSED - INDUSTRIAL IND (SUBJECT TO ZBA)
CURRENT - HIGHWAY COMMERCIAL HC

MUNICIPAL ADDRESS: 128 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO, CANADA

LEGAL DESCRIPTION: PIN 71195-0669 (LT)
PART OF LOT 24, CONCESSION 7 AND
PART OF LOT 24, CONCESSION 8 AND
PART OF ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 7&8
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

SURVEY INFORMATION: PROJECT: 31772-22
VAN HARTEN SURVEYING INC
423 WOOLWICH ST.,
GUELPH, ONTARIO
N1H 1X3

METRIC NOTE:

1. DISTANCES AND COORDINATES SHOWN HEREON ARE IN METERS AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GENERAL NOTES:

- REFER TO SEPARATE SITE GRADING, DRAINAGE AND SERVICING PLANS AS PREPARED BY **MERITECH ENGINEERING.**
- EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY **VAN HARTEN SURVEYING INC.** DATED OCTOBER 27, 2022.
- REFER TO SEPARATE WASTEWATER TREATMENT PLANS AS PREPARED BY **FLOWSPEC ENGINEERING.**
- REFER TO LANDSCAPE PLAN AS PREPARED BY **ABOUD & ASSOCIATES.**
- ALL NEW SIGNAGE TO IDENTIFY PARKING STALLS AND TRAFFIC WITHIN THE SITE SHALL BE INSTALLED ON HOT DIPPED GALVANIZED PRE-PUNCHED METAL POSTS. FIRE ROUTE SIGNS TO BE MOUNTED SO THAT THE SIGN FACES THE FIRE ROUTE WITH THE BOTTOM OF THE SIGN AT 2.1m TO 2.7m FROM FINISH GRADE.
- WALL LIGHTING ON BUILDING ADDITIONS SHALL BE FULL FACE CUT OFF TYPE.
- ALL ROOFTOP MECHANICAL UNITS ON THE BUILDING ADDITION WILL BE SCREENED BY THE BUILDING AND WILL NOT BE VISIBLE FROM THE ROAD TO THE SATISFACTION OF THE GENERAL MANAGER OF PLANNING AND BUILDING SERVICES.
- REFER TO GEOTECHNICAL REPORT FOR ASPHALT CONSTRUCTION.
- ALL PARKING LINES TO BE DELINEATED WITH 100mm WIDE EXTERIOR GRADE YELLOW TRAFFIC PAINT W/ HIGH ABRASION RESISTANCE.

CONSTRUCTION NOTES:

(AS REFERENCED ON SITE PLAN)

1. EXISTING HYDRO POLE, HYDRO WIRES AND ALL ASSOCIATED GUY WIRES TO BE REMOVED. SEE SITE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. EXISTING POTABLE WATER WELLS ENCOUNTERED ARE TO BE DECOMMISSIONED AND PLUGGED BY A WELL CONTRACTOR LICENSED BY THE MINISTRY OF THE ENVIRONMENT. WORK MUST COMPLY WITH MINISTRY OF THE ENVIRONMENT PROCEDURES FOR PLUGGING UNUSED WATER WELL ACCORDING TO ONTARIO REGULATION 903. SEE SITE SERVICING DRAWINGS FOR MORE INFORMATION.
3. SEE LANDSCAPING PLAN FOR TREE REMOVALS.
4. CAST IN PLACE CONCRETE RETAINING WALL, C/W 1070mm HIGH GUARDRAIL. SEE GRADING AND STRUCTURAL DRAWINGS.
5. PAINTED LADDER PEDESTRIAN CROSSWALK DESIGNED TO O.REG. 402/15
6. CURB RAMP AT SIDEWALK C/W TACTILE WALKING SURFACE INDICATOR AT TOP OF ACCESS AISLE AS PER OBC 3.8.2.2.(1)(h). TACTILE ATTENTION INDICATORS SHALL SHALL CONFORM TO SENTENCE (2) AND CLAUSES 4.1.1. AND 4.1.2. OF ISO 23599, "ASSISTIVE PRODUCTS FOR BLIND AND VISION-IMPAIRED PERSONS – TACTILE WALKING SURFACE INDICATORS". THE DEPTH OF INDICATOR SHALL BE NOT LESS THAN 300mm AND NOT MORE THAN 610mm. CURB RAMP TO CONFIRM TO OBC 3.8.3.2.(3) AND (4).
7. DRAFT HYDRANT TO BE DESIGNED IN ACCORDANCE WITH NFPA 22 AND NFPA 24.
8. 602,000 LITRE (159,000 US GALLON) UNDERGROUND FIREFIGHTING WATER TANK. **VOLUME DESIGNED FOR WAREHOUSE (WORST CASE) PER NFPA 13**. PROVIDE WATER SUPPLY WITH AUTOFILL AND DEPTH SENSOR/ALARM. TANK TO HAVE VENT PIPE AND MAN HOLE ACCESS HATCH. PROVIDE BOLLARDS AROUND PERIMETER TO PREVENT VEHICULAR TRAFFIC. FIRE PROTECTION ENGINEER/CIVIL RESPONSIBLE FOR DESIGN OF FIRE SERVICE MAINS FROM TANKS TO SPRINKLER ROOM/HYDRANT.
9. PARKING ACCESS CONTROL GATE. GATE CONTROLLED VIA SECURITY GUARDHOUSE. ELECTRICAL TO PROVIDE COMMUNICATION CONDUIT TO OFFICE. PROVIDE EMERGENCY USE KEYS INSIDE A FIRE DEPARTMENT LOCK BOX. LOCK BOX TO BE INSTALLED ON OR NEAR THE GATE IN A CONSPICUOUS PLACE.
10. ELECTRICAL POST AT TRACTOR PARKING. SEE DETAIL '4/SP3'.
11. SURFACE MOUNTED BIKE RACKS, 27 BICYCLE PARKING SPACES TOTAL. SEE DETAIL '5/SP3'.
12. ELECTRIC TRANSFORMER ON MIN 200 THK., 32 MPa CONCRETE SLAB R/W 15M AT 300 OC. EACH WAY BOTTOM. PROVIDE BOLLARDS PER CODE. COORDINATE WITH ELECTRICAL.
13. 2 - 7.62 LONG x 2.64m APART PAINTED GUIDE LINES CENTERED AT EACH DOCK DOOR. PAINT TO BE EXTERIOR GRADE TRAFFIC PAINT WITH HIGH ABRASION RESISTANCE

PARKING DATA:

PARKING

PARKING REQUIRED (BASED ON NET FLOOR AREAS)

WAREHOUSE	=1 SP / 200 SM	= 20,690 / 200	= 104 SPACES
BUSINESS OFFICE	=1 SP / 40 SM	= 2,630 / 40	= 66 SPACES
TOTAL	**170 SPACES**		

PARKING PROVIDED **170 SPACES (EXCLUDING TRACTOR PARKING)**

DESIGNATED PARKING SPACES ARE INCLUDED IN THE PARKING SPACES PROVIDED ABOVE

DESIGNATED PARKING SPACES REQUIRED 8 SPACES (4 + 2% REQ'D SPACES)
DESIGNATED PARKING SPACES PROVIDED 8 SPACES

TYPICAL PARKING SPACE 3.0m x 6.0m
ACCESSIBLE PARKING SPACES
TYPE 'A' 3.6m x 6.0m
MOBILITY ACCESS AISLE 1.5m x 6.0m
DRIVE AISLE 6.0m

LOADING SPACES

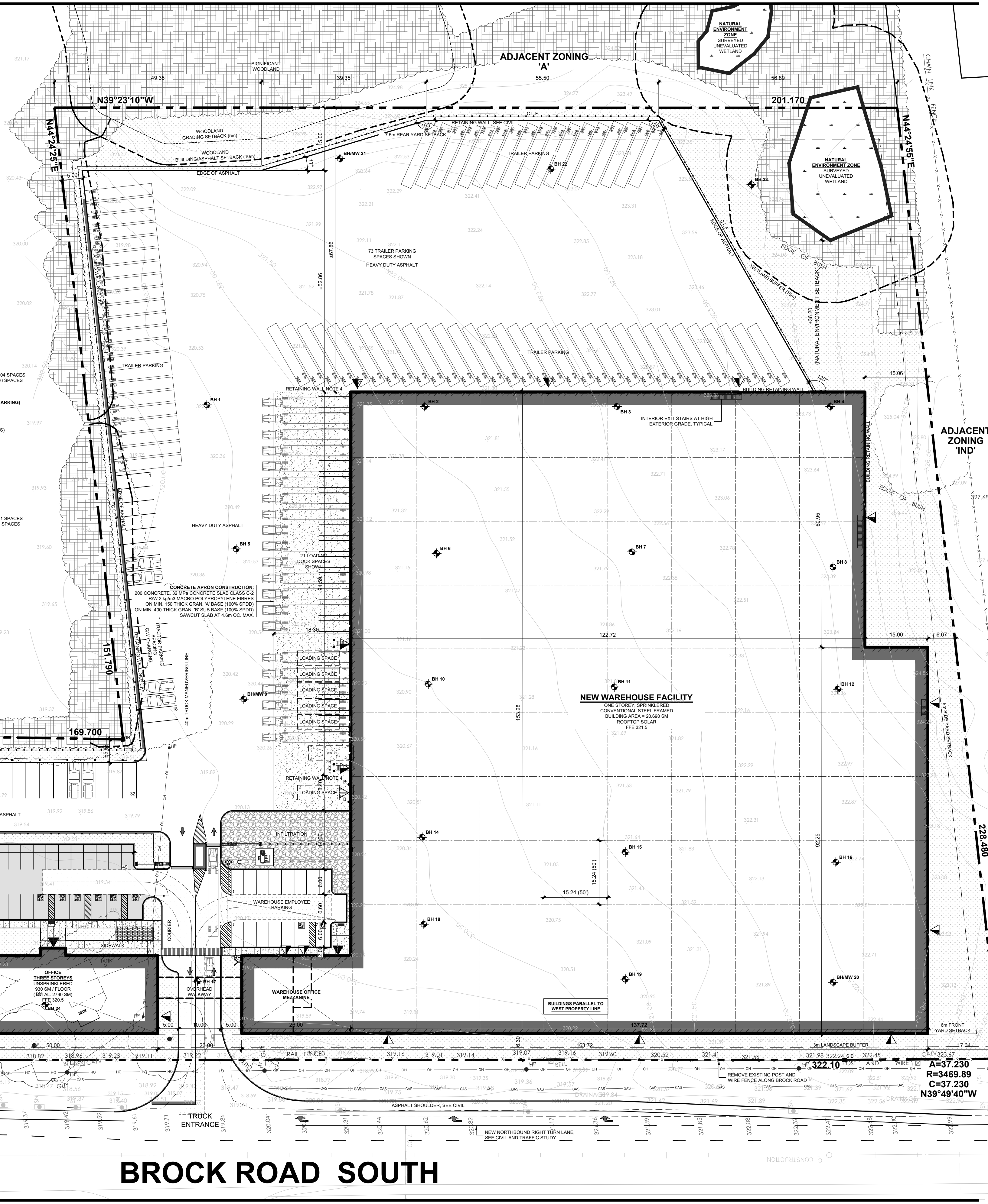
LOADING SPACES REQUIRED **6 SPACES**
LOADING SPACES PROVIDED **21 SPACES**
TYPICAL LOADING SPACE 3.5m x 10m

BICYCLE PARKING

SPACES REQUIRED

WAREHOUSE	=1 SP / 1,000 SM	= 20,690 / 1000	= 21 SPACES
OFFICE	=2 SP / 1,000 SM	= 2,790 / 500	= 6 SPACES
TOTAL	**27 SPACES**		

PARKING PROVIDED **27 SPACES**
TYPICAL BICYCLE SPACE 0.6m x 1.8m



PROJECT NORTH / TRUE NORTH

No.	Date	Issued for / Revision:
1.	OCT. 19, 2022	CONCEPTUAL REVIEW
2.	OCT. 20, 2022	CONCEPTUAL REVIEW
3.	NOV. 18, 2022	CONCEPTUAL REVIEW
4.	DEC. 02, 2022	TRAFFIC STUDY REVIEW
5.	DEC. 21, 2022	ZONING BYLAW AMENDMENT

TACOMA ENGINEERS
176 Speedvale Avenue West
Guelph, Ontario N1H 1C3
Tel: 519.763.2000
www.tacomaengineers.com

Collaborative Structures Limited
6683 ELLIS ROAD, CAMBRIDGE, ONTARIO

WELLINGTON MOTOR FREIGHT

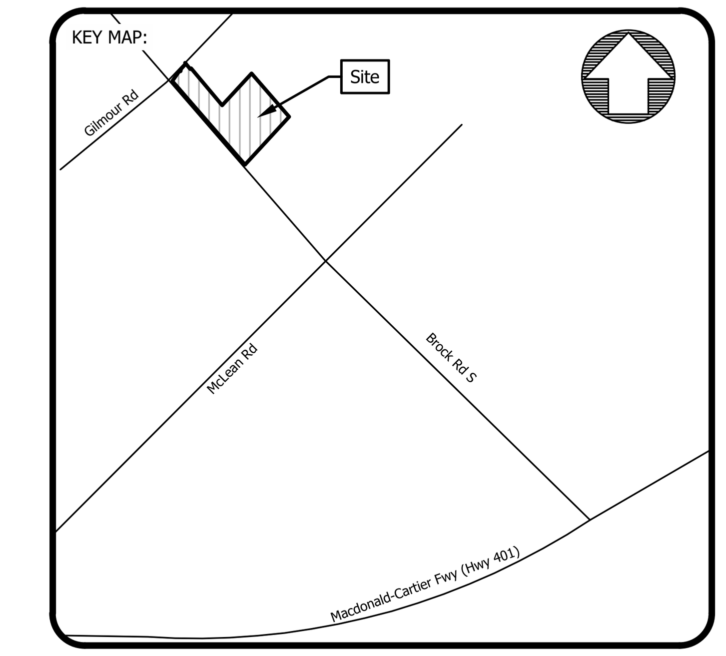
BROCK ROAD, PUSLINCH, ONTARIO

CONCEPTUAL SITE PLAN

Project No.	Drawn By:
TE-41102-22	S.KOLKMAN

SP1

Appendix B: Preliminary Design Drawings



Project Notes

1. This drawing is to be read in conjunction with the standard notes, specifications and details shown on Meritech dwg 5228-BP and the following additional information:
   a. Site Plan by << >>, dated <<Mmm yyyy>>.
   b. Architectural Plans by << >>, dated <<Mmm yyyy>>.
   c. Landscape Plans by << >>, dated <<Mmm yyyy>>.
   d. Geotechnical Report by << >>, dated <<Mmm yyyy>>.
   e. Stormwater Management Report by << >>, dated <<Mmm yyyy>>.
2. Survey and elevations:
   a. Topographic survey completed by Van Harten Surveying Inc, dated Oct 2022.
   b. Geodetic reference elevation:Elevations based on GPS observations from permanent reference stations in the NAD83 (CSRS-2010) coordinate system, with heights converted to orthometric elevations on the CVGD28 datum (1978 adjustment) with geoid model HTv2.0, as supplied by Natural Resources Canada.
   c. Local reference elevation: Cut cross in the municipal sidewalk, located approximately 38m south of the west corner of the subject property. Elevation = 318.29m

MERITECH engineering
1315 Bishop Street North, Suite 202 Cambridge
T 519.623.1140 F 519.623.7334 www.meritech.ca

No.	REVISION/ISSUE	DATE	BY
1.	Issued for Review & Approval	DWGDATE	XXX

OWNER: Wellington Motor Freight

LOCATION: Township of Puslinch

PROJECT: 128 Brock Road South

DRAWING: Base Plan

DESIGNED BY: TDK	CHECKED BY: CHT	CONTRACT:
DRAWN BY: TDK	DATE: Nov 22, 2022	FILE NAME: 5228
DRAWING: 5228-BP SHEET: BP of 1	SCALE: 1:750	0 3.75 7.5 15 22.5 30 1:750

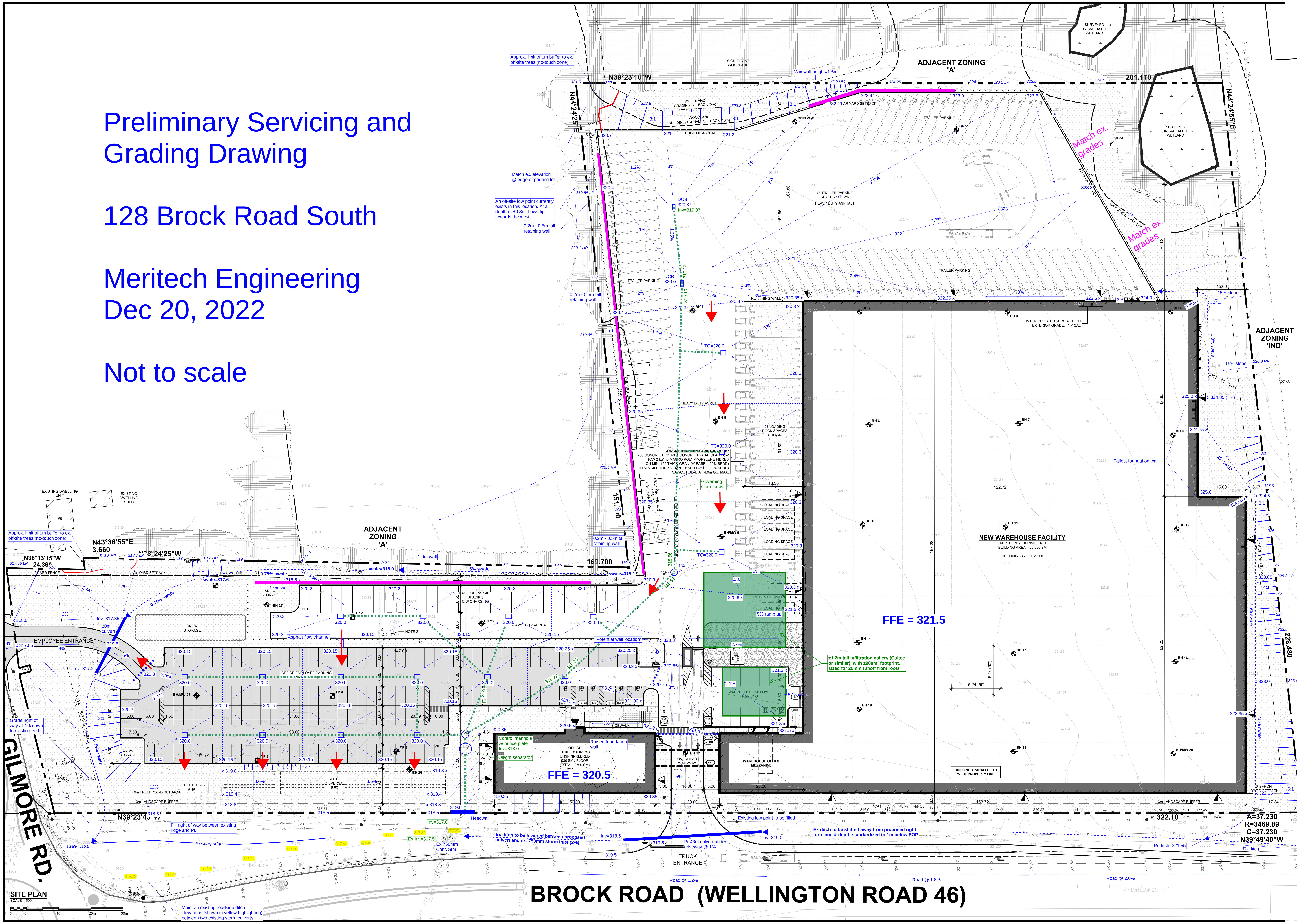
Filename: 5228.dwg, 5228-BP -- Plotted: December 2, 2022 12:10 PM, Student2

Preliminary Servicing and Grading Drawing

128 Brock Road South

Meritech Engineering
Dec 20, 2022

Not to scale



Appendix C: Calculations

Project: 5228
File: 5228
Calc'd by: Akshay
Date: 25-Nov-22
Chk'd by: CHT
Date: 19-Dec-22

Summary of Historical Climate Data

Township of Puslinch

Station Name: WATERLOO WELLINGTON A
Station ID: 6149387
Latitude: N 43°27'43.250"
Longitude: W 80°23'80.380"
Elevation (m): 317.00

Temperature:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Daily Average (°C)	-6.5	-5.5	-1.0	6.2	12.5	17.6	20.0	18.9	14.5	8.2	2.5	-3.3	7.0
Precipitation													
Rainfall (mm)	28.7	29.7	36.8	68.0	81.8	82.4	98.6	83.9	87.8	66.1	75.0	38.0	776.8
Snowfall (cm)	43.7	30.3	26.5	7.3	0.4	0.0	0.0	0.0	0.0	1.4	13.0	37.2	159.8
Precipitation (mm)	65.2	54.9	61.0	74.5	82.3	82.4	98.6	83.9	87.8	67.4	87.1	71.2	916.3

Note: WMO standards for "CLIMATE NORMALS" - Class A: No more than three consecutive or 5 total missing years between 1981 to 2010

This station **meets** WMO standards for temperature and preciptation

Read in conjunction with 'Calculation of Evapotranspiration by Thornthwaite Equation' and 'Water Balance Calculation' sheets

Project: 5228
File: 5228
Calc'd by: Akshay
Date: 25-Nov-22
Chk'd by: CHT
Date: 19-Dec-22

Calculation of Evapotranspiration by Thornthwaite Formula

Township of Puslinch

Station: WATERLOO WELLINGTON A
Station ID: 6149387
Station Latitude (N): 43°27'43.250"
Station Longitude (W): 80°23'80.380"
Elevation (m): 317.00

Soil: Sand, sandy silt till, silt till
Vegetation Cover: Grasses, shrubs, lawns
Water Holding Capacity in Root Zone of Soil (7) : 100 mm

Month	Daily Average Temperature	Precipitation, P (mm)	Monthly heat index (I) (1)	UnAdj Daily PET (mm) (2)	Adj PET Factor (Lat. = 43°) (3)	Adj PET (mm)	Precipitation - AdjPET (mm) (4)	Accum. Potential Water Loss (mm)(5)	Storage, ST (mm) (6)	Soil Moisture Change, ΔS (mm)	Actual Evapotranspiration, AE (mm) (8)
1	-6.5	65.2	0.00	0.00	24.3	0.0	65.2	0.0	252.1	0	0.0
2	-5.5	54.9	0.00	0.00	24.6	0.0	54.9	0.0	307.0	0	0.0
3	-1	61.0	0.00	0.00	30.6	0.0	61.0	0.0	368.0	0	0.0
4	6.2	74.5	1.39	1.00	33.6	33.6	40.9	0.0	408.9	0	33.6
5	12.5	82.3	4.00	2.00	37.8	75.6	6.7	0.0	415.6	0	75.6
6	17.6	82.4	6.72	3.00	38.4	115.2	-32.8	-32.8	71.8	-28.2	110.6
7	20	98.6	8.16	3.40	38.7	131.6	-33.0	-65.8	51.8	-48.2	146.8
8	18.9	83.9	7.49	3.30	36.0	118.8	-34.9	-100.7	35.7	-64.3	148.2
9	14.5	87.8	5.01	3.20	31.2	99.8	-12.0	-112.7	32.7	-67.3	155.1
10	8.2	67.4	2.12	1.40	28.5	39.9	27.5	0.0	60.2	-39.8	39.9
11	2.5	87.1	0.35	1.30	24.3	31.6	55.5	0.0	115.7	0	31.6
12	-3.3	71.2	0.00	0.00	23.1	0.0	71.2	0.0	186.9	0	0.0
	Total Heat Index TE=		35.2								
					Total PET (mm)	**646.1**		**Actual Yearly Evaportranspiration, e (mm)=**			**741.4**

PET = Potential Evapotranspiration
Heat Index, Potential Evapotranspiration is zero at temperatures less than 0°C

(1) Monthly Heat Index from Table 2 - Thornthwaite & Mather Method (1957) [pg 208]
(2) Unadjusted Daily PET read from Table 4 - Thornthwaite & Mather Method (1957) [pg 218-225] with Daily Average Temp/Total Heat Index(TE)
(3) Adjustment factors from Table 6 - Thornthwaite & Mather Method (1957) [pg 228].
(4) A negative number means more evapotranspiration happens in a month than precipatation, and the soil becomes dried out
(5) Accumulates the overall moisture loss in soils of consecutive months of precipitation being less than evapotranspiration
(6) If Cell is blue, Storage (mm) needs to be looked up in Tables (see PET Note 6 on References sheet).If temp <0°C, soil is considered frozen with no water movement through soil, precipitation accumulates month-to-month as snow.
(7) A function of the soils and typical vegetative cover of the site. Use 'Applicable Soil Moisture Retention Table' in Table 10 - Thornthwaite & Mather Method (1957) [pg 244]
(8) Where P>PET, soil remains saturated and Actual ET = Potential ET. When P<PET, soil dries out and Actual ET = P + Water Drawn from Soil Moisture Storage (ΔS)

Project: 5228
File: 5228
Calc'd by: Akshay
Date: 25-Nov-22
Chk'd by: CHT
Date: 19-Dec-22

Thornthwaite & Mather Water Balance Calculations

Township of Puslinch

	Area (m^2)	Infiltration Factors [1] Topography	Soil	Cover	Cumulative Infiltration Factor (IF) [2]	Precipitation Data P [3] (mm/yr)	E [4] [6] (mm/yr)	Calculated [5] I (mm/yr)	R (mm/yr)
Pre-Development									
Impervious Areas	3,630	Runoff assumed to be 0; all surplus to infiltration			1	916.3	183.3	733 **2660.9 m³/yr**	0.0 **0.0 m³/yr**
Pervious Areas	56,870	Runoff assumed to be 0; all surplus to infiltration			1.00	916.3	741.4	175 **9947.1 m³/yr**	0 **0.0 m³/yr**
					Total pre-development infiltration			**12608.1 m³/yr**	
Post-Development									
Impervious Areas	47,260	-	-	-	0	916.3	183.3	0 **0.0 m³/yr**	733.0 **34643.5 m³/yr**
Pervious Areas	13,330	0.15 (flat to hilly)	0.4 Open Sandy Loam	0.15 (open to woodland)	0.70	916.3	741.4	122 **1632.1 m³/yr**	52 **699.5 m³/yr**
					Total post-development infiltration			**1632.1 m³/yr**	
							Change	**10976.0 m³/yr**	

Infiltration Galleries to Balance Deficit

	Impervious Contributing Area (m^2)	Vol. (m^3/yr)	Pervious Contributing Area (m^2)	Vol. (m^3/yr)		
Roofs to infil.	21,620	15848.3	0	0.0	Total Gallery Infiltration (m3/yr)	15,848
		0.0		0.0	Overall Water Balance (m3/yr)	4,872
		0.0		0.0		
		0.0		0.0		

[1] Hydrogeological Technical Information Requirements for Land Development Applications (MOE, 1995). See References sheet
[2] Infiltration Factor (IF), the sum of the infiltration factors
[3] Precipitation (P), monthly average from Environment Canada Climate Normals 1981-2010, WATERLOO WELLINGTON A station
[4] Evapotranspiration (E) calculated using the Thornthwaite equation
[5] Infiltration, I = IF x (P-E), and runoff R = P - E - I
[6] Evapotranspiration on impervious area is assumed to be 20% of Precipitation (P)

Appendix D: Modelling

Appendix D.1: Pre-Development Conditions

```
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"               Company                                                     "
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"      180.000   Max. Storm length"
"    15000.000   Max. Hydrograph"
" 81          ADD COMMENT==================================================="
"          1  Lines of comment"
"             SWM analysis of 2-year 3 hour pre-development peak flow"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      743.000   Coefficient A"
"        6.000   Constant B"
"        0.798   Exponent C"
"        0.400   Fraction R"
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"        1.000   Time step multiplier"
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"             Total depth                 34.438    mm"
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" 33          CATCHMENT 101"
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"            1   Equal length"
"            1   SCS method"
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"        4.500   % Impervious"
"        6.059   Total Area"
"      110.000   Flow length"
"        2.000   Overland Slope"
"        5.786   Pervious Area"
"      110.000   Pervious length"
"        2.000   Pervious slope"
"        0.273   Impervious Area"
"      110.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.112   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.848   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.059     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           5.786      0.273      6.059      hectare"
"             Time of concentration  75.943     4.812      57.274     minutes"
"             Time to Centroid       191.695    95.254     166.383    minutes"
"             Rainfall depth         34.438     34.438     34.438     mm"
```

```
"            Rainfall volume        1992.71    93.90      2086.60    c.m"
"            Rainfall losses        30.572     5.243      29.432     mm"
"            Runoff depth           3.866      29.195     5.006      mm"
"            Runoff volume          223.69     79.60      303.29     c.m"
"            Runoff coefficient     0.112      0.848      0.145      "
"            Maximum flow           0.026      0.057      0.059      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.059     0.059     0.000     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.059     0.059     0.059     0.000"
" 40         HYDROGRAPH   Combine    6"
"           6   Combine "
"           6   Node #"
"               101"
"            Maximum flow                  0.059    c.m/sec"
"            Hydrograph volume           303.291    c.m"
"                   0.059     0.059     0.059     0.059"
" 38         START/RE-START TOTALS 101"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                     6.059    hectare"
"            Total Impervious area                    0.273    hectare"
"            Total % impervious                       4.500"
" 19         EXIT"
```

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"      180.000   Max. Storm length"
"    15000.000   Max. Hydrograph"
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"          1  Lines of comment"
"             SWM analysis of 5-year 3 hour pre-development peak flow"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.400   Fraction R"
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"        1.000   Time step multiplier"
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" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Site"
"        4.500   % Impervious"
"        6.059   Total Area"
"      110.000   Flow length"
"        2.000   Overland Slope"
"        5.786   Pervious Area"
"      110.000   Pervious length"
"        2.000   Pervious slope"
"        0.273   Impervious Area"
"      110.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.882   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.093     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           5.786      0.273      6.059      hectare"
"             Time of concentration  51.217     4.319      42.469     minutes"
"             Time to Centroid       160.355    92.263     147.653    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
```

```
"              Rainfall volume        2733.46    128.80     2862.26    c.m"
"              Rainfall losses        38.680     5.583      37.191     mm"
"              Runoff depth           8.560      41.657     10.049     mm"
"              Runoff volume          495.28     113.58     608.86     c.m"
"              Runoff coefficient     0.181      0.882      0.213      "
"              Maximum flow           0.086      0.079      0.093      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.093     0.093     0.000     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.093     0.093     0.093     0.000"
" 40           HYDROGRAPH   Combine    6"
"             6   Combine "
"             6   Node #"
"                 101"
"              Maximum flow                  0.093    c.m/sec"
"              Hydrograph volume           608.864    c.m"
"                     0.093     0.093     0.093     0.093"
" 38           START/RE-START TOTALS 101"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                      6.059    hectare"
"              Total Impervious area                     0.273    hectare"
"              Total % impervious                        4.500"
" 19           EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"           10  Units used:                                          ie METRIC"
"               Job folder:        C:\M\Meritech Engineering\PRJ - DOCS\5228\"
"                                                                60-Design\SWM"
"               Output filename:                        5228x10yr20221124.out"
"               Licensee name:                                   Windows User"
"               Company                                                      "
"               Date & Time last used:                11/24/2022 at 2:02:45 PM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"   15000.000   Max. Hydrograph"
" 81          ADD COMMENT==================================================="
"           1  Lines of comment"
"             SWM analysis of 10-year 3 hour pre-development peak flow"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"    2221.000   Coefficient A"
"      12.000   Constant B"
"       0.908   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"             Maximum intensity           169.551    mm/hr"
"             Total depth                  56.290    mm"
"           6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Site"
"       4.500   % Impervious"
"       6.059   Total Area"
"     110.000   Flow length"
"       2.000   Overland Slope"
"       5.786   Pervious Area"
"     110.000   Pervious length"
"       2.000   Pervious slope"
"       0.273   Impervious Area"
"     110.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      69.000   Pervious SCS Curve No."
"       0.225   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"      11.412   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.894   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.163     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           5.786      0.273      6.059      hectare"
"             Time of concentration  41.567     3.973      35.638     minutes"
"             Time to Centroid       148.003    90.801     138.981    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
```

```
"              Rainfall volume        3257.14    153.48     3410.62    c.m"
"              Rainfall losses        43.630     5.982      41.936     mm"
"              Runoff depth           12.660     50.308     14.355     mm"
"              Runoff volume          732.58     137.17     869.75     c.m"
"              Runoff coefficient     0.225      0.894      0.255      "
"              Maximum flow           0.153      0.096      0.163      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                      0.163     0.163     0.000     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                      0.163     0.163     0.163     0.000"
" 40           HYDROGRAPH   Combine    6"
"             6   Combine "
"             6   Node #"
"                 101"
"              Maximum flow                  0.163    c.m/sec"
"              Hydrograph volume           869.745    c.m"
"                      0.163     0.163     0.163     0.163"
" 38           START/RE-START TOTALS 101"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                        6.059    hectare"
"              Total Impervious area                       0.273    hectare"
"              Total % impervious                          4.500"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                          ie METRIC"
"               Job folder:         C:\M\Meritech Engineering\PRJ - DOCS\5228\"
"                                                                60-Design\SWM"
"               Output filename:                        5228x100yr20221124.out"
"               Licensee name:                                    Windows User"
"               Company                                                       "
"               Date & Time last used:                11/24/2022 at 2:11:03 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    15000.000   Max. Hydrograph"
" 81          ADD COMMENT==================================================="
"           1  Lines of comment"
"            SWM analysis of 100-year 3 hour pre-development peak flow"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4688.000   Coefficient A"
"       17.000   Constant B"
"        0.962   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"            Maximum intensity           239.650    mm/hr"
"            Total depth                  87.263    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Site"
"        4.500   % Impervious"
"        6.059   Total Area"
"      110.000   Flow length"
"        2.000   Overland Slope"
"        5.786   Pervious Area"
"      110.000   Pervious length"
"        2.000   Pervious slope"
"        0.273   Impervious Area"
"      110.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.347   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.920   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.532     0.000     0.000     0.000 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
"            Surface Area           5.786      0.273      6.059      hectare"
"            Time of concentration  28.795     3.433      25.976     minutes"
"            Time to Centroid       129.625    88.754     125.084    minutes"
"            Rainfall depth         87.263     87.263     87.263     mm"
```

```
"            Rainfall volume        5049.36    237.93     5287.29    c.m"
"            Rainfall losses        57.012     7.008      54.762     mm"
"            Runoff depth           30.251     80.256     32.501     mm"
"            Runoff volume          1750.44    218.82     1969.26    c.m"
"            Runoff coefficient     0.347      0.920      0.372      "
"            Maximum flow           0.505      0.138      0.532      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.532     0.532     0.000     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.532     0.532     0.532     0.000"
" 40         HYDROGRAPH   Combine    6"
"           6   Combine "
"           6   Node #"
"               101"
"            Maximum flow                  0.532    c.m/sec"
"            Hydrograph volume          1969.258    c.m"
"                   0.532     0.532     0.532     0.532"
" 38         START/RE-START TOTALS 101"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                     6.059    hectare"
"            Total Impervious area                    0.273    hectare"
"            Total % impervious                       4.500"
" 19         EXIT"
```

Appendix D.2: Post-Development Conditions

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:          C:\M\Meritech Engineering\PRJ - DOCS\5228\"
"                                                                60-Design\SWM"
"                Output filename:                         5228d2yrDec172022.out"
"                Licensee name:                                    Windows User"
"                Company                                                       "
"                Date & Time last used:               12/17/2022 at 12:48:49 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    15000.000   Max. Hydrograph"
" 81          ADD COMMENT==================================================="
"          2  Lines of comment"
"             SWM analysis of 2-year 3 hour post-development peak flow"
"             Preliminary design"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      743.000   Coefficient A"
"        6.000   Constant B"
"        0.798   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           109.637    mm/hr"
"             Total depth                  34.438    mm"
"            4   2hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 701"
"            2   Rectangular"
"            1   Equal length"
"            1   SCS method"
"          701   Warehouse roof"
"      100.000   % Impervious"
"        2.069   Total Area"
"       20.000   Flow length"
"        0.500   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        0.500   Pervious slope"
"        2.069   Impervious Area"
"       20.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"      100.000   Impervious SCS Curve No."
"        1.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.000   Impervious Initial abstraction"
"                     0.630     0.000     0.000     0.000 c.m/sec"
"             Catchment 701          Pervious   Impervious Total Area "
"             Surface Area           0.000      2.069      2.069      hectare"
"             Time of concentration  31.081     2.541      2.541      minutes"
"             Time to Centroid       126.152    82.894     82.894     minutes"
```

```
"             Rainfall depth         34.438     34.438     34.438     mm"
"             Rainfall volume        0.00       712.52     712.52     c.m"
"             Rainfall losses        28.341     0.000      0.000      mm"
"             Runoff depth           6.097      34.438     34.438     mm"
"             Runoff volume          0.00       712.52     712.52     c.m"
"             Runoff coefficient     0.000      1.000      1.000      "
"             Maximum flow           0.000      0.630      0.630      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.630     0.630     0.000     0.000"
" 54          POND DESIGN"
"        0.630   Current peak flow    c.m/sec"
"        0.642   Target outflow    c.m/sec"
"        712.5   Hydrograph volume    c.m"
"           4.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.150   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                0.05000   0.02400   200.000"
"                 0.1000   0.04800  1065.153"
"                 0.1500   0.07200  1965.153"
"           1.   ROOFTOP"
"                Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                  hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                    2.069       1.800    600.000      24.000     200.000"
"             Using 30 roofdrains on roofstorage area of 18000. square metre"
"             Peak outflow                 0.033    c.m/sec"
"             Maximum level                0.068    metre"
"             Maximum storage            514.863    c.m"
"             Centroidal lag               4.659   hours"
"                  0.630     0.630     0.033     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.630     0.033     0.033     0.000"
" 33          CATCHMENT 702"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          702   Controlled portion of site incl office"
"       85.000   % Impervious"
"        2.900   Total Area"
"       30.000   Flow length"
"        1.000   Overland Slope"
"        0.435   Pervious Area"
"       30.000   Pervious length"
"        1.000   Pervious slope"
"        2.465   Impervious Area"
"       30.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.112   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.841   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.508     0.033     0.033     0.000 c.m/sec"
"             Catchment 702          Pervious   Impervious Total Area "
"             Surface Area           0.435      2.465      2.900      hectare"
"             Time of concentration  42.878     2.717      3.642      minutes"
"             Time to Centroid       154.848    92.074     93.519     minutes"
"             Rainfall depth         34.438     34.438     34.438     mm"
"             Rainfall volume        149.81     848.90     998.70     c.m"
"             Rainfall losses        30.573     5.492      9.254      mm"
"             Runoff depth           3.865      28.946     25.184     mm"
"             Runoff volume          16.81      713.52     730.33     c.m"
"             Runoff coefficient     0.112      0.841      0.731      "
"             Maximum flow           0.003      0.508      0.508      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.508     0.534     0.033     0.000"
" 54          POND DESIGN"
"        0.534   Current peak flow    c.m/sec"
"        0.300   Target outflow    c.m/sec"
"       1442.7   Hydrograph volume    c.m"
"           4.   Number of stages"
"      318.000   Minimum water level    metre"
"      320.300   Maximum water level    metre"
"      318.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                318.000     0.000     0.000"
"                320.000   0.04373    50.000"
"                320.150   0.04541   600.000"
"                320.300   0.04702  2000.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                318.000     0.630    0.1200     1.000"
"             Peak outflow                 0.045    c.m/sec"
"             Maximum level              320.151    metre"
"             Maximum storage            609.929    c.m"
"             Centroidal lag               5.464   hours"
"                  0.508     0.534     0.045     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.508     0.045     0.045     0.000"
" 33          CATCHMENT 501"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          501   Uncontrolled portions of site"
"        6.000   % Impervious"
"        1.081   Total Area"
"       30.000   Flow length"
"        5.000   Overland Slope"
"        1.016   Pervious Area"
"       30.000   Pervious length"
"        5.000   Pervious slope"
"        0.065   Impervious Area"
"       30.000   Impervious length"
"        5.000   Impervious slope"
```

```
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.112   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.842   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                        0.015     0.045     0.045     0.000 c.m/sec"
"            Catchment 501          Pervious   Impervious Total Area "
"            Surface Area           1.016      0.065      1.081      hectare"
"            Time of concentration  26.457     1.676      18.433     minutes"
"            Time to Centroid       136.552    90.355     121.593    minutes"
"            Rainfall depth         34.438     34.438     34.438     mm"
"            Rainfall volume        349.94     22.34      372.28     c.m"
"            Rainfall losses        30.575     5.453      29.068     mm"
"            Runoff depth           3.863      28.985     5.371      mm"
"            Runoff volume          39.26      18.80      58.06      c.m"
"            Runoff coefficient     0.112      0.842      0.156      "
"            Maximum flow           0.009      0.015      0.015      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                        0.015     0.059     0.045     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                        0.015     0.059     0.059     0.000"
" 40         HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total flow"
"            Maximum flow                  0.059    c.m/sec"
"            Hydrograph volume          1500.311    c.m"
"                        0.015     0.059     0.059     0.059"
" 38         START/RE-START TOTALS 501"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                      6.050    hectare"
"            Total Impervious area                     4.599    hectare"
"            Total % impervious                       76.014"
" 19         EXIT"
```

```
"              MIDUSS Output ----------------------------------------------->"
"              MIDUSS version                          Version 2.25  rev. 473"
"              MIDUSS created                        Sunday, February 7, 2010"
"          10  Units used:                                          ie METRIC"
"              Job folder:        C:\M\Meritech Engineering\PRJ - DOCS\5228\"
"                                                               60-Design\SWM"
"              Output filename:                          5228d5yrDec172022.out"
"              Licensee name:                                     Windows User"
"              Company                                                       "
"              Date & Time last used:               12/17/2022 at 12:57:53 AM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"   15000.000   Max. Hydrograph"
" 81          ADD COMMENT==================================================="
"         2  Lines of comment"
"             SWM analysis of 5-year 3 hour post-development peak flow"
"             Preliminary design"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"    1593.000   Coefficient A"
"      11.000   Constant B"
"       0.879   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"             Maximum intensity           139.250    mm/hr"
"             Total depth                  47.240    mm"
"           4   5hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 701"
"           2   Rectangular"
"           1   Equal length"
"           1   SCS method"
"         701   Warehouse roof"
"     100.000   % Impervious"
"       2.069   Total Area"
"      20.000   Flow length"
"       0.500   Overland Slope"
"       0.000   Pervious Area"
"      20.000   Pervious length"
"       0.500   Pervious slope"
"       2.069   Impervious Area"
"      20.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.000   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"     100.000   Impervious SCS Curve No."
"       1.000   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.000   Impervious Initial abstraction"
"                   0.800     0.000     0.000     0.000 c.m/sec"
"             Catchment 701          Pervious   Impervious Total Area "
"             Surface Area           0.000      2.069      2.069      hectare"
"             Time of concentration  22.745     2.309      2.309      minutes"
"             Time to Centroid       114.328    81.988     81.988     minutes"
```

```
"            Rainfall depth         47.240     47.240     47.240     mm"
"            Rainfall volume        0.00       977.39     977.39     c.m"
"            Rainfall losses        35.061     0.000      0.000      mm"
"            Runoff depth           12.179     47.240     47.240     mm"
"            Runoff volume          0.00       977.39     977.39     c.m"
"            Runoff coefficient     0.000      1.000      1.000      "
"            Maximum flow           0.000      0.800      0.800      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.800     0.800     0.000     0.000"
" 54         POND DESIGN"
"       0.800   Current peak flow    c.m/sec"
"       0.642   Target outflow    c.m/sec"
"       977.4   Hydrograph volume    c.m"
"          4.   Number of stages"
"       0.000   Minimum water level    metre"
"       0.150   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"               0.05000   0.02400   200.000"
"                0.1000   0.04800  1065.153"
"                0.1500   0.07200  1965.153"
"          1.   ROOFTOP"
"               Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                 hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                   2.069       1.800     600.000      24.000     200.000"
"            Using 30 roofdrains on roofstorage area of 18000. square metre"
"            Peak outflow                  0.039    c.m/sec"
"            Maximum level                 0.082    metre"
"            Maximum storage             746.772    c.m"
"            Centroidal lag                5.228   hours"
"                 0.800     0.800     0.039     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    0.800     0.039     0.039     0.000"
" 33         CATCHMENT 702"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         702   Controlled portion of site incl office"
"      85.000   % Impervious"
"       2.900   Total Area"
"      30.000   Flow length"
"       1.000   Overland Slope"
"       0.435   Pervious Area"
"      30.000   Pervious length"
"       1.000   Pervious slope"
"       2.465   Impervious Area"
"      30.000   Impervious length"
"       1.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      69.000   Pervious SCS Curve No."
"       0.181   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"      11.412   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
```

```
"        0.875   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.721     0.039     0.039     0.000 c.m/sec"
"             Catchment 702          Pervious   Impervious Total Area "
"             Surface Area           0.435      2.465      2.900      hectare"
"             Time of concentration  28.918     2.438      3.372      minutes"
"             Time to Centroid       134.362    89.497     91.078     minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        205.49     1164.46    1369.96    c.m"
"             Rainfall losses        38.687     5.921      10.836     mm"
"             Runoff depth           8.553      41.319     36.404     mm"
"             Runoff volume          37.21      1018.51    1055.72    c.m"
"             Runoff coefficient     0.181      0.875      0.771      "
"             Maximum flow           0.010      0.721      0.721      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.721     0.750     0.039     0.000"
" 54          POND DESIGN"
"        0.750   Current peak flow    c.m/sec"
"        0.300   Target outflow    c.m/sec"
"       2033.2   Hydrograph volume    c.m"
"           5.   Number of stages"
"      318.000   Minimum water level    metre"
"      320.400   Maximum water level    metre"
"      318.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                318.000     0.000     0.000"
"                320.000   0.04373    50.000"
"                320.150   0.04541   600.000"
"                320.300   0.04702  2000.000"
"                320.400     4.901  3000.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                320.300     0.900   100.000     0.000     0.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                318.000     0.630    0.1200     1.000"
"             Peak outflow                 0.046    c.m/sec"
"             Maximum level              320.189    metre"
"             Maximum storage            968.492    c.m"
"             Centroidal lag               7.106   hours"
"                  0.721     0.750     0.046     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.721     0.046     0.046     0.000"
" 33          CATCHMENT 501"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          501   Uncontrolled portions of site"
"        6.000   % Impervious"
"        1.081   Total Area"
"       30.000   Flow length"
"        5.000   Overland Slope"
"        1.016   Pervious Area"
```

```
"        30.000   Pervious length"
"         5.000   Pervious slope"
"         0.065   Impervious Area"
"        30.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        69.000   Pervious SCS Curve No."
"         0.181   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"        11.412   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.877   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.034     0.046     0.046     0.000 c.m/sec"
"             Catchment 501          Pervious   Impervious Total Area "
"             Surface Area           1.016      0.065      1.081      hectare"
"             Time of concentration  17.843     1.505      13.986     minutes"
"             Time to Centroid       121.444    88.036     113.556    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        480.02     30.64      510.66     c.m"
"             Rainfall losses        38.685     5.816      36.713     mm"
"             Runoff depth           8.555      41.424     10.527     mm"
"             Runoff volume          86.93      26.87      113.80     c.m"
"             Runoff coefficient     0.181      0.877      0.223      "
"             Maximum flow           0.029      0.020      0.034      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.034     0.080     0.046     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.034     0.080     0.080     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total flow"
"             Maximum flow                  0.080    c.m/sec"
"             Hydrograph volume          2147.082    c.m"
"                     0.034     0.080     0.080     0.080"
" 38          START/RE-START TOTALS 501"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                       6.050    hectare"
"             Total Impervious area                      4.599    hectare"
"             Total % impervious                        76.014"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                          ie METRIC"
"               Job folder:        C:\M\Meritech Engineering\PRJ - DOCS\5228\"
"                                                                60-Design\SWM"
"               Output filename:                        5228d10yrDec172022.out"
"               Licensee name:                                    Windows User"
"               Company                                                       "
"               Date & Time last used:                 12/17/2022 at 12:56:16 AM"
" 31         TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"   15000.000   Max. Hydrograph"
" 81         ADD COMMENT==================================================="
"          2  Lines of comment"
"            SWM analysis of 10-year 3 hour post-development peak flow"
"            Preliminary design"
" 32         STORM Chicago storm"
"           1   Chicago storm"
"    2221.000   Coefficient A"
"      12.000   Constant B"
"       0.908   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"            Maximum intensity           169.551    mm/hr"
"            Total depth                  56.290    mm"
"           5   10hyd   Hydrograph extension used in this file"
" 33         CATCHMENT 701"
"           2   Rectangular"
"           1   Equal length"
"           1   SCS method"
"         701   Warehouse roof"
"     100.000   % Impervious"
"       2.069   Total Area"
"      20.000   Flow length"
"       0.500   Overland Slope"
"       0.000   Pervious Area"
"      20.000   Pervious length"
"       0.500   Pervious slope"
"       2.069   Impervious Area"
"      20.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.000   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"     100.000   Impervious SCS Curve No."
"       1.000   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.000   Impervious Initial abstraction"
"                    0.974     0.000     0.000     0.000 c.m/sec"
"            Catchment 701          Pervious   Impervious Total Area "
"            Surface Area           0.000      2.069      2.069      hectare"
"            Time of concentration  19.171     2.134      2.134      minutes"
"            Time to Centroid       109.225    81.511     81.511     minutes"
```

```
"              Rainfall depth         56.290     56.290     56.290     mm"
"              Rainfall volume        0.00       1164.64    1164.64    c.m"
"              Rainfall losses        39.028     0.000      0.000      mm"
"              Runoff depth           17.262     56.290     56.290     mm"
"              Runoff volume          0.00       1164.64    1164.64    c.m"
"              Runoff coefficient     0.000      1.000      1.000      "
"              Maximum flow           0.000      0.974      0.974      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                      0.974     0.974     0.000     0.000"
" 54           POND DESIGN"
"        0.974   Current peak flow    c.m/sec"
"        0.642   Target outflow    c.m/sec"
"       1164.6   Hydrograph volume    c.m"
"           4.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.150   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                0.05000   0.02400   200.000"
"                 0.1000   0.04800  1065.153"
"                 0.1500   0.07200  1965.153"
"           1.   ROOFTOP"
"                Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                  hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                    2.069       1.800    600.000      24.000     200.000"
"              Using 30 roofdrains on roofstorage area of 18000. square metre"
"              Peak outflow                  0.044    c.m/sec"
"              Maximum level                 0.091    metre"
"              Maximum storage             912.070    c.m"
"              Centroidal lag                5.572   hours"
"                   0.974     0.974     0.044     0.000 c.m/sec"
" 40           HYDROGRAPH Next link "
"             5   Next link "
"                      0.974     0.044     0.044     0.000"
" 33           CATCHMENT 702"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           702   Controlled portion of site incl office"
"       85.000   % Impervious"
"        2.900   Total Area"
"       30.000   Flow length"
"        1.000   Overland Slope"
"        0.435   Pervious Area"
"       30.000   Pervious length"
"        1.000   Pervious slope"
"        2.465   Impervious Area"
"       30.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.225   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"       0.892   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.907     0.044     0.044     0.000 c.m/sec"
"            Catchment 702          Pervious   Impervious Total Area "
"            Surface Area           0.435      2.465      2.900      hectare"
"            Time of concentration  23.469     2.243      3.147      minutes"
"            Time to Centroid       126.169    88.191     89.809     minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        244.86     1387.55    1632.41    c.m"
"            Rainfall losses        43.632     6.072      11.706     mm"
"            Runoff depth           12.659     50.218     44.584     mm"
"            Runoff volume          55.06      1237.88    1292.94    c.m"
"            Runoff coefficient     0.225      0.892      0.792      "
"            Maximum flow           0.017      0.906      0.907      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.907     0.939     0.044     0.000"
" 54         POND DESIGN"
"       0.939   Current peak flow    c.m/sec"
"       0.300   Target outflow    c.m/sec"
"      2457.4   Hydrograph volume    c.m"
"          5.   Number of stages"
"     318.000   Minimum water level    metre"
"     320.400   Maximum water level    metre"
"     318.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               318.000     0.000     0.000"
"               320.000   0.04373    50.000"
"               320.150   0.04541   600.000"
"               320.300   0.04702  2000.000"
"               320.400     4.901  3000.000"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"             elevation coefficie   breadth sideslope sideslope"
"               320.300     0.900   100.000     0.000     0.000"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               318.000     0.630    0.1200     1.000"
"            Peak outflow                  0.046    c.m/sec"
"            Maximum level               320.218    metre"
"            Maximum storage            1232.526    c.m"
"            Centroidal lag                8.310   hours"
"                 0.907     0.939     0.046     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    0.907     0.046     0.046     0.000"
" 33         CATCHMENT 501"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         501   Uncontrolled portions of site"
"       6.000   % Impervious"
"       1.081   Total Area"
"      30.000   Flow length"
"       5.000   Overland Slope"
"       1.016   Pervious Area"
```

```
"        30.000   Pervious length"
"         5.000   Pervious slope"
"         0.065   Impervious Area"
"        30.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        69.000   Pervious SCS Curve No."
"         0.225   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"        11.412   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.892   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.060     0.046     0.046     0.000 c.m/sec"
"             Catchment 501          Pervious   Impervious Total Area "
"             Surface Area           1.016      0.065      1.081      hectare"
"             Time of concentration  14.481     1.384      11.836     minutes"
"             Time to Centroid       115.319    86.914     109.581    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        571.99     36.51      608.50     c.m"
"             Rainfall losses        43.635     6.102      41.383     mm"
"             Runoff depth           12.655     50.188     14.907     mm"
"             Runoff volume          128.59     32.55      161.14     c.m"
"             Runoff coefficient     0.225      0.892      0.265      "
"             Maximum flow           0.053      0.025      0.060      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.060     0.105     0.046     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.060     0.105     0.105     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total flow"
"             Maximum flow                  0.105    c.m/sec"
"             Hydrograph volume          2618.455    c.m"
"                     0.060     0.105     0.105     0.105"
" 38          START/RE-START TOTALS 501"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    6.050    hectare"
"             Total Impervious area                   4.599    hectare"
"             Total % impervious                     76.014"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                          ie METRIC"
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"                                                                60-Design\SWM"
"               Output filename:                      5228d100yrDec172022.out"
"               Licensee name:                                    Windows User"
"               Company                                                       "
"               Date & Time last used:              12/17/2022 at 12:51:54 AM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"   15000.000   Max. Hydrograph"
" 81          ADD COMMENT==================================================="
"          2  Lines of comment"
"             SWM analysis of 100-year 3 hour post-development peak flow"
"             Preliminary design"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"    4688.000   Coefficient A"
"      17.000   Constant B"
"       0.962   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"             Maximum intensity           239.650    mm/hr"
"             Total depth                  87.263    mm"
"           6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 701"
"           2   Rectangular"
"           1   Equal length"
"           1   SCS method"
"         701   Warehouse roof"
"     100.000   % Impervious"
"       2.069   Total Area"
"      20.000   Flow length"
"       0.500   Overland Slope"
"       0.000   Pervious Area"
"      20.000   Pervious length"
"       0.500   Pervious slope"
"       2.069   Impervious Area"
"      20.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.000   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"     100.000   Impervious SCS Curve No."
"       1.000   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.000   Impervious Initial abstraction"
"                    1.377     0.000     0.000     0.000 c.m/sec"
"             Catchment 701          Pervious   Impervious Total Area "
"             Surface Area           0.000      2.069      2.069      hectare"
"             Time of concentration  14.021     1.859      1.859      minutes"
"             Time to Centroid       101.860    81.186     81.186     minutes"
```

```
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        0.00       1805.48    1805.48    c.m"
"             Rainfall losses        49.280     0.000      0.000      mm"
"             Runoff depth           37.984     87.263     87.263     mm"
"             Runoff volume          0.00       1805.48    1805.48    c.m"
"             Runoff coefficient     0.000      1.000      1.000      "
"             Maximum flow           0.000      1.377      1.377      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.377     1.377     0.000     0.000"
" 54          POND DESIGN"
"        1.377   Current peak flow    c.m/sec"
"        0.642   Target outflow    c.m/sec"
"       1805.5   Hydrograph volume    c.m"
"           4.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.150   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                0.05000   0.02400   200.000"
"                 0.1000   0.04800  1065.153"
"                 0.1500   0.07200  1965.153"
"           1.   ROOFTOP"
"                Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                  hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                    2.069       1.800     600.000      24.000     200.000"
"             Using 30 roofdrains on roofstorage area of 18000. square metre"
"             Peak outflow                  0.059    c.m/sec"
"             Maximum level                 0.122    metre"
"             Maximum storage            1465.903    c.m"
"             Centroidal lag                6.482   hours"
"                  1.377     1.377     0.059     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    1.377     0.059     0.059     0.000"
" 33          CATCHMENT 702"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          702   Controlled portion of site incl office"
"       85.000   % Impervious"
"        2.900   Total Area"
"       30.000   Flow length"
"        1.000   Overland Slope"
"        0.435   Pervious Area"
"       30.000   Pervious length"
"        1.000   Pervious slope"
"        2.465   Impervious Area"
"       30.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.346   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.925   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.368     0.059     0.059     0.000 c.m/sec"
"             Catchment 702          Pervious   Impervious Total Area "
"             Surface Area           0.435      2.465      2.900      hectare"
"             Time of concentration  16.258     1.938      2.826      minutes"
"             Time to Centroid       114.321    86.528     88.250     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        379.60     2151.04    2530.64    c.m"
"             Rainfall losses        57.039     6.526      14.103     mm"
"             Runoff depth           30.225     80.737     73.160     mm"
"             Runoff volume          131.48     1990.17    2121.65    c.m"
"             Runoff coefficient     0.346      0.925      0.838      "
"             Maximum flow           0.053      1.360      1.368      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.368     1.406     0.059     0.000"
" 54          POND DESIGN"
"        1.406   Current peak flow    c.m/sec"
"        0.300   Target outflow    c.m/sec"
"       3927.1   Hydrograph volume    c.m"
"           5.   Number of stages"
"      318.000   Minimum water level    metre"
"      320.400   Maximum water level    metre"
"      318.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                318.000     0.000     0.000"
"                320.000   0.04373    50.000"
"                320.150   0.04541   600.000"
"                320.300   0.04702  2000.000"
"                320.400     4.901  3000.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                320.300     0.900   100.000     0.000     0.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                318.000     0.630    0.1200     1.000"
"             Peak outflow                 0.108    c.m/sec"
"             Maximum level              320.301    metre"
"             Maximum storage           2012.786    c.m"
"             Centroidal lag              11.476   hours"
"                  1.368     1.406     0.108     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     1.368     0.108     0.108     0.000"
" 33          CATCHMENT 501"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          501   Uncontrolled portions of site"
"        6.000   % Impervious"
"        1.081   Total Area"
"       30.000   Flow length"
"        5.000   Overland Slope"
"        1.016   Pervious Area"
```

```
"       30.000   Pervious length"
"        5.000   Pervious slope"
"        0.065   Impervious Area"
"       30.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       69.000   Pervious SCS Curve No."
"        0.345   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       11.412   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.918   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.171     0.108     0.108     0.000 c.m/sec"
"             Catchment 501          Pervious   Impervious Total Area "
"             Surface Area           1.016      0.065      1.081      hectare"
"             Time of concentration  10.031     1.196      8.749      minutes"
"             Time to Centroid       106.684    85.545     103.616    minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        886.72     56.60      943.32     c.m"
"             Rainfall losses        57.153     7.161      54.153     mm"
"             Runoff depth           30.110     80.103     33.110     mm"
"             Runoff volume          305.96     51.95      357.92     c.m"
"             Runoff coefficient     0.345      0.918      0.379      "
"             Maximum flow           0.154      0.037      0.171      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.171     0.217     0.108     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.171     0.217     0.217     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total flow"
"             Maximum flow                  0.217    c.m/sec"
"             Hydrograph volume          4286.822    c.m"
"                     0.171     0.217     0.217     0.217"
" 38          START/RE-START TOTALS 501"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     6.050    hectare"
"             Total Impervious area                    4.599    hectare"
"             Total % impervious                      76.014"
" 19          EXIT"
```

Appendix E: Agency Correspondence

PUSLINCH

Comment Summary – 128 Brock Rd S

Consultant		**Comments**
County of Wellington Planning		See letter attached
GM BluePlan		See letter attached
Stan Denhoed-Township Hydrogeologist		Waiting for comments
Ecology Comments		See letter attached
County of Wellington Roads Department		The Wellington Roads has comments for this pre-consultation request, • In regards to access as outlined in the County's Official Plan, Section 9.8.1 Wellington Rd 46 e) In areas designated industrial or commercial, a maximum of **<u>one</u>** driveway for commercial or industrial access is permitted for each existing property with up to 100 metres of frontage along the county road, where access is acceptable. Only one access point will be provided to this development. • A Traffic Impact Study with the terms of reference submitted for review and comment. • A Stormwater management report for review and comment.
Township of Puslinch Fire Department – Brent Smith		Waiting for comments
Township of Puslinch Building Department – Andrew Hartholt, CBO		Waiting for comments
Township of Puslinch Public Works – Mike Fowler		After review, public works has no comment or concerns.

PUSLINCH

Source Water		This site is located in a Significant Groundwater Recharge Area (SGRA) and a draft Wellhead Protection Area for Quantity (WHPA-Q) with a significant risk level. See attached maps. The proposed development would require the following during the site plan process: • Completion of the Drinking Water Threats Screening Form. This form is an important tool that the Risk Management office uses to determine how Source Protection Plan policies may affect the property. • Depending on answers to the screening form, a Threats Disclosure Report (TDR) may be required to be completed to discuss all Prescribed Drinking Water Threats, specifically winter maintenance activities, chemical handling, fuel, and waste. Depending on what is identified in the TDR, a Chemical Management Plan may be required for fuel, chemical and / or waste handling and storage. At minimum, we will request that a site plan condition be required for any temporary fuel storage during construction. ○ If the tenants are not known at this point, the TDR can be completed at a later time. The applicant would need to discuss and negotiate this with the Risk Management office. • Confirmation of stormwater management design for the property and whether an Environmental Compliance Approval (ECA) is required. • Confirmation of sewage works capacity for the property and whether an Environmental Compliance Approval (ECA) is required. If capacity is in excess of 10,000L per day, Ministry approval is required. • Please discuss if any Permits to Take Water are required or are currently subject to the property. If water taking's exceed 50,000L per day, Ministry approval is required.

PUSLINCH

		• In relation to consumptive water taking, we encourage that properties within the WHPA-Q install a flow meter to monitor water usage. Its not a legal requirement yet but when the policies become in legal effect, it may be required by the Township. During the site plan process, we will provide best management practices for the recharging and infiltration of clean water. Please provide a description of what water is used for on site (ie potable use, truck washing etc) in future submissions. ○ It is important to note that depending on when site plan is submitted, these draft policies may be in legal effect. • Details on any excavation, deep cassions or piers, geothermal, existing wells and other potential transport pathways proposed.
GRCA		See letter attached

COUNTY OF WELLINGTON

PLANNING AND DEVELOPMENT DEPARTMENT
Zach Prince RPP MCIP, Senior Planner
TEL: (519) 837-2600 ext. 2064
EMAIL: zacharyp@wellington.ca

ADMINISTRATION CENTRE
74 WOOLWICH STREET
GUELPH, ONTARIO
N1H 3T9

September 20th, 2022

Township of Puslinch
7404 Wellington Road 34
Guelph, ON N0B 2J0

Dear Ms. Lynne Banks:

Re: Pre-consultation Request – 128 Brock Road

Thank you for circulating the request for pre-consultation comments for the above-noted property. As part of the pre-consultation, we have reviewed the following submitted items:

- A summary
- Proposed site plan. Dated Jan 14, 2022

Based on our review of the above information, and in our capacity as the Township's Planning consultants, we offer the following planning comments for consideration:

Proposal:
- A warehouse of 16,766 m^2 and office of 1,600 m^2 with an ancillary truck depot.

County of Wellington Official Plan:
- The subject property is designated as Secondary Agriculture and within the WHPA Q1 and Q2.
- A portion of the subject property located within the special policy area of the Puslinch Economic Development Area (PA7-1) and within the Paris Galt Moraine.
- Section 6.5.3 permits small scale commercial, industrial and institutional uses on the lands designated secondary Agriculture.
- As per Section 6.5.4 commercial, industrial and institutional uses may be permitted provided the proposed use is compatible with surrounding uses and the use will be small scale and take place on one lot.
- Section 9.8.5 of the Official plan states that "the land identified as PA7-1 is an area intended to service the Township by providing locations for economic activity and employment opportunities. This area is the predominant location for business and industry in the Township, but does not preclude the establishment of small-scale activities outside of concentrations elsewhere in the Township."
- Comments from Source Water Protection staff shall also be considered.

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N1H 3T9

Township Zoning By-law:

- The subject property is designated as site-specific special provisions Highway Commercial (HC (SP89)).
- A Business or professional office is permitted within HC zone.
- A warehouse and trucking terminal is not permitted within the HC zone, but is a permitted use Industrial (I) zone. **A zoning by-law amendment for the proposed use will be required.**
- When preparing a site plan submission, a detailed review of the Zoning By-law will be required to demonstrate compliance. Including but not limited to provisions related to the following:
  - Any outdoor storage would need to meet Section 4.22, including location and limits on area;
  - Section 4.15 provides direction for on-site lighting, which would be demonstrated through a Photometric Plan.
  - Section 5.2 for parking requirements and barrier free parking:
    - Additional clarification regarding the use (Warehouse, Trucking Terminal and offices) is required to determine the minimum parking requirements.
    - The number of barrier free parking requirements are to be confirmed with parking, but a minimum of 1 stall would be required.
    - Bicycle parking shall also be considered on-site.

Township Design Guidelines:
Please refer to the following Guidelines to assist with the site plan submission. Below includes links to the Guidelines:

- Puslinch Design Guidelines - Microsoft Word - 1 PDG Cover Feb1-10 FINAL.doc (puslinch.ca)

***Planning Act* Applications Required:**

- If the applicants choose to peruse with the construction of the warehouse and Truck Terminal on the subject property a Zoning By-Law Amendment (ZBA) application will be required.

Submission Requirements for Zoning By-Law Amendment (ZBA) application and Site Plan application:
Included below is a preliminary list of potential supporting studies that are required by Planning Staff for the future application submissions. The list of studies/assessments identifies minimum requirements.

- ZBA application and fees;
- Planning justification report;

PLANNING AND DEVELOPMENT DEPARTMENT
Zach Prince RPP MCIP, Senior Planner
TEL: (519) 837-2600 ext. 2064
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ADMINISTRATION CENTRE
74 WOOLWICH STREET
GUELPH, ONTARIO
N1H 3T9

- Site plan showing the proposed building including septic and well, parking, setbacks, adjacent and abutting lands etc.;
- Building elevation plans.

The ZBA application is to be prepared in accordance with the Township's Zoning By-law Amendment Guidelines requirements -- Microsoft Word - Zoning By-law Amendment Guidelines (puslinch.ca).

A site plan application is required prior to building permits. Included below is the list of minimum required preliminary studies/assessments.

- Site plan application and fee;
- Site plan showing the proposed building including septic and well, on-site truck movement, garbage receptacles etc.;
- Building elevation plans completed by an Architect.
- Landscape Plan;
- Photometric Plan;
- Grading and Servicing Plan;
- Source Water Protection Screening Form or Drinking Water Threats Screening Form; and
- All of the studies, plans and submission requirements as identified by the other commenting agencies and Township Consultants.

The site plan submission is to be prepared in accordance with the Township's Site Plan & Drawing Requirements -- Site Plan and Drawing Requirements (puslinch.ca).

All studies/assessments are required to meet (at a minimum) the requirements set out in Section 4.6 *Impact Assessment* of the Official Plan. All studies/assessments are to be completed and signed by a qualified professional.

Additional Planning Comments:

- The proposed is access is on Brock Road S. Comments from the County Roads Department should be considered regarding and A traffic impact study may be required to be reviewed by the County and/or MTO.

- *Additional Clarification questions to be addressed*
    - Are the offices related to the warehouse and trucking terminal use?
    - Will the proposed warehouse and the office space will have separate washroom facilities?
    - What level of traffic (truck and vehicles) are coming to and from the site?
    - Is any outdoor storage proposed?

COUNTY OF WELLINGTON

PLANNING AND DEVELOPMENT DEPARTMENT
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These comments have been prepared without the benefit of reviewing detailed comments from other consultants or agencies and based on a conceptual proposal. These comments may change as the development progresses and as more details are provided.

I trust these comments will be of assistance if you have questions please contact the County of Wellington Planning and Development Department.

Yours truly,

[redacted]

Asavari Jadhav
Junior Planner

[redacted]CIP,
Senior Planner

September 20, 2022
Our File: 122006-018

Township of Puslinch
7404 Wellington Road 34
Guelph, ON N0B 2J0

Attention: Ms. Lynne Banks

Re: Pre-Consultation- Zoning Bylaw Amendment
128 Brock Road South, Township of Puslinch

Dear Ms. Banks,

An email was received on August 30, 2022, requesting pre-consultation comments for a future zoning bylaw amendment application related to a proposed future industrial development, on the subject lands located at 128 Brock Road South, in the Township of Puslinch. The proposed development consists of a one-storey warehouse facility, a two-storey office facility and trailer parking and loading spaces, with two accesses to Brock Road South.

In support of the identification of the engineering requirements for a future zoning bylaw amendment application, the following documents and drawings were received and reviewed:

- Summary.
- Site Plan, prepared by Maple Reinders, dated January 14, 2022.

Based on our review of the site and provided documents, we provide the following engineering requirements to support a future zoning bylaw amendment application:

- ***Geotechnical and Hydrogeological Studies,*** prepared by qualified individuals (professional geoscientist, professional engineer and/or professional hydrogeologist) providing information on site setting, desktop review of geologic and hydrogeologic information, results of field investigation programs, nitrate impact analysis, and recommendations related to design and construction of structures and buildings, including foundations; stormwater management systems; septic system design; and availability of potable groundwater.

- ***Functional Servicing and Stormwater Management Report,*** detailing:
    - The original (pre-development) conditions of the site and the nature of the proposed development.
    - How the site is to be serviced by potable water, fire water and wastewater treatment/disposal.
    - How stormwater management is to be provided for the site including water quality, water quantity and water balance, as required by the Township Development Standard, and GRCA requirements.
    - The legal drainage outlet for the proposed SWM facility.
    - Grading and drainage considerations for the site.
    - Geotechnical and hydrogeological considerations.

- ***Concept Plan***, generally showing the proposed limits of development and setbacks, entrances and sightlines for entrances, proposed buildings, driveways, parking areas, loading areas, sidewalk, and locations of well, septic system and stormwater management facility.

- ***Traffic Impact Study***, due to the location of the site on Brock Road South. The Terms of Reference for the TIS should be reviewed by the Township and County before commencement of the study.

Should the proposal proceed to site plan approval, the above-mentioned documents and drawings would need to be updated as required to reflect the final design of the development, and the following additional documents and drawings would be required:

- ***Site Plan***, generally showing the proposed above ground infrastructure and services including but not limited to buildings, curbs, parking areas, loading areas, turning areas, entrances, easements, fire routes and fire protection infrastructure, signage, fencing, lighting, sidewalks, catchbasins, and potable water well.

- ***Site Grading and Servicing Plan,*** generally showing the existing and proposed site grading, and proposed underground infrastructure and services, including but not limited to storm sewers, water and sanitary lines, septic system and stormwater facilities.

- ***Erosion and Sediment Control Plan****,* providing provisions for the control of sediment and potential erosion during construction.

- ***Landscaping Plan and Tree Preservation Plan,*** designed to illustrate existing and proposed plantings onsite and required restoration works for the property.

- ***Photometric Plan***, demonstrating how the site is to be illuminated in accordance with Township Standards.

- ***Spills Management Plan,*** to document the control of potential spills for the subject property.

- ***An Itemized Construction Cost Estimate****,* which includes 15% for engineering and contingencies.

If you have any questions or require additional information, please do not hesitate to contact us.

Yours truly,

GM BLUEPLAN ENGINEERING
Per:

[redacted]

Andrea Reed, P. Eng.
Project Engineer

September 20th, 2022

Jeff Bunn
Deputy Clerk
Township of Puslinch
7404 Wellington Rd. 34, Puslinch, Ontario
N0B 2J0

RE: Natural Heritage Review, File No. D11/Pre/128Brock - Review of pre-consultation for 128 Brock Rd S, Puslinch, ON

INTRODUCTION

Dougan & Associates (D&A) was retained by the Township of Puslinch to complete an ecology review for a site plan application submitted by Wellington Motor Freight. Based on our review, the owner is proposing to develop a warehouse and office on the property, with an ancillary truck depot. The project site is located just south of Gilmour Road on Brock Road South (Wellington Road 46).

The subject property is currently zoned *Highway Commercial* (HC) which does not permit the proposed industrial use. The Wellington County Official Plan designates the property as Secondary Agricultural, which permits small scale commercial, industrial and institutional uses. The property is also located within Policy Area PA7-7 Puslinch Economic Development Area which is to allow economic activity and employment opportunities in Puslinch.

The existing HC zoning that is applied to the site does not permit the proposed use for warehouse/industrial. Therefore, a zoning amendment application is required to change the existing HC zone to the Industrial zone (Wellington County Official Plan).

D&A has reviewed the relevant local and provincial natural heritage policies, mapping, and available plant and wildlife species records to confirm the presence and potential implications of ecological sensitivities that are to be considered for the application and proposed undertaking.

GENERAL COMMENTS

1. The subject lands and proposed building envelope contain GRCA regulated lands. Natural heritage features present on the subject lands and adjacent lands (i.e. within 120 m of) include:
    a. Unevaluated Wetlands (Conservation Authorities Act & O Reg 150/06)
    b. Significant Woodlands (Wellington County Official Plan)
    c. Core Greenlands (Wellington County Official Plan)
2. An Environmental Impact Study (EIS) is required to demonstrate that the proposed development will not result in negative impacts to the identified natural heritage features (Map 1). It is recommended that a Terms of Reference (TOR) is prepared in consultation with the County, Township and GRCA to scope the study. Given that the proposed work is being undertaken within GRCA Regulated Area, a permit is required from GRCA before undertaking the proposed site alteration.

A summary of existing natural heritage constraints is provided in the following section based on a preliminary desktop review of the site and displayed on Map 1.

EXISTING NATURAL HERITAGE CONSTRAINTS

Based on a desktop review, the subject lands are adjacent to (i.e. within 120 m of) mapped natural heritage resources and/ or policy designations as identified on Map 1 and summarized in Table 1.

Table 1: Natural Heritage Constraints – 128 Brock Road South, Puslinch

NATURAL HERITAGE FEATURE OR POLICY AREA	*POLICY REFERENCE*	*POLICY IMPLICATIONS*	*SITE IMPLICATIONS / STUDY REQUIREMENTS (See Map 1)*
Unevaluated Wetlands	Conservation Authorities Act & O Reg 150/06 (2006)	GRCA is authorized under Section 28 of the Conservation Authorities Act to implement and enforce the Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 150/06). GRCA regulates the area within 30 m of non-provincially significant wetlands <2 ha (O.Reg 150/06).	Present on site and within 120 m adjacent lands. Two unevaluated wetlands are mapped in the north and east portions of the property. These wetlands and their 30 m adjacent *area of interference* are regulated by GRCA. Any development or interference within wetlands, or development within the adjacent 30 m *area of interference* require a permit from GRCA. GRCA should be consulted with regard to

NATURAL HERITAGE FEATURE OR POLICY AREA	*POLICY REFERENCE*	*POLICY IMPLICATIONS*	*SITE IMPLICATIONS / STUDY REQUIREMENTS (See Map 1)*
			permitting and EIS requirements.
Environmental Protection Zone (EP) Overlay	Township of Puslinch Zoning Bylaw 13.2	"[The Environmental Protection Zone Overlay] *represents natural heritage features included in the "Greenlands" designation of the County Official Plan, as well as lands to which Grand River Conservation Authority Regulation 150/06 applies (and such lands have been mapped by the GRCA). The Environmental Protection Overlay (EP Overlay) permits development of the lands within the EP Overlay, subject to the following special provisions (Table 13.1):* *a regulated area according to a Conservation Authority…. The erection of a building or structure will not be allowed unless the written approval of the applicable Conservation Authority is obtained."*	The EP overlay corresponds to GRCA-regulated unevaluated wetlands (see above line item). As noted above, permission from GRCA is required prior to site alteration or development within regulated areas.
Significant Woodland	Provincial Policy Statement (2020) Wellington County OP (2021) sec. 5.5.4, 10.2.2 & sched A7 County of Wellington Forest Conservation Bylaw 5115 -09	Significant Woodlands are Key Natural Heritage Features within the Core Greenland designation and will be protected from development or site alterations, as well as any negative impacts of development or site alterations on adjacent lands. Tree removal within woodlands is subject to the Wellington County Forest Conservation Bylaw.	Present along the northern boundary of the subject lands and 120 m adjacent lands. The mapped woodland is approximately 1.8 ha in size and does not meet the County's size criteria for significance (> 4 ha within the Rural System). The woodland contains Core Greenlands (unevaluated wetland) and likely meets other significance criteria outlined in County policy 5.5.4: *"proximity to watercourses, wetlands, or other woodlands; linkage functions; age of the stand or individual*

NATURAL HERITAGE FEATURE OR POLICY AREA	POLICY REFERENCE	POLICY IMPLICATIONS	SITE IMPLICATIONS / STUDY REQUIREMENTS (See Map 1)
			trees; presence of endangered or threatened species; or overall species composition." An EIS is required to demonstrate the proposal will result in no negative impact to the woodland or its ecological functions.
Core Greenlands	County of Wellington OP s. 5.6.1, 5.6.2, 5.6.5; Schedule A7.	*Where development is proposed in the Greenland system or <u>on adjacent lands</u>, the County or local municipality shall require the developer to:* *a) identify the nature of the features potentially impacted by the development;* *b) prepare, where required, an environmental impact assessment to ensure that the requirements of this Plan will be met and consider enhancement of the natural area where appropriate and reasonable.* *c) address any other relevant requirements set out in Section 4.6.3 Environmental Impact Assessment.* *No development will be approved unless the County is satisfied that the Greenland and Environmental Impact Assessment policies are met* (Wellington County OP, s. 5.6.2)	Present on subject lands and 120 m adjacent lands. An EIS is required to demonstrate the proposal will result in no negative impact to Core Greenland features or their ecological functions.
Species At Risk (see Appendix A)	Provincial Policy Statement (2020) Species at Risk Act (SARA) (2002) Endangered Species Act (ESA) (2007)	Development and site alteration is not permitted within habitat for Endangered & Threatened species unless a permit has been obtained through the MECP for specific circumstances. Special Concern and S1-S3 species' habitat receive protection under the province's Significant Wildlife Habitat provisions. Development and site	Potentially present within and adjacent to proposed development area. NHIC's online natural heritage database (queried on Sept 9, 2022) reported 9 Species at Risk that have been recorded within approximately 1 km of the

NATURAL HERITAGE FEATURE OR POLICY AREA	POLICY REFERENCE	POLICY IMPLICATIONS	SITE IMPLICATIONS / STUDY REQUIREMENTS (See Map 1)
		alteration within and adjacent to SWH must demonstrate no negative impacts to the species or its habitat.	subject lands (ref. Appendix A). Habitat for these species may be present on and adjacent to the subject lands and should be assessed as part of an EIS to demonstrate the development will result in no negative impact to SAR or their habitats.
Significant Wildlife Habitat	Provincial Policy Statement (2020)	Significant Wildlife Habitat (SWH) is a Key Natural Heritage Feature. Development and site alteration is not permitted in Significant Wildlife Habitat unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. Development and site alteration shall not be permitted on adjacent lands to SWH unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological function	Potentially present within and adjacent to proposed development area. An EIS is required to identify candidate and/or confirmed SWH within the subject lands and adjacent 120 m and demonstrate the proposal will result in no negative impacts to SWH.

This preliminary constraint assessment is based on a desktop review of currently available background and policy information. Additional significant attributes and ecological functions may be identified through future field investigations.

CONCLUSION & RECOMMENDATIONS

This document has been prepared based on a preliminary desktop review of existing natural heritage features and policy. According to provincial and local policy, an EIS is required to demonstrate the proposal will not result in negative impacts to identified natural heritage features or their ecological functions. The EIS should be prepared in accordance with the County's Official Plan section 4.6.3. A TOR should be established with the County, Township and GRCA to confirm the scope.

We trust this document provides you with a preliminary review of the ecological constraints present on the subject lands, and next steps regarding the application. Please do not hesitate to contact the undersigned with any questions or concerns regarding this review.

Regards,

[redacted] [redacted]

Christina Myrdal, HBSc, Eco. Mgmt. Tech.
Ecology Manager

Todd Fell, OALA, CSLA, CERP
Director, Landscape Arch., Rest. Ecologist

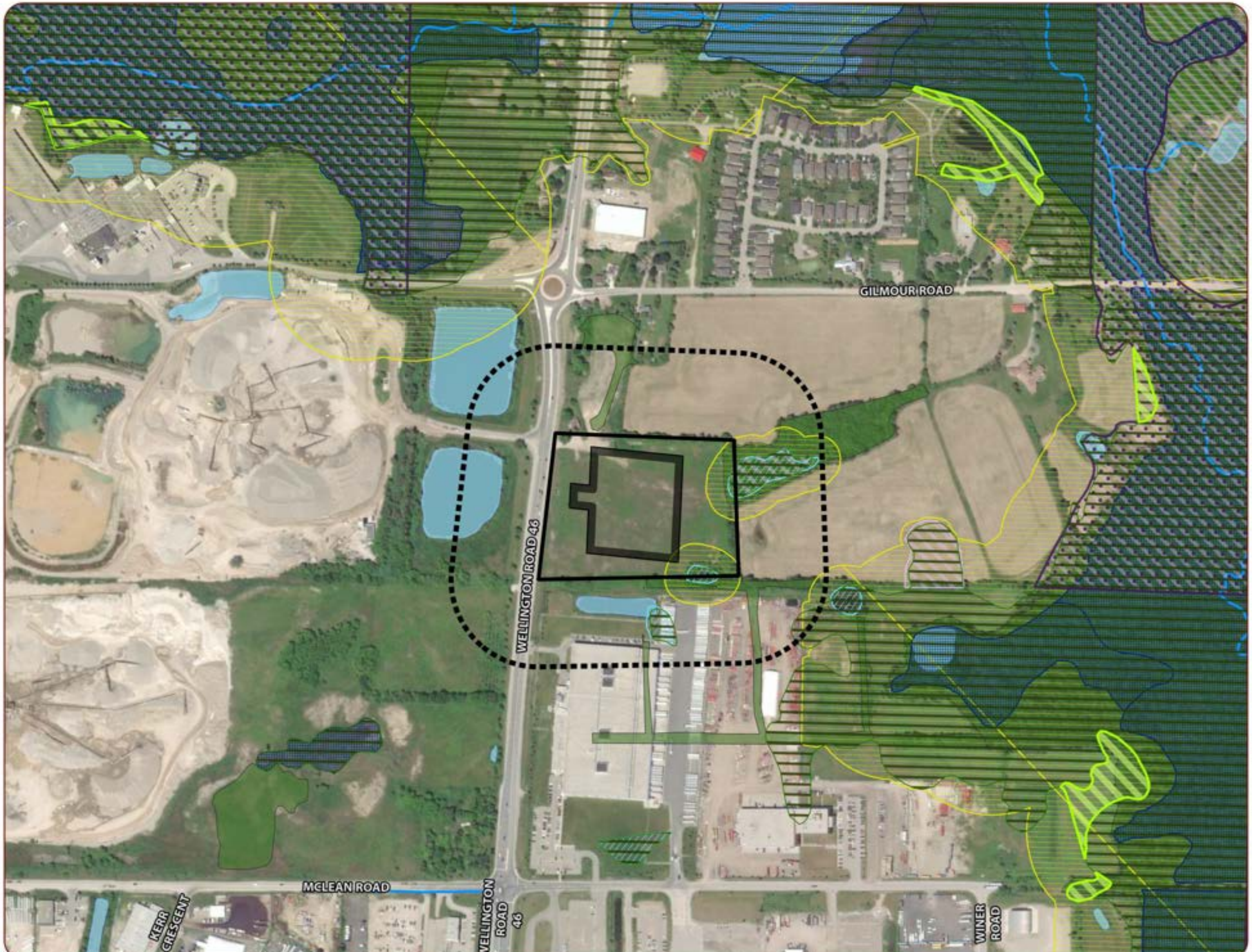
Map 1. Preliminary Natural Heritage Constraints

PROJECT: DA21-034-16

CLIENT: Township of Puslinch

DATE: 16, September 2022

DRAWN BY: N.White



Map 1: Preliminary Constraints

Preliminary Ecology and Natural Heritage Review for 128 Brock Rd S, Puslinch, ON

- Approximate Study Area
- Adjacent Lands (120 m)
- Proposed Building (Approximate Location)

Wellington County OP Designation

- Greenland
- Core Greenland

Puslinch Zoning Bylaw Schedule A

- Environmental
- Overlay

Wetland With Significance

- MNR Wetland - Not Evaluated
- MNR Wetland - Evaluated-Other
- MNR Provincially Significant Wetland
- ANSI
- GRCA Regulation Limit

Greenbelt Designation

- Protected Countryside
- Watercourse
- Waterbody
- MNR Wooded Area

Basemap: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri, Town of Oakville, Maxar

0 50 100 200

Metres

SCALE: 1:5,000

Disclaimer:
The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation.
MNRF data provided by Queen's Printer of Ontario. Use of the data in any derivative product does not constitute an endorsement by the MNRF or the Ontario Government of such products.

Appendix A. NHIC Query

A query of the Natural Heritage Information Centre (NHIC) was conducted on September 6, 2022, to determine whether any Species at Risk (SAR) and/or provincially rare species (i.e. those with SRanks S1 – S3) were on record within approximately 1 km of the subject lands. Table 1 summarizes the results of the query.

Table 1. NHIC species records within approx. 1 km of the subject lands (NHIC, 2022)

COMMON NAME	SCIENTIFIC NAME	SARA STATUS*	ESA STATUS*	SRANK*	GENERAL HABITAT
Smooth Yellow False Foxglove	*Aureolaria flava*	---	THR	S2?	Oak savannahs / woodlands
Yellow-banded Bumblebee	*Bombus terricola*	SC	SC	S3S5	Variety of habitats / mixed woodlands / open grasslands
Snapping Turtle	*Chelydra serpentina*	SC	SC	S3	streams / ponds / lakes
Midland Painted Turtle	*Chrysemys picta marginata*	---	SC	S4	streams / ponds / lakes
Eastern Wood-pewee	*Contopus virens*	SC	SC	S4B	Woodlands / forest edges and openings
Bobolink	*Dolichonyx oryzivorus*	THR	THR	S4B	large grasslands / hayfields
Double-striped Bluet	*Enallagma basidens*	---	---	S3	Streams / ponds / lakes
Eastern Milksnake	*Lampropeltis triangulum*	SC	NAR	S4	Rocky outcrops / fields / forest edges
Eastern Meadowlark	*Sturnella magna*	THR	THR	S4B	large grasslands / hayfields

* END = Endangered; THR = Threatened; SC = Special Concern.
S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure

Grand River Conservation Authority
Administration Centre: 400 Clyde Road, P.O. Box 729 Cambridge, ON N1R 5W6
Phone: 519-621-2761 Toll free: 1-866-900-4722 Fax: 519-621-4844 www.grandriver.ca

September 15, 2022

Lynne Banks, Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Road 34
Puslinch, ON, N0B 2J0

Re: Pre-consultation Request – 128 Brock Road South, Puslinch, Ontario

Dear Ms. Banks,

The Grand River Conservation Authority (GRCA) has reviewed the pre-consultation request for a proposed Site Plan Application and Zoning-Bylaw Amendment at 128 Brock Road South.

The subject property includes an unevaluated wetland and its regulated allowance, as well as the regulated allowance to a separate offsite wetland. These features and their associated allowances are regulated by the GRCA. A map showing the location of these features is appended to these comments. The subject property is also located in the vicinity of the Mill Creek Puslinch Provincially Significant Wetland (PSW) Complex, approximately 275 metres to the east. The GRCA would request the following information in support of the proposed Site Plan Application and Zoning By-law Amendment:

1. Detailed Site Plan and Grading Plan.
2. Functional Servicing and Stormwater Management Report.
3. Wetland boundary delineation performed by a qualified professional and subsequent verification by the GRCA.
4. Scoped Environmental Impact Study (EIS) following GRCA guidelines and submission standards for wetlands (GRCA, 2005).
5. EIS Terms of Reference (TOR) circulated for approval prior to undertaking the EIS.

GRCA offers the following comments for the pre-consultation request:

- The collection and review of background information for the EIS should include the Mill Creek Subwatershed Study as it provides guidance on wetland setbacks as well as stormwater management details.

- As part of the EIS, the unevaluated wetland features on and immediately adjacent the property should be screened for suitability to be complexed with the adjacent Mill Creek PSW. This will help identify and inform the proposed development's ability to satisfy GRCA policies.
- A water balance study will be required to evaluate potential post-development impacts to wetlands resulting from changes to site perviousness and drainage.
- Please include all wetlands and associated allowances on and immediately adjacent the property on the Site Plan and Grading Plans.
- The EIS should identify and interpret additional technical studies such as, but not limited to, a grading plan, stormwater management plan and functional servicing report.
- A permit from the GRCA pursuant to Ontario Regulation 150/06 will be required for any proposed development within regulated features and/or their regulated allowance.
- We wish to note that this application may be subject to Growth Plan policies for key hydrologic features and suggest that the Township of Puslinch consider the applicable policies in their review of this pre-consultation.

We trust this information is of assistance. If you have any questions or require additional information, please contact Chris Lorenz at 519-621-2763 ext. 2236 or clorenz@grandriver.ca.

Sincerely,

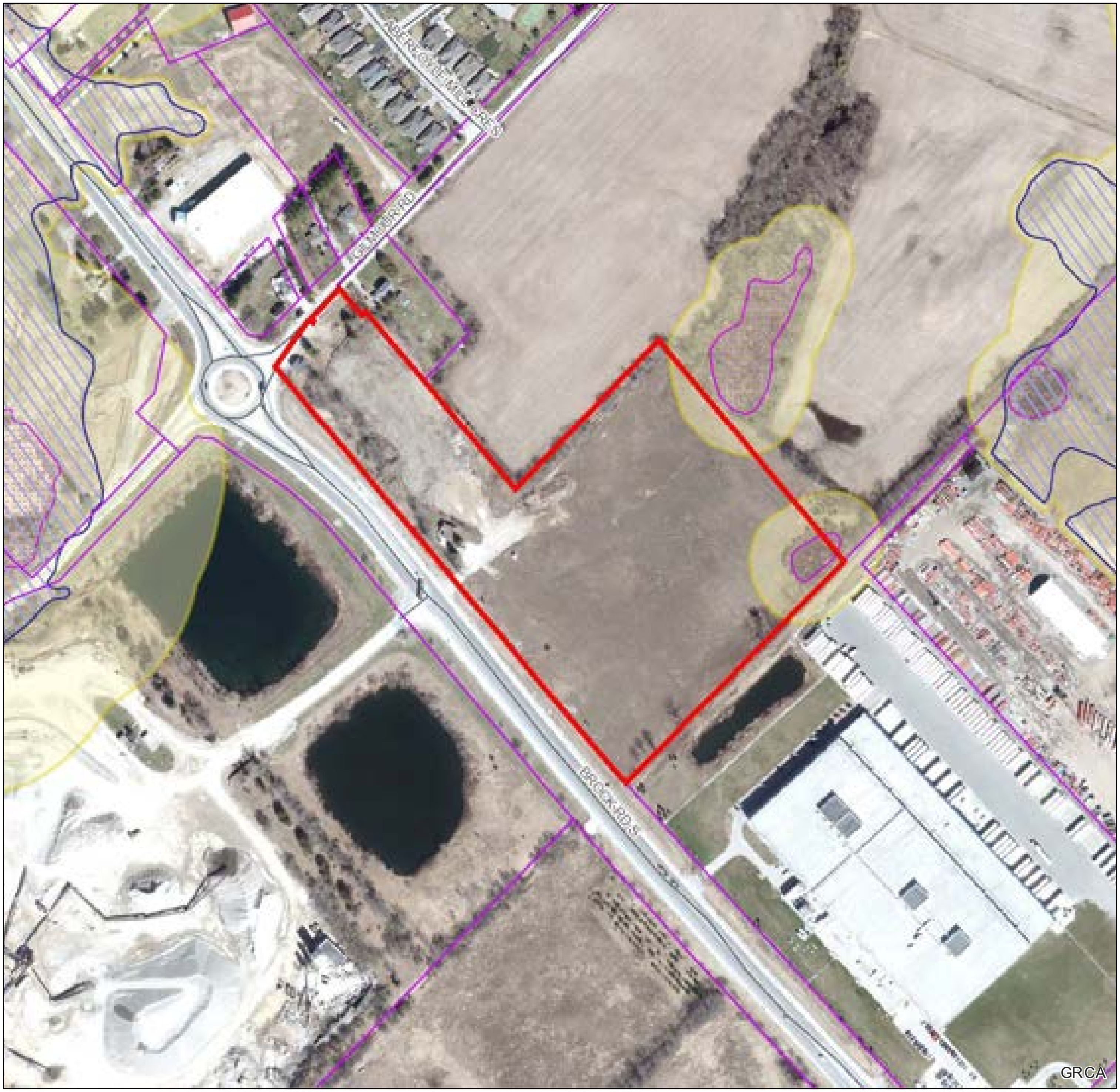
[redacted]

Chris Lorenz
Resource Planner
Grand River Conservation Authority

Enclosed: GRCA resource mapping

Grand River Conservation Authority
Date: Aug 30, 2022
Author: AG

128 Brock Road, Puslinch



Legend

- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
  - Special Policy Area
- Slope Valley (GRCA)
  - Steep
  - Oversteep
  - Steep
- Slope Erosion (GRCA)
  - Oversteep
  - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

This legend is static and may not fully reflect the layers shown on the map. The text of Ontario Regulation 150/06 supercedes the mapping as represented by these layers.

0 20 40 80 120 Metres

N

Map Centre (UTM NAD83 z17): 569,638.60 4,812,877.94

This map is not to be used for navigation | 2020 Ortho (ON)

NAD 1983 UTM Zone 17N

Scale: 4,097

Sarah Brent

From: Steve Head
Sent: Wednesday, November 16, 2022 8:41 AM
To: filing@meritech.ca
Cc: Christopher Togeretz
Subject: FW: 128 Brock Road South, Puslinch - TOR for EIS (proj2984) JQ5228

Categories: Tracked To Dynamics 365

Sarah, could you pls pdf the email below and save to the COM folder?

S

From: Elaine Gosnell <egosnell@nrsi.on.ca>
Sent: November 15, 2022 17:07
To: Pierre Chauvin <pchauvin@mhbcplan.com>; Sandy Anderson <sandy.anderson@cvdengineering.com>; Steve Head <steveh@meritech.ca>; Steve Kolkman Tacoma Engineers <s.kolkman@tacomaengineers.com>; Joshua Blackler Collaborative Structures <JBlackler@collaborativestructures.com>; Mike Gilles Tacoma Engineers <mikeg@tacomaengineers.com>; Joe Vanderzalm CVD Engineering <joe.vanderzalm@cvdengineering.com>
Subject: Fwd: 128 Brock Road South, Puslinch - TOR for EIS (proj2984)

Hello,

I am passing along the comments from GRCA's review of our Terms of Reference. Note that their comments relate to maintaining the wetland water balance and maintaining recharge and infiltration to groundwater.

Elaine

Elaine Gosnell B.Sc. P.Biol. (she/her/hers)
Senior Terrestrial and Wetland Biologist
Natural Resource Solutions Inc.
415 Phillip Street, Unit C
Waterloo, ON N2L 3X2
(p) 519-725-2227 Ext. 413 (f) 519-725-2575
(m) 519-580-1746
(w) www.nrsi.on.ca (e) egosnell@nrsi.on.ca
@nrsinews Natural Resource Solutions Inc.
Over 20 years of environmental consulting excellence

-------- Forwarded Message --------
Subject:RE: 128 Brock Road South, Puslinch - TOR for EIS (proj2984)

Date: Tue, 15 Nov 2022 21:10:33 +0000
From: Jenn Simons <jsimons@grandriver.ca>
To: Elaine Gosnell <egosnell@nrsi.on.ca>

Good afternoon Elaine,

GRCA staff has had the opportunity to review the Terms of Reference for Environmental Impact Study related to the address above and offer the following comments:

1. We understand that the previous EIS and supporting Hydrogeological Investigation by MBN Environmental Engineering (2014) determined that the 2 small wetlands are not connected to the Mill Creek-Puslinch Provincially Significant Wetland Complex either by surface or by groundwater, based on their isolated nature and direction of groundwater flow. We would ask that the new EIS and supporting studies identify and demonstrate how the wetland water balance for the 2 small wetland features will be maintained and matched to pre-development conditions.
2. The subject site has a high recharge value and ask that the EIS and supporting studies identify and demonstrate how the sites recharge and infiltration rates will be maintained.

As an advisory comment, due to the high recharge value you may wish to explore opportunities to infiltrate clean roof water at the detailed design stage.

I trust this is of assistance. Please let me know if you have any questions.

Sincerely,

Jenn Simons
Resource Planner
Grand River Conservation Authority

400 Clyde Road, PO Box 729
Cambridge, ON N1R 5W6
Office: 519-621-2763 ext. 2238
Email: jsimons@grandriver.ca
www.grandriver.ca | Connect with us on social media

From: Elaine Gosnell <egosnell@nrsi.on.ca>
Sent: Wednesday, November 9, 2022 2:40 PM
To: Chris Lorenz <clorenz@grandriver.ca>; jbunn@puslinch.ca
Cc: pchauvin@mhbcplan.com; jblackler@collaborativestructures.com; steveh@meritech.ca; Sandy Anderson <sandy.anderson@cvdengineering.com>
Subject: 128 Brock Road South, Puslinch - TOR for EIS (proj2984)

Hello Chris and Jeff,

Natural Resource Solutions has been retained by Wellington Motor Freight as part of a team to prepare an EIS for the development of a truck facility at 128 Brock Road S in Puslinch. I have reviewed the Pre-Consultation notes as well as the previous EIS and hydrogeology reports prepared for the Site Alteration permit for the property. The site has been graded, filled and leveled in 2016, and I have prepared the TOR for the EIS based on it's current condition and the existing background information.

The Terms of Reference are attached for your review and comment. If you have any questions, please contact me.

Elaine

--

Elaine Gosnell B.Sc. P.Biol. (she/her/hers)
Senior Terrestrial and Wetland Biologist
Natural Resource Solutions Inc.
415 Phillip Street, Unit C
Waterloo, ON N2L 3X2
(p) 519-725-2227 Ext. 413 (f) 519-725-2575
(m) 519-580-1746
(w) www.nrsi.on.ca (e) egosnell@nrsi.on.ca
@nrsinews Natural Resource Solutions Inc.
Over 20 years of environmental consulting excellence

Christopher Togeretz

From: Howard Wray <hwray@tritoneng.on.ca>
Sent: Tuesday, November 15, 2022 4:51 PM
To: Christopher Togeretz
Cc: Steve Head; joedk@wellington.ca
Subject: RE: 128 Brock Rd S, Puslinch JQ5228
Attachments: M6386-Gilmour Road Development Area.pdf

Categories: Tracked To Dynamics 365

Hi Chris

We allowed for the existing drainage area and conditions flowing towards Brock Road. The contributing area of 27 Ha is illustrated on the attached. We used a C factor of 0.25. This run-off is conveyed in storm sewers in the Brock Road right of way towards the north, and any development would have to be controlled to pre-development flows.

The two private ponds on Dufferin's property were not considered in the design.

I trust that this is of some assistance.

Howard Wray, P. Eng.

Triton Engineering Services Limited
229 Broadway, Unit 1 Orangeville, ON L9W 1K4
Tel (519) 941-0330 ext 223 • Fax (519) 941-1830 • www.tritoneng.on.ca

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From: Christopher Togeretz <christophert@meritech.ca>
Sent: November 15, 2022 3:37 PM
To: Howard Wray <hwray@tritoneng.on.ca>
Cc: Steve Head <steveh@meritech.ca>; joedk@wellington.ca
Subject: 128 Brock Rd S, Puslinch JQ5228

Good day Howard, Joe pointed me to you.

We're just beginning pre-design (zone change) for a potential development at the southeast corner of Brock Rd @ Gilmour Rd. Joe will send us the latest drawings of the road, but said that I should contact you to ask about the scope/extent of the storm drainage design you completed in relation to the design of storm sewers, culverts, etc.

Of course, what I'm trying to establish is what sort of allowance/assumptions were made regarding the site in question. It would be handy if the two ponds across the road were designed to take flows from the site, but we're not going to assume anything.

Anything you can provide will be greatly appreciated and valuable.

Regards,

Chris Togeretz, P.Eng.
Manager, Design Services

Meritech Engineering
1315 Bishop Street North, Suite 202
Cambridge, ON N1R 6Z2
www.meritech.ca
519-623-1140

Christopher Togeretz

From: Pasquale Costanzo <pasqualec@wellington.ca>
Sent: Thursday, November 24, 2022 8:45 AM
To: Christopher Togeretz
Cc: Steve Head; Akshay Anilkumar
Subject: RE: 128 Brock Rd S, Puslinch JQ5228

Categories: Tracked To Dynamics 365

Caution! This message was sent from outside your organization. Allow sender | Block sender

Hi Chris,

As per Howard's comments, the County's expectation is that the development would have to control per to post for all events up to the 100-yr.

Take care

Pasquale Costanzo, C.E.T., CMMII Infrastructure Specialist
Technical Services Supervisor
County of Wellington, Roads Division
T 519.837.2601 x 2250
E pasqualec@wellington.ca

From: Christopher Togeretz <christophert@meritech.ca>
Sent: Tuesday, November 22, 2022 4:45 PM
To: Pasquale Costanzo <pasqualec@wellington.ca>
Cc: Steve Head <steveh@meritech.ca>; Akshay Anilkumar <shaya@meritech.ca>
Subject: 128 Brock Rd S, Puslinch JQ5228

CAUTION: This email originated from outside the organization. Do not click links or open attachments unless you know the contents to be safe.

Good afternoon Pasquale,

Ms. Andrea Reed from GM BluePlan had provided comments to the Township on an industrial project (rezoning and then site plan) at the above-noted site on Sept 20.
We're now working on the conceptual grading/servicing/SWM design, and I wanted to get buy-in on the SWM criteria before we progressed too far.

Andrea's email to me today says: *We will defer to the County when establishing SWM criteria for the site, as Brock Road is a County Road. I would recommend reaching out to Pasquale….*

Last week I corresponded with Triton, who designed the reconstruction of Brock Road (see email thread attached) – my question was whether the site was accounted for in the design of the culverts under Brock Street. Good news: yes. The email from Triton last Tuesday says that "development would have to be controlled to pre-development flows". However, obviously there's a difference between "control each storm event to an allowable flow" and "control the 100-year event down to the 25-year storm with a C of 0.25".

Are you able to review the attached email chain and let us know if you concur that the quantity control criteria should be to **control the post-development peak flows from the site in each design storm to an allowable flow rate using each design storm and a C of 0.25**? In other words, because the road crossing culverts are sized for the 25-year storm, in larger storm events some overland flows over Gilmour Road are permitted, if the SWM design for the site requires it?

Thanks in advance, have a great day,

Chris Togeretz, P.Eng.
Manager, Design Services

Meritech Engineering
1315 Bishop Street North, Suite 202
Cambridge, ON N1R 6Z2
www.meritech.ca
519-623-1140


27.045
0.25

Appendix F: Project Team Documents

FIRE FIGHTING ON-SITE WATER SUPPLY - OFFICE

Date:	December 2, 2022	**No. of Pages:**	2
Project:	Wellington Motor Freight - Office	**Project No.:**	TE-41102-22
Address:	128 Brock Road, Aberfoyle, Ontario		
Client:	CSL		
Distribution:	Steve Head — Meritech	steveh@meritech.ca	

This letter is to outline our on-site water supply calculation for fire-fighting purposes for the unsprinklered office building, based on Div. B A-3.2.5.7. of the 2012 r2022 Ontario Building Code (OBC).

The water supply quantity formula [Div.B, A-3.2.5.7.3.(a)]:

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

- $\underline{K = 18}$ from table 1. The building is D major occupancy, and is proposed to be combustible construction
- $\underline{V = 3{,}720\ m^3}$ based on the total building volume, calculated from the conceptual Site Plan. Floor to floor heights assumed to be 4 meters. Building area = 930 square meters.
- $\underline{S_{tot} = 1.0}$ from figure 1. All exposure distances exceed 10m, based on the conceptual Site Plan. Therefore, $S_{tot} = 1.0 + (0+0+0+0)$.

Q = 18 *x 3,720 m*^{3} *x 1.0*

Q = *66,960 litres* *or 17,690 US gal*

The minimum water flow rate as derived from Table 2 [Div.B, A-3.2.5.7.3.(b)(c)]:

2,700 L/min at minimum pressure of 140 kPa (if Q< 108,000L)

Minimum water supply based on flow rate.

Qflow = 30 min. x 2,700 L/min.

Qflow = ***81,000 litres*** *or 21,400 US gal*

Therefore, the minimum quantity of on-site water storage for fire-fighting purposes is 81,000 litres. Design of the water storage system must conform to the provisions outlined in OBC Div.B, A-3.2.5.7. The site provisions for fire department access must conform to the requirements of OBC Div.B, 3.2.5.

176 Speedvale Ave. West
Guelph, Ontario
Canada N1H 1C3

T: 519-763-2000 x241
F: 519-824-2000
s.kolkman@tacomaengineers.com

The subject property comprises two buildings as defined by OBC, a sprinklered warehouse and an unsprinklered office, connected by an elevated walkway. For the purposes determining the total volume of on-site fire fighting water, it can be assumed that fires would not occur in both building simultaneously. Therefore, the total water volume can be taken as the worst case as calculated for each building. The water volumes do not need to be summed.

Please feel free to contact the undersigned if there are any questions pertaining to this report.

Sincerely,

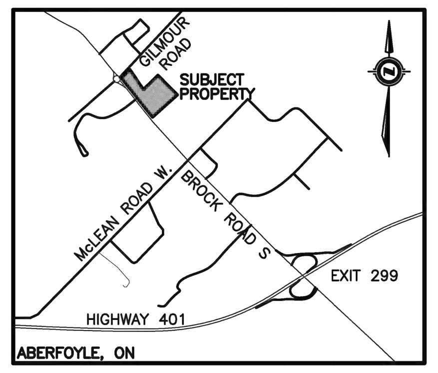
Per [redacted]__

Steve Kolkman, C.E.T.
Technologist

Encl. None

PUSLINCH ZONING REGULATION:

1	REGULATION	REQUIRED	ACTUAL
2	ZONE	IND	IND
3	MIN. REQ'D LOT AREA	0.4 ha (4,000 sm)	6.05 ha (60,565 sm)
4	MIN. LOT FRONTAGE	30m	±387m
5	MIN. FRONT YARD	6m	6m
6	MIN. INTERIOR SIDEYARD	5m	10.6m
7	MIN. INTERIOR SIDEYARD ADJACENT TO RES. ZONE	15m	N/A
8	MIN. EXTERIOR SIDEYARD	15m	137m
9	MIN. REAR YARD	7.5m	±68m
10	MAX. LOT COVERAGE	75%	33.4%
11	MIN. LANDSCAPED OPEN SPACE	15%	29.18%
12	MAXIMUM HEIGHT	25m	15m
13	BUFFER REQ'D IF ADJACENT TO RES. ZONE	1.5m PLANTING STRIP	1.5m PLANTING STRIP
14	OFF-STREET PARKING	169 SPACES	165 SPACES
15	OFF-STREET LOADING	>5000 SM = 3 SPACES + 1 ADDITIONAL FOR EA. 10,000 SM ABOVE 5,000 SM	21 SPACES
16	GARBAGE STORAGE		INDOORS
17	NATURAL ENVIRONMENT SETBACK	30m	37m
18	LANDSCAPE BUFFER ALONG BROCK ROAD	3m	3m



KEY MAP

SITE DATA:

PROPERTY AREA:	60,590 SM (14.97 ACRES)
ZONING:	PROPOSED - INDUSTRIAL IND (SUBJECT TO ZBA) CURRENT - HIGHWAY COMMERCIAL HC
MUNICIPAL ADDRESS:	128 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO, CANADA
LEGAL DESCRIPTION:	PIN 71195-0669 (LT) PART OF LOT 24, CONCESSION 7 AND PART OF LOT 24, CONCESSION 8 AND PART OF ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 7&8 TOWNSHIP OF PUSLINCH COUNTY OF WELLINGTON
SURVEY INFORMATION:	PROJECT: 31772-22 VAN HARTEN SURVEYING INC 423 WOOLWICH ST., GUELPH, ONTARIO N1H 1X3

LEGEND

(symbol)	EXIT MAN DOOR
(symbol)	MAIN ENTRANCE DOOR (PRINCIPLE ENTRANCE)
(symbol)	O/H DRIVE-IN DOOR
(symbol)	LOADING DOCK DOOR
SSIB	SHORT STANDARD IRON BAR
SIB	STANDARD IRON BAR
IB	IRON BAR
C.L.F.	CHAIN LINK FENCE
HPL	NEW HYDRO POLE
HP	EXISTING HYDRO POLE

B
BH-#
TP-#
FDC
FH
LANDSCAPING DRAWINGS

METRIC NOTE:

1. DISTANCES AND COORDINATES SHOWN HEREON ARE IN METERS AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GENERAL NOTES:

- REFER TO SEPARATE SITE GRADING, DRAINAGE AND SERVICING PLANS AS PREPARED BY **MERITECH ENGINEERING.**
- EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY **VAN HARTEN SURVEYING INC.** DATED OCTOBER 27, 2022.
- REFER TO LANDSCAPE PLAN AS PREPARED BY **ABOUD & ASSOCIATES.**
- ALL NEW SIGNAGE TO IDENTIFY PARKING STALLS AND TRAFFIC WITHIN THE SITE SHALL BE INSTALLED ON HOT DIPPED GALVANIZED PRE-PUNCHED METAL POSTS. FIRE ROUTE SIGNS TO BE MOUNTED SO THAT THE SIGN FACES THE FIRE ROUTE WITH THE BOTTOM OF THE SIGN AT 2.1m TO 2.7m FROM FINISH GRADE.
- WALL LIGHTING ON BUILDING ADDITIONS SHALL BE FULL FACE CUT OFF TYPE.
- ALL ROOFTOP MECHANICAL UNITS ON THE BUILDING ADDITION WILL BE SCREENED BY THE BUILDING AND WILL NOT BE VISIBLE FROM THE ROAD TO THE SATISFACTION OF THE GENERAL MANAGER OF PLANNING AND BUILDING SERVICES.
- REFER TO GEOTECHNICAL REPORT FOR ASPHALT CONSTRUCTION.
- ALL PARKING LINES TO BE DELINEATED WITH 100mm WIDE EXTERIOR GRADE YELLOW TRAFFIC PAINT W/ HIGH ABRASION RESISTANCE.

CONSTRUCTION NOTES:
(AS REFERENCED ON SITE PLANS)

1. EXISTING HYDRO POLE, HYDRO WIRES AND ALL ASSOCIATED GUY WIRES TO BE REMOVED. SEE SITE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. EXISTING POTABLE WATER WELLS ENCOUNTERED ARE TO BE DECOMMISSIONED AND PLUGGED BY A WELL CONTRACTOR LICENSED BY THE MINISTRY OF THE ENVIRONMENT. WORK MUST COMPLY WITH MINISTRY OF THE ENVIRONMENT PROCEDURES FOR PLUGGING UNUSED WATER WELL ACCORDING TO ONTARIO REGULATION 903. SEE SITE SERVICING DRAWINGS FOR MORE INFORMATION.
3. SEE LANDSCAPING PLAN FOR TREE REMOVALS.
4. CAST IN PLACE CONCRETE RETAINING WALL, C/W 1070mm HIGH GUARDRAIL. SEE GRADING AND STRUCTURAL DRAWINGS.

PARKING DATA:

PARKING

PARKING REQUIRED (BASED ON NET FLOOR AREAS)

WAREHOUSE	=1 SP / 200 SM	= 18,800 / 200	= 94 SPACES
BUSINESS OFFICE	=1 SP / 40 SM	= 3,000/ 40	= 75 SPACES
TOTAL		**169 SPACES**	

PARKING PROVIDED — **165 SPACES (EXCLUDING TRACTOR PARKING)**

DESIGNATED PARKING SPACES ARE INCLUDED IN THE PARKING SPACES PROVIDED ABOVE

DESIGNATED PARKING SPACES REQUIRED	4 + 2% REQ'D SPACES
DESIGNATED PARKING SPACES PROVIDED	8 SPACES
TYPICAL PARKING SPACE	3.0m x 6.0m
ACCESSIBLE PARKING SPACES	
TYPE 'A'	3.6m x 6.0m
MOBILITY ACCESS AISLE	1.5m x 6.0m
DRIVE AISLE	6.0m

LOADING SPACES

LOADING SPACES REQUIRED	**6 SPACES**
LOADING SPACES PROVIDED	**21 SPACES**
TYPICAL LOADING SPACE	3.5m x 10m

BICYCLE PARKING

SPACES REQUIRED

WAREHOUSE	=1 SP / 1,000 SM	= 18,800 / 1000	= 19 SPACES
OFFICE	=2 SP / 1,000 SM	= 2,790 / 500	= 6 SPACES
TOTAL		**26 SPACES**	

PARKING PROVIDED	**26 SPACES**
TYPICAL BICYCLE SPACE	0.6m x 1.8m

AUTOMATIC SPRINKLER PROTECTION & HOSE STREAMS – STORED WATER SUPPLY CALCULATION

WELLINGTON MOTOR FREIGHT
BROCK ROAD
NOV 30,2022

OBC 3.2.5.7 & NFPA#13–2013 (ALL CALCULATIONS ARE IN U.S. GALLONS)

SPRINKLER WATER DEMAND – HYDRAULIC CALCULATION METHOD:

NFPA#13 – CHAPTER 16 & 17 CALCULATION FOR CLASS 1–4 STORAGE
12 SPRINKLERS OPERATING AT 40PSI = 1921.25 GPM — = 1921.25 U.S.GPM TOTAL SPRINKLER DEMAND.

INSIDE HOSE STREAM ALLOWANCE:

CHAPTER 12 – 12.8.6.1 (NOT REQUIRED IF NO HOSES CONNECTED AS PER NFPA#13 – A.12.8.1) — = 0 U.S. GPM
BUILDING CANNOT EXCEED 14M IN HEIGHT AS PER O.B.C(2012) 3.2.9.1

OUTSIDE HOSE STREAM ALLOWANCE:

CHAPTER 12 – 12.8.6.1 DRAFT PORT (NO HYDRANTS OFF PUMP) — = 150 U.S. GPM

TOTAL INSIDE AND OUTSIDE HOSE STREAM ALLOWANCE: — = 150 U.S. GPM

DURATION REQUIRED:

(SYSTEM ALARMS AND FIRE PUMP RUNNING CONTACT MUST BE WIRED TO A ULC CENTRAL MONITORING STATION)

CHAPTER 12 – 12.8.6.2 (12 ESFR SPRINKLERS IS 60) — = 60 MINUTES

METHOD#1
MAXIMUM SPRINKLER AND HOSE STREAM WATER VOLUME DEMAND CALCULATION:

(STORAGE–NFPA#13–2013 TABLE 12.8.6.1)

1921.25 U.S. GPM SPRINKLER + 0 U.S. GPM INSIDE HOSE + 150 U.S. GPM OUTSIDE HOSE STREAMS = 2071.25 U.S. GPM x 60 MINUTES — =124,275 U.S. GALLONS

NOTE: THE TOP 12" OF THE TANK MUST NOT BE USED IN THE CALCULATION TO ALLOW FOR THE FILL LINE c/w FLOAT.

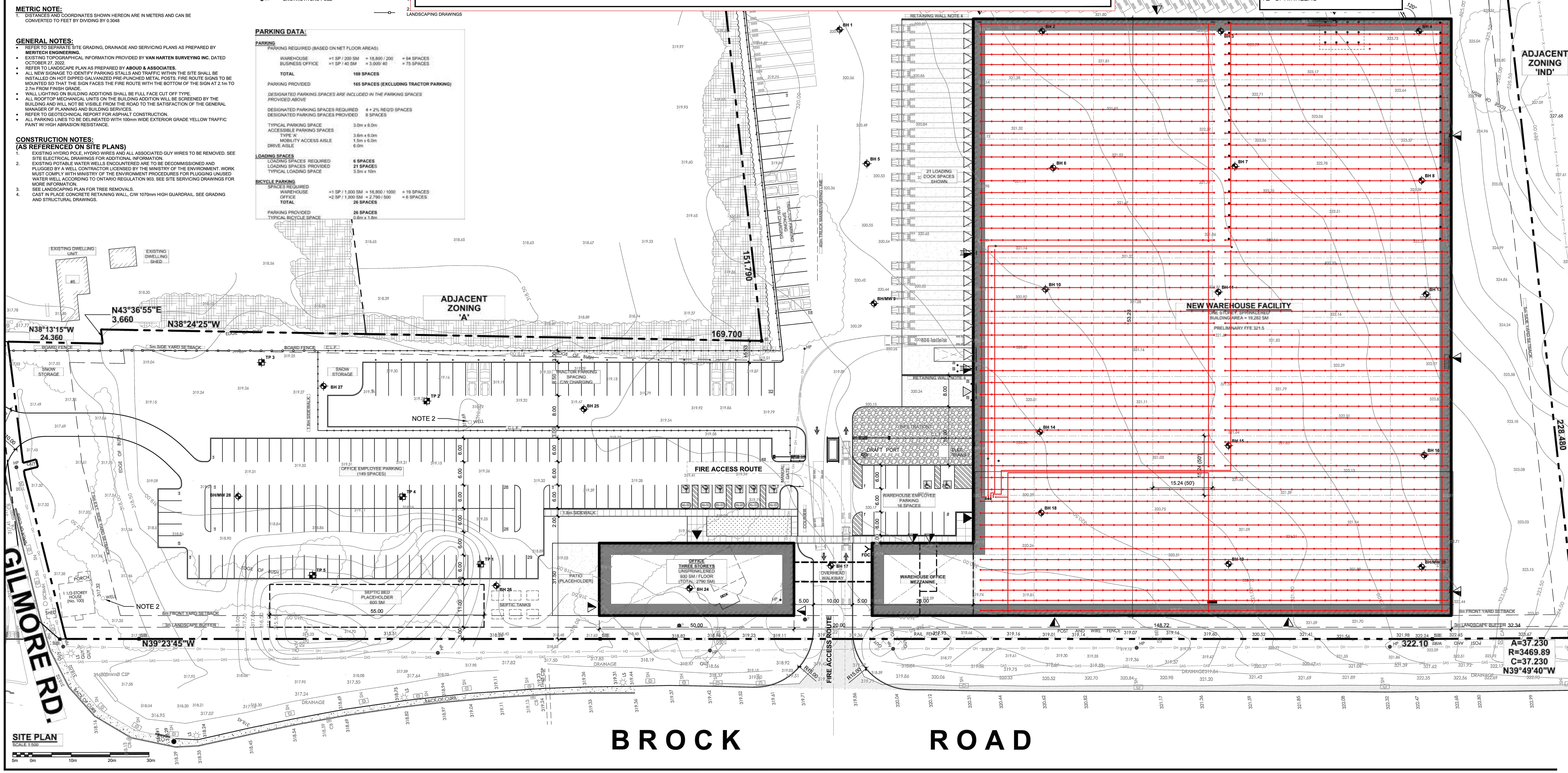
METHOD#2
MAXIMUM FIRE PUMP AND HOSE STREAM WATER VOLUME DEMAND CALCULATION:

2500 U.S. GPM RATED PUMP + 150 U.S. GPM OUTSIDE HOSE STREAM = 2650 U.S. GPM x 60 MINUTES — = 159,000 U.S. GALLONS

PRELIMINARY CALCULATION: TOTAL VOLUME OF REQUIRED WATER TO BE STORED IN THE WATER STORAGE TANK: — = 159,000 U.S. GALLONS

PRELIMINARY SPRINKLERS

WAREHOUSE – RACK STORAGE ON SINGLE, DOUBLE & MULTI–ROW RACK OF CLASS 1–4 PRODUCTS TO A HEIGHT OF 35'–0", 45'–0" DECK, ENCAPSULATED & NONENCAPSULATED, 12 K25.2 ESFR SPRINKLERS OPERATING AT 40psi AS PER NFPA 13(2013) 16.3.3, 16.3.3.1 & TABLE 16.3.3.1, & 16.3.3.4
12 SPRINKLERS



PROJECT NORTH
TRUE NORTH

No.	Date	Issued for / Revision:
1.	OCT. 19, 2022	CONCEPTUAL REVIEW
2.	OCT. 20, 2022	CONCEPTUAL REVIEW
3.	NOV. 18, 2022	CONCEPTUAL REVIEW
4.	DEC. 02, 2022	TRAFFIC STUDY REVIEW

TACOMA ENGINEERS
176 Speedvale Avenue West
Guelph, Ontario N1H 1C3
Tel: 519.763.2000
www.tacomaengineers.com

Stamp

Client:
Collaborative Structures Limited
6683 ELLIS ROAD, CAMBRIDGE, ONTARIO

Project:
WELLINGTON MOTOR FREIGHT
BROCK ROAD, PUSLINCH, ONTARIO

Drawing:
SITE PLAN

Project No.	Drawn By:
TE-41102-22	S.KOLKMAN

SP1

FlowSpec ENGINEERING

December 20, 2022

Tacoma Engineers Inc.
176 Speedvale Avenue West
Guelph, ON N1H 1C3
Attn: Steve Kolkman, C.E.T.

File No.: 00835-1
Document No.: 00835-1.02

Dear Mr. Kolkman:

Subject: Onsite Wastewater Servicing Assessment for
Proposed Wellington Motor Freight Warehouse Complex
128 Brock Road South
Township of Puslinch

This letter presents an onsite wastewater servicing assessment for a proposed warehouse complex for Wellington Motor Freight at the above-referenced location. A “Class 4” wastewater treatment system (“WTS”) (i.e., subsurface discharge of treated effluent to an infiltration or “leaching” bed) is proposed near the northwest corner of the property to service the complex, given the absence of proximal municipal or communal services in the area.

The peak wastewater flow for the property is to exceed 10,000 L/day, based on our calculation using theoretical flow-rates from the Ontario Building Code (“OBC”); and therefore, an Environmental Compliance Approval (“ECA”) will need to be procured from the Ontario Ministry of the Environment, Conservation and Parks (“MECP”), pursuant to the Ontario Water Resources Act, in order to construct the WTS.

The purpose of this assessment is twofold: (i) to determine if the proposed site layout is able to physically accommodate a WTS for the complex, and (ii) to provide a general description of how the WTS is to be configured and approved. This report is intended to supplement a comprehensive functional servicing assessment by Meritech Engineering for a proposed zoning bylaw amendment submission, and includes the following information:

(a) characterization of subsurface soil stratigraphy and groundwater conditions;
(b) derivation of assessment parameters;
(c) calculation of minimum area required for subsurface effluent discharge; and
(d) preliminary description of WTS configuration and approval requirements.

Characterization of Subsurface

Chung & Vander Doelen Engineering (“CVD”) explored the subsurface of the property in October 2022, in support of its geotechnical and hydrogeological assessments, via advancement of 28 boreholes. Four of the boreholes were completed as monitoring wells, and CVD subsequently measured groundwater levels in the wells on three occasions in October and November 2022.

CVD and our firm underwent a secondary exploration of the subsurface in November 2022 within the northerly portion of the property, in further support of the geotechnical assessment and design of the WTS, via excavation of five test pits.

The borehole and test pit locations are shown on the attached figure prepared by CVD (Interpreted Fall 2022 Water Table Contours).

We performed laboratory particle-size analysis of several collected samples of soil from the test pit exploration to derive a soil percolation time for design.

The soil stratigraphy encountered during the subsurface explorations in the proposed location of the WTS (i.e., depicted on our attached preliminary layout plan and proximal to Borehole 26 and Test Pits 1 and 5) generally consisted of surficial fill of varying thickness, overlying layers of native topsoil, silt, and silty sand till to a depth of about 3.5 m, and underlain by a deposit of sand/gravel. The surface of the sand/gravel deposit contained some silt, with silt content decreasing to a trace by a depth of about 4 m.

Groundwater in the proposed location of the WTS lies within the native sand/gravel deposit at a depth of about 4 m (elevation of about 312 m) and, based on CVD's hydrogeological assessment in process (refer to attached CVD figure), flows directly offsite in a generally westerly direction toward ponds on the opposite side of Brock Road South and ultimately in the direction of Mill Creek and its flanking wetlands.

Derivation of Assessment Parameters

Soil percolation time (i.e., infiltration rate), peak wastewater flow, and effluent concentration criteria were the principal parameters used for the assessment, and are discussed further in the following sections.

<u>Soil Percolation Time</u>

A soil percolation time was derived for the assessment using the following methodology: (i) classification of each relevant soil deposit using the Unified Soil Classification System, (ii) correlation with a percolation time using OBC Supplementary Standard SB-6, "Percolation Time and Soil Descriptions", and (iii) modification, as necessary, to account for observed physical characteristics (i.e., density, consistency, and structure). The following table summarizes the assessment:

Soil Description	Unified Soil Classification	Percolation Time (min/cm)
SILTY SAND, some gravel (surficial fill)	SM-ML	25 to 30 (estimated)
SAND AND GRAVEL, <u>some silt</u> (native) *(±3.5 m depth)*	SM	15
SAND AND GRAVEL, <u>trace silt</u> (native) *(±4 m depth)*	GW-SW	3

Based on founding of the bed on a combination of the upper and lower native sand/gravel deposit, a blended soil percolation time of 12 min/cm was used for the assessment.

Peak Wastewater Flow

Wastewater from the complex is to be "domestic" in nature (defined in the OBC as, "human body waste, toilet or other bathroom waste, and shower, tub, culinary, sink and laundry waste"), as there is to be no generation of industrial process, truck-wash, or truck maintenance wastewater. Any floor-drains are intended only for collection of temporary snow-melt in the at-grade loading bays, which create a negligible volume of wastewater.

A preliminary peak domestic wastewater flow was estimated for the assessment using occupancy data supplied by Wellington Motor Freight and prescribed flow-rates for "office" (including a gym) and "warehouse" occupancies from OBC Table 8.2.1.3.B. The following table outlines the calculation:

Occupancy	Occupancy Data and OBC Flow-Rates for "Office" and "Warehouse"	OBC Peak Wastewater Flow (L/day)
"Office"	[150 employees x 75 L/day/employee] + 10% *(reasonable increase to account for limited shower-use in gym)* *or* [2,800 m^2 maximum total office footprint x 50% *(reasonable ratio for actual office finished floorspace)* x 75 L/day/9.3 m^2 finished floorspace] + 10% *(reasonable increase to account for limited shower-use in gym)*	12,375 *or* 12,420
"Warehouse"	6 water-closets x 950 L/day/water-closet *and* 30 loading-bays x 150 L/day/loading-bay	5,700 *and* 4,500
	Total	**22,620**

In order to accommodate any potential occupancy adjustments between now and the final design stage, a conservative OBC peak wastewater flow of 25,000 L/day was used for the assessment.

Effluent Concentration Criteria

Section 22.5 (Assessment of Impact on Water Resources) of the MECP document, "Design Guidelines for Sewage Works" ("DGSW"), sets forth general requirements for assessing the theoretical impact on "water resources" of a WTS, and for establishing effluent concentration objectives and limits in compliance with MECP emission requirements, based on the assessed theoretical impact. For this site, "water resources" comprise the following:

(a) offsite groundwater which is or could be used as a potable supply, and
(b) Mill Creek and its flanking wetlands located west of the property.

On the basis of DGSW Subsection 22.5.5 (Critical Contaminants), total inorganic nitrogen ("TIN") is the critical contaminant used for assessment of impact on groundwater, and phosphorous and ammonia-nitrogen are the critical contaminants used for assessment of impact on surface water.

In executing our design, we will establish effluent concentration objectives and limits upon completion of CVD's hydrogeological assessment and assessment of impact on water resources, and present these criteria to the MECP for review during the mandatory pre-application consultation stage. Upon acceptance of the concentration criteria by the MECP, we will prepare a final WTS design which accommodates the criteria via customized proprietary wastewater treatment infrastructure. Finally, we will submit the final design to the MECP, along with a completed application form, to procure an ECA for construction of the WTS.

Preliminary Design

In order for the WTS to achieve the MECP's effluent emission requirement for TIN, a "Level IV" advanced treatment system (along with componentry for TIN reduction) is to be incorporated into the design. Additional treatment for phosphorous reduction may also be necessary, depending on the outcome of the assessment of impact on water resources.

Inclusion of a "Level IV" system advantageously allows higher hydraulic loading to and lesser required space for subsurface effluent discharge than are permitted when employing a conventional septic tank only. Using this advantage, we propose a Type A dispersal bed for subsurface effluent discharge. The following calculation illustrates the minimum area required by the OBC for a Type A dispersal bed, using the assessment criteria described above:

$A = Q \times T \div 850$ *(OBC Sentence 8.7.7.1.(5))*

where:
A = *minimum required area* (m^2)
Q = *OBC peak wastewater flow used for the assessment (L/day)*
T = *soil percolation time used for the assessment (min/cm)*

$A = 25{,}000 \text{ L/day} \times 12 \text{ min/cm} \div 850$
$= 353 \text{ m}^2$

Based on our experience, the above-referenced formula would more appropriately be revised to, *"A = Q x T ÷ 400"*; and as such, we allocated approximately 775 m^2 for the bed, as depicted on our attached preliminary layout plan.

Conclusion

In conclusion, it is our opinion the proposed warehouse complex may be serviced by a WTS comprising a "Level IV" advanced treatment system (with additional treatment for TIN and potentially phosphorous) and a Type A dispersal bed, located near the northwest corner of the property (as depicted on our attached preliminary layout plan), provided the following processes are undertaken: (i) completion of CVD's hydrogeological assessment and assessment of impact on water resources, in order to derive effluent concentration criteria, all to the satisfaction of the MECP (via pre-application consultation), and (ii) procurement of an ECA from the MECP for construction of the WTS.

Should you have any questions regarding the above, please do not hesitate to contact the undersigned.

Yours truly,
FlowSpec Engineering Ltd.

[redacted]

[redacted]
D.J. MORLOCK
December 20, 2022
PROVINCE OF ONTARIO

Consulting Engineer

encl. water table contours figure by Chung & Vander Doelen Engineering
preliminary layout plan by FlowSpec Engineering

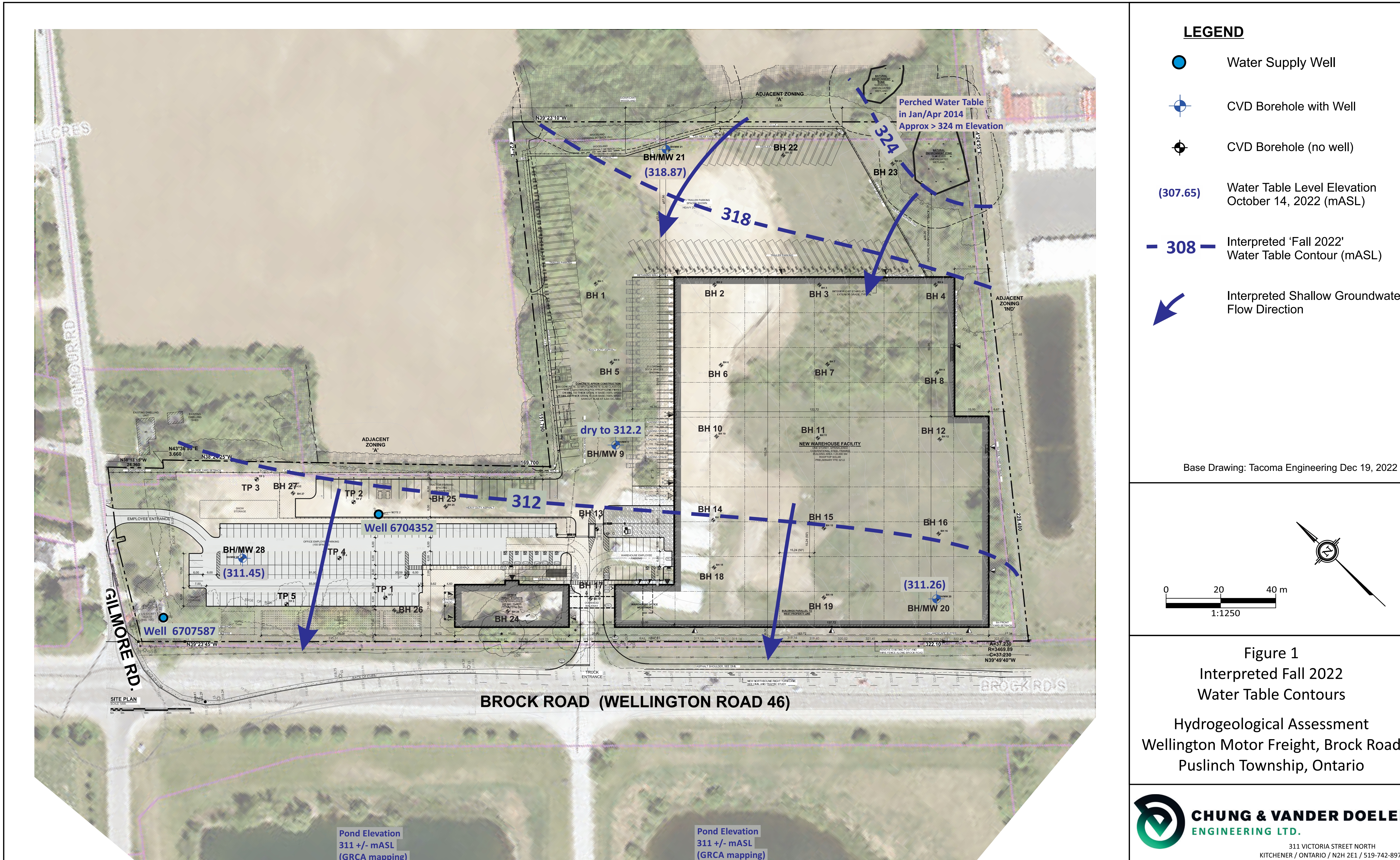
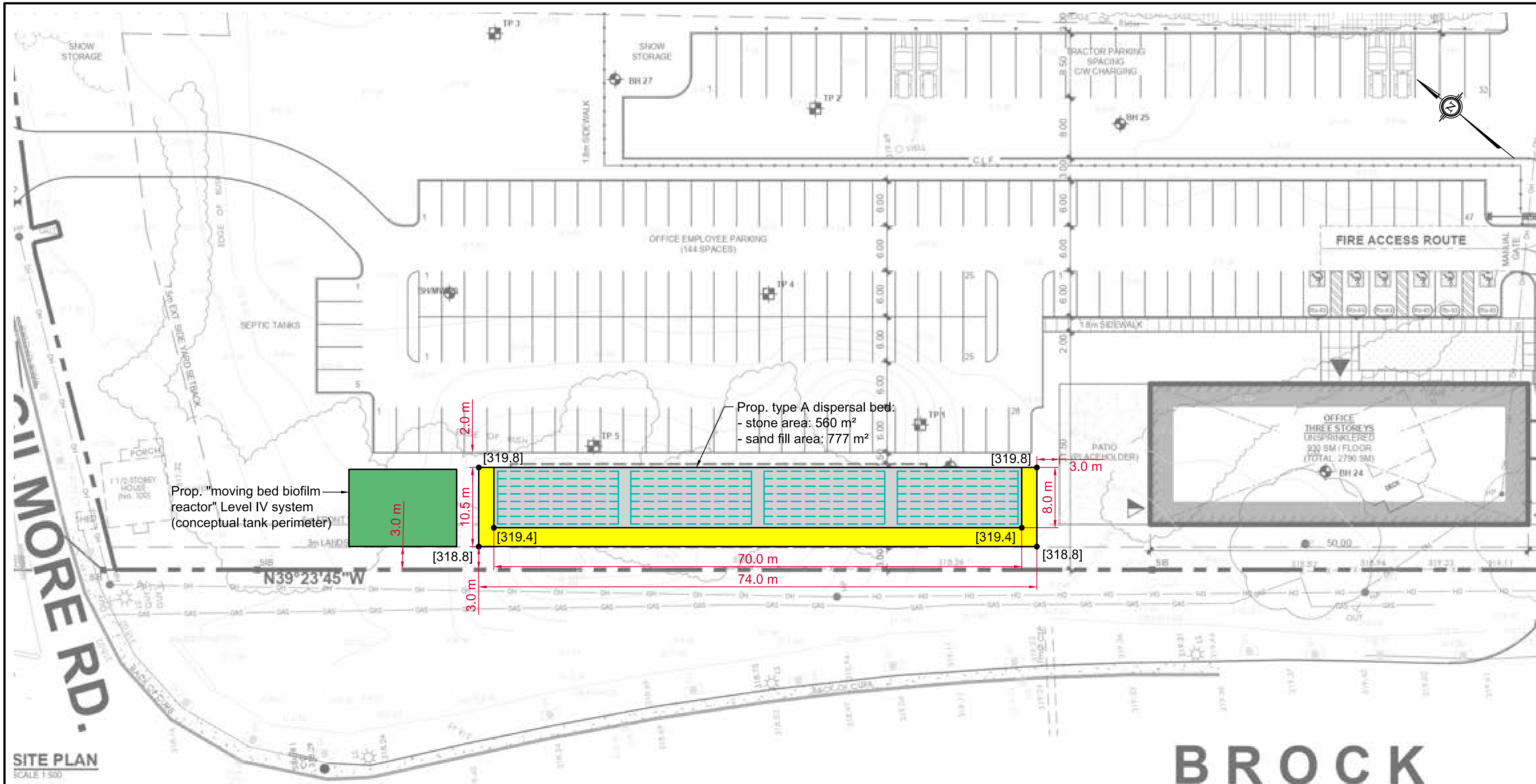


Figure 1
Interpreted Fall 2022
Water Table Contours

Hydrogeological Assessment
Wellington Motor Freight, Brock Road
Puslinch Township, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 2E1 / 519-742-8979

Drawn By: SA	Date: Dec 20 2022	File No.: G22518



ENGINEERING

FlowSpec Engineering Ltd., 31 McBrine Drive, Unit 1, Kitchener, ON N2R 1J1
Office: 519-744-9336 Web: www.flowspec.ca

Legend:

- Prop. Distribution Line
- Prop. Stone
- Prop. Sand Fill (T = 6 to 10 min/cm)

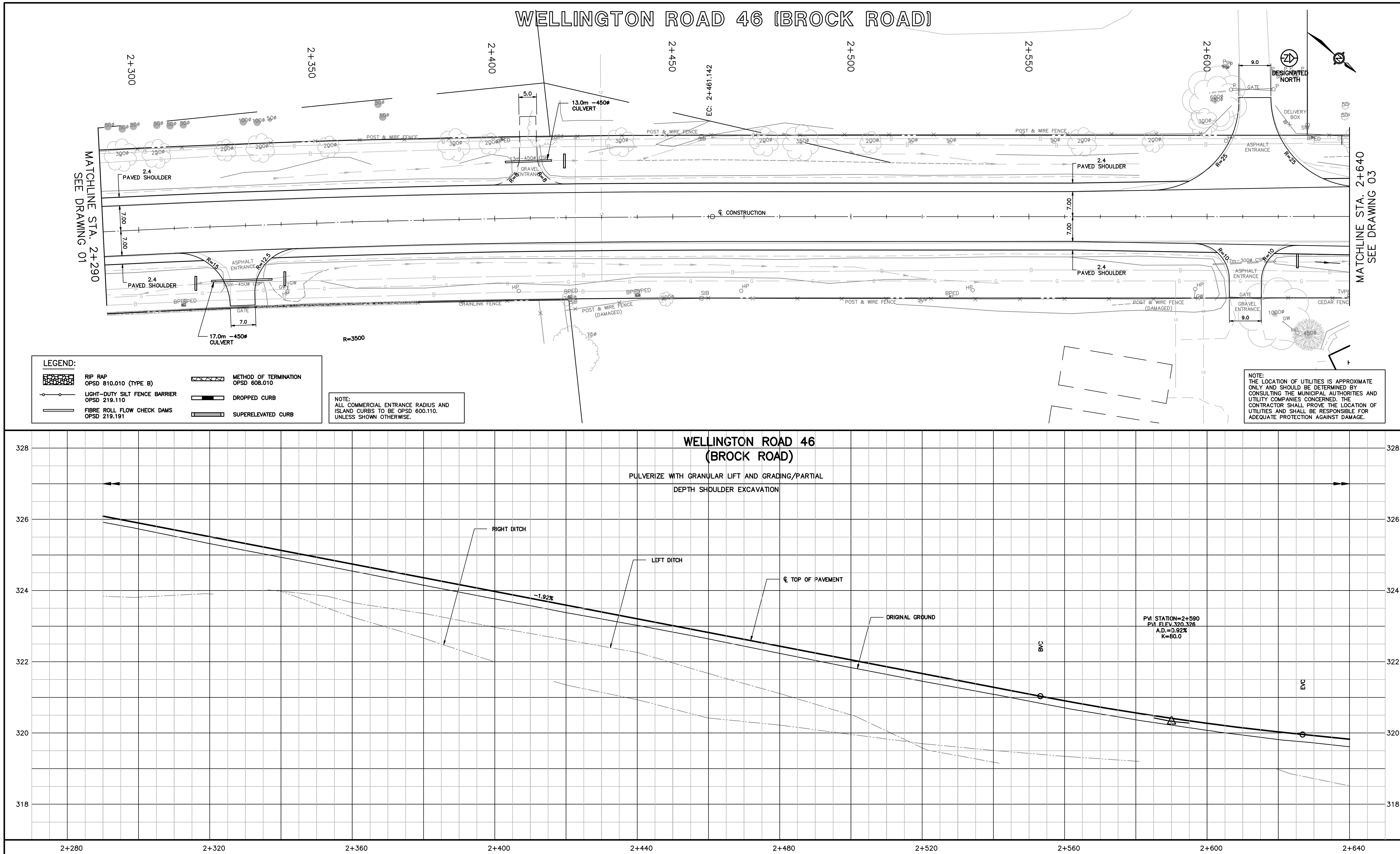
Dwg. Ref.: Collaborative Structures Ltd., Site Plan Option B, Project No. TE-41102-22, November 18, 2022

Client:	Tacoma Engineers Inc.
Project:	Design of Wastewater Treatment System Proposed Warehouse Complex Wellington Motor Freight
Location:	128 Brock Road South Township of Puslinch
Figure:	Preliminary Layout Plan

No.	Revision	Date	Checked

Scale:	0 5 10 15 1:500
Design: DFIII	Checked:
Drawn:	DFIII
Date:	December 20, 2022
File No.:	00835-1
Figure No.:	1

Appendix G: Historical Drawings



NOTES

No	DATE	REVISION	INITIAL
02	MAR 2019	ISSUED FOR TENDER	H.W.W.
01	SEPT 2018	ISSUED FOR REVIEW	H.W.W.

LICENSED PROFESSIONAL ENGINEER
H.W. WRAY
PROVINCE OF ONTARIO

RECONSTRUCTION OF
WELLINGTON ROAD 46
FROM
NORTH OF MCLEAN ROAD TO NORTH OF WELLINGTON ROAD 34

COUNTY OF WELLINGTON
74 WOOLWICH STREET
GUELPH, ONTARIO N1H 3T9

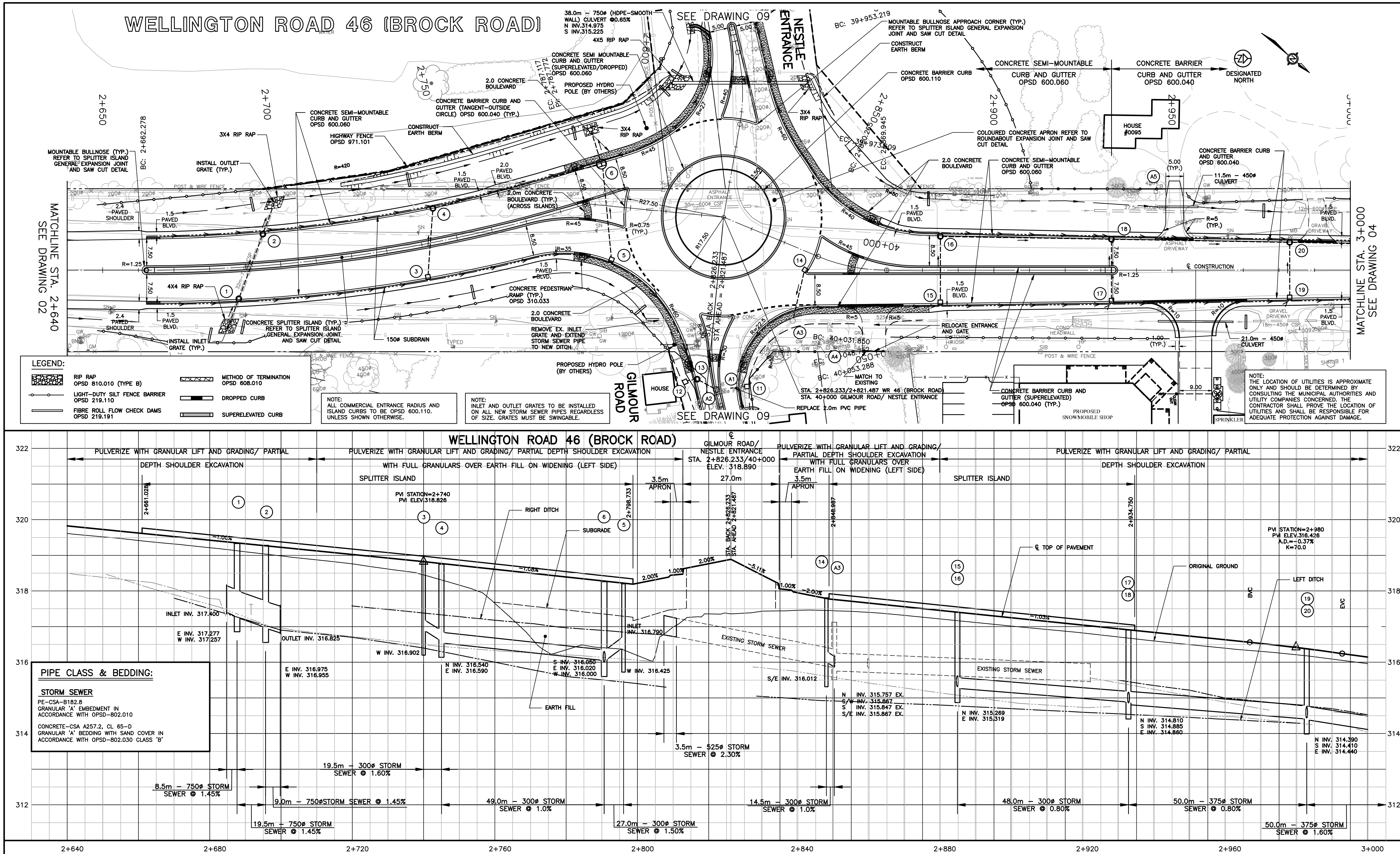
CONSTRUCTION PLAN AND PROFILE
STA. 2+290 TO STA. 2+640

PROJECT No	CW2019-007
TRITON FILE No	M6386
DRAWN BY:	K.J.G.
CHECKED BY:	G.J.K.
APPROVED BY:	H.W.W.
DATE:	APRIL 2017

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

SCALES	
1:500	1:50
HORIZONTAL	VERTICAL

DRAWING NUMBER **02**



NOTES

No	DATE	REVISION	INITIAL
02	MAR 2019	ISSUED FOR TENDER	H.W.W.
01	SEPT 2018	ISSUED FOR REVIEW	H.W.W.

LICENSED PROFESSIONAL ENGINEER H.W. WRAY PROVINCE OF ONTARIO

RECONSTRUCTION OF
WELLINGTON ROAD 46
FROM
NORTH OF MCLEAN ROAD TO NORTH OF WELLINGTON ROAD 34

COUNTY OF WELLINGTON
74 WOOLWICH STREET
GUELPH, ONTARIO N1H 3T9

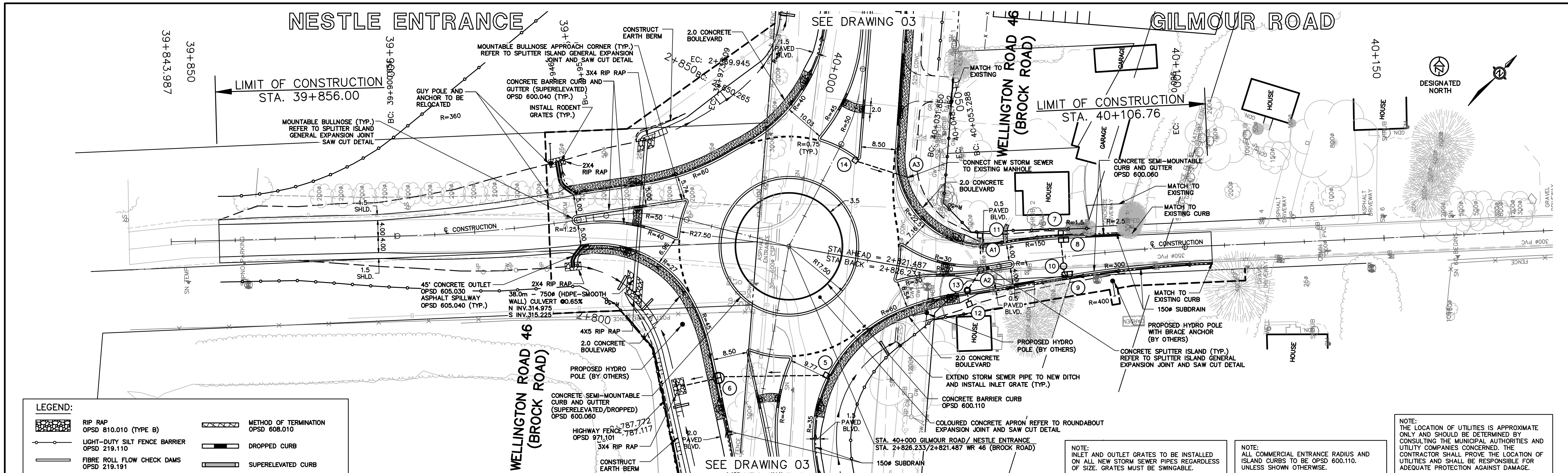
CONSTRUCTION PLAN AND PROFILE
STA. 2+640 TO STA. 3+000

PROJECT No: CW2019-007
TRITON FILE No: M6386
DRAWN BY: K.J.G.
CHECKED BY: G.J.K.
APPROVED BY: H.W.W.
DATE: APRIL 2017

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

SCALES
1:500 HORIZONTAL
1:50 VERTICAL

DRAWING NUMBER 03



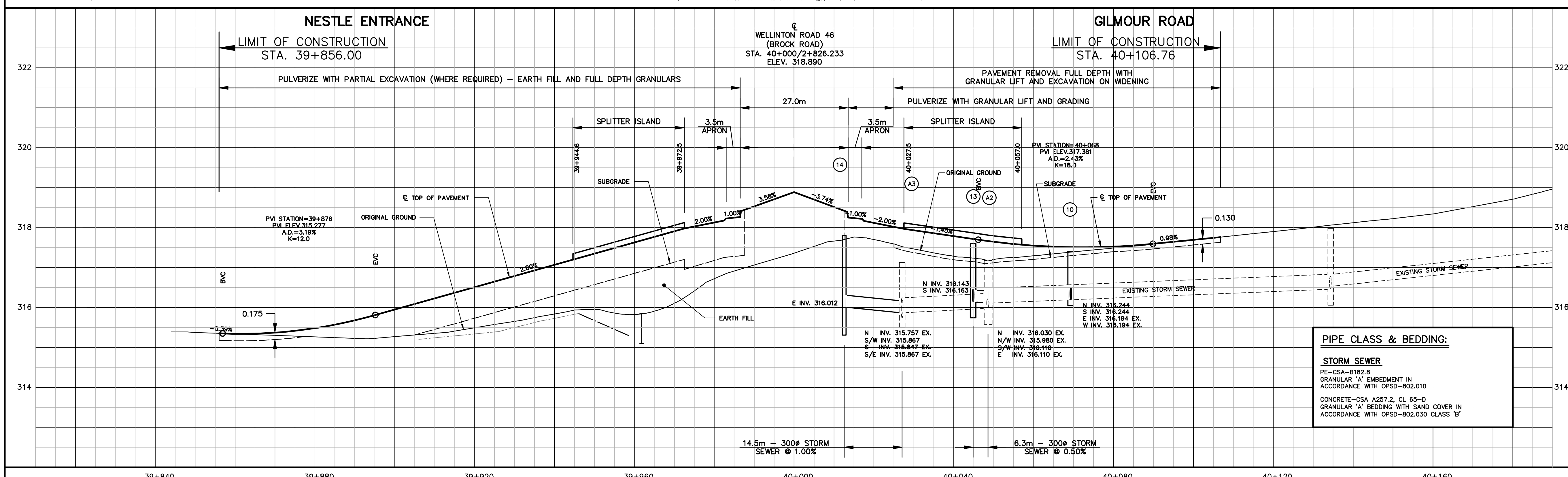
LEGEND:

RIP RAP OPSD 810.010 (TYPE B)		METHOD OF TERMINATION OPSD 608.010	
LIGHT-DUTY SILT FENCE BARRIER OPSD 219.110		DROPPED CURB	
FIBRE ROLL FLOW CHECK DAMS OPSD 219.191		SUPERELEVATED CURB	

NOTE:
INLET AND OUTLET GRATES TO BE INSTALLED ON ALL NEW STORM SEWER PIPES REGARDLESS OF SIZE. GRATES MUST BE SWINGABLE.

NOTE:
ALL COMMERCIAL ENTRANCE RADIUS AND ISLAND CURBS TO BE OPSD 600.110, UNLESS SHOWN OTHERWISE.

NOTE:
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION AGAINST DAMAGE.



PIPE CLASS & BEDDING:

STORM SEWER

PE-CSA-B182.8
GRANULAR 'A' EMBEDMENT IN ACCORDANCE WITH OPSD-802.010

CONCRETE-CSA A257.2, CL 65-D
GRANULAR 'A' BEDDING WITH SAND COVER IN ACCORDANCE WITH OPSD-802.030 CLASS 'B'

NOTES

No	DATE	REVISION	INITIAL
02	MAR 2019	ISSUED FOR TENDER	H.W.W.
01	SEPT 2018	ISSUED FOR REVIEW	H.W.W.

LICENSED PROFESSIONAL ENGINEER H.W. WRAY PROVINCE OF ONTARIO

RECONSTRUCTION OF
WELLINGTON ROAD 46
FROM
NORTH OF MCLEAN ROAD TO NORTH OF WELLINGTON ROAD 34

COUNTY OF WELLINGTON
74 WOOLWICH STREET
GUELPH, ONTARIO N1H 3T9

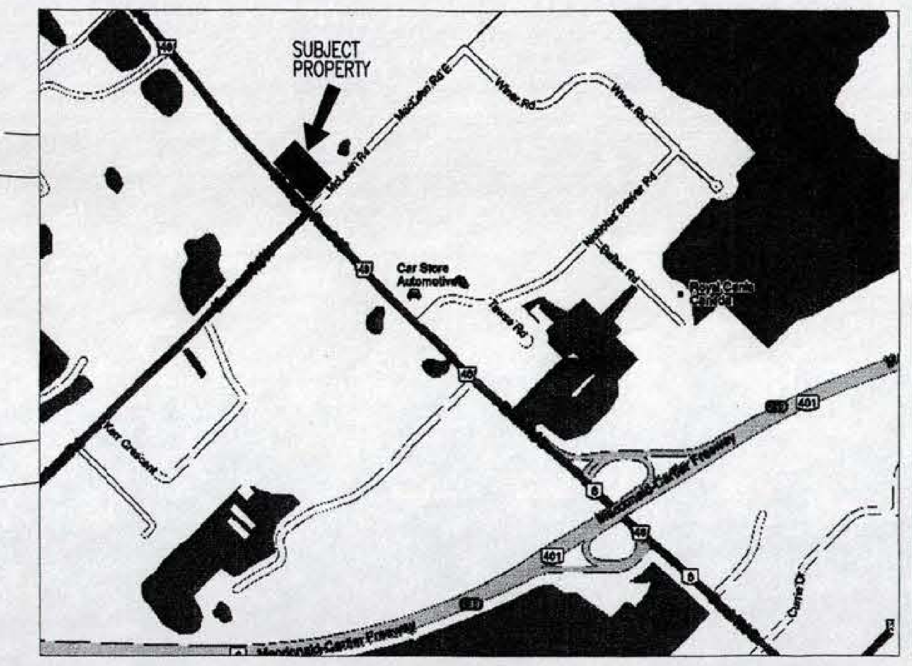
CONSTRUCTION PLAN AND PROFILE
STA. 39+850 TO STA. 40+190

PROJECT No:	CW2019-007
TRITON FILE No:	M6386
DRAWN BY:	K.J.G.
CHECKED BY:	G.J.K.
APPROVED BY:	H.W.W.
DATE:	APRIL 2017

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

SCALES
1:500 HORIZONTAL
1:50 VERTICAL

DRAWING NUMBER 09



Area Key Plan

Site Data Schedule

ITEM	DESCRIPTION		BYLAW REQUIREMENT	PROPOSED CONFORMANCE
1	ZONING DESIGNATION		IND-7	IND-7
2	MINIMUM SETBACKS	FRONTYARD	10.0m	106.56 m
		EXTERIOR SIDEYARD	10.0m	33.124 m
		INTERIOR SIDEYARD	10.0m	69.36 m
		REARYARD	10.0m	85.389 m
3	SITE AREA 96,100.49s.m. (9.61ha)			
4	BUILDING FOOTPRINT 26,210.2 s.m. (282,124s.f.)			
5	LOT COVERAGE MAX. (ON GROSS SITE)		40%	27.3%
6	PARKING PROVISIONS:		1:100 s.m. Warehouse 1:40 s.m. Office	33.6 sp Warehouse 241.4 sp Office — Total 275
7	BUILDING HEIGHT		15m	14m
8	LANDSCAPED / OPEN and WOODLAND SPACE		25% min.	42.7%
9				

O.L.S. SITE DESCRIPTION :
Part of South West Half of Lot 25
Concession 8
Township of Puslinch
County of Wellington

MALHOTRA architecture
551 Kininvie Drive - London ON - N6G 1P1
Tel. 519 - 859 - 2037

Certificate of Practice Number:

Name of Project:

Location:

The architect noted above has exercised responsible control with respect to design activities. The architects seal number is the architects BCDN.

Ontario Building Code Data Matrix

Item	Ontario Building Code Data Matrix		OBC Reference: ☒ Part 3	☐ Part 9
1	Project Description: ☒ New ☐ Addition ☐ Change of Use ☐ Alteration	☐ Part 11 11.1 to 11.4	2.1.1.	2.1.1. 9.10.1.3
2	Major Occupancies F-2 (WAREHOUSE, LAB), D (OFFICE)		3.1.2.1.(1)	9.10.2.
3	Building Area (m²) Existing New 26,210.2 s.m Total 26,210.2 s.m		1.1.3.2.	1.1.3.2.
4	Gross Area Existing New 26,210.2 s.m Total 26,210.2 s.m		1.1.3.2.	1.1.3.2.
5	Number of Storeys Above grade Single Storey Below grade N/A		3.2.1.1.+ 1.1.3.2.	2.1.1.3.
6	Number of Streets/Fire Fighter Access One Street		3.2.2.10. + 3.2.5.	9.10.19.
7	Building Classification 3.2.2.67. Any Ht, Any Area, Sprinklered		3.2.2.10 - 3.2.2.83	9.10.4.
8	Sprinkler System Proposed ☒ entire building ☐ basement only ☐ in lieu of roof rating ☐ not required		3.2.2.10 - 3.2.2.83 3.2.1.5. 3.2.2.17.	9.10.8.
9	Standpipe required ☐ Yes ☒ No		3.2.9 3.2.9.1.(c)	N/A
10	Fire Alarm required Code Compliant system provided by Owner Requirement ☒ Yes ☐ No		3.2.4.	9.10.17.2.
11	Water Service/Supply is Adequate ☒ Yes ☐ No		3.2.5.7.	N/A
12	High Building ☐ Yes ☒ No		3.2.6.	N/A
13	Permitted Construction: ☐ combustible ☒ non-combustible ☐ both Actual Construction: ☐ combustible ☒ non-combustible ☐ both		3.2.2.10 - 3.2.2.83	9.10.6.
14	Mezzanine(s) Area N/A		3.2.1.1.(3)-(8)	9.10.4.1.
15	Occupant Load based on: ☐ area / person ☒ design of building 1st Floor: Occupancy Warehouse, Shipping Load 90 persons 1st Floor: Occupancy Office, Laboratory Load 60 persons 1st Floor: Occupancy ____ Load ____ persons Mezzanine: Occupancy N/A Load ____ persons		3.1.16.	9.9.1.3.
16	Barrier Free Design ☒ Yes ☐ No		3.8	9.5.2.
17	Hazardous Substances ☒ Yes ☐ No Laboratory compliant with NFPA 45 and O.F.C. 4.12.2.1.(1) - No explosive substances present.		3.3.1.2. + 3.3.1.19	9.10.1.3.(4)
18	Required Fire Resistance Rating FRR — Horizontal Fire Separations: Floors 2 Hrs. Hours; Roof 3.2.2.17 compliant Hours; Mezzanine 1 Hrs. Hours	Tested design No. or Description: All floors are 'Slab-on-grade'; The building is sprinklered. No mezzanines proposed.	3.2.2.10.-83 + 3.2.1.4.	9.10.8. 9.10.9.
	Vertical Fire Separations: Roof Access Stair 2 Hrs.	SB-2 2.1.1. Std. 240mm CMU Eq.Th.=127 / 2.4 Hrs.		
	Laboratory 1 Hrs.	ULC W415 / ULC W446-'E' or 'F'		
	Mechanical Rm. 1 Hrs.	SB-2 2.1.1. Std. 240mm CMU Eq.Th.=127 / 2.4 Hrs.		
	Janitor Rm. 0 Hrs.	Make tight to floor and deck above		
19	Spacial Separation - Construction of Exterior Walls		3.2.3.	9.10.14.
20	Other			

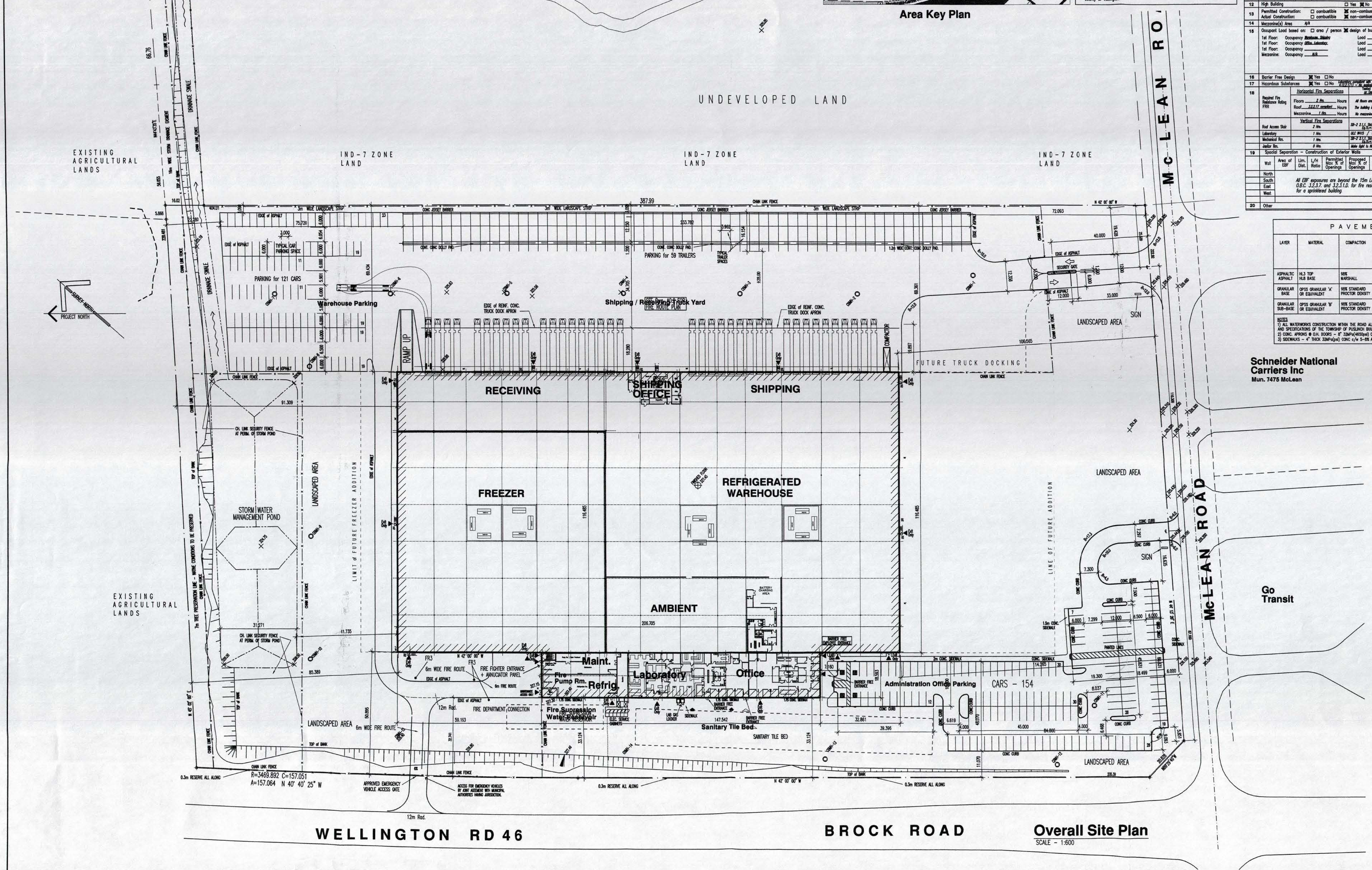
Wall	Area of EBF	Lim. Dist.	L/H Ratio	Permitted Max % of Openings	Proposed Max % of Openings	FRR (Hours)	Listed Design or Description	Comb Constr	Comb. Constr. + non-comb. Cladding	Non-Comb Constr
North	All EBF exposures are beyond the 15m Limiting Distance threshold for compliance with O.B.C. 3.2.3.7. and 3.2.3.1.D. for fire resistance ratings and construction restrictions for a sprinklered building.									
South										
East										
West										

PAVEMENT LEGEND

LAYER	MATERIAL	COMPACTION	RECOMMENDED HEAVY DUTY ASPHALT (TRUCKS) mm	RECOMMENDED LIGHT DUTY ASPHALT (CARS) mm	RECOMMENDED CONCRETE TRUCK AREAS (TRUCKS) mm
ASPHALTIC ASPHALT	HL3 TOP HL8 BASE	98% MARSHALL	40(1.6") 60(2.3")	35(1.4") 40(1.6")	200mm(8") 32MPa CONC SEE NOTE
GRANULAR BASE	OPSS GRANULAR 'A' OR EQUIVALENT	98% STANDARD PROCTOR DENSITY	150(6")	150(6")	200mm(8") (MTC SPEC)
GRANULAR SUB-BASE	OPSS GRANULAR 'B' OR EQUIVALENT	98% STANDARD PROCTOR DENSITY	450(18")	300(12")	

NOTES
1) ALL WATERWORKS CONSTRUCTION WITHIN THE ROAD ALLOWANCE SHALL CONFIRM TO THE CURRENT STANDARDS . AND SPECIFICATIONS OF THE TOWNSHIP OF PUSLINCH BUILDING DEPT.
2) CONC. APRONS @ O.H. DOORS - 8" 32MPa(4650psi) CONC c/w 5-8% AIR ENTRAINMENT, CONTROL JOINTS @ 15'c/c
3) SIDEWALKS - 4" THICK 32MPa(psi) CONC c/w 5-8% AIR ENTRAINMENT

THIS PLAN IS TO BE READ IN CONJUNCTION WITH SITE ENGINEERING and STORM WATER MANAGEMENT PLANS by MALLOTT CREEK ASSOCIATES INC. and LANDSCAPE DESIGN PLANS by RON KOUDYS, LANDSCAPE ARCHITECT.



Overall Site Plan
SCALE - 1:600

No.	Date	Revisions
1	June.4.12	SPA Resubmission

McKAY-COCKER

MALHOTRA architecture
551 Kininvie Drive - London ON - N6G 1P1
Tel. 519 - 859 - 2037

MAPLE LEAF FOODS

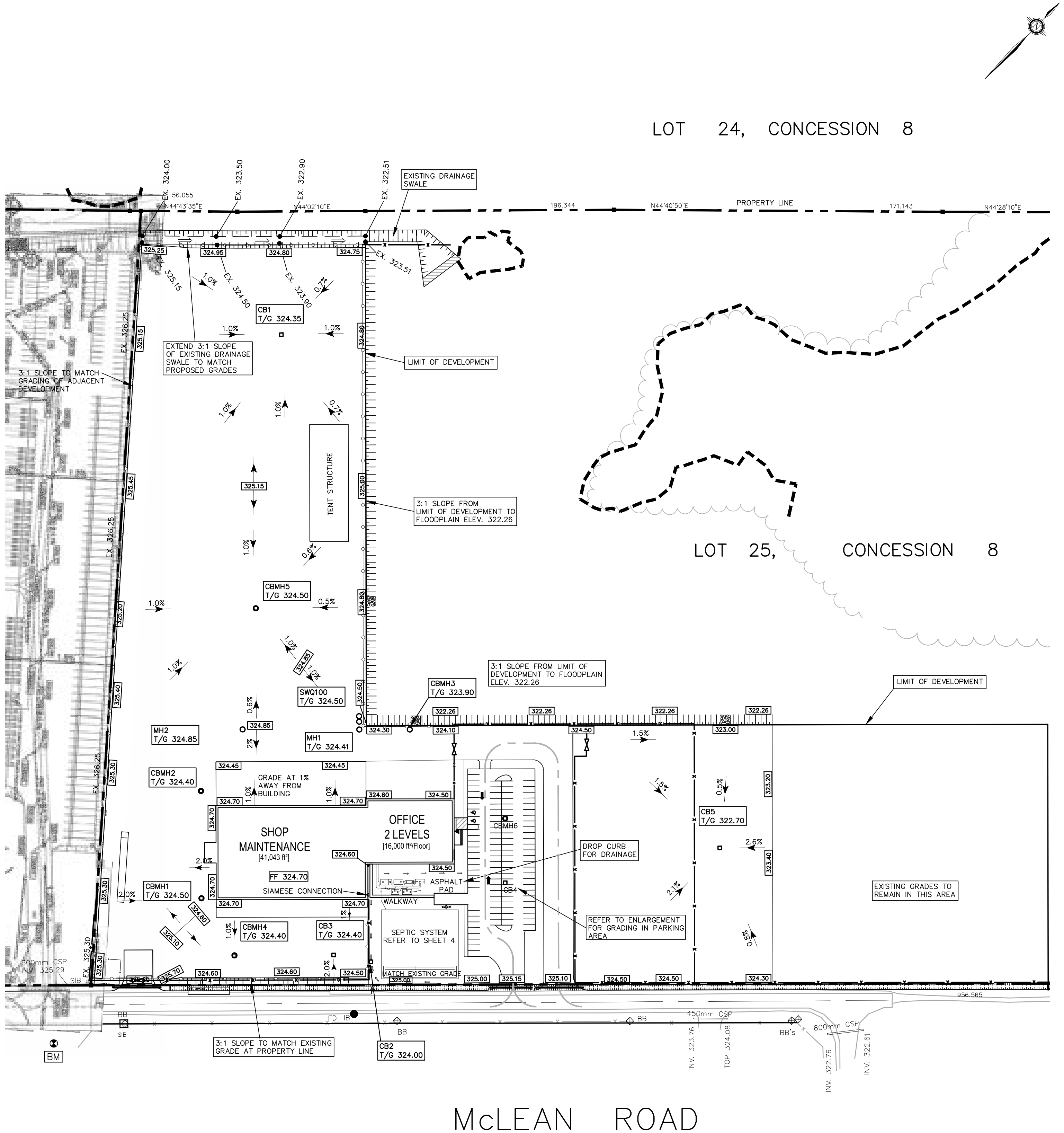
Distribution Centre
PUSLINCH - ONTARIO

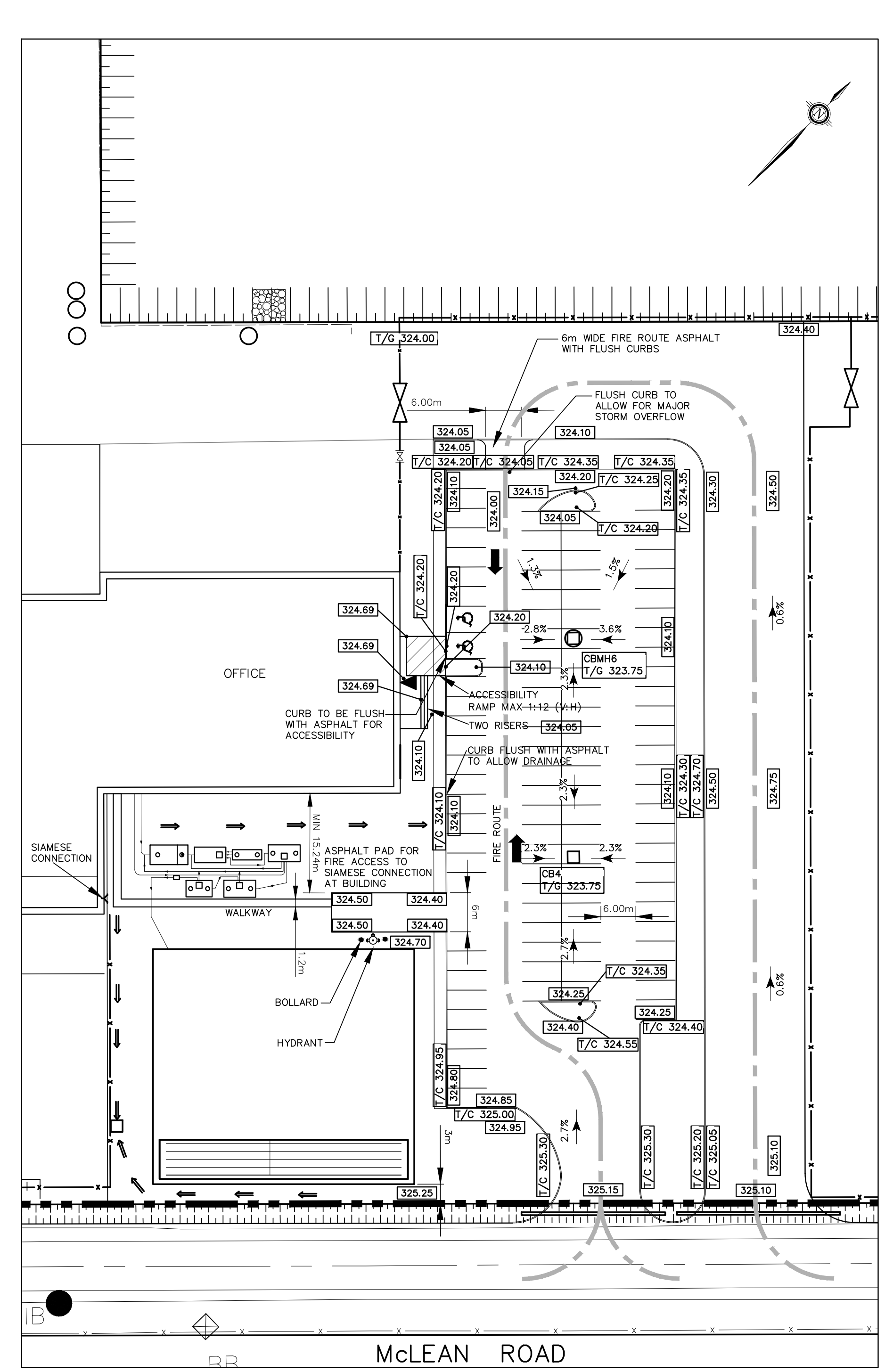
Overall Site Plan
Zoning / OBC Matrix
Area Key Plan

e-mail address: drafting@mckaycocker.com

[redacted]
LICENCE 3586

DATE Mar.07
DRAWN dg
CHECKED -
SCALE 1 : 600
SHEET No. A0.1
JOB No. 9680
REV. No. 1





ENLARGEMENT OF ASPHALT PARKING AREA
SCALE: 1:500

MAMMOET

BENCHMARK NOTES

BRASS TABLET LOCATED ON ONE AND ONE-HALF STOREY FRAME HOUSE WITH ASBESTOS SIDING SITUATED ON THE SOUTHEAST CORNER OF WELLINGTON COUNTY ROAD No. 46 AND PUSLINCH TOWNSHIP ROAD No. 23, 2.0km NORTH OF WELLINGTON COUNTY ROAD No. 46 AND HIGHWAY 401 (INTERCHANGE 37) AT MORRISTON, 0.8km NORTH OF PUSLINCH TOWNSHIP ROAD No. 25, 15.2m SOUTH OF PUSLINCH TOWNSHIP ROAD No. 23 AND 28.3m EAST OF CENTERLINE OF WELLINGTON COUNTY ROAD No. 46. TABLET IS SET HORIZONTALLY IN NORTH FACE OF CONCRETE FOUNDATION, 3.78m EAST OF THE NORTHWEST CORNER AND 52cm BELOW SIDING, HAVING AN ELEVATION OF 317.59 METRES.

LEGEND

x 306.00	EXISTING ELEVATION
306.00	PROPOSED ELEVATION
	DIRECTION OF SURFACE FLOW
	PROPOSED SURFACE SWALE
	BUILDING ENTRANCE
EX. 326.25	EXISTING ELEVATION TO MATCH

Nº	DATE	ISSUE
22.	DEC19/13	REISSUED FOR CONSTRUCTION
21.	DEC13/13	ACCESSIBILITY RAMP ADDED
20.	NOV19/13	FENCING REVISED
19.	NOV15/13	SEPTIC SYSTEM NOTES REVISED
18.	NOV13/13	PARKING LOT GRADING REVISED
17.	OCT22/13	WEIGH SCALE ADDED
16.	SEPT30/13	SIAMESE CONNECTION LOCATION REVISED
15.	SEPT18/13	SEPTIC BED LOCATION REVISED
14.	SEPT17/13	REVISED AS PER TWP COMMENTS
13.	SEPT16/13	GRADING CORRECTIONS
12.	AUG 27/13	REVISED AS PER COMMENTS FROM TWP
11.	JULY 23/13	REVISED TO INCLUDE RECYCLED ASPHALT SURFACE WORKS
10.	JULY 11/13	ISSUED FOR CONSTRUCTION
9.	JUNE 17/13	REVISED AS PER TWP COMMENTS
8.	MAY 17/13	BUILDING PERMIT/BP No. 4
7.	APR. 11/13	REVISED SEPTIC TANK LOCATION
6.	APR. 4/13	REVISED FOR TENDER (SEPTIC SYSTEM)
5.	MAR. 28/13	ISSUED FOR COORDINATION
4.	MAR. 25/13	FOUNDATION PERMIT
3.	MAR. 15/13	BID PACKAGE #2
2.	MAR. 8/13	FOUNDATION PERMIT
1.	FEB. 21/13	REVISED AS PER TOWNSHIP COMMENTS

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
85 McINTYRE DRIVE, KITCHENER, ONTARIO N2R 1H6
519 – 748 – 1199

DO NOT SCALE THESE DRAWINGS. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS AND / OR OMISSIONS TO THE ARCHITECT / CONSULTANT BEFORE COMMENCING THE WORK.

THESE DRAWINGS ARE THE PROPERTY OF THE ARCHITECT / CONSULTANT AND ARE NOT TO BE DUPLICATED OR DISTRIBUTED WITHOUT CONSENT FROM THE ARCHITECT / CONSULTANT.

[redacted] DAVID A. HARSCH 18606103 DEC. 21/12 PROVINCE OF ONTARIO

PROFESSIONAL [redacted] LICENSED S. L. SWANTON 100119707 DEC. 21/12 PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT

NEW FACILITIES FOR
MAMMOET CANADA EASTERN

McLEAN ROAD, PUSLINCH TOWNSHIP
COUNTY OF WELLINGTON, ONTARIO

DRAWING

GRADING PLAN

DRAWN BY	CHECKED BY
NMB	SS

DATE: DECEMBER 21, 2012

SCALE: 1:1250

DRAWING Nº: C102

PROJECT Nº: 1594-1

PLOT DATE: 2013-12-19 TIME: 3:52:35 PM FILE PATH: C:\12-106\SITE PLAN 12-106.dwg

128 Brock Road South, Puslinch

Scoped Environmental Impact Study

Prepared for:

Wellington Motor Freight
7419 McLean Rd W
Puslinch, ON N0B2J0

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NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

128 Brock Road South, Puslinch

Scoped Environmental Impact Study

Project Team

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1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by Wellington Motor Freight in September 2022 to complete a Scoped Environmental Impact Study (EIS) in support of a proposed industrial development at 128 Brock Road South in the Township of Puslinch, Ontario, herein referred to as ‘the subject property’.

The subject property is approximately 6 hectares (ha), and is located south-east of Brock Road South at the intersection with Gilmour Road. The subject property is bounded by Brock Road to the west and Gilmour Road to the north. The surrounding adjacent lands (within 120m) are comprised of agricultural lands, aggregate operations and existing developments as shown on Map 1. A Significant Woodland is located to the northeast and two Unevaluated Wetlands are along the eastern boundary. These natural features within the subject property are designated as Significant Woodlands (5.5.4) and Core Greenlands (5.6.1), as per the County of Wellington Official Plan (OP, 2022). The subject property is located within the Mill Creek watershed and is within Ecoregion 6E.

Wellington Motor Freight has proposed the construction of a warehouse, truck facility and office on the subject property, as well as a stormwater management and a septic system on the property. An EIS is thus required for this development to ensure there are no negative impacts on the natural features on the site and adjacent lands.

This report contains the findings of the Scoped EIS, including the characterization of existing natural features based on the results of a background review and original field surveys. This detailed characterization was used to inform an analysis of the significance and sensitivity of natural features, the identification of any natural feature constraints in association with land use policy designations, and the assessment of potential impacts and mitigation measures associated with details of the proposed development.

The proponent has retained the following team to facilitate the preparation of the Site Plan Application (SPA) and rezonong in support of the proposed industrial development:

- MHBC – Planning
- CVD – Geotechnical and Hydrogeology
- Meritech Engineering – Stormwater Management, Grading and Servicing
- Tacoma Engineering – Site Plan

- Natural Resource Solutions Inc. – Natural Environment

Pre-consultation agency review comments were received from the County of Wellington, Township of Puslinch, GM BluePlan [Township engineering and stormwater management peer reviewer], Dougan & Associates Ecological Consulting & Design [Township natural heritage peer reviewer], and Grand River Conservation Authority (GRCA) (September 20, 2022). The subject property was formerly evaluated through an EIS prepared for the previous owner (Milan Lesics Holdings), who applied for a Site Alteration Permit to allow the levelling of the site for the purposes of future development. A Scoped EIS was prepared by Aboud and Associates in 2014 to document the existing conditions and address the impact of development on the wetlands, vegetation and wildlife on the subject property. That study was approved and the site alteration has since taken place (2016), which included the grading and filling of the entire property except for the natural features and their recommended buffers. Based on the alteration of the property and the previous work completed, this EIS has been prepared as an update to the 2014 EIS to ensure that the proposed developments do not have negative impacts on the retained natural features within the subject property and the surrounding lands.

Based on September 15, 2022 comments from the GRCA, the subject property contains unevaluated wetland features that are regulated by the GRCA, and is within the vicinity of the Mill Creek Puslinch Provincially Significant Wetland (PSW). As such, a permit will be required under the GRCA Regulation 150/06 for any proposed developments within or adjacent to these regulated features.

This Scoped EIS has been prepared in accordance with the approved Terms of Reference dated November 8, 2022 (included in Appendix I) following the guidance of the County of Wellington OP (2022) and the EIS guidelines of the GRCA (2005). This report assesses the potential impacts of the proposed redevelopment on the natural heritage features and their ecological functions. Mitigation measures, where appropriate, have been recommended to ensure that the proposed works do not cause negative impacts on the natural areas and their ecological functions.

1.1 Study Area

The term “study area” refers to the subject property and lands surrounding the subject property, including adjacent lands (approximately 120m) and any contiguous natural features extending beyond (Map 1). The 120m radius that is included in the study area has been selected based on the definition of ‘adjacent lands’ provided in the Natural Heritage Reference Manual [NHRM] (OMNR 2010), which requires the assessment of potential impacts on all relevant ecological receivers and wildlife habitat for any development within 120m.

Additionally, the study area review includes data from the Natural Heritage Information Centre [NHIC] (MNRF 2022) (1x1km squares) natural heritage background data and the areas covered by wildlife atlases (10x10km squares).

2.0 Project Scoping

2.1 Proposed Undertaking

The proposed development of the subject property consists of a warehouse and trucking facility (20,690 m^2), a 3-storey office building (930m^2), stormwater management and septic system infrastructure (Tacoma Engineers, 2022).

2.2 Collection and Review of Background Information

Existing natural heritage information was collected and reviewed to identify key natural heritage features, habitats and species that are reported from, or have the potential to occur within the study area. The following background information sources were reviewed to provide an accurate understanding of the physical and biological attributes within the study area:

- Environmental Impact Study (2014) as prepared by Aboud and Associates;
- Mill Creek Subwatershed Study (CH2M Gore and Storrie Ltd. et al 1996);
- Natural Heritage Information Centre (NHIC) database (MNRF 2022);
- County of Wellington Official Plan (OP) (2022);
- A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019);
- Grand River Conservation Authority (GRCA) Watershed Mapping;
- Puslinch Zoning By-Law (2021);
- Ministry of Environment, Conservation and Parks (MECP) Species at Risk;
- Government of Canada Species at Risk Act (SARA) (2002);
- Ontario Breeding Bird Atlas (OBBA) (Bird Studies Canada (BSC) et al. 2022);
- Ontario Reptile and Amphibian Atlas (ORAA) (Ontario Nature 2019);
- Mammal Atlas of Ontario (Dobbyn 1994);
- Ontario Butterfly Atlas Online (MacNaughton et al. 2022); and
- Ontario Odonate Atlas (OOAD 2022).

Species lists were compiled to provide information on species reported from within the vicinity of the study area based on data available from the wildlife atlases listed above. These atlases provide data based on 10x10 km survey squares. Information on species from the survey squares that overlap with the study area (17NJ6912) were compiled. These initial species lists were used to guide the scope and type of wildlife field surveys required as outlined in the following sections.

2.2.1 Significant Species Screening

A preliminary list of potential SAR was developed to identify those which are reported from the local area and may have suitable habitat within the subject property and study area. An initial list was compiled from background data and a list provided by Dougan and Associates in the pre-consultation notes. The screening was completed by cross-referencing the preferred habitat for potential SAR and Species of Conservation Concern (SCC) (OMNR 2000) against habitats known to occur in the subject property and study area. This was completed to ensure that the potential presence of all SAR and SCC within the study area was adequately assessed. SAR are defined as species listed as Threatened or Endangered provincially or federally. Confirmed habitat for SAR is protected under the *ESA* (2007). SCC are defined as:

- Species designated provincially as Special Concern;
- Species that have been assigned a conservation status (S-Rank) of S1 to S3 or SH by the NHIC; and
- Species that are designated federally as Threatened or Endangered by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC), but not provincially by the Committee on the Status of Species at Risk in Ontario (COSSARO). These species are protected by the federal *Species at Risk Act*, but not provincially by the *ESA*.

Based on the original field surveys completed by NRSI in 2022, only one SAR/SCC listed has suitable habitat on-site and adjacent; the Eastern Wood-peewee (*Contopus virens*). The SAR/SCC screening results have been updated since the TOR stage and are provided in Appendix I.

2.2.2 Significant Wildlife Habitat Screening

A Significant Wildlife Habitat (SWH) assessment was completed for the study area. The Significant Wildlife Habitat Technical Guide (SWHTG) is a guideline document that outlines the types of habitats that the MNRF considers significant in Ontario as well as criteria to identify these habitats (OMNR 2000, OMNR 2015). The SWHTG groups SWH into 4 broad categories: 1) seasonal concentration areas, 2) rare vegetation communities and specialized wildlife habitat, 3) habitats of SCC, and 4) animal movement corridors. Based on the comparing the natural features and vegetation communities to the criteria for each type of SWH, the subject property does not contain habitats that may be significant for wildlife. However, there is potential for SWH to occur within the woodland adjacent to the subject property, specifically Bat Maternity Colonies and Special Concern and Rare Wildlife Species (OMNR 2015).

3.0 Relevant Policies, Legislation and Planning Studies

Table 1 provides an overview of natural heritage-based policies, regulation and legislation that were considered and which informed the field program and analysis. To help inform suitable land-use concepts, guide the layout of development and identify areas to be protected, inventoried natural features were evaluated against relevant policies, regulations and legislation outlined in the following sections. The specific implications of these policies to the proposed development are discussed further below.

Table 1. Relevant Policies, Legislation and Planning Studies

Policy/Legislation/Planning Study	Description	Project Relevance
Provincial Policy Statement (OMMAH 2020)	• Issued under the authority of Section 3 of the Planning Act and came into effect on May 1, 2020, replacing the 2014 PPS (OMMAH 2014). • Section 2.1 of the PPS – Natural Heritage, establishes clear direction on the adoption of an ecosystem approach and the protection of resources that have been identified as 'significant'. • The Natural Heritage Reference Manual (OMNR 2010) and the Significant Wildlife Habitat Technical Guide (OMNR 2000) were prepared by the MNRF to provide guidance on identifying natural features and in interpreting the Natural Heritage sections of the PPS.	• A Significant Woodland is identified within and adjacent to the subject property

Policy/Legislation/Planning Study	Description	Project Relevance
Endangered Species Act (Government of Ontario 2007)	• The original ESA, written in 1971, underwent a year-long review which resulted in a number of changes which came into force in 2007. • The ESA prohibits killing, harming, harassing or capturing Species at Risk (SAR) and protects their habitats from damage and destruction.	• Based on the background review, no SAR were identified as having the potential to occur within the study area based on potential adjacent habitats. • No habitat for SAR was identified within the subject property during 2022 surveys, however potential SAR habitat was noted in adjacent woodland habitat.
Species at Risk Act (SARA, Government of Canada 2002)	• SARA establishes the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as an independent body of experts responsible for assessing and identifying species at risk. • It creates prohibitions to protect listed threatened and endangered species and their critical habitat.	• Any observed species listed by COSEWIC as endangered or threatened shall be protected, along with their habitat. The EIS shall demonstrate that no impacts to SAR will occur. • No endangered or threatened species listed by COSEWIC, or their habitats, are present within the subject property. Adjacent woodland may provide habitat for SAR.

Policy/Legislation/Planning Study	Description	Project Relevance
Migratory Birds Convention Act (Government of Canada 1994)	• The MBCA protects migratory game birds, insectivorous birds, and several other migratory non-game birds from persecution in the form of harassment. • The schedule of on-site work must consider MBCA windows, with timing of breeding bird season typically occurring between April 1 and August 31, however, this is a guideline, since the MBCA applies to nesting bird species. • "Incidental take" is considered illegal, with the exception of a permit obtained by the Canadian Wildlife Service (CWS).	• Species protected by the MBCA were observed within the subject property during the 2014 and 2022 field surveys. • The timing of construction activities, especially vegetation clearing and site grading must have consideration for the MBCA timing windows.
Fish and Wildlife Conservation Act (Government of Ontario 1997)	• The *Fish and Wildlife Conservation Act* (FWCA) provides protection for certain bird species, not protected under the MBCA (e.g., raptors), as well as furbearing mammals and their dens or habitual dwellings, aside from the Red Fox (*Vulpes vulpes*) and Striped Skunk (*Mephitis mephitis*).	• The timing of construction activities, especially vegetation clearing and site grading must have consideration for bird nesting (including nesting season for Raptors, Hawks and Owls) and den sites for furbearing mammals. • Wildlife sweeps by a qualified biologist are recommended in advance of any vegetation clearing and site grubbing during the bird active season to ensure that no active nests/dens are present.

Policy/Legislation/Planning Study	Description	Project Relevance
County of Wellington Official Plan (The Corporation of Wellington, 2022)	• The County of Wellington's new Official Plan (2022), outlines current policies for the protection of natural features within the County of Wellington which represent a constraint for development.	• The Township of Puslinch Greenbelt mapping (Schedule A7-3) shows significant natural features in and adjacent to the study area. • Subject property is currently zoned as a Highway Commercial (HC) area, and designated as Secondary Agriculture.
County of Wellington Forest Conservation Bylaw 5115-09 (2009)	• Regulates harm or destruction of woodlands within the County of Wellington. • Defines "woodlands" (Section 1. ai, i-iv).	• The significant woodland is protected by the Forest Conservation Bylaw (5115-09).
GRCA Regulation 150/06 under the Conservation Authorities Act And Policies for the Administration for the Development, Interference with Wetlands and Alterations of Shorelines and Watercourses (GRCA 2015)	• Regulation issued under the *Conservation Authorities Act*, R.S.O. 1990. • Through this regulation, the GRCA has the responsibility to regulate activities in natural and hazardous areas (i.e., areas in and near rivers, streams, floodplains, wetlands and slopes). • GRCA requires that an EIS be undertaken in accordance with their *EIS Guidelines and Submission Standards for Wetlands* where development is proposed within 120m of PSW or 30m from non-PSW	• GRCA noted in a letter September 15 2022 that the subject property includes an unevaluated wetland and its regulated allowance, as well as the regulated allowance to a separate off-site wetland. These features and their associated allowances are regulated by GRCA. • A scoped EIS is required
Mill Creek Subwatershed Study (CH2M Gore and Storrie Ltd. et al 1996)	• Investigates and provides recommendations on wetland setbacks and stormwater management details within the Mill Creek Subwatershed	• The subject property is within the Mill Creek Subwatershed • The unevaluated wetlands are within close proximity to the Mill Creek PSW, and may be suitable for complexing into the subwatershed.

4.0 Field Methods

Field surveys were undertaken within the subject property to characterize natural features and identify any significant and sensitive natural heritage features and species that have potential to be adversely affected by the proposed development. Field visits were completed on October 14, 21 and November 22, 2022 and are described in detail below and summarized in Table 2. Surveys were undertaken in accordance with provincial and local guidance documents as indicated below.

Table 2. Field Survey Summary.

Survey	Protocol	Dates (2022)
Ecological Land Classification	Ecological Land Classification for Southern Ontario (Lee et al. 1998)	October 14 and 21
Vegetation Inventories	Systematic search by ELC polygon	October 14 and 21
Wetland Boundary Delineation	Onsite wetland survey with sub-metre GPS boundary mapping	October 21
Woodland Dripline Delineation	Onsite woodland survey with sub-metre GPS boundary mapping	October 21
Wildlife Assessment	Recorded observations of wildlife within or adjacent to subject property	October 14 and 21, November 22

4.1.1 Ecological Land Classification

The vegetation community delineation and description from the 2014 EIS was reviewed and updated using aerial photography and through investigations in the field. The standard Ecological Land Classification (ELC) System for southern Ontario was applied (Lee et al. 1998). Details of vegetation communities were recorded including species composition, dominance, uncommon species or features and evidence of anthropogenic disturbance.

4.1.2 Vegetation Inventories

A fall season inventory of all vegetation communities within the subject property was completed on October 21 2022, to update the existing conditions from the original 2014 Aboud and Associates vegetation inventories. All species of vascular flora identifiable at the time of the field survey were documented.

4.1.3 Wetland Boundary Delineation

The boundaries of the on-site and adjacent wetlands were delineated according to the Ontario Wetland Evaluation System (OWES) for southern Ontario on October 21, 2022, and surveyed using a sub-metre accuracy Trimble GPS unit. The wetlands are shown on Map 2 and incorporated into all other maps and plans prepared by the team. Although the boundary was determined outside of the growing season, it was found to be near identical to the wetland boundary delineated in 2014 by Aboud and Associates. The GRCA confirmed that no on-site verification with their ecologist was required (email from J. Simons, GRCA November 16, 2022).

A GRCA mapped wetland is shown within the woodland to the east of the subject property. This area was investigated during the fall 2022 field work and the wetland was found not to exist. The area in question is a hilly wooded landform feature and has no wetland present as shown on Map 2.

4.1.4 Woodland Dripline Delineation

The dripline of the woodland was delineated at the outer edge of the tree canopy by a trained biologist, and surveyed using a sub-metre accuracy Trimble GPS unit. The dripline is shown on Map 2 and incorporated into all other maps and plans prepared by the team.

4.1.5 Additional Wildlife

All observations of birds, herpetofauna, mammals and insects were documented on all field visits. This included direct observations of individuals, as well as signs of wildlife presence (i.e., tracks, scats, dens, nests etc.). The house on-site was inspected for any evidence of use by nesting birds and/or bats. Individual trees were assessed for the presence of cavities suitable for SAR bats.

5.0 Existing Conditions

5.1 Soils, Terrain and Drainage

The subject property occurs at the northwest boundary of the physiographic region known as the Galt Moraines (Chapman and Putnam 1984) and the flatter low-lying outwash valley orientated from southwest to northeast through the Aberfoyle area. The Galt Moraines typically consist of Wentworth Till, a hard stony sand silt till, but can vary into a sandy till in many areas (Karrow 1987). The southeastern section of the subject property is underlain with the Wentworth Till, while the northwestern section is underlain with outwash gravel. While regional-scale mapping indicates a distinct boundary between these two deposit types, it is not uncommon rather for transitional zones of variable interlayered materials of sand and gravel with varying silt content (CVD 2022a).

The subject property is located within the Mill Creek Subwatershed, with Mill Creek and its associated wetlands found to the northeast and northwest of the subject property. The subject property ranges in elevation from approximately 325mASL in the southeast corner grading downwards to the north and west to a low point near Brock Road of 314mASL. Groundwater in the subject property flows from a shallow water table within granular deposits beneath the northwestern section, and extends westward into the outwash valley and eventually discharging into Mill Creek.

The water table at this property is “laterally-discontinuous” due to the variable and layered geological conditions and topography, ranging from primarily low-permeability sand-silt till in the southeast and transitioning to an interlayered granular and sand-silt till in the north and west, which are frequently overlain by fill.

There is a seasonally variable “perched” water table on top of the till deposit in the southeast corner, near the small wetland pocket. In the spring of 2014, MBN measured the water table elevation there to be above 214 mASL (+/-) and was ~ 0.5 to 1.0 m lower during the winter of 2014. The wetland pockets were observed to be dry in the fall of this 2022 drought year.

A transition from the perched water table area in the southeast to a much lower water across the remainder of the property to the north and west (i.e., <312 mASL) was observed. Based on these data and the elevation of the ponds located west of Brock Road (see note in Figure 1), groundwater flow is interpreted to be directed in a westerly directly across the site and toward these off-site ponds. The Hydrogeological Report indicates that the small wetlands on-site and adjacent are not considered to be groundwater ‘receptors’, as they are not expected to be sustained by groundwater discharge. These features are expected to be sustained by overland runoff and are often only seasonally wet. The proposed development and the associated grading are not expected to have any impact on this wetland feature, since it is sustained by overland runoff 9and possibly some shallow interflow) originating from higher topographic areas located further east from the property (CVD 2022b).

5.2 Vegetation

5.2.1 Vegetation Communities

The subject property has been almost entirely cleared, graded and filled under the previous Site Alteration Permit, resulting in a very disturbed site. A summary of the ELC communities identified within and adjacent to the subject property is provided in Table 3 and shown on Map 2.

Table 3. Ecological Land Classification Community Descriptions.

ELC Code	Community Type	Community Description
CUM1	Mineral Cultural Meadow Ecosite	The cultural meadow ecosite occupies the majority of the subject property. Due to the past grading, the site is disturbed with new pioneer field species emerging. Fill piles are located along the northwest boundary. Common field species such as Smooth Brome (*Bromus inermis*), Common Vetch (*Vicia Sativa*), and Wild Carrot (*Daucus carota*) occur throughout the cultural meadow, with occasional seedlings of White Pine (*Pinus strobus*) and Manitoba Maple (*Acer negundo*) interspersed.
CUT1	Mineral Cultural Thicket Ecosite	The cultural thicket is located along the edges of the property. The understory and groundcover layer is dominated by Orchard Grass (*Dactylis glomerata*), Kentucky Bluegrass (*Poa pratensis*), New England Aster (*Symphyotrichum novae-angliae*) and Red Raspberry (*Rubus idaeus*). Canopy is composed of Common Buckthorn (*Rhamnus cathartica*), with occasional White Elm (*Ulmus americana*) and Sandbar Willow (*Salix exigua*).
CUW1	Mineral Cultural Woodland Ecosite	The cultural woodland is located in a depression area in the northwest corner of the subject property and is bounded by Brock Rd South and adjacent residential areas. The woodland was been partially disturbed by filling and tree removal and contains open meadow areas with stands of trees or single trees. The understory and groundcover layers are composed of both native and non-native species including Garlic Mustard (*Alliaria petiolata*), Tartarian HoneySuckle (*Lonicera tatarica*) and Common Buckthorn. Canopy is dominated by remnant Sugar Maple, Manitoba Maple, with occasional Trembling Aspen (*Populus tremuloides*) and Hawthorn (*Crataegus sp*).
FOD5	Dry- Fresh Sugar Maple Deciduous Forest Ecosite	The fresh Sugar Maple deciduous forest ecosite is located in the northeast corner adjacent to the subject property, and extending northwards between agricultural land. A silt fence marks the previous woodland dripline and marks the boundary of the industrial grading in the adjacent CUM1 ecosite. Canopy

ELC Code	Community Type	Community Description
		is composed of Bitternut Hickory (*Carya cordiformis*), Sugar maple (*Acer saccharum*), and White Ash (*Fraxinus americana*), although many of the latter are deceased. Common Buckthorn and Staghorn Sumac (*Rhus typhina*) compose most of the woodland understory.
H1	Deciduous Hedgerow	The deciduous hedgerows are located along the north/northwest boundary of the subject property, dividing the cultural meadow from the adjacent agricultural land. The hedgerow is composed of medium to large trees including Black Cherry (*Prunus serotina*), Bitternut Hickory, Sugar Maple and White Ash, with Common Buckthorn dominating the understory.
H2	Young Poplar Deciduous Hedgerow	The young poplar deciduous hedgerow is located along the north/northeast boundary of the subject property, dividing the adjacent residential and agricultural land from the CUM1 and CUT1 ecosites. This area consists of saplings and small poplar re-growth.
Res	Residential	Residential areas contain lawn and ornamental plantings.
SWT2-5	Red-Osier Mineral Thicket Swamp Ecosite	The two unevaluated wetlands are located within and adjacent to the southeast corner of the subject property, and were determined to be Red-osier Dogwood Mineral Thicket Swamp ecosites. The understory is dominated by Red-Osier Dogwood (*Cornus sercea*), with a fringe of Common Buckthorn. Canopy is comprised largely of Trembling Aspen (*Populus tremuloides*), White Elm and Sandbar Willow.

5.2.2 Vascular Flora

A total of 57 plant species were observed by NRSI biologists within the subject property during fall vegetation inventories. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix II.

Based on available background information, one SAR plant, False Leaved Yellow Foxglove (*Aureolaira pedicularia*) is reported from the vicinity of the study area (MNRF 2022). There is no habitat for this species on-site or in the study area. NRSI did not observe any provincially or federally significant species within the subject property during the 2022 field visits and none were recorded by Aboud and Associates in 2014.

5.3 Wildlife

5.3.1 Birds

A total of 114 bird species are reported from the study area or vicinity based on the OBBA and NHIC data bases (BSC et al. 2022; MNRF 2022). NRSI biologist observed 12 species during the 2022 fall field investigations. Aboud and Associates documented 29 species during their 2014 EIS. Their study included surveys during the breeding season and documented 26 species with breeding evidence. Much of the habitat used by those species has since been removed. A complete list of species reported from and observed by NRSI is provided in Appendix III.

Based on available background information, 4 bird SCC and 6 bird SAR are reported from the vicinity of the study area (BSC et al. 2022; MNRF 2022) as summarized in the screening table in Appendix I. Two SAR birds (Barn swallow and bank swallow) and 1 SCC (eastern wood-pewee) were observed by Aboud and Associates in 2014, but were determined not to be breeding on-site. The eastern wood-pewee has suitable habitat present within the woodland on and adjacent to the subject property. No significant species of birds are expected to use the remainder of the subject property for breeding based on the alteration that has occurred on-site.

5.3.2 Amphibians and Reptiles

According to the Ontario Reptile and Amphibian Atlas (ORAA, Ontario Nature 2019), 27 species of herpetofauna, including 3 SCC and 2 SAR are known from within the 10x10km grid overlapping the subject property. NRSI biologists did not observe any herpetofauna species during any of the field investigations. Aboud and Associates also did not document any amphibian or reptile species during their 2014 EIS. Their study included turtle nesting surveys during the nesting season with no evidence of turtles recorded. Their report states that significant wildlife habitat for turtles is not present on-site. All species of herpetofauna reported from background sources for the study area are listed in Appendix IV.

5.3.3 Mammals

A total of 48 mammal species are documented from the study area or vicinity based on the Mammal Atlas of Ontario and NHIC database (Dobbyn 1994; MNRF 2022). A single common mammal species, the Eastern Grey Squirrel (*Sciurus carolinensis*), was observed during the field investigations by NRSI. Aboud and Associates did not document any mammals using the subject property. A complete list of all observed species and species reported from the vicinity of the study are is provided in Appendix V.

Based on available background information, 1 mammal SCC and 5 mammal SAR are reported from the vicinity of the study area (Dobbyn 1994; MNRF 2022). No regionally, provincially or federally significant species, or their preferred habitats, were observed within the subject property during the 2014 or 2022 field surveys and none are expected to be present.

5.3.4 Butterflies

A total of 58 butterfly species are reported from the study area or vicinity based on the Ontario Butterfly Atlas and NHIC database (MacNaughton et al. 2022; MNRF 2022). NRSI biologists and Aboud and Associates did not observe any butterfly species during any of the field investigations. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix VI.

Based on available background information, 1 SCC is reported from the vicinity of the study area (MacNaughton et al. 2022; MNRF 2022). Although the subject property does contain meadow vegetation, it is not considered preferred habitat due to its size and overall poor quality. No regionally, provincially or federally significant species were observed within the subject property during the 2022 field surveys and none are expected to be present.

5.3.5 Insects

Based on available background information, 2 SAR/SCC insects have been reported from the vicinity of the study area (MNRF 2022) including Double-striped Bluet (*Enallagma basidens*) and Yellow-banded bumblebee (*Bombus terricola*). No regionally, provincially or federally significant species were observed within the subject property during the 2022 field surveys and none are expected to be present.

6.0 Significance and Sensitivity

The subject property is within the eastern headwaters of Mill creek. Mill Creek is a significant creek with important coldwater aquatic habitats which support sensitive coldwater fish species including brook trout. The coldwater thermal regime is created due to the progressive and significant inputs of cold groundwater, discharging to the creek throughout the upper and middle parts of the subwatershed. In order to preserve and maintain this significant habitat, upland recharge and lowland discharge must continue (CH2M Gore and Storrie 1996). The Mill Creek Subwatershed Study provides guidance on maintaining the balance of water to Mill Creek such as impervious cover limits, infiltration practices and erosion and sediment control.

The subject property has been altered through the grading and filling of almost the entire property, as per an approved permit in 2014. The results of the field surveys and background review show that the subject property is mainly occupied by regenerating cultural meadow and disturbed lands which are of low quality and not significant. The minimal natural features on-site include a small wetland and the edge of a significant woodland. These features extend off-site to the north and east; however, they have potential to be affected by development of the subject property.

The on-site wetland and a second smaller off-site wetland are unevaluated but have been mapped and are regulated by GRCA. The previous EIS (Aboud 2014) and supporting Hydrogeological Investigation by MBN Environmental Engineering Inc. (2014) determined that the 2 small wetlands are not connected to the Mill Creek Puslinch Provincially Significant Wetland Complex either by surface water or by groundwater, based on their isolated nature and the direction of groundwater flow being westerly, away from the PSW. This conclusion is supported by the current hydrogeological study (CVD 2022b) which also determined that the wetlands are not connected to the Mill Creek PSW either by surface water or groundwater. Therefore, these two small unevaluated wetlands should not be included in the PSW complex and are not provincially significant.

The topography of the site slopes from east to west and away from the wetland. This indicates that the wetland is not influenced by surface water runoff originating on the subject property, rather the wetland is expected to receive water only from the topographically-higher off site lands to the east from a very localized catchment, and precipitation that falls directly on the wetland itself. A 15m buffer to the wetland is recommended to maintain its limited water balance and to protect it from any direct impacts of the development.

Groundwater recharge at the property is expected to move to the west and will ultimately discharge to Mill Creek located about 400 m to the west/northwest. Pre-development groundwater recharge quantity at the property (prior to the 2016 filling) was heavily influenced by the presence of a large depression in the north end of the property. The previous depression created a considerably higher than normal groundwater recharge and a lower runoff from the property. These influences are to be factored into the pre-post water balance assessment and in the stormwater management plan to maintain and enhance the groundwater discharge function to Mill Creek.

The dripline of the significant woodland was delineated in 2022 as an update to the 2014 study. This woodland was previously given a 5m buffer for protection during the grading activities. During the intervening years, the trees along the edge of the woodland have continued to grow, and presumably their roots to recolonize the graded area. As such, a 5m buffer from the new dripline to any grading has been recommended, and an additional 5m buffer be provided to any structures or impervious surfaces.

Hedgerows along the shared property lines have been identified as requiring protection to avoid impacts to non-owned off-site trees. These hedgerows (H1) were previously protected during the grading operations by fencing located at the dripline which is still semi in place. It is recommended that these trees be protected by detailed 3D surveying of the trees and their dripline and a 1m buffer where possible.

There are no significant species or other habitats present on the property which require specific protection measures. Individual and isolated trees should be inventoried and assessed for retention and protection measures through a Tree Preservation Plan.

7.0 Impact Analysis and Enhancement Recommendations

7.1 Proposed Development

The proposed development consists of a one storey 20,690 square foot new warehouse facility with approximately 20 loading dock spaces, 72 trailer parking spots, 50 tractor parking spots, office employee parking, a 3-storey office building, septic tank and bed and an infiltration gallery for stormwater management. The parking area will be asphalt paved. A Conceptual Site Plan has been prepared by Tacoma Engineers (2022) and is superimposed onto the natural feature mapping and shown on Map 3.

A Preliminary Servicing and Stormwater Management Report has been prepared by Meritech (2022) to show how the development will be serviced including water supply, wastewater treatment and stormwater management. Water will be provided by a proposed on-site well, and wastewater will be managed by an on-site treatment system which will discharge treated effluent to the subsurface in accordance with the requirements of the Ontario Building Code. The stormwater management approach will provide parking lot storage and an oil-grit separator to satisfy the criteria for water quantity and quality control. A large underground infiltration gallery for roof runoff will ensure that infiltration targets for this area of the Mill Creek watershed are met.

7.2 Approach to Impact Analysis

This impact analysis has been prepared by comparing the details of the proposed development plan to the natural heritage features within and adjacent to the subject property. NRSI has reviewed the reports and plans provided by other team members including servicing and stormwater management, Conceptual Site Plan, geotechnical and hydrogeological to prepare this section.

The following is a description of the types of impacts discussed in the sections below:

- **Direct impacts** to the natural features on the subject property associated with disruption or displacement caused by the actual proposed footprint of the undertaking.
- **Indirect impacts** associated with changes in site conditions such as drainage and water quantity/quality.

- **Induced impacts** associated with impacts after the development is constructed such as subsequent demand on the resources created by increased use of the area and vicinity.

7.3 Direct Impacts and Recommended Mitigation

7.3.1 Tree and Vegetation Removal

The development of the site has avoided any direct impacts to the significant woodland and the wetlands. These features are retained and buffered and will be protected during construction by fencing and a sediment barrier to be installed at the limit of development. The development will require the removal of the cultural meadow vegetation and individual trees across the entire site. There are several mature sugar maples and other medium to large trees that will be removed from around the existing house and from the CUW1 at the depression along the frontage on Brock Road South. A future tree inventory and preservation plan will provide more detail on species, size, condition and retention vs. removal. Some trees may be able to be retained along Brock Road South and Gilmore Road depending on final grading. Hedgerow trees along the north and east sides of the property will be protected by avoiding and minimizing grading and asphalt within the dripline and providing a 1m buffer where possible. The grading plan includes a low retaining wall along the limit of the parking lot, in order to match grades within the root zones of off-site trees. These retaining walls will be refined further once detailed tree inventory and elevation surveying has been completed.

Mitigation

Construction limit fencing and sediment barrier be located and installed at the limit of development to protect the on- and off-site significant woodland and wetlands. A Tree Preservation Plan be prepared to address tree retention and removal within the subject property and provide recommendations for tree protection measures.

7.3.2 Birds and Their Nests

The removal of trees and meadow vegetation has the potential to harm and disrupt nesting birds. The *Migratory Birds Convention Act* (MBCA, Government of Canada 1994) identifies a list of migratory bird species that are protected. It prohibits the destruction of nests, individuals and activities that would cause an adult bird to abandon a nest. Tree and vegetation removal is to occur outside of the core nesting period for migratory birds as established by the Canadian Wildlife Service (CWS) which extends from approximately April 1 – August 31 (Government of

Canada 2018). Every developer, consultant, contractor, etc. is legally obliged to carry out due diligence to protect migratory birds from harm during all construction projects.

Mitigation

Should vegetation/tree removal be required to occur within the core nesting period, a nest search may be conducted by qualified biologists within simple habitat just prior to the removal activity (less than 48 hours prior). Simple habitat means individual trees or small areas of vegetation where the visibility and probability of detecting nests is good. Should any active nest be identified, there shall be no removal or construction activity until sign-off is obtained from the qualified biologist that the nest is no longer active. Vegetated areas and tree(s) identified as having no nesting activity can be removed; however, removal is to occur within 48 hours of the nest search. If removal does not occur within this time frame, additional nest searches are to be conducted.

If a nest search is conducted, a clearance letter is to be prepared by the qualified biologist that undertook the surveys. The letter would be submitted to the client for their files in the event a record of due diligence is requested by the CWS.

7.4 Indirect Impacts

The following section outlines potential sources of indirect impacts associated with the proposed development.

- Alterations to Drainage and Flow Patterns, Water Quality, Groundwater;
- Wildlife Disturbance; and,
- Erosion and Sedimentation.

7.4.1 Alterations to Drainage and Flow Patterns, Water Quality, Groundwater

A Preliminary Servicing and Stormwater Management Report has been prepared by Meritech (2022) that provides details on the proposed approach to managing and treating stormwater runoff following development. Due to the past alteration of the site, along with the existing soil type and land cover, the water balance of the site is primarily driven by evapotranspiration (Meritech 2022).

The proposed stormwater management plan will control water quantity by providing storage in the parking lots and on the warehouse building rooftop. The parking lots will drain to a storm sewer system which controls the outflow by an appropriately sized orifice, prior to being outlet to an oil/grit separator for quality control. The OGS will provide ‘enhanced protection’ to meet water quality objectives including long term average removal of 80% of suspended solids in the total runoff volume. Treated water will be released to an existing 750mm culvert under Brock Road South, then flowing north in the roadside ditch and ultimately into Mill Creek.

In order to meet the infiltration requirements of the Mill Creek Subwatershed, rooftop water will be directed to underground infiltration galleries sized for 25mm/hr runoff. This infiltration infrastructure has been placed in an area of permeable native soils conducive to infiltration such that post-development will meet and exceed the pre-development infiltration condition, thereby contributing to maintaining and enhancing water balance in the Mill Creek Subwatershed.

The Hydrogeological Assessment report (CVD 2022b) indicates that there will be no impact to groundwater quality or quantity due to the proposed water usage or the wastewater treatment system of the proposed development.

Mitigation, Protection, and Enhancement

Implement the stormwater management plan as designed and recommended by Meritech.

7.4.2 Wildlife Disturbance

Increased disturbance caused by excessive noise, dust, vibrations, lighting, and proximity of human presence during construction may cause wildlife species on-site and within the adjacent natural features to abandon or avoid the area for travel, nesting or foraging. Additionally, truck noise and parking lot lighting during operation of the facility has potential to disrupt wildlife.

The on-site and adjacent natural features have been retained and buffered from the proposed development and will continue to provide habitat for wildlife during and after construction. Construction limit fencing is recommended to ensure that buffers are adhered to prior and during construction. Disturbance impacts due to construction are anticipated to be localized and temporary.

Common and tolerant species of wildlife were documented using the wetlands and woodland during the 2014 EIS and this study. The species and individuals that are present in the study area are those which have adapted to the current noise, lighting and disturbance conditions which are present due to the existing adjacent trucking facility, heavy equipment business, Brock Road South traffic and neighboring aggregate operations. To avoid and minimize disturbance to wildlife during operation it is recommended that truck movements and noise be limited to the extent possible during the breeding season for birds and wildlife which includes April to August, including nighttime. Parking lot lighting should be directed away and shielded from shining into natural features.

Mitigation, Protection, and Enhancement

Construction limit fencing should be installed prior to any works beginning to ensure that buffering of natural features is adhered to. Construction noise be restricted during spring and summer (April to August) to between 7:00 am and 7:00 pm. Any lighting equipment associated with construction activities should be turned off at the end of daily construction activities. Impacts due to dust should be mitigated for by moistening areas of bare, dry soil with water as needed during construction activities to reduce the amount of dust produced. Permanent parking lot lighting should be shielded and directed away from the adjacent natural features so as to prevent 'lightwash' of these areas.

7.4.3 *Erosion & Sedimentation*

During rain or thaw events, erosion of exposed soils has the potential to occur during construction. Sediment laden surface water runoff has potential to flow into receiving catch basins and ditches, potentially impairing downstream water quality.

Mitigation, Protection, and Enhancement

ESC measures should be installed along the limit of construction/grading to ensure that sediment laden runoff does not impact the on-site and adjacent natural features, or downstream receiving watercourses or water bodies. An erosion and sediment control plan should be prepared and implemented prior to any construction or site works.

7.5 Induced Impacts

Induced impacts are described as those that are not directly related to the construction or operation of the facilities in question, but rather arise as a result of the use of the natural areas or immediately adjacent lands for the development. The simplest example is an increase in the use of natural areas adjacent to development by residents, feral domestic wildlife, and unauthorized trail/pathway construction and dumping of debris.

Induced impacts are anticipated to be negligible on this subject property. The proposed development has been placed within the disturbed and cultural areas of the property. Human activity is expected to be focused within the development and will not enter natural features.

8.0 Summary

The proposed undertaking is to construct a warehouse, truck facility and office with stormwater management and septic system on the subject property. The property has been previously altered by grading and contains limited on-site and adjacent natural features. An EIS has been prepared to ensure there are no negative impacts on the remaining natural features.

Below is a summary of mitigation measures provided is this report:

- Implement a no-touch buffer of 15m for the wetlands;
- Implement a 5m no-touch buffer for the woodland followed by an additional 5m buffer where grading is permitted;
- Install construction limit fencing along the outer edge of construction/grading/buffer limit prior to any clearing or construction activity;
- Tree Inventory and Preservation Plan be prepared, including details of protection for off-site hedgerow trees;
- All vegetation/tree clearing should be conducted outside of the core bird nesting season (April 1 to August 31);
- Nest searches should be conducted by a qualified biologist where vegetation/tree clearing cannot be maintained outside of the core bird nesting season;
- Implement Stormwater Management Plan and recommendations provided by Meritech;
- Mitigate spring and summer construction noise impacts by restricting activities to between 7:00 am and 7:00 pm during April to August;
- Turn off construction lighting at the end of each day;
- Implement measures to mitigate dust;
- Permanent lighting of the parking lots to be directed away and shielded from shining into the woodland and wetlands;
- Prepare and implement an Erosion and Sediment Control plan.

Providing the protection and mitigation measures recommended within this report, as well as the stormwater management plan and recommendations by other team members are adhered to, no significant negative environmental impacts are anticipated to the natural features on-site and adjacent as a result of the proposed development.

9.0 References

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Appendix I

Terms of Reference

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

November 8, 2022 Project 2984

Chris Lorenz, Resource Planner
Grand River Conservation Authority
clorenz@grandriver.ca

Jeff Bunn, Deputy Clerk
Township of Puslinch
jbunn@puslinch.ca

Dear Mr. Lorenz and Mr. Bunn,

Re: 128 Brock Road South, Puslinch, Wellington Motor Freight
Environmental Impact Study - Terms of Reference

Natural Resource Solutions (NRSI) was retained by Wellington Motor Freight to prepare an Environmental Impact Study (EIS) for the property located at 128 Brock Road South, Puslinch Ontario. Wellington Motor Freight has proposed the construction of a warehouse, truck facility and office on the property. An EIS is required for this development to ensure there are no negative impacts on the natural features on the site and surrounding lands including a Significant Woodland and two Unevaluated Wetlands to the east.

The County of Wellington Official Plan designated the natural features within and adjacent to the subject property as Core Greenlands (5.6.1) and Significant Woodlands (5.5.4). In the eastern corner of the property there is an unevaluated wetland which is regulated by the Grand River Conservation Authority (GRCA). The site itself has been largely disturbed by re-grading and levelling. Adjacent lands include active agricultural fields, aggregate extraction and other trucking facilities.

Upon review of the Growth Plan mapping, the subject property is not overlain by the provincial natural heritage system and no key natural heritage features or key hydrologic features are identified on the subject property or adjacent and therefore it is assumed that the policies of the Growth Plan do not apply to this property.

An EIS was conducted by Aboud and Associates in 2014 for the re-grading which was approved and appears to have occurred in 2016. It is requested that this current EIS be prepared as an update to the 2014 EIS. The attached Terms of Reference identify how the EIS update will be prepared, with specific recommendations to the proposed development.

Sincerely,
Natural Resource Solutions Inc.
Elaine Gosnell, B.Sc., P.Biol.
Senior Wetland and Terrestrial Biologist

Wellington Motor Freight EIS
128 Brock Road South, Puslinch
Terms of Reference
November 8, 2022

Introduction

Wellington Motor Freight has proposed the construction of a 16,766m^2 warehouse and truck facility as well as a 1,600m^2 office on the subject property at 128 Brock Road South. A stormwater management pond and septic system is proposed at the north end as shown on the Site Plan Concept appended to this document.

The study team includes (as well as other disciplines):

MHBC – Planning

CVD – Geotechnical and Hydrogeology

Meritech Engineering – Stormwater Management, Grading and Servicing

Natural Resource Solutions Inc. – Natural Environment

The subject property is shown on Map 2 with the study area being identified as those lands within 120m of the property boundary, as identified by Dougan and Associates. 120m is considered sufficient adjacent lands to capture natural environment features which could be affected by the proposed undertaking.

Background Information Collection and Review

The subject property was formerly studied through an EIS prepared for the previous owner who applied for a Site Alteration Permit to allow the levelling of the site for the purposes of future development. A Scoped EIS was prepared by Aboud and Associates in 2014 to document the existing conditions and address the impact of development on the wetlands, vegetation and wildlife on the subject property. That study was approved and the site alteration has since taken place which included the grading and filling of the entire property except for the natural features and their recommended buffers. Based on the alteration of the property and the previous work completed, this EIS TOR has been prepared as an update to the 2014 EIS.

Collection and Review of Background Information

Any newer background information will be collected for the study area to update species lists from the 2014 EIS. Species status will be updated where changes have occurred. Wildlife species lists will include the 10kmx10km atlas square that overlaps the subject property. This area is considered sufficient to characterize the natural features and ensure that SAR and other significant and sensitive species known from the area are considered in the proposed development.

The following background information sources will be reviewed in the preparation of the EIS:

- Environmental Impact Study (2014) as prepared by Aboud and Associates;
- Mill Creek Subwatershed Study (CH2M Gore and Storrie Ltd. et al 1996);
- Natural Heritage Information Centre (NHIC) database (NDMNRF 2022);

- County of Wellington Official Plan (OP) (2022);
- A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019);
- Grand River Conservation Authority (GRCA) Watershed Mapping;
- Puslinch Zoning By-Law (2021);
- Ministry of Environment, Conservation and Parks (MECP) Species at Risk;
- Government of Canada Species at Risk Act (SARA) (2022);
- Ontario Breeding Bird Atlas (OBBA) (Bird Studies Canada (BSC) et al. 2006);
- Ontario Reptile and Amphibian Atlas (ORAA) (Ontario Nature 2019);
- Mammal Atlas of Ontario (Dobbyn 1994);
- Ontario Butterfly Atlas Online (MacNaughton et al. 2022); and,
- Ontario Odonate Atlas (OOAD 2022).

Screening for Species At Risk

The 2014 EIS found 3 SAR birds during their field work, with none showing evidence of breeding on-site. No other species at risk flora or fauna were observed, and due to the site alteration that has taken place, none are expected to be present on-site. A screening for Species at Risk (SAR) and Species of Conservation (SCC) that may be present on-site has been undertaken using the background information collected in addition to a fall field visit. This screening found no SAR with potential to be present on-site or to be affected by the proposed undertaking. The screening table is included in Appendix I.

Significant Wildlife Habitat Screening

A screening of Significant Wildlife Habitat types for Ecoregion 6E was carried out by comparing the habitats present on the subject property and adjacent lands and using the background information available and based on a fall field visit to the habitat criteria as provided by MNRF (2015). No SWH types are expected to be present on the subject property, although potentially may be present in the woodland on adjacent lands including:

- Bat Maternity Colonies, and,
- Special Concern and Rare Wildlife Species.

Field Surveys

The following surveys have been completed to update the characterization of natural heritage features on and adjacent to the subject property and to identify the presence of wildlife using the habitat on the site. Species information from surveys conducted for the 2014 Aboud and Associates report will be compiled with current data to characterize the adjacent habitats.

Vascular Flora Inventory and Vegetation Community Mapping

A fall season floral inventory and vegetation community mapping survey has been completed on October 21, 2022 to update the existing conditions vegetation community mapping for the study area. Vegetation communities within the study area were mapped and described according to the Ecological Land Classification (ELC) system for southern Ontario (Lee et al. 1998) and are shown on Map 1. All species of vascular flora identifiable at the time of the field survey were documented. No significant species of plants or vegetation communities are present on-site and none are expected due to the site alteration that has taken place.

Wetland Boundary Delineation

Two small unevaluated wetlands were delineated in the 2014 EIS and were reviewed in the field on October 21, 2022. The on-site wetland was investigated and surveyed with a sub-metre accuracy Trimble GPS unit and is shown on appended maps. The 2022 wetland boundary was found to be near identical to that delineated in 2014 and as such, is recommended to be accepted, although it is recognized that this work was done outside of the typical growing season and has not been reviewed with GRCA at this time. A fall 2022 site meeting to review the wetlands can be arranged if desired.

A grading limit of 19m from the wetlands was implemented in 2014 to maintain wetland hydrology.

A GRCA mapped wetland is shown within the woodland to the east of the subject property. This area was investigated during the fall 2022 field work and was found not to exist. The area in question is a hilly wooded landform feature and has no wetland present.

Woodland Dripline Delineation

The boundary of the Significant Woodland to the east of the property was also delineated and surveyed using a Trimble GPS unit with sub-metre accuracy during the October 21, 2022 field visit. The woodland boundary is very similar to that identified in the 2014 EIS. This delineation of the dripline as well as the previous 5m buffer for grading will be used to inform development plans along this border of the property.

Wildlife

Based on the alteration of the subject property as well as the previous work completed, it is proposed that this EIS update be prepared based on the existing information available. The 2014 EIS completed 3 breeding bird surveys between late May and early July. Surveys for turtle nesting also occurred during all spring and summer field surveys, with no evidence of turtles or nesting being found. All wildlife species were recorded during the fall current field survey. This included direct observations, as well as signs such as dens, tracks, scats, etc.

Constraints

Natural feature constraints and buffer recommendations for the current proposed undertaking will be based on the existing altered condition of the subject property and the previous buffer limits which were implemented for the grading and filling work. Information on soils, hydrogeology and hydrology contributed by other team members will be used to identify suitable buffers from the wetland and woodland and to assess pre-development and post-development water balance to these features. The previous EIS and supporting Hydrogeological Investigation by MBN Environmental Engineering Inc. (2014) determined that the 2 small wetlands are not connected to the Mill Creek Puslinch Provincially Significant Wetland Complex either by surface water or by groundwater, based on their isolated nature and the direction of groundwater flow. Therefore, these two small unevaluated wetlands should not be included in the PSW complex and are not provincially significant.

The two small wetlands are supported by surface water runoff from their catchment, which is primarily from the southeast (i.e. off-site). They are not significant in terms of groundwater recharge or discharge based on hydrogeological information. Buffers and other mitigation measures will be recommended based on the aspects of the development proposed immediately adjacent as well as the stormwater management plan or other measures to be implemented.

Reporting

The EIS report will characterize the existing site conditions and identify all natural heritage features, designations and applicable policy. The report will summarize the available background material including the 2014 EIS and update it with 2022 field survey results and study team findings. The SAR, SCC and SWH screenings will be updated and the results discussed.

Significant biological features and their buffers and setbacks will be described. These constraints will be compiled onto mapping to show a combined development limit to inform the proposed Site Plan.

The details of the proposed undertaking will be reviewed and compared to the existing conditions and habitat in the Study Area. Potential impacts will be discussed where there are any areas of conflict between significant natural features, buffers or ecological functions and the proposed development.

The assessment of potential impacts will be divided into three main categories:

- **Direct impacts** associated with removal of natural features caused by the actual 'footprint' of the proposed development.
- **Indirect impacts** associated with changes in site conditions, such as indirect impacts to wildlife, or modifications to drainage and water quantity/quality as it pertains to the site drainage and the adjacent wetland features.
- **Induced impacts** associated with proposed activities and their impact on natural features or species and their habitats over time in space, including, but not limited to, the spread of invasive species or disturbance to natural features or wildlife habitats caused by human use of the property.

Recommendations to avoid, or otherwise minimize or mitigate impacts to significant natural features and functions will be presented in the EIS report. Opportunities for ecological enhancement and restoration on the Subject Property, will be highlighted.

PUSLINCH ZONING REGULATION:

1	REGULATION	REQUIRED	ACTUAL
2	ZONE	IND	IND
3	MIN. REQ'D LOT AREA	0.4 ha (4,000 sm)	6.05 ha (60,565 sm)
4	MIN. LOT FRONTAGE	30m	±387m
5	MIN. FRONT YARD	6m	6m
6	MIN. INTERIOR SIDEYARD	5m	10.6m
7	MIN. INTERIOR SIDEYARD ADJACENT TO RES. ZONE	15m	N/A
8	MIN. EXTERIOR SIDEYARD	15m	137m
9	MIN. REAR YARD	7.5m	±68m
10	MAX. LOT COVERAGE	75%	33.4%
11	MIN. LANDSCAPED OPEN SPACE	15%	29.18%
12	MAXIMUM HEIGHT	25m	15m
13	BUFFER REQ'D IF ADJACENT TO RES. ZONE	1.5m PLANTING STRIP	1.5m PLANTING STRIP
14	OFF-STREET PARKING	170 SPACES	170 SPACES
15	OFF-STREET LOADING	>5000 SM = 3 SPACES + 1 ADDITIONAL FOR EA. 10,000 SM ABOVE 5,000 SM	21 SPACES
16	GARBAGE STORAGE		INDOORS
17	NATURAL ENVIRONMENT SETBACK	30m	37m
18	LANDSCAPE BUFFER ALONG BROCK ROAD	3m	3m

SITE DATA:

PROPERTY AREA: 60,590 SM (14.97 ACRES)

ZONING: PROPOSED - INDUSTRIAL IND (SUBJECT TO ZBA)
CURRENT - HIGHWAY COMMERCIAL HC

MUNICIPAL ADDRESS: 128 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO, CANADA

LEGAL DESCRIPTION: PIN 71195-0669 (LT)
PART OF LOT 24, CONCESSION 7 AND
PART OF LOT 24, CONCESSION 8 AND
PART OF ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 7&8
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

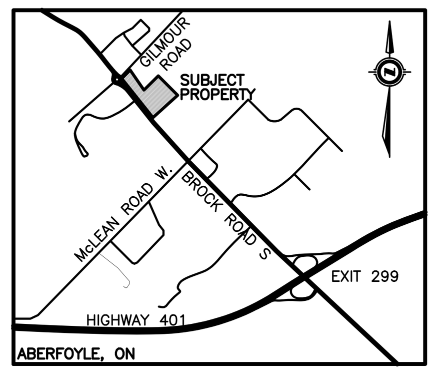
SURVEY INFORMATION: PROJECT: 31772-22
VAN HARTEN SURVEYING INC
423 WOOLWICH ST.,
GUELPH, ONTARIO
N1H 1X3

METRIC NOTE:

1. DISTANCES AND COORDINATES SHOWN HEREON ARE IN METERS AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GENERAL NOTES:

- REFER TO SEPARATE SITE GRADING, DRAINAGE AND SERVICING PLANS AS PREPARED BY **MERITECH ENGINEERING.**
- EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY **VAN HARTEN SURVEYING INC.** DATED OCTOBER 27, 2022.
- REFER TO SEPARATE WASTEWATER TREATMENT PLANS AS PREPARED BY **FLOWSPEC ENGINEERING.**
- REFER TO LANDSCAPE PLAN AS PREPARED BY **ABOUD & ASSOCIATES.**
- ALL NEW SIGNAGE TO IDENTIFY PARKING STALLS AND TRAFFIC WITHIN THE SITE SHALL BE INSTALLED ON HOT DIPPED GALVANIZED PRE-PUNCHED METAL POSTS. FIRE ROUTE SIGNS TO BE MOUNTED SO THAT THE SIGN FACES THE FIRE ROUTE WITH THE BOTTOM OF THE SIGN AT 2.1m TO 2.7m FROM FINISH GRADE.
- WALL LIGHTING ON BUILDING ADDITIONS SHALL BE FULL FACE CUT OFF TYPE.
- ALL ROOFTOP MECHANICAL UNITS ON THE BUILDING ADDITION WILL BE SCREENED BY THE BUILDING AND WILL NOT BE VISIBLE FROM THE ROAD TO THE SATISFACTION OF THE GENERAL MANAGER OF PLANNING AND BUILDING SERVICES.
- REFER TO GEOTECHNICAL REPORT FOR ASPHALT CONSTRUCTION.
- ALL PARKING LINES TO BE DELINEATED WITH 100mm WIDE EXTERIOR GRADE YELLOW TRAFFIC PAINT W/ HIGH ABRASION RESISTANCE.



KEY MAP

LEGEND

EXIT MAN DOOR	
MAIN ENTRANCE DOOR (PRINCIPLE ENTRANCE)	
O/H DRIVE-IN DOOR	
LOADING DOCK DOOR	
SSIB	SHORT STANDARD IRON BAR
SIB	STANDARD IRON BAR
IB	IRON BAR
C.L.F.	CHAIN LINK FENCE
HPL	NEW HYDRO POLE
HP	EXISTING HYDRO POLE
E.O.A.	EDGE OF ASPHALT
	LIGHT DUTY ASPHALT
B	200 DIA. CONCRETE FILLED STEEL PIPE BOLLARD. SEE SECTION ON DRAWING SP2
	LIGHT STANDARD, SEE SITE PHOTOMETRIC PLAN
BH-#	INDICATES APPROXIMATE BOREHOLE LOCATION AND NUMBER. SEE GEOTECH REPORT
TP-#	INDICATES APPROXIMATE TESTPIT LOCATION AND NUMBER. SEE GEOTECH REPORT
FDC	FIRE DEPARTMENT CONNECTION (SIAMESE)
FH	FIRE HYDRANT (DRAFT)
	2.4m HIGH CHAINLINK PERIMETER FENCING TO OPSD 972.102, 972.130 AND 972.132
	2.4m HIGH BOARD FENCING, SEE LANDSCAPING DRAWINGS
WP	WALL PACK LIGHTING FASTENED TO FACE OF BUILDING OR AT T/O PARAPET

SITE AREA BREAKDOWN

AREA TYPE	AREA SQ.M.	AREA S.F.	% COVER
BUILDING AREA	21,630	232,825	35.71
PAVED AREA / HARD SURFACE	22,953	247,066	37.90
SOFT LANDSCAPING	15,982	172,030	26.39
TOTAL SITE AREA	60,565	14.97 AC	100

CONSTRUCTION NOTES:

(AS REFERENCED ON SITE PLAN)

1. EXISTING HYDRO POLE, HYDRO WIRES AND ALL ASSOCIATED GUY WIRES TO BE REMOVED. SEE SITE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. EXISTING POTABLE WATER WELLS ENCOUNTERED ARE TO BE DECOMMISSIONED AND PLUGGED BY A WELL CONTRACTOR LICENSED BY THE MINISTRY OF THE ENVIRONMENT. WORK MUST COMPLY WITH MINISTRY OF THE ENVIRONMENT PROCEDURES FOR PLUGGING UNUSED WATER WELL ACCORDING TO ONTARIO REGULATION 903. SEE SITE SERVICING DRAWINGS FOR MORE INFORMATION.
3. SEE LANDSCAPING PLAN FOR TREE REMOVALS.
4. CAST IN PLACE CONCRETE RETAINING WALL, C/W 1070mm HIGH GUARDRAIL. SEE GRADING AND STRUCTURAL DRAWINGS.
5. PAINTED LADDER PEDESTRIAN CROSSWALK DESIGNED TO O.REG. 402/15
6. CURB RAMP AT SIDEWALK C/W TACTILE WALKING SURFACE INDICATOR AT TOP OF ACCESS AISLE AS PER OBC 3.8.2.2.(1)(h). TACTILE ATTENTION INDICATORS SHALL SHALL CONFORM TO SENTENCE (2) AND CLAUSES 4.1.1. AND 4.1.2. OF ISO 23599, "ASSISTIVE PRODUCTS FOR BLIND AND VISION-IMPAIRED PERSONS – TACTILE WALKING SURFACE INDICATORS". THE DEPTH OF INDICATOR SHALL BE NOT LESS THAN 300mm AND NOT MORE THAN 610mm. CURB RAMP TO CONFIRM TO OBC 3.8.3.2.(3) AND (4).
7. DRAFT HYDRANT TO BE DESIGNED IN ACCORDANCE WITH NFPA 22 AND NFPA 24.
8. 602,000 LITRE (159,000 US GALLON) UNDERGROUND FIREFIGHTING WATER TANK. **VOLUME DESIGNED FOR WAREHOUSE (WORST CASE) PER NFPA 13**. PROVIDE WATER SUPPLY WITH AUTOFILL AND DEPTH SENSOR/ALARM. TANK TO HAVE VENT PIPE AND MAN HOLE ACCESS HATCH. PROVIDE BOLLARDS AROUND PERIMETER TO PREVENT VEHICULAR TRAFFIC. FIRE PROTECTION ENGINEER/CIVIL RESPONSIBLE FOR DESIGN OF FIRE SERVICE MAINS FROM TANKS TO SPRINKLER ROOM/HYDRANT.
9. PARKING ACCESS CONTROL GATE. GATE CONTROLLED VIA SECURITY GUARDHOUSE. ELECTRICAL TO PROVIDE COMMUNICATION CONDUIT TO OFFICE. PROVIDE EMERGENCY USE KEYS INSIDE A FIRE DEPARTMENT LOCK BOX. LOCK BOX TO BE INSTALLED ON OR NEAR THE GATE IN A CONSPICUOUS PLACE.
10. ELECTRICAL POST AT TRACTOR PARKING. SEE DETAIL '4/SP3'.
11. SURFACE MOUNTED BIKE RACKS, 27 BICYCLE PARKING SPACES TOTAL. SEE DETAIL '5/SP3'.
12. ELECTRIC TRANSFORMER ON MIN 200 THK., 32 MPa CONCRETE SLAB R/W 15M AT 300 OC. EACH WAY BOTTOM. PROVIDE BOLLARDS PER CODE. COORDINATE WITH ELECTRICAL.
13. 2 - 7.62 LONG x 2.64m APART PAINTED GUIDE LINES CENTERED AT EACH DOCK DOOR. PAINT TO BE EXTERIOR GRADE TRAFFIC PAINT WITH HIGH ABRASION RESISTANCE

PARKING DATA:

PARKING

PARKING REQUIRED (BASED ON NET FLOOR AREAS)

WAREHOUSE	=1 SP / 200 SM	= 20,690 / 200	= 104 SPACES
BUSINESS OFFICE	=1 SP / 40 SM	= 2,630 / 40	= 66 SPACES
TOTAL	**170 SPACES**		

PARKING PROVIDED **170 SPACES (EXCLUDING TRACTOR PARKING)**

DESIGNATED PARKING SPACES ARE INCLUDED IN THE PARKING SPACES PROVIDED ABOVE

DESIGNATED PARKING SPACES REQUIRED 8 SPACES (4 + 2% REQ'D SPACES)
DESIGNATED PARKING SPACES PROVIDED 8 SPACES

TYPICAL PARKING SPACE 3.0m x 6.0m
ACCESSIBLE PARKING SPACES
TYPE 'A' 3.6m x 6.0m
MOBILITY ACCESS AISLE 1.5m x 6.0m
DRIVE AISLE 6.0m

LOADING SPACES

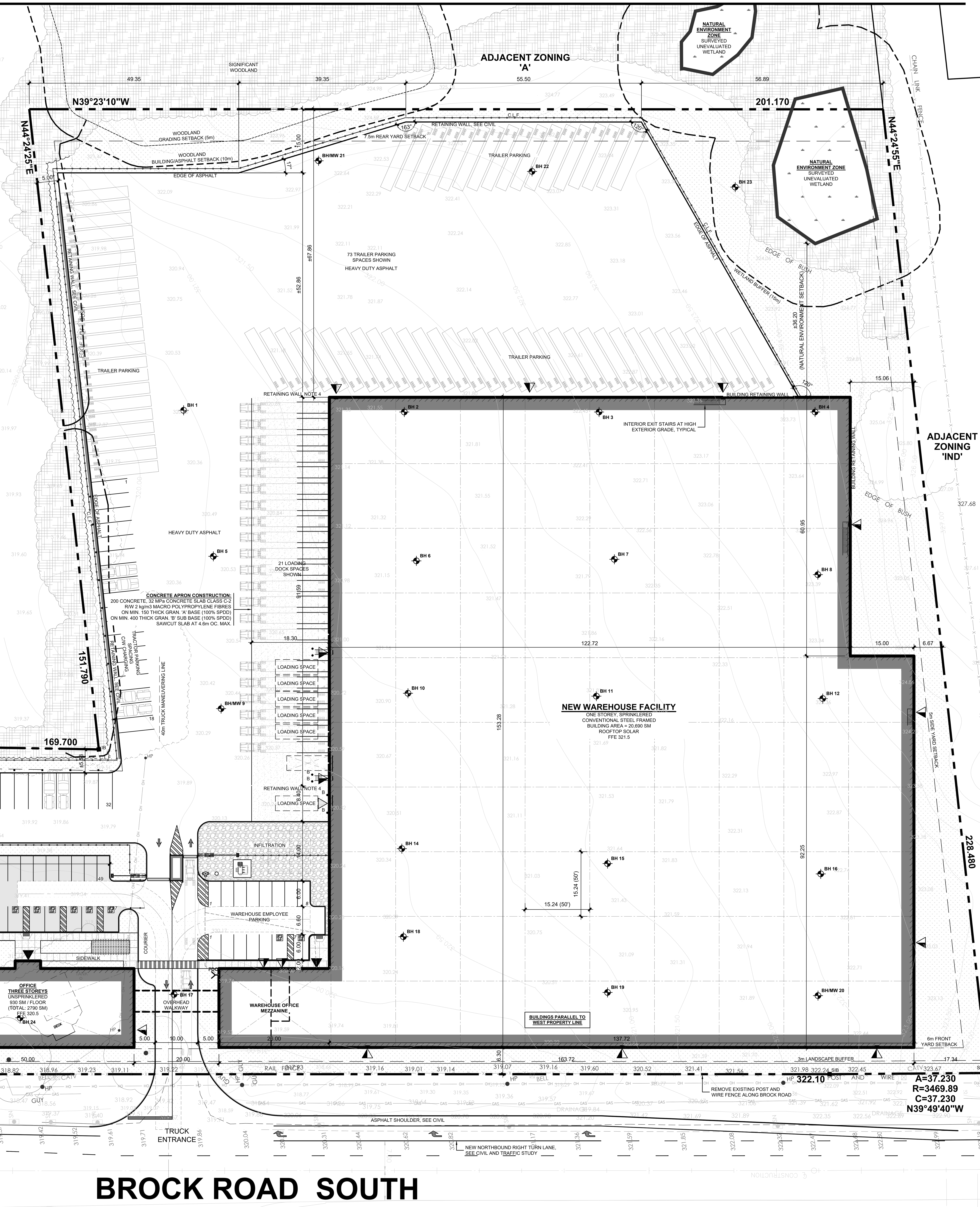
LOADING SPACES REQUIRED **6 SPACES**
LOADING SPACES PROVIDED **21 SPACES**
TYPICAL LOADING SPACE 3.5m x 10m

BICYCLE PARKING

SPACES REQUIRED

WAREHOUSE	=1 SP / 1,000 SM	= 20,690 / 1000	= 21 SPACES
OFFICE	=2 SP / 1,000 SM	= 2,790 / 500	= 6 SPACES
TOTAL	**27 SPACES**		

PARKING PROVIDED **27 SPACES**
TYPICAL BICYCLE SPACE 0.6m x 1.8m



PROJECT NORTH | TRUE NORTH

No.	Date	Issued for / Revision:
1.	OCT. 19, 2022	CONCEPTUAL REVIEW
2.	OCT. 20, 2022	CONCEPTUAL REVIEW
3.	NOV. 18, 2022	CONCEPTUAL REVIEW
4.	DEC. 02, 2022	TRAFFIC STUDY REVIEW
5.	DEC. 21, 2022	ZONING BYLAW AMENDMENT

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www.tacomaengineers.com

Collaborative Structures Limited
6683 ELLIS ROAD, CAMBRIDGE, ONTARIO

WELLINGTON MOTOR FREIGHT

BROCK ROAD, PUSLINCH, ONTARIO

CONCEPTUAL SITE PLAN

Project No.	Drawn By:
TE-41102-22	S.KOLKMAN

SP1

CONSTRUCTION NOTES:
(AS REFERENCED ON SITE PLAN)

1. EXISTING HYDRO POLE, HYDRO WIRES AND ALL ASSOCIATED GUY WIRES TO BE REMOVED. SEE SITE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
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LEGEND

	EXIT MAN DOOR
	MAIN ENTRANCE DOOR (PRINCIPLE ENTRANCE)
	O/H DRIVE-IN DOOR
	LOADING DOCK DOOR
SSIB	SHORT STANDARD IRON BAR
SIB	STANDARD IRON BAR
IB	IRON BAR
C.L.F.	CHAIN LINK FENCE
HPL	NEW HYDRO POLE
HP	EXISTING HYDRO POLE
E.O.A.	EDGE OF ASPHALT
	LIGHT DUTY ASPHALT
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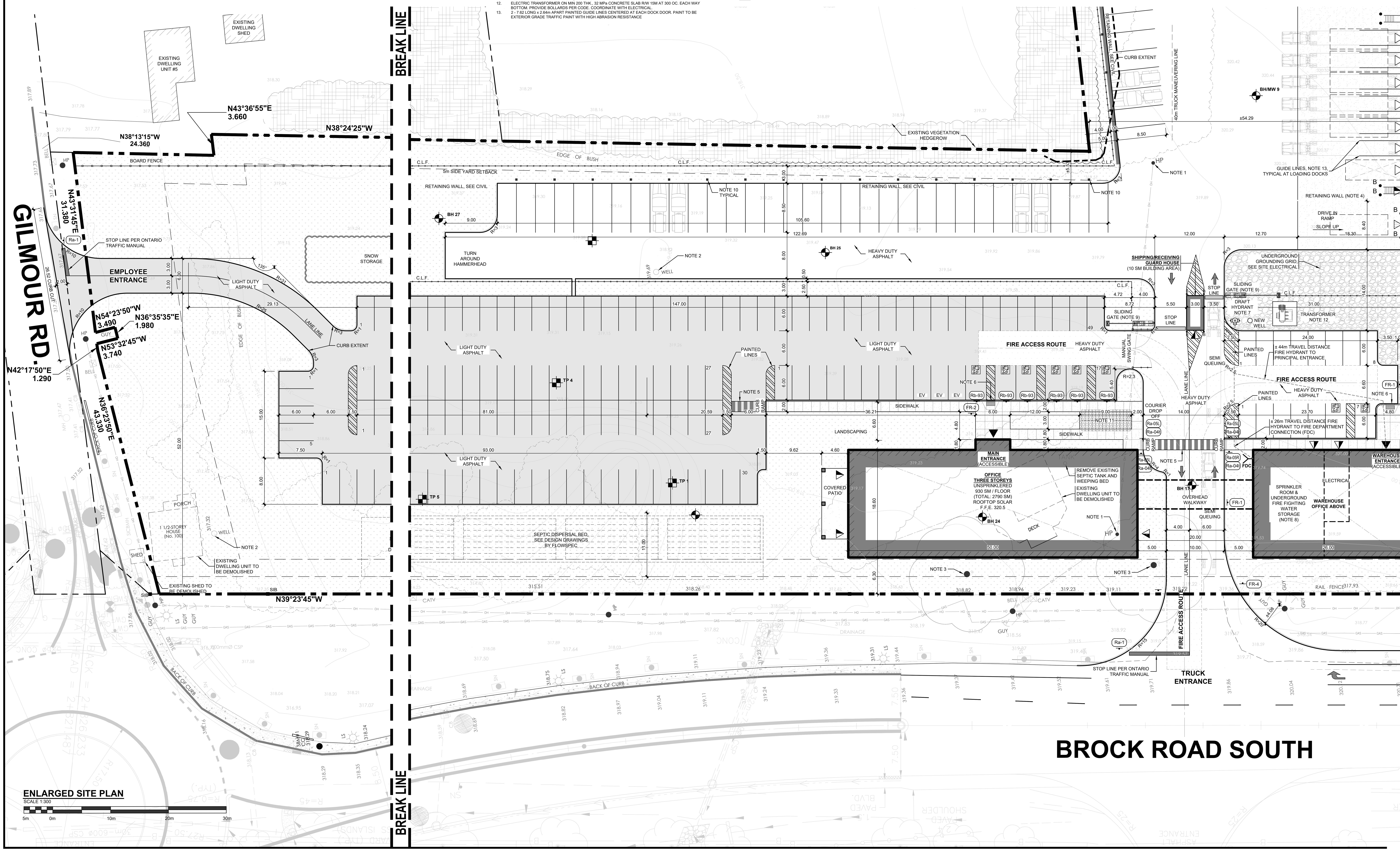

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CONCEPTUAL ENLARGED SITE PLAN

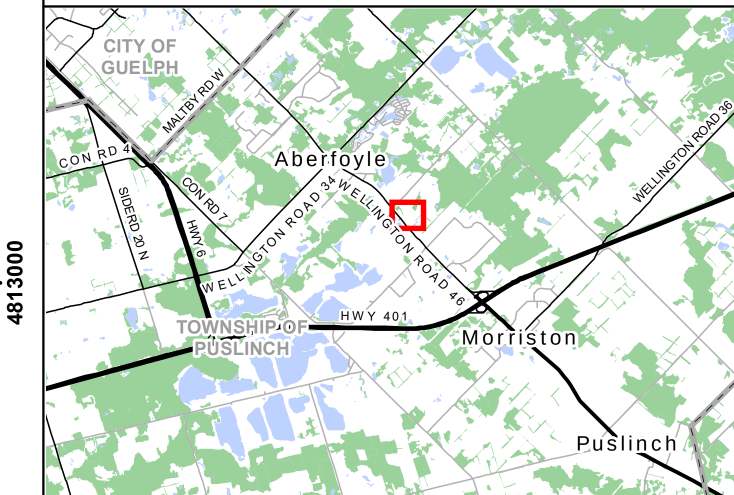
Project No.: TE-41102-22
Drawn By: S.KOLKMAN

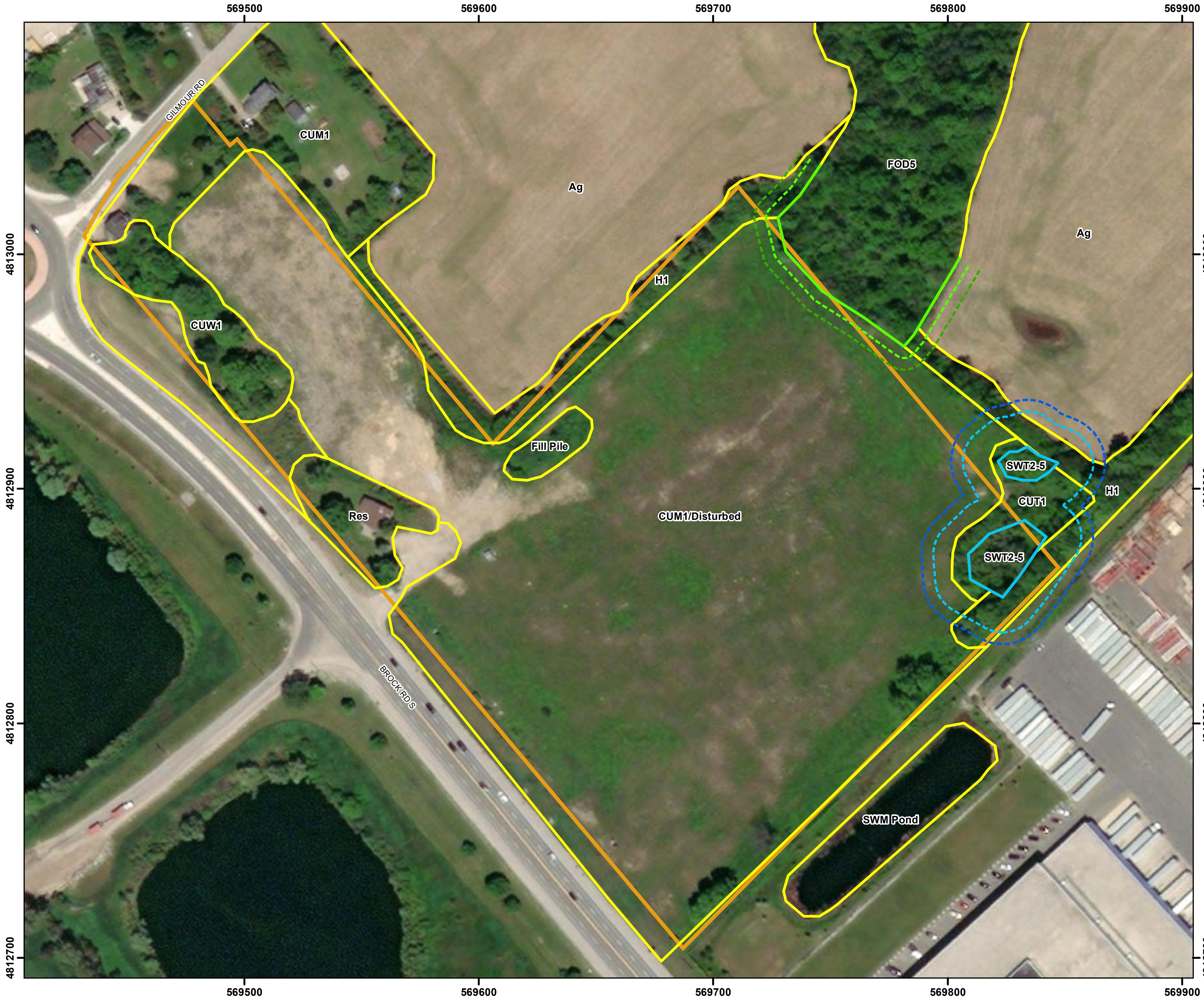
SP2

Map 2

Wellington Motor Freight EIS

Existing Conditions





Legend

- Subject Property (Approximate)
- Surveyed Wetland (NRSI 2022)
- Wetland Buffer (15m)
- Wetland Buffer (20m)
- Surveyed Dripline (NRSI 2022)
- Dripline Buffer (5m)
- Dripline Buffer (10m)
- Ecological Land Classification (ELC)

(Ag) Agricultural
(CUM1) Mineral Cultural Meadow Ecosite
(CUT1) Mineral Cultural Thicket Ecosite
(CUW1) Mineral Cultural Woodland Ecosite
(FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
(H1) Deciduous Hedgerow
(Res) Residential
(SWT2-5) Red-osier Dogwood Mineral Thicket Swamp Type

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 2984 Date: November 9, 2022	NAD83 - UTM Zone 17 Size: 11x17" **1:1,600**

0 20 40 60 80 100 Metres

N

Path: X:\2984_WellingtonMotorFreight_EIS\NRSI_2984_Map2_ExistingConditions_2K_2022_11_KEF.mxd

Appendix I. SAR/SCC Screening

Scientific Name	Common Name	S-RANK[1]	SARO[1]	COSEWIC[2]	SARA[2]	SARA Schedule[2]	Background Source	Observed by NRSI (2022) or Aboud (2014)	Habitat Requirements	Suitable Habitats within Subject Property	Carried Forward to EIS?	Rationale
Birds												
Ammodramus savannarum	Grasshopper Sparrow	S4B	SC	SC	SC	Schedule 1	OBBA 2006		Well-drained grassland or prairie with low cover of grasses, taller weeds or sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities. Requires perches for singing and tracts of grassland generally >5ha.[3,4]	No	No	Subject property is mainly disturbed soils with sparse weedy groundcover which may be suitable habitat but is smaller than general habitat size (<5ha) and is adjacent to a busy road and trucking facility. Not observed during 2014 breeding bird surveys.
Chaetura pelagica	Chimney Swift	S3B	THR	T	T	Schedule 1	OBBA 2006		Commonly found in urban areas near buildings; nests in chimneys, hollow trees,and crevices of rock cliffs. Feeds over open water.[3,4]	No	No	Not an urban area, no buildings with chimneys. Observed foraging during 2014, no evidence of breeding.
Chordeiles minor	Common Nighthawk	S4B	SC	SC	T	Schedule 1	OBBA 2006		Open ground; clearings in dense forests (including burns and logged areas); rock barrens; peat bogs; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs.[3,4]	No	No	Subject property is mainly disturbed soils with sparse weedy groundcover. However, site is adjacent to busy road and trucking facility, not suitable.
Contopus virens	Eastern Wood-pewee	S4B	SC	SC	SC	Schedule 1	OBBA 2006, Aboud 2014	X	Mid-canopy layer of forest clearings and edges of deciduous and mixed forest. Abundant in intermediate-age mature forest stands with little understory vegetation.[3,4]	Yes	Yes	Suitable forest habitat is present within woodland on and adjacent to subject property. Observed singing from hedgerow during 2014, no evidence of breeding on-site.
Dolichonyx oryzivorus	Bobolink	S4B	THR	T	T	Schedule 1	OBBA 2006		Large (>10 ha), open expansive grasslands, pastures, hayfields, meadows or fallow fields with dense ground cover. Occassionally nest in large (>50 ha) fields of winter wheat and rye in southwestern Ontario.[3,4]	No	No	No large open grasslands present on-site.
Hirundo rustica	Barn Swallow	S4B	THR	SC	T	Schedule 1	OBBA 2006, About 2014	X	Farmlands, rural areas and other open or semi-open areas near body of water. Nests almost exclusively on human-made structures such as open barns, buildings, bridges and culverts.[3,4]	No	No	No nests observed on on-site buildings. Observed foraging during 2014, no evidence of breeding.
Hylocichla mustelina	Wood Thrush	S4B	SC	T	T	Schedule 1	OBBA 2006		Carolinian and Great Lakes-St. Lawrence forest zones. Undisturbed moist mature deciduous or mixed forest with deciduous sapling growth. Near pond or swamp. Must have some trees higher than 12 m.[3,4]	No	No	No suitable forest habitat on-site or adjacent.
Melanerpes erythrocephalus	Red-headed Woodpecker	S3	SC	E	E	Schedule 1	OBBA 2006		Open, deciduous forest with little understory; fields, parks or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees. Requires cavity trees with at least 40 cm dbh.[3,4]	No	No	No suitable forest habitat or trees on-site or adjacent.
Riparia riparia	Bank Swallow	S4B	THR	T	T	Schedule 1	OBBA 2006, Aboud 2014	X	Nests in burrows in natural and human-made settings with vertical faces in silt and sand deposits. Usually on banks of river and lakes, but also found in sand and gravel pits.[3,4]	No	No	No banks present on-site for nest burrows. Observed foraging in 2014, with no evidence of breeding. Local gravel pits are likely used for nesting.
Sturnella magna	Eastern Meadowlark	S4B, S3N	THR	T	T	Schedule 1	OBBA 2006		Open pastures, hayfields, grasslands or grassy meadows with elevated singing perches (small trees, shrubs or fence posts). Also weedy borders of croplands, roadsides, orchards, airports, shrubby overgrown fields or other open areas. Generally prefers larger tracts of habitat >10 ha, but will sometimes use smaller tracts.[3,4]	No	No	No large open grasslands present on-site.
Turtles												

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Scientific Name	Common Name	S-RANK[1]	SARO[1]	COSEWIC[2]	SARA[2]	SARA Schedule[2]	Background Source	Observed by NRSI (2022) or Aboud (2014)	Habitat Requirements	Suitable Habitats within Subject Property	Carried Forward to EIS?	Rationale
Chelydra serpentina	Snapping Turtle	S4	SC	SC	SC	Schedule 1	ORAA 2019		Slow-flowing rivers and streams, lakes, and permanent or semi-permanent wetlands with soft substrates and vegetation. Key habitat requirements: open areas with structures for basking, open sand or gravel areas for nesting, shallow areas with soft substrates to bury in, soft banks or substrates for hibernation.[3]	No	No	No suitable water bodies present on-site or adjacent. No observations from 2014 nesting surveys.
Chrysemys picta marginata	Midland Painted Turtle	S4		SC	SC	Schedule 1	ORAA 2019		quiet, warm, shallow water with abundant aquatic vegetation such as ponds, large pools, streams, ditches, swamps, marshy meadows; eggs are laid in sandy places, usually in a bank or hillside, or in fields; bask in groups; not territorial	No	No	No suitable water bodies present on-site or adjacent. No observations from 2014 nesting surveys.
Graptemys geographica	Northern Map Turtle	S3	SC	SC	SC	Schedule 1	ORAA 2019		large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water; home range size is larger for females (about 70 ha) than males (about 30 ha) and includes hibernation, basking, nesting and feeding areas; aquatic corridors (e.g. stream) are required for movement; not readily observed	No	No	No suitable water bodies present on-site or adjacent. No observations from 2014 nesting surveys.
Emydoidea blandingii	Blanding's Turtle (Great Lakes / St. Lawrence population)	S3	THR	E	T	Schedule 1	ORAA 2019		Eutrophic, shallow wetlands such as marshes, ponds, swamps, bogs, fens, or coastal wetlands, with soft, muddy substrates, abundant aquatic vegetation, and basking structures (logs, stumps, hummocks). Large overland movements occur between aquatic habitats and to open sandy or gravelly areas for nesting. Forest habitat is important for upland movements. Overwintering typically occurs in permanent wetlands.[7]	No	No	No suitable water bodies present on-site or adjacent. No observations from 2014 nesting surveys.
Snakes												
Lampropeltis triangulum	Eastern Milksnake	S4	SC	SC	SC	Schedule 1			Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings; often uses communal nest sites.[4]	No	No	No suitable meadow or forest habitat on-site or adjacent.
Salamanders												
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	E	E	Schedule 1	ORAA 2019		Large deciduous or mixed forest containing, or in close proximity to, suitable breeding ponds which include fishless vernal pools or wetlands with suitable hydroperiod for larval development (was present until Aug/Sept). Habitats must contain shelter features including leaf litter, woody debris, rocks, logs, or stumps. Hibernation sites are underground in mammal burrows, root systems, or crevices or fissures in rocks.[17]	No	No	No suitable breeding ponds or large forests present on-site or adjacent.
Frogs and Toads												
Pseudacris triseriata pop.1	Western Chorus Frog (Great Lakes - St. Lawrence - Canadian Shield population)	S4	NAR	T	T	Schedule 1	ORAA 2019		Moist forest, prairie, meadows, cultural meadows, or marshes. Breeds in shallow, temporary, fishless wetlands, including flooded ditches, marshes, flooded fields, pastures, temporary ponds, pools, and swamps. Hibernates in terrestrial habitats under rocks, logs, leaf litter, loose soil, or in animal burrows.[21]	No	No	No suitable temporary wetlands present on-site or adjacent.
Mammals												
Microtus pinetorum	Woodland Vole	S3?	SC	SC	SC	Schedule 1	Dobbyn 1994		Mature deciduous forest in the Carolinian region where there is a deep litter layer that allows it to burrow.[3,4]	No	No	No suitable forest present on-site or adjacent.

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Myotis leibii	Eastern Small-footed Myotis	S2S3	END				Dobbyn 1994		Roosts in caves, mine shafts, crevices or buildings that are in or near woodland. Hibernates in cold dry caves or mines. Maternity colonies in caves or buildings. Hunts in forests.[3,4]	No	No	No suitable buildings or caves present. No suitable woodlands or trees.
Myotis lucifungus	Little Brown Myotis	S3	END	E	E	Schedule 1	Dobbyn 1994		Uses caves, quarries, tunnels, hollow trees or buildings for roosting. Winters in humid caves. Maternity sites in dark warm areas such as attics and barns. Feeds primarily in wetlands and forest edges.[3,4]	No	No	No suitable buildings or caves present. No suitable woodlands or trees.
Myotis septentrionalis	Northern Myotis	S3	END	E	E	Schedule 1	Dobbyn 1994		Roosts in houses and man-made structures but prefers hollow trees or under loose bark. Hibernates in mines or caves. Hunts within forest, below the canopy.[3,4]	No	No	No suitable buildings or caves present. No suitable woodlands or trees.
Perimyotis subflavus	Tri-colored Bat	S3?	END	E	E	Schedule 1	Dobbyn 1994		Roosts and maternity colonies in older forests and occassionally in barns or other sturctures. Forage over water and along streams in the forest. Hibernate in caves.[3,4]	No	No	No suitable buildings or caves present. No suitable woodlands or trees.
Taxidea taxus jacksoni	American Badger (Southwestern Ontario population)	S2	END	E	E	Schedule 1	Dobbyn 1994		Open grasslands, oak savannahs, sand barrens and farmland.[3,4]	No	No	No grasslands present on-site or adjacent.
Butterflies												
Danaus plexippus	Monarch	S2N, S4B	SC	END	SC	Schedule 1	MacNaughton et al 2022		Adults found in a diversity of habitats with a variety of wildflowers. Caterpillars are confined to meadows and open areas where milkweeds grow (larval food plants).[3]	No	No	Subject property is mainly disturbed soils with sparse weedy groundcover. Very limited number of milkweed plants observed in 2022.
Insects												
Bombus terricola	Yellow-banded Bunblebee	S3, S5	SC	SC	SC	Schedule 1			Found in mixed woodlands, particularly for nesting and overwintering, as well as a variety of open habitat such as native grasslands, farmlands and urban areas. This species is a forage and habitat generalist, able to use a variety of nectaring plants and environmental conditions.	No	No	Subject property is mostly disturbed soil with sparse groundcover for nectaring plants.
Plants												
Aureolarla flava	Smooth Yellow False Foxglove	S2	THR	T	-	No Schedule			Open oak woods.[4]	No	No	No suitable woodland habitat on-site or adjacent

3: Ministry of the Environment, Conservation, and Parks (MECP). 2020. Species at Risk in Ontario. Published: 12-07-2018. Updated: 09-11-2020. Available: https://www.ontario.ca/page/species-risk-ontario

4: Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. Appendix G: Wildlife Habitat Matrices and Habitat Descriptions for Rare Vascular Plants. October 2000.

7: Ministry of the Environment, Conservation and Parks. 2019. Recovery Strategy for the Blanding's Turtle (Emydoidea blandingii) in Ontario. Ontario Recovery Strategy Series. Prepared by the Ministry of the Environment, Conservation and Parks, Peterborough, Ontario. iv + 6 pp. + Appendix. Adoption of the Recovery Strategy for Blanding's Turtle (Emydoidea blandingii), Great Lakes / St. Lawrence population, in Canada (Environment and Climate Change Canada 2018). https://www.ontario.ca/page/blandings-turtle-recovery-strategy#section-1

17: Linton, J, J. McCarter and H. Fotherby 2018. Recovery Strategy for the Jefferson Salamander (Ambystoma jeffersonianum) and Unisexual Ambystoma (Jefferson Salamander dependent population) (Ambystoma laterale - (2) jeffersonianum) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 58 pp. https://www.ontario.ca/page/jefferson-salamander-and-jefferson-dependent-unisexual-ambystoma-recovery-strategy#section-1

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Appendix II

Plant Species List

Plant Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Aboud & Associates EIS	NHIC Data*	NRSI Observed
		NDMNRF 2021	MECP 2022	Government of Canada 2021	Government of Canada 2021	Government of Canada 2021	Aboud 2014	MNRF 2022	NRSI Results From 2022
Gymnosperms	**Conifers**								
Cupressaceae	**Cypress Family**								
Thuja occidentalis	Eastern White Cedar	S5					X		X
Pinaceae	**Pine Family**								
Picea glauca	White Spruce	S5					X		
Pinus strobus	Eastern White Pine	S5							X
Pinus sylvestris	Scots Pine	SE5					X		X
Tsuga canadensis	Eastern Hemlock	S5							X
Dicotyledons	**Dicots**								
Aceraceae	**Maple Family**								
Acer negundo	Manitoba Maple	S5					X		X
Acer saccharinum	Silver Maple	S5					X		
Acer saccharum	Sugar Maple	S5							X
Anacardiaceae	**Sumac or Cashew Family**								
Rhus typhina	Staghorn Sumac	S5					X		X
Apiaceae	**Carrot or Parsley Family**								
Daucus carota	Wild Carrot	SE5					X		X
Asclepiadaceae	**Milkweed Family**								
Asclepias syriaca	Common Milkweed	S5					X		
Asteraceae	**Composite or Aster Family**								
Achillea millefolium	Common Yarrow	SE5?							X
Cirsium arvense	Creeping Thistle	SE5					X		
Erigeron annuus	Annual Fleabane	S5					X		X
Euthamia graminifolia	Grass-leaved Goldenrod	S5							X
Hieracium vulgatum	Common Hawkweed	SE2?							X
Solidago canadensis	Canada Goldenrod	S5							X
Solidago flexicaulis	Zigzag Goldenrod	S5							X
Solidago nemoralis	Gray-stemmed Goldenrod	S5							X
Sonchus arvensis ssp. arvensis	Glandular Field Sow-thistle	SE5					X		
Sonchus asper	Prickly Sow-thistle	SE5							X
Symphyotrichum novae-angliae	New England Aster	S5					X		X
Tanacetum vulgare	Common Tansy	SE5					X		
Tragopogon pratensis	Meadow Goat's-beard	SE5					X		
Tussilago farfara	Colt's-foot	SE5							X
Betulaceae	**Birch Family**								
Betula papyrifera	Paper Birch	S5					X		
Ostrya virginiana	Eastern Hop-hornbeam	S5							X
Boraginaceae	**Borage Family**								
Echium vulgare	Common Viper's Bugloss	SE5							X
Brassicaceae	**Mustard Family**								
Alliaria petiolata	Garlic Mustard	SE5					X		
Caprifoliaceae	**Honeysuckle Family**								
Lonicera tatarica	Tatarian Honeysuckle	SE5					X		X
Viburnum opulus var. americanum	Highbush Cranberry	S5					X		
Caryophyllaceae	**Pink Family**								
Silene vulgaris	Bladder Campion	SE5					X		
Cornaceae	**Dogwood Family**								
Cornus alternifolia	Alternate-leaved Dogwood	S5							X
Cornus sericea	Red-osier Dogwood	S5					X		X
Cucurbitaceae	**Gourd Family**								
Echinocystis lobata	Wild Mock-cucumber	S5					X		
Elaeagnaceae	**Oleaster Family**								

Plant Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Aboud & Associates EIS	NHIC Data*	NRSI Observed
Elaeagnus angustifolia	Russian Olive	SE3							X
Fabaceae	**Pea Family**								
Glycine max	Soy Bean	SE2					X		
Medicago lupulina	Black Medic	SE5					X		
Medicago sativa	Alfalfa	SE5							X
Melilotus albus	White Sweet-clover	SE5							X
Trifolium pratense	Red Clover	SE5							X
Vicia cracca	Tufted Vetch	SE5							X
Grossulariaceae	**Currant Family**								
Ribes triste	Swamp Red Currant	S5					X		
Juglandaceae	**Walnut Family**								
Carya cordiformis	Bitternut Hickory	S5							X
Juglans nigra	Black Walnut	S4?							X
Lamiaceae	**Mint Family**								
Leonurus cardiaca	Common Motherwort	SE5					X		
Mentha canadensis	Canada Mint	S5					X		
Oleaceae	**Olive Family**								
Fraxinus americana	White Ash	S4					X		X
Onagraceae	**Evening-primrose Family**								
Circaea canadensis ssp. canadensis	Canada Enchanter's Nightshade	S5					X		
Oenothera parviflora	Small-flowered Evening-primrose	S5							X
Oxalidaceae	**Wood Sorrel Family**								
Oxalis stricta	Upright Yellow Wood-sorrel	SE5					X		
Papaveraceae	**Poppy Family**								
Chelidonium majus	Greater Celandine	SE5					X		
Plantaginaceae	**Plantain Family**								
Plantago lanceolata	English Plantain	SE5							X
Polygonaceae	**Smartweed Family**								
Rumex crispus	Curly Dock	SE5							X
Rhamnaceae	**Buckthorn Family**								
Endotropis alnifolia	Alder-leaved Buckthorn	S5					X		
Frangula alnus	Glossy Buckthorn	SE5							X
Rhamnus cathartica	Common Buckthorn	SE5					X		X
Rosaceae	**Rose Family**								
Crataegus sp.	Hawthorn sp.								X
Fragaria vesca	Woodland Strawberry	S5					X		
Fragaria virginiana	Wild Strawberry	S5					X		X
Geum laciniatum	Rough Avens	S4					X		
Malus pumila	Common Apple	SE4					X		
Physocarpus opulifolius	Eastern Ninebark	S5							X
Potentilla recta	Sulphur Cinquefoil	SE5					X		
Prunus serotina	Black Cherry	S5					X		X
Rubus idaeus ssp. strigosus	Wild Red Raspberry	S5					X		X
Rubiaceae	**Madder Family**								
Galium palustre	Marsh Bedstraw	S5					X		
Salicaceae	**Willow Family**								
Populus alba	White Poplar	SE5					X		
Populus balsamifera	Balsam Poplar	S5					X		X
Populus tremuloides	Trembling Aspen	S5					X		X
Salix amygdaloides	Peach-leaved Willow	S5					X		
Salix eriocephala	Heart-leaved Willow	S5					X		X
Salix interior	Sandbar Willow	S5							X
Scrophulariaceae	**Figwort Family**								
Linaria vulgaris	Butter-and-eggs	SE5					X		
Verbascum thapsus	Common Mullein	SE5							X
Solanaceae	**Nightshade Family**								

Plant Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Aboud & Associates EIS	NHIC Data*	NRSI Observed
Solanum dulcamara	Bittersweet Nightshade	SE5					X		X
Tiliaceae	**Linden Family**								
Tilia americana	American Basswood	S5							X
Ulmaceae	**Elm Family**								
Ulmus americana	American Elm	S5					X		X
Vitaceae	**Grape Family**								
Parthenocissus quinquefolia	Virginia Creeper	S4?					X		
Parthenocissus vitacea	Thicket Creeper	S5					X		
Vitis riparia	Riverbank Grape	S5					X		X
Monocotyledons	**Monocots**								
Cyperaceae	**Sedge Family**								
Carex lupuliformis	False Hop Sedge	S1	END	E	E	Schedule 1	X		
Carex norvegica	Norway Sedge	S4							X
Poaceae	**Grass Family**								
Bromus inermis	Smooth Brome	SE5					X		X
Dactylis glomerata	Orchard Grass	SE5					X		X
Elymus trachycaulus	Slender Wildrye	S5					X		
Miscanthus sinensis	Chinese Silver Grass	SE1							X
Phalaris arundinacea	Reed Canary Grass	S5					X		X
Phragmites australis	Common Reed	SU							X
Poa pratensis	Kentucky Bluegrass	S5					X		X
Typhaceae	**Cattail Family**								
Typha latifolia	Broad-leaved Cattail	S5					X		
TOTAL							**58**	**0**	**57**

*NHIC Atlas Square(s): 17NJ6912

References

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Appendix III

Bird Species List

Bird Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Aboud and Associates EIS	OBBA*	NHIC Data**	NRSI Observed: Highest Level of Breeding Evidence
		NDMNRF 2022	MECP 2022	Government of Canada 2022	Government of Canada 2022	Government of Canada 2022	Aboud 2014	BSC et al. 2006	MNRF 2022	NRSI Results from 2022
Anatidae	**Ducks, Geese & Swans**									
Aix sponsa	Wood Duck	S5B,S3N						CO		
Anas platyrhynchos	Mallard	S5						CO		
Anas rubripes	American Black Duck	S4						CO		
Branta canadensis	Canada Goose	S5						CO		
Phasianidae	**Partridges, Grouse & Turkeys**									
Bonasa umbellus	Ruffed Grouse	S5						CO		
Meleagris gallopavo	Wild Turkey	S5					PR	PO		
Podicipediformes	**Grebes**									
Podilymbus podiceps	Pied-billed Grebe	S4B,S2N						PO		
Columbidae	**Pigeons & Doves**									
Columba livia	Rock Pigeon	SNA						CO		
Zenaida macroura	Mourning Dove	S5					PO	CO		OB
Cuculiformes	**Cuckoos & Anis**									
Coccyzus erythropthalmus	Black-billed Cuckoo	S4S5B						PO		
Coccyzus sp.	Black/Yellow-billed Cuckoo	NP						PO		
Caprimulgidae	**Goatsuckers**									
Chordeiles minor	Common Nighthawk	S4B	SC	SC	T	Schedule 1		PO		
Apodidae	**Swifts**									
Chaetura pelagica	Chimney Swift	S3B	THR	T	T	Schedule 1		PO		
Trochilidae	**Hummingbirds**									
Archilochus colubris	Ruby-throated Hummingbird	S5B						CO		
Rallidae	**Rails, Gallinules & Coots**									
Porzana carolina	Sora	S5B						PR		
Rallus limicola	Virginia Rail	S4S5B						PR		
Charadriidae	**Plovers & Lapwings**									
Charadrius vociferus	Killdeer	S4B						CO		
Scolopacidae	**Sandpipers & Allies**									
Actitis macularia	Spotted Sandpiper	S5B						PR		
Gallinago delicata	Wilson's Snipe	S5B						PO		
Scolopax minor	American Woodcock	S4B						PR		
Ardeidae	**Herons & Bitterns**									
Ardea herodias	Great Blue Heron	S4						PO		
Botaurus lentiginosus	American Bittern	S5B						PR		
Butorides virescens	Green Heron	S4B						PR		
Cathartidae	**Vultures**									
Cathartes aura	Turkey Vulture	S5B,S3N						PR		
Accipitridae	**Hawks, Kites, Eagles & Allies**									
Accipiter cooperii	Cooper's Hawk	S4	NAR	NAR	NS	No schedule		CO		
Accipiter striatus	Sharp-shinned Hawk	S5	NAR	NAR	NS	No schedule		PO		
Buteo jamaicensis	Red-tailed Hawk	S5	NAR	NAR	NS	No schedule		CO		OB
Buteo platypterus	Broad-winged Hawk	S5B						PR		
Strigidae	**Typical Owls**									
Asio otus	Long-eared Owl	S4						PR		
Bubo virginianus	Great Horned Owl	S4						CO		
Megascops asio	Eastern Screech-Owl	S4	NAR	NAR	NS	No schedule		PR		

Bird Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Aboud and Associates EIS	OBBA*	NHIC Data**	NRSI Observed: Highest Level of Breeding Evidence
Alcedinidae	**Kingfishers**									
Megaceryle alcyon	Belted Kingfisher	S5B,S4N						PR		
Picidae	**Woodpeckers**									
Colaptes auratus	Northern Flicker	S5					PR	CO		
Dryobates pubescens	Downy Woodpecker	S5						CO		
Dryobates villosus	Hairy Woodpecker	S5						PR		
Dryocopus pileatus	Pileated Woodpecker	S5						CO		
Melanerpes carolinus	Red-bellied Woodpecker	S5						PR		OB
Melanerpes erythrocephalus	Red-headed Woodpecker	S3	END	E	E	Schedule 1		PR		
Falconidae	**Caracaras & Falcons**									
Falco sparverius	American Kestrel	S4						CO		
Tyrannidae	**Tyrant Flycatchers**									
Contopus virens	Eastern Wood-Pewee	S4B	SC	SC	SC	Schedule 1	PO	PR		
Empidonax alnorum	Alder Flycatcher	S5B						PR		
Empidonax minimus	Least Flycatcher	S5B						PO		
Empidonax traillii	Willow Flycatcher	S4B						PR		
Myiarchus crinitus	Great Crested Flycatcher	S5B					PO	CO		
Sayornis phoebe	Eastern Phoebe	S5B						CO		
Tyrannus tyrannus	Eastern Kingbird	S4B					PO	CO		
Vireonidae	**Vireos**									
Vireo gilvus	Warbling Vireo	S5B					PR	CO		
Vireo olivaceus	Red-eyed Vireo	S5B					PO	CO		
Vireo solitarius	Blue-headed Vireo	S5B						PR		
Corvidae	**Crows & Jays**									
Corvus brachyrhynchos	American Crow	S5						CO		OB
Cyanocitta cristata	Blue Jay	S5					PR	CO		OB
Alaudidae	**Larks**									
Eremophila alpestris	Horned Lark	S4						PR		
Hirundinidae	**Swallows**									
Hirundo rustica	Barn Swallow	S4B	THR	SC	T	Schedule 1	OB	CO		
Petrochelidon pyrrhonota	Cliff Swallow	S4S5B						PR		
Riparia riparia	Bank Swallow	S4B	THR	T	T	Schedule 1	OB	CO		
Stelgidopteryx serripennis	Northern Rough-winged Swallow	S4B					OB	PR		
Tachycineta bicolor	Tree Swallow	S4S5B						CO		
Paridae	**Chickadees & Titmice**									
Poecile atricapillus	Black-capped Chickadee	S5					PO	CO		OB
Sittidae	**Nuthatches**									
Sitta canadensis	Red-breasted Nuthatch	S5						CO		
Sitta carolinensis	White-breasted Nuthatch	S5						PO		
Certhiidae	**Creepers**									
Certhia americana	Brown Creeper	S5						PO		
Troglodytidae	**Wrens**									
Cistothorus palustris	Marsh Wren	S4B,S3N						PO		
Cistothorus stellaris	Sedge Wren	S4B	NAR	NAR	NS	No schedule		PO		
Troglodytes aedon	House Wren	S5B						CO		
Troglodytes hiemalis	Winter Wren	S5B,S4N						CO		
Regulidae	**Kinglets**									
Regulus satrapa	Golden-crowned Kinglet	S5								OB
Turdidae	**Thrushes**									

Bird Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Aboud and Associates EIS	OBBA*	NHIC Data**	NRSI Observed: Highest Level of Breeding Evidence
Catharus fuscescens	Veery	S5B						CO		
Hylocichla mustelina	Wood Thrush	S4B	SC	T	T	Schedule 1		CO		
Sialia sialis	Eastern Bluebird	S5B,S4N	NAR	NAR	NS	No schedule		CO		
Turdus migratorius	American Robin	S5					CO	CO		OB
Mimidae	**Mockingbirds, Thrashers & Allies**									
Dumetella carolinensis	Gray Catbird	S5B,S3N					PR	CO		
Mimus polyglottos	Northern Mockingbird	S4						PR		
Toxostoma rufum	Brown Thrasher	S4B						PR		
Sturnidae	**Starlings**									
Sturnus vulgaris	European Starling	SNA					CO	CO		
Bombycillidae	**Waxwings**									
Bombycilla cedrorum	Cedar Waxwing	S5					PR	PR		
Passeridae	**Old World Sparrows**									
Passer domesticus	House Sparrow	SNA						CO		
Fringillidae	**Finches & Allies**									
Haemorhous mexicanus	House Finch	SNA					PO	CO		
Haemorhous purpureus	Purple Finch	S5						PO		
Spinus pinus	Pine Siskin	S5						CO		
Spinus tristis	American Goldfinch	S5					PR	PR		
Emberizidae	**New World Sparrows & Allies**									
Ammodramus savannarum	Grasshopper Sparrow	S4B	SC	SC	SC	Schedule 1		PR		
Junco hyemalis	Dark-eyed Junco	S5								OB
Melospiza georgiana	Swamp Sparrow	S5B,S4N						CO		
Melospiza melodia	Song Sparrow	S5					PR	CO		
Passerculus sandwichensis	Savannah Sparrow	S5B,S3N						CO		
Passerella iliaca	Fox Sparrow	S5B,S3N								OB
Pipilo erythrophthalmus	Eastern Towhee	S4B,S3N						PR		
Pooecetes gramineus	Vesper Sparrow	S4B						PO		
Spizella pallida	Clay-colored Sparrow	S4B						CO		
Spizella passerina	Chipping Sparrow	S5B,S3N					PR	CO		
Spizella pusilla	Field Sparrow	S4B,S3N					PR	CO		
Zonotrichia albicollis	White-throated Sparrow	S5						PR		OB
Icteridae	**Troupials & Allies**									
Agelaius phoeniceus	Red-winged Blackbird	S5					CO	CO		
Dolichonyx oryzivorus	Bobolink	S4B	THR	SC	T	Schedule 1		CO		
Icterus galbula	Baltimore Oriole	S4B					PO	CO		
Icterus spurius	Orchard Oriole	S4B						CO		
Molothrus ater	Brown-headed Cowbird	S5					PO	CO		
Quiscalus quiscula	Common Grackle	S5					CO	CO		
Sturnella magna	Eastern Meadowlark	S4B,S3N	THR	T	T	Schedule 1		CO		
Parulidae	**Wood Warblers**									
Geothlypis philadelphia	Mourning Warbler	S5B						PO		
Geothlypis trichas	Common Yellowthroat	S5B,S3N						PR		
Leiothlypis ruficapilla	Nashville Warbler	S5B						PO		
Mniotilta varia	Black-and-white Warbler	S5B						PR		
Parkesia noveboracensis	Northern Waterthrush	S5B						PR		
Seiurus aurocapilla	Ovenbird	S5B						PR		
Setophaga coronata	Yellow-rumped Warbler	S5B,S4N						PO		
Setophaga pensylvanica	Chestnut-sided Warbler	S5B						PR		

Bird Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Aboud and Associates EIS	OBBA*	NHIC Data**	NRSI Observed: Highest Level of Breeding Evidence
Setophaga petechia	Yellow Warbler	S5B					PR	CO		
Setophaga pinus	Pine Warbler	S5B,S3N						CO		
Setophaga ruticilla	American Redstart	S5B					PR	PO		
Setophaga virens	Black-throated Green Warbler	S5B						CO		
Vermivora cyanoptera	Blue-winged Warbler	S4B						CO		
Vermivora sp.	Blue-winged/Golden-winged Warbler	NP						PR		
Cardinalidae	**Cardinals, Grosbeaks & Allies**									
Cardinalis cardinalis	Northern Cardinal	S5						CO		OB
Passerina cyanea	Indigo Bunting	S5B						CO		
Pheucticus ludovicianus	Rose-breasted Grosbeak	S5B					PO	CO		
Piranga olivacea	Scarlet Tanager	S5B						PO		
Total							**29**	**114**	**0**	**12**

*OBBA Atlas Square: 17TNJ61
**NHIC Atlas Square: 17NJ6912

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Appendix IV
Reptiles and Amphibians Species Lists

Reptile and Amphibian Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	ORAA*	NHIC Data**
		NDMNRF 2022	MECP 2022	Government of Canada 2022	Government of Canada 2022	Government of Canada 2022	Ontario Nature 2019	MNRF 2022
Turtles								
Chelydra serpentina	Snapping Turtle	S4	SC	SC	SC	Schedule 1	X	
Chrysemys picta marginata	Midland Painted Turtle	S4		SC	SC	Schedule 1	X	
Emydoidea blandingii	Blanding's Turtle (Great Lakes / St. Lawrer	S3	THR	E	E	Schedule 1	X	
Graptemys geographica	Northern Map Turtle	S3	SC	SC	SC	Schedule 1	X	
Trachemys scripta	Pond Slider	SNA					X	
Snakes								
Lampropeltis triangulum	Milksnake	S4	NAR	SC	SC	Schedule 1	X	
Nerodia sipedon sipedon	Northern Watersnake	S5	NAR	NAR	NS	No schedule	X	
Storeria dekayi	Dekay's Brownsnake	S5	NAR	NAR	NS	No schedule	X	
Storeria occipitomaculata	Red-bellied Snake	S5					X	
Thamnophis sauritus septentrionalis	Northern Ribbonsnake	S4	SC	SC	SC	Schedule 1	X	
Thamnophis sirtalis sirtalis	Eastern Gartersnake	S5					X	
Salamanders								
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	E	E	Schedule 1	X	
Ambystoma laterale	Blue-spotted Salamander	S4					X	
Ambystoma maculatum	Spotted Salamander	S4					X	
Hemidactylium scutatum	Four-toed Salamander	S4	NAR	NAR	NS	No schedule	X	
Notophthalmus viridescens viridescens	Red-spotted Newt	S5					X	

Reptile and Amphibian Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	ORAA*	NHIC Data**
Plethodon cinereus	Eastern Red-backed Salamander	S5					X	
Frogs and Toads								
Anaxyrus americanus	American Toad	S5					X	
Dryophytes versicolor	Gray Treefrog	S5					X	
Pseudacris triseriata pop. 2	Western Chorus Frog (Great Lakes / St. La	S4	NAR	T	T	Schedule 1	X	
Pseudacris crucifer	Spring Peeper	S5					X	
Lithobates catesbeianus	American Bullfrog	S4					X	
Lithobates clamitans	Green Frog	S5					X	
Lithobates palustris	Pickerel Frog	S4	NAR	NAR	NS	No schedule	X	
Lithobates pipiens	Northern Leopard Frog	S5	NAR	NAR	NS	No schedule	X	
Lithobates septentrionalis	Mink Frog	S5					X	
Lithobates sylvaticus	Wood Frog	S5					X	
Total							**27**	**0**

*ORAA Atlas Square: 17NJ61

**NHIC Atlas Square: 17NJ6912

References

Ministry of Natural Resources and Forestry (MNRF). 2022. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2022-04-11. Available: https://www.ontario.ca/page/get-natural-heritage-information

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Ontario Nature. 2019. Ontario Reptile and Amphibian Atlas Program: Interactive Range Maps. Accessed October 2019.

Ministry of Natural Resources and Forestry (MNRF). 2022. Natural Heritage Information Centre (NHIC): Make a Natural Heritage Area Map Application. Published: 2014-07-17. Updated 2022-01-20. Available: https://www.ontario.ca/page/make-natural-heritage-area-map

Appendix V
Mammals Species Lists

Mammal Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Ontario Mammal Atlas	NHIC Data**	NRSI Observed
		NDMNRF 2022	MECP 2022	Government of Canada 2022	Government of Canada 2022	Government of Canada 2022	Dobbyn 1994	MNRF 2022	NRSI Results from 2022
Didelphimorphia	**Opossums**								
Didelphis virginiana	Virginia Opossum	S4					X		
Eulipotyphla	**Shrews, Moles, Hedgehogs, and Allies**								
Blarina brevicauda	Northern Short-tailed Shrew	S5					X		
Condylura cristata	Star-nosed Mole	S5					X		
Parascalops breweri	Hairy-tailed Mole	S4					X		
Sorex cinereus	Masked Shrew	S5					X		
Sorex fumeus	Smoky Shrew	S5					X		
Sorex palustris	Water Shrew	S5					X		
Chiroptera	**Bats**								
Eptesicus fuscus	Big Brown Bat	S4					X		
Lasionycteris noctivagans	Silver-haired Bat	S4					X		
Lasiurus borealis	Eastern Red Bat	S4					X		
Lasiurus cinereus	Hoary Bat	S4					X		
Myotis leibii	Eastern Small-footed Myotis	S2S3	END				X		
Myotis lucifugus	Little Brown Myotis	S3	END	E	E	Schedule 1	X		
Myotis septentrionalis	Northern Myotis	S3	END	E	E	Schedule 1	X		
Perimyotis subflavus	Tri-colored Bat	S3?	END	E	E	Schedule 1	X		
Lagomorpha	**Rabbits and Hares**								
Lepus americanus	Snowshoe Hare	S5					X		
Lepus europaeus	European Hare	SNA					X		
Sylvilagus floridanus	Eastern Cottontail	S5					X		
Rodentia	**Rodents**								
Castor canadensis	Beaver	S5					X		
Erethizon dorsatum	Porcupine	S5					X		
Glaucomys sabrinus	Northern Flying Squirrel	S5					X		
Marmota monax	Woodchuck	S5					X		
Microtus pennsylvanicus	Meadow Vole	S5					X		
Microtus pinetorum	Woodland Vole	S3?	SC	SC	SC	Schedule 1	X		
Mus musculus	House Mouse	SNA					X		
Napaeozapus insignis	Woodland Jumping Mouse	S5					X		
Ondatra zibethicus	Muskrat	S5					X		
Peromyscus leucopus	White-footed Mouse	S5					X		
Peromyscus maniculatus	Deer Mouse	S5					X		
Rattus norvegicus	Norway Rat	SNA					X		
Sciurus carolinensis	Eastern Gray Squirrel	S5					X		X
Synaptomys cooperi	Southern Bog Lemming	S4					X		
Tamias striatus	Eastern Chipmunk	S5					X		
Tamiasciurus hudsonicus	Red Squirrel	S5					X		
Zapus hudsonius	Meadow Jumping Mouse	S5					X		
Canidae	**Canines**								
Canis latrans	Coyote	S5					X		
Vulpes vulpes	Red Fox	S5					X		
Felidae	**Felines**								
Lynx rufus	Bobcat	S4					X		
Mephitidae	**Skunks and Stink Badgers**								
Mephitis mephitis	Striped Skunk	S5					X		
Mustelidae	**Weasels and Allies**								
Mustela frenata	Long-tailed Weasel	S4					X		

Mammal Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Ontario Mammal Atlas	NHIC Data**	NRSI Observed
Mustela richardsonii	American Ermine	S5					X		
Neovison vison	American Mink	S4					X		
Taxidea taxus jacksoni	American Badger (Southwestern Ontario	S1	END	E	E	Schedule 1	X		
Procyonidae	**Raccoons and Allies**								
Procyon lotor	Northern Raccoon	S5					X		
Ursidae	**Bears**								
Ursus americanus	American Black Bear	S5	NAR	NAR	NS	No schedule	X		
Artiodactyla	**Deer and Bison**								
Odocoileus virginianus	White-tailed Deer	S5					X		
Total							**46**	**0**	**1**

*Mammal Atlas Square Numbers: NU
**NHIC Atlas Squares: 17NJ6912

References

Ministry of Natural Resources and Forestry (MNRF). 2022. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2022-04-11. Available: https://www.ontario.ca/page/get-natural-heritage-information
Ministry of the Environment, Conservation, and Parks (MECP). 2022. Species at Risk in Ontario. Published: 2018-07-12. Updated: 2022-04-01. Available: https://www.ontario.ca/page/species-risk-ontario
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Dobbyn, J.S. 1994. Atlas of the Mammals of Ontario. Don Mills, Federation of Ontario Naturalists. 120p.
Ministry of Natural Resources and Forestry (MNRF). 2022. Natural Heritage Information Centre (NHIC): Make a Natural Heritage Area Map Application. Published: 2014-07-17. Updated 2022-01-20. Available: https://www.ontario.ca/page/make-natural-heritage-area-map

Appendix VI

Butterfly Species Lists

Butterfly Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Ontario Butterfly Atlas*	NHIC Data**
		NDMNRF 2022	MECP 2022	Government of Canada 2022	Government of Canada 2022	Government of Canada 2022	Macnaughton et al. 2022	MNRF 2022
Hesperiidae	**Skippers**							
Anatrytone logan	Delaware Skipper	S4					X	
Ancyloxypha numitor	Least Skipper	S5					X	
Carterocephalus palaemon	Arctic Skipper	S5					X	
Erynnis baptisiae	Wild Indigo Duskywing	S4					X	
Erynnis juvenalis	Juvenal's Duskywing	S5					X	
Euphyes vestris	Dun Skipper	S5					X	
Pholisora catullus	Common Sootywing	S4					X	
Poanes hobomok	Hobomok Skipper	S5					X	
Poanes viator	Broad-winged Skipper	S4					X	
Polites mystic	Long Dash Skipper	S5					X	
Polites peckius	Peck's Skipper	S5					X	
Polites themistocles	Tawny-edged Skipper	S5					X	
Pompeius verna	Little Glassywing	S4					X	
Thymelicus lineola	European Skipper	SNA					X	
Wallengrenia egeremet	Northern Broken Dash	S5					X	
Papilionidae	**Swallowtails**							
Papilio canadensis	Canadian Tiger Swallowtail	S5					X	
Papilio cresphontes	Giant Swallowtail	S4					X	
Papilio glaucus	Eastern Tiger Swallowtail	S5					X	
Papilio polyxenes	Black Swallowtail	S5					X	
Pieridae	**Whites and Sulphurs**							
Colias eurytheme	Orange Sulphur	S5					X	
Colias philodice	Clouded Sulphur	S5					X	
Pieris oleracea	Mustard White	S4					X	
Pieris rapae	Cabbage White	SNA					X	
Lycaenidae	**Harvesters, Coppers, Hairstreaks, Blues**							
Callophrys augustinus	Brown Elfin	S5					X	
Celastrina lucia	Northern Spring Azure	S5					X	
Celastrina sp.	Azure species	SNA					X	
Cupido comyntas	Eastern Tailed Blue	S5					X	
Feniseca tarquinius	Harvester	S4					X	
Glaucopsyche lygdamus	Silvery Blue	S5					X	
Lycaena hyllus	Bronze Copper	S5					X	
Satyrium acadica	Acadian Hairstreak	S4					X	
Satyrium calanus	Banded Hairstreak	S4					X	
Nymphalidae	**Brush-footed Butterflies**							
Aglais milberti	Milbert's Tortoiseshell	S5					X	
Asterocampa clyton	Tawny Emperor	S3					X	
Boloria bellona	Meadow Fritillary	S5					X	
Boloria selene	Silver-bordered Fritillary	S5					X	
Cercyonis pegala	Common Wood-Nymph	S5					X	

Butterfly Species Reported from the Study Area - Wellington Motor Freight EIS (Project #2984)

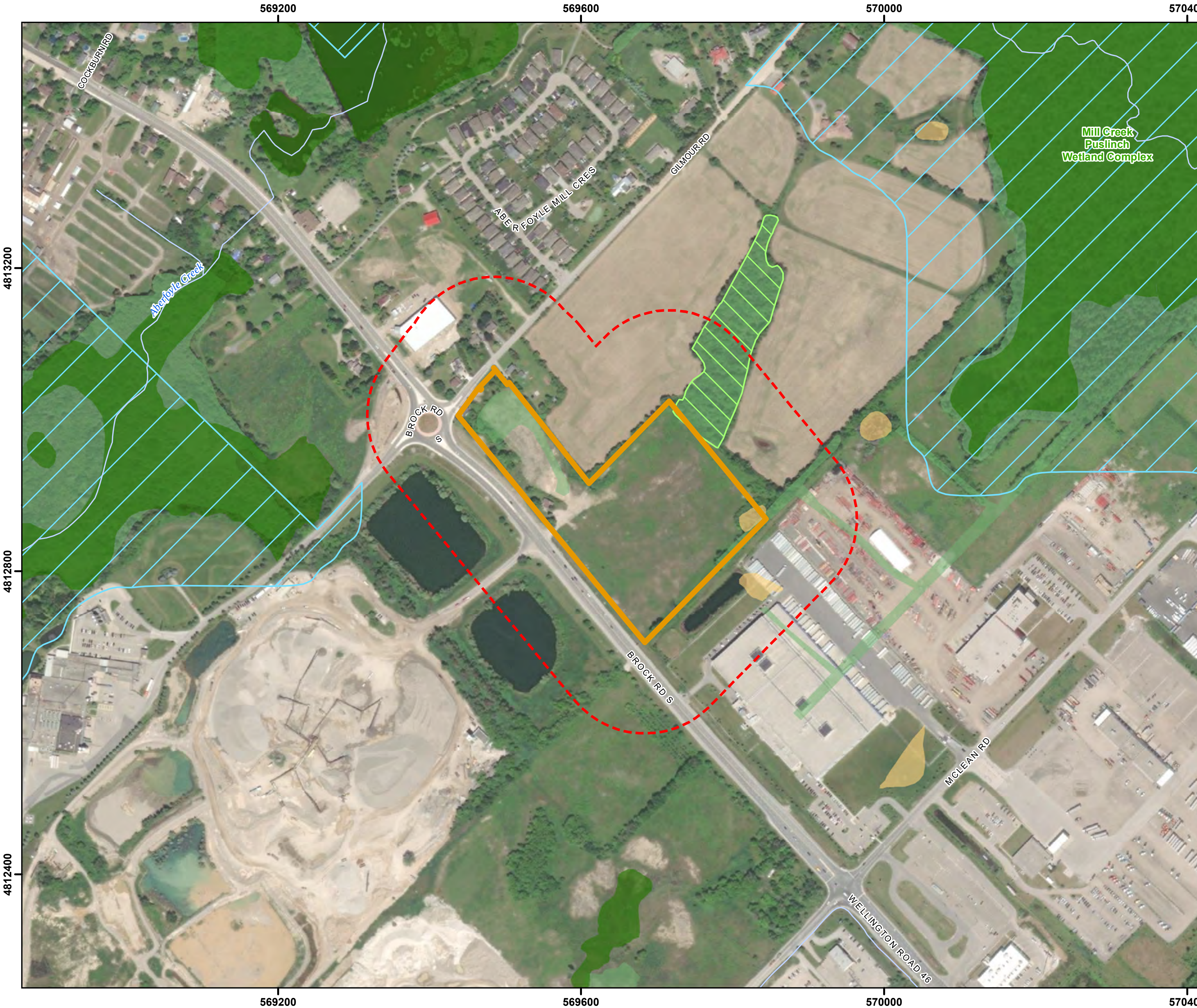
Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Ontario Butterfly Atlas*	NHIC Data**
Coenonympha california	Common Ringlet	S5					X	
Danaus plexippus	Monarch	S2N,S4B	SC	E	SC	Schedule 1	X	
Euphydryas phaeton	Baltimore Checkerspot	S4					X	
Lethe anthedon	Northern Pearly-Eye	S5					X	
Lethe appalachia	Appalachian Brown	S4					X	
Lethe eurydice	Eyed Brown	S5					X	
Limenitis archippus	Viceroy	S5					X	
Limenitis arthemis arthemis	White Admiral	S5					X	
Limenitis arthemis astyanax	Red-spotted Purple	S5					X	
Megisto cymela	Little Wood-Satyr	S5					X	
Nymphalis antiopa	Mourning Cloak	S5					X	
Nymphalis l-album	Compton Tortoiseshell	S5					X	
	Northern Crescent	S5					X	
	Pearl Crescent	S4					X	
	Eastern Comma	S5					X	
	Question Mark	S5					X	
	Gray Comma	S5					X	
	Great Spangled Fritillary	S5					X	
	Red Admiral	S5B					X	
	Painted Lady	S5B					X	
	American Lady	S5					X	
							58	**0**

*TEA Atlas Square: 17NJ61
**NHIC Atlas Square: 17NJ6912

References

Ministry of Natural Resources and Forestry (MNRF). 2022. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17.
All Species List Updated: 2022-04-11. Available: https://www.ontario.ca/page/get-natural-heritage-information
Ministry of the Environment, Conservation, and Parks (MECP). 2022. Species at Risk in Ontario. Published: 2018-07-12. Updated: 2022-04-01. Available: https://www.ontario.ca/page/species-ris
Government of Canada. 2022. Species at Risk Public Registry: Species Search. COSEWIC Last Assessment Date: 2022-05-11. Available: https://species-registry.canada.ca/index-en.html#/spec
Macnaughton A., Layberry R., Cavasin R., Edwards B., and C. Jones. 2022. Ontario Butterfly Atlas. Updated February 2022. Available: https://www.ontarioinsects.org/atlas/index.html
Ministry of Natural Resources and Forestry (MNRF). 2022. Natural Heritage Information Centre (NHIC): Make a Natural Heritage Area Map Application. Published: 2014-07-17.
Updated 2022-01-20. Available: https://www.ontario.ca/page/make-natural-heritage-area-map

Maps



Map 1

Wellington Motor Freight EIS

Study Area

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Data provided by MNRF© Copyright: Queen's Printer Ontario. Imagery: ESRI (2020, 2018).

Project: 2984
Date: December 22, 2022

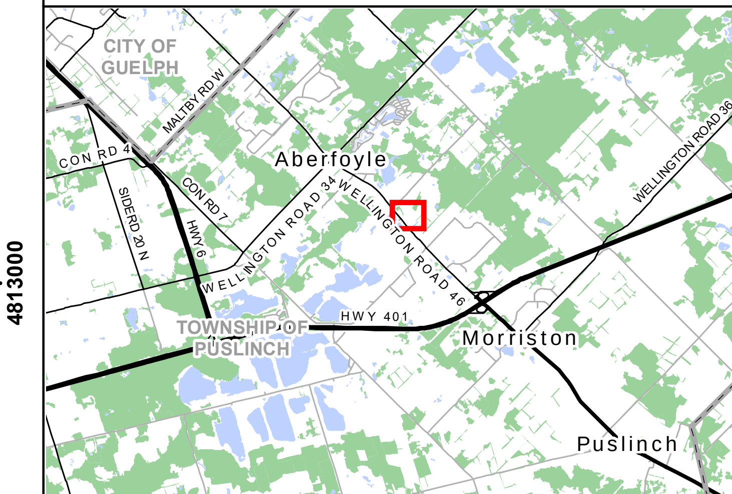
NAD83 - UTM Zone 17
Size: 11x17"
1:5,000

Path: X:\2984_WellingtonMotorFreight_EIS\NRSI_2984_Map1_StudyArea_2K_2022_12_22_JAS.mxd

Map 2

Wellington Motor Freight EIS

Existing Conditions



Legend

- Subject Property
- Surveyed Wetland (NRSI 2022)
- Wetland Buffer (15m)
- Surveyed Dripline (NRSI 2022)
- Dripline Buffer (1m)
- Dripline Buffer (5m)
- Dripline Buffer (10m)
- Ecological Land Classification (ELC)

(Ag) Agricultural
(CUM1) Mineral Cultural Meadow Ecosite
(CUT1) Mineral Cultural Thicket Ecosite
(CUW1) Mineral Cultural Woodland Ecosite
(FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
(H1) Deciduous Hedgerow
(H2) Young Poplar Deciduous Hedgerow
(Res) Residential
(SWT2-5) Red-osier Dogwood Mineral Thicket Swamp Type

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 2984
Date: January 3, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:1,600

0 20 40 60 80 100 Metres

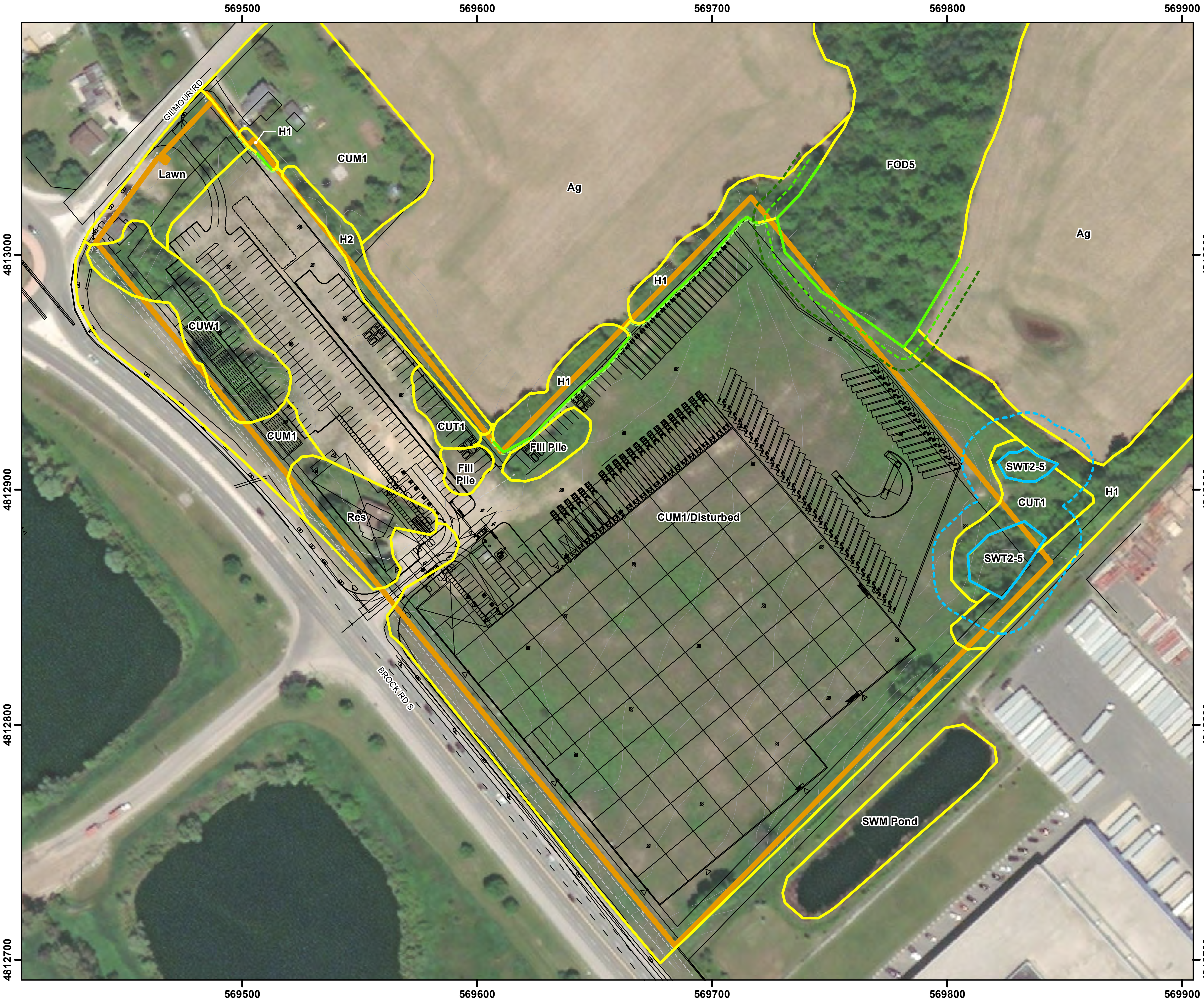
N

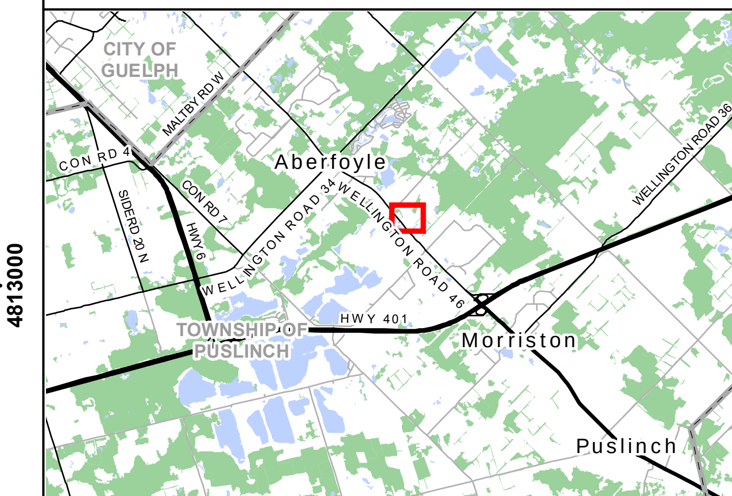
Path: X:\2984_WellingtonMotorFreight_EIS\NRSI_2984_Map2_ExistingConditions_2K_2023_01_03_GCS.mxd

Map 3

Wellington Motor Freight EIS

Proposed Development





Legend

- Subject Property
- Site Plan
- Services
- Existing Contours
- Surveyed Wetland (NRSI 2022)
- Wetland Buffer (15m)
- Surveyed Dripline (NRSI 2022)
- Dripline Buffer (1m)
- Dripline Buffer (5m)
- Dripline Buffer (10m)
- Ecological Land Classification (ELC)

(Ag) Agricultural
(CUM1) Mineral Cultural Meadow Ecosite
(CUT1) Mineral Cultural Thicket Ecosite
(CUW1) Mineral Cultural Woodland Ecosite
(FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
(H1) Deciduous Hedgerow
(H2) Young Poplar Deciduous Hedgerow
(Res) Residential
(SWT2-5) Red-osier Dogwood Mineral Thicket Swamp Type

Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists

Project: 2984
Date: January 3, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:1,600

0 20 40 60 80 100 Metres

N

March 14, 2023

Lynne Banks
Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Rd. 34, Puslinch, Ontario
N0B 2J0

RE: P11/6678 Ecology Peer Review of: NRSI Response to Comments on the Scoped Environmental Impact Study (EIS) supporting Zoning Bylaw Amendment Application - 128 Brock Road South, Puslinch (Wellington Motor Freight)

INTRODUCTION

Dougan & Associates (D&A) was initially retained by the Township of Puslinch in September 2022 to complete a pre-consultation ecology review of a site plan submitted by Wellington Motor Freight for their property at 128 Brock Road South, Puslinch. Based on our desktop review of the proposal and existing natural heritage features and policy, it was concluded that an Environmental Impact Study (EIS) was required and that a Terms of reference (TOR) be established with the County, Township and Grand River Conservation Authority (GRCA) to confirm the scope. These comments were submitted to the Township on September 20, 2022.

The proponent submitted a Zoning Bylaw Amendment (ZBA) application dated January 9, 2023 which includes a revised site plan and Scoped EIS (hereafter referred to as the "EIS") prepared by NRSI dated January 2023. D&A reviewed NRSI's Scoped EIS and provided comments to the Township on June 29, 2022 and reviewed the comments with NRSI via phone call on February 22, 2023. NRSI prepared a response to D&A's comments which were received on March 8, 2023.

D&A has reviewed NRSI's response and prepared the following comments in response. Please note that a revised EIS was not received as part of this response; D&A's comments are based on the information provided including: comment response table, GRCA correspondence on the Terms of Reference, updated Species at Risk (SAR) and Significant Wildlife Habitat (SWH) tables, and data sheets on the FOD5 ELC community. A few of our responses are pending until we are able to review the revised EIS.

Please do not hesitate to contact the undersigned with any questions or concerns regarding this review.

Regards,

[redacted]

[redacted]

Christina Olar, HBsc, Eco. Mgmt. Tech., ISA
Ecology Manager, Ecologist, Arborist

Todd Fell, OALA, CSLA, CERP
Director, Landscape Arch., Rest. Ecologist

KEY COMMENTS

D&A Comment (January 27, 2023)	Additional Comments and Clarifications
There is no indication whether the Terms of Reference for the Scoped EIS were reviewed or approved by any reviewing agencies. This is concerning given the fact that most of the field surveys conducted by NRSI occurred prior to the submission of the TOR, and because the Scoped EIS relies heavily on field data collected by Aboud & Associates as part of a 2014 EIS. The field data collected by Aboud & Associates in 2013/2014 is considered out-of-date (i.e., > 5 years old). Since that time, the site has undergone significant changes (e.g. clearing and filling of some portions of the property, years of natural vegetation regeneration). Some of the surveys completed by Aboud & Associates were not repeated by NRSI during appropriate survey/breeding windows. As a result, the 2014 data and surveys conducted outside of appropriate survey windows should not be used to draw conclusions about the existing conditions and significance of features on site.	Sufficient documentation of TOR review by GRCA has been provided by NRSI. Please see detailed comments.
Seasonally appropriate field surveys should be conducted to address the above noted deficiencies. Alternatively, (i.e., In absence of such information), a conservative interpretation should be applied to the evaluation and status of existing natural heritage features, unless it can be explicitly explained (preferably with more detailed information) why such an interpretation is not appropriate, and the deficiencies are not of concern. Please refer to the detailed comments below for further reference/guidance	See detailed comments.
The EIS concludes that there will be no negative impacts on natural features onsite or adjacent lands, however this conclusion is likely premature; adequate field studies have not been carried out to support the EIS.	See detailed comments.

DETAILED COMMENTS

Table 1 summarizes our comments, which identify specific concerns and/or requests for clarification based on the review of the Revised Scoped EIS.

Table 1 Detailed comments on NRSI's Scoped Environmental Impact Study

Comment Number	Section Number	Section Title	D&A Original Comment (January 27, 2023)	D&A Recommendation (January 27, 2023)	Applicant Response (March 9, 2023)	Additional Comments and Clarifications
1	2.2	Collection and Review of Background Information	One additional source of background information should have been consulted, i.e., the Nestlé Waters Canada Biological Monitoring Program data collected at the 101 Brock Street South location, directly across the road from the subject lands.	Consult with Nestlé Waters Canada to see if they will release their monitoring data for review.	Nestle Waters no longer exists as the company was sold to Blue Triton. The team is in contact with Blue Triton to discuss.	No additional comments.
2	2.2.1	Significant Species Screening	The text indicates that there is suitable habitat present in the study area for only one SAR/SCC 3listed species, Eastern Wood-Pewee.	Please indicate why the SWM pond directly south of the property, and the two Dufferin Aggregates ponds, are not considered suitable habitat for Snapping Turtle.	Snapping turtles may inhabit SWM ponds but these are man-made infrastructure for containing and treating storm runoff and should not be identified as habitat. Similarly, the aggregate ponds across Brock Road may be inhabited by snapping turtle, but these ponds lack natural cover and are across a busy 4-lane road, and are not considered to be connected to the subject	Although manmade structures like SWM ponds cannot qualify for protection as SWH, they should still be considered potential habitat for SAR like Snapping Turtle. Unless sufficient surveys were undertaken to prove the absence of sensitive species, they should be assumed to be present and using the ponds as habitat, and suitable mitigation should be put in place. Please ensure

Comment Number	Section Number	Section Title	D&A Original Comment (January 27, 2023)	D&A Recommendation (January 27, 2023)	Applicant Response (March 9, 2023)	Additional Comments and Clarifications
					property. The EIS text has been updated.	this is clarified in the EIS.
3	2.2.1	Significant Species Screening	The text indicates that there is suitable habitat present in the study area for only one SAR/SCC listed species, Eastern Wood-Pewee.	Please indicate why the trees on the subject lands (e.g., CUW1, H1, H2) and adjacent to the property (e.g., FOD5) are not considered suitable maternity roost habitat for SAR listed bats. Text in Section 2.2.2 states that there is potential Bat Maternity Colonies SWH within FOD5.	Bat maternity roost habitat is a type of SWH which is related to woodland or forest communities and not isolated trees.	Although isolated trees do not qualify for SWH designation, they can still\ provide suitable habitat for SAR bats that should be preserved where possible. Please ensure it is clear in the EIS whether isolated SAR habitat trees are present and that any impacts/removals are in compliance with the Endangered Species Act.
4	2.2	Significant Wildlife Habitat Screening	The EIS text states that *"The subject property does not contain habitats that may be significant for wildlife."* However, the statement could not be verified because the SWH screening/assessment was not included in the EIS for review.	Please provide the complete SWH screening/assessment for review (i.e., including those features not considered SWH). For example, please indicate why Reptile Hibernaculum SWH (i.e., for snakes) is not present on or adjacent to the subject lands.	The SWH screening table has been provided. Two types of SWH are considered possible for the site and adjacent study area; bat maternity colonies and amphibian breeding habitat (woodland). Snake Hibernaculum SWH is considered not present due to the lack of burrows, rock crevices, crumbling foundations on-site and adjacent, as well as the level of disturbance that	The SWH table indicates that amphibian movement corridors are also possible on the subject property. Please ensure this is included in the text.

Comment Number	Section Number	Section Title	D&A Original Comment (January 27, 2023)	D&A Recommendation (January 27, 2023)	Applicant Response (March 9, 2023)	Additional Comments and Clarifications
					has occurred on-site and the developed/disturbed nature of the adjacent lands study area (roads, aggregate operation, commercial development).	
5	3.0	Relevant Policies, Legislation and Planning Studies Table 1: Provincial Policy Statement (OMMAH, 2020)	The Natural Heritage Reference Manual and Significant Wildlife Habitat Technical Guide (OMNR, 2000) were listed as relevant policy documents pertaining to the Provincial Policy Statement. However, the Significant Wildlife Habitat Criteria Schedule (SWHCS) for Ecoregion 6E (OMNR, 2015) was not listed.	Please include the SWHCS for Ecoregion 6E on this list. Reference to this document is made in the Terms of Reference.	This document has been added.	Sufficient if updated in EIS.
6	3.0	Relevant Policies, Legislation and Planning Studies, Table 1	Puslinch Zoning bylaw is a relevant policy document missing from the table.	The Puslinch Zoning By-law should be reviewed and added to the table.	Added.	Sufficient if updated in EIS.
7	3.0	Relevant Policies, Legislation and Planning Studies, Table 1	In the County of Wellington Official Plan section, there is a reference to Schedule A7-3. This schedule only shows Greenbelt designations and there	Refer to Schedule A7 instead of Schedule A7-3	Added.	Sufficient if updated in EIS.

Comment Number	Section Number	Section Title	D&A Original Comment (January 27, 2023)	D&A Recommendation (January 27, 2023)	Applicant Response (March 9, 2023)	Additional Comments and Clarifications
			are none related to this property. Likely this was intended to refer to Schedule A7, which shows the property designated as "secondary agriculture" and illustrates a patch of Core Greenlands adjacent to the property.			
8	3.0	Relevant Policies, Legislation and Planning Studies, Table 1	With respect to the County Official Plan, Schedule B7 shows the property within the "Paris Galt Moraine Policy Area". The EIS has not considered this policy designation.	Review County Official Plan Schedule B7 and policies related to the *Paris Galt Moraine Policy Area* designation and clarify whether there are implications that should be addressed in the EIS.	Added.	Sufficient if updated in EIS.
9	3.0	Relevant Policies, Legislation and Planning Studies, Table 1	The Wellington County Official Plan has policies related to wetlands and woodlands that are not clearly noted in Table 1.	Table 1, Wellington County Official Plan, under "project relevance" it should refer to relevant policies regarding wetlands and woodlands.	Added.	Sufficient if updated in EIS.
10	3.0	Relevant Policies, Legislation and Planning Studies, Table 1	It is noted that the unevaluated wetlands may be suitable for complexing with the Mill Creek PSW, however, in result of very recent changes to the OWES system this is no longer the case.	The concept of complexing has been removed from OWES protocol as of January 1, 2023. Please note that if a wetland evaluation were required, these unevaluated wetlands would have to be considered as individual units. No action required at this time.	Noted.	No further comments.

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11	4.0	Field Methods	None of the field surveys took place during the standard wildlife breeding windows. The 2014 survey data is 8.5 years old and considered out-of-date.	Please conduct seasonally appropriate breeding bird, amphibian, and reptile surveys and include the survey results in an EIS addendum. In absence of such information, a conservative interpretation should be applied to the evaluation and status of existing natural heritage features, unless explicitly explained why such an interpretation is not appropriate.	The natural features on-site and adjacent are well defined and have been incorporated into the Site Plan along with appropriate buffers and other mitigation measures such as timing windows for tree removal, construction limit fencing, erosion and sediment control measures, tree protection plan, noise and lighting recommendations and a landscape plan. These measures are considered sufficient to protect the common and significant species, wildlife habitat functions and provide areas for enhancement plantings.	Response pending review of revised EIS.
12	4.1.2	Vegetation Inventories	Aboud & Associates vegetation inventories included only 2 site visits: August 2013 and June 2014. The site has undergone significant change since this time including clearing, fill/grading, and 8+ years of time for natural	Spring and summer vegetation surveys should be completed to accurately characterize the current vegetation composition of the site.	The 2014 data was included for completeness and as valuable for characterizing the natural features which remain on-site and adjacent. The vegetation communities of the woodland and	This rationale is acceptable. No further comment.

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			vegetation regeneration to occur. The 2013/ 2014 data is therefore of very minimal value at this point. The NRSI vegetation inventories included only mid- to late October visits, which is insufficient to characterize the flora of the site.		wetlands will be retained entirely. The vegetation currently on-site in the area of the proposed undertaking has arisen since the clearing and filling/grading (2016) and is sparse and weedy in nature. Most plant species documented in this area in the 2022 field work are non-native and typical of disturbed sites. Spring and summer vegetation surveys within this area are not expected to provide additional value to the study as there are no significant or sensitive habitats present.	
13	4.1.3	Wetland Boundary Delineation	The report states "*The GRCA confirmed that no on-site verification with their ecologist was required (email from J. Simons, GRCA November 16, 2022).* *A GRCA mapped wetland is shown within the*	Please provide the email correspondence with GRCA indicating that on-site verification of the wetland is not required. Similarly, please provide additional evidence/field notes to confirm the mapped wetland does not exist including photographs, soil texture and moisture regime, plant species.	GRCA email is provided. Notes and ELC data forms are provided for the FOD5 community, showing no wetland community present.	Acceptable data provided. No further comment.

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			woodland to the east of the subject property. This area was investigated during the fall 2022 field work and the wetland was found not to exist. The area in question is a hilly wooded landform feature and has no wetland present as shown on Map 2."			
14	4.1.5	Additional Wildlife	The EIS text states: *"The house on-site was inspected for any evidence of use by nesting birds and/or bats. Individual trees were assessed for the presence of cavities suitable for SAR bats."*	Please indicate what protocols were used to conduct the bat surveys in order to ensure that they were conducted appropriately.	Survey Protocol for Maternity Roost Surveys (Forests/Woodlands) (MECP 2022) Bat Survey Standards Note (MECP 2022) Survey Protocol for Species at Risk Bats within Treed Habitats for Little Brown Myotis, Northern Myotis & Tri-colored Bats (MNRF 2017)	Acceptable response. No further comment.
15	5.1	Soils, Terrain and Drainage	The last paragraph states that the small wetlands are largely surface water dependent, and that "*The proposed development and the associated grading are not expected to have any impact on this wetland feature, since*	This statement needs to be substantiated. Wetlands sustained by overland runoff may be vulnerable to changes in surficial hydrology. The EIS should clearly demonstrate no negative impact to wetland hydrology.	This analysis of wetland water balance and impacts was provided by CVD in their Scoped Hydrogeological Assessment (2022) report and is based on their analysis of background information,	Acceptable response. No further comment.

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			it is sustained by overland runoff (and possibly some shallow interflow) originating from higher topographic areas located further east from the property (CVD 2022b).”		geotechnical investigations, water level monitoring and groundwater sampling. Refer to pages 4 and 5 of their report. The on-site portion of the surface water catchment of the wetlands is very small, with the majority of water coming from lands that are higher topographically and east of the subject property. The proposed development is located downslope and outside of the catchment and will have little to no effect on the surface water contribution to the wetlands.	
16	5.2.2	Vascular Flora	The second paragraph states that one SAR plant is reported from the vicinity of the property, but there is no habitat for this species within the study area. The common and scientific names of this plant are spelled incorrectly (should be Fern-leaved Yellow False	Please correct the spelling error and qualify this statement by providing a brief overview of the species’ habitat vs. habitats within the study area.	Spelling error fixed. This species is found in dry open woods and savanna habitats (MECP 2022), of which there is none present on-site or in the study area.	Acceptable response. No further comment.

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			Foxglove (*Aureolaria pedicularia*)). We agree this species is unlikely to exist on the property due to lack of suitable habitat, however this should be justified more specifically in the text.			
17	5.2.2	Vascular Flora	The second paragraph states that no provincially or federally significant species were recorded in the 2014 study or during 2022 field investigations, however, local status does not appear to have been considered.	Please confirm whether any locally significant plant species were documented, using the "Significant Plant List for Wellington County" which can be found on page 128 of the *Guelph Natural Heritage Strategy – Phase 2: Terrestrial Inventory and Natural Heritage System* document (Dougan & Associates, 2009) available online.	Two locally significant plant species were found on the site based on the Dougan and Associates 2009 list; rough avens (Geum laciniatum) and meadow horsetail (Equisetum pratense). These species were documented by Aboud (2014) in the forest and wet meadow communities in the north-west part of the property. Those communities were removed during the site grading.	Acceptable response. No further comment.
18	5.3.2	Amphibians and Reptiles	It is stated that: *"NRSI biologists did not observe any herpetofauna species during any of the field investigations. Aboud and Associates also did not document any amphibian*	Please qualify this statement by acknowledging that with the exception of turtle nesting surveys conducted by Aboud & Associates in 2014, no dedicated surveys to document the presence of herpetofauna were conducted on or adjacent	No additional dedicated surveys for herpetofauna were carried out by Aboud and Associates or NRSI during the studies to date on the subject property, and no studies	Given that amphibian breeding surveys were not undertaken and the wetlands on site possibly contain Amphibian Breeding Habitat SWH, mitigation strategies should

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			or reptile species during their 2014 EIS." However, except for the turtle nesting surveys carried out by Aboud & Associates, no dedicated reptile and amphibian surveys were carried out by Aboud & Associates or NRSI. For example, no nocturnal amphibian call surveys were conducted at the unevaluated wetland features at the NE edge of the property. Similarly, no snake surveys were conducted. Certainly, the information provided did not indicate that the unevaluated wetland features did not provide suitable amphibian breeding habitat.	to the subject lands, and as a result it can't be concluded that none are presently utilizing the natural features on or adjacent to the property. Also, please indicate whether the SWM pond directly to the south or the Dufferin Aggregates (Aberfoyle Pit 1) ponds across Brock Road were surveyed?	were undertaken at the adjacent SWM pond or the ponds across Brock Road. The wetlands on-site likely provide habitat for a small population of common amphibian species such as spring peeper, gray treefrog and American toad as well as reptiles such as eastern gartersnake. The on-site wetlands do not have permanent standing water and are not suitable for turtles or salamander species. The proposed plan retains the wetlands and provides a suitable buffer for its protection and the habitat necessary for these expected species. The off-site manmade pond features were not surveyed. These ponds may contain amphibian and reptile species but these are not natural features and do not warrant protection. The SWM pond to the south	assume that SWH is present. Additional rationale is required to support that a 15 m buffer is sufficient to specifically protect amphibian breeding populations from indirect impacts of the development.

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					is entirely contained by chain link fencing and the ponds across Brock Road are separated from the site by a busy 4 lane road and over 70m of distance. There is very little likelihood of turtles travelling from these ponds onto the subject property.	
19	5.3.2	Amphibians and Reptiles	The EIS text states: *"Their study included turtle nesting surveys during the nesting season with no evidence of turtles recorded".*	For clarity, please indicate how many turtle nesting survey visits were conducted by Aboud & Associates and whether NRSI considers the effort consistent with standard survey protocol.	The turtle nesting surveys were requested as part of the previous EIS as the subject property previously contained a gravel extraction site and a small pond in the NW part of the site. Aboud & Associates carried out turtle nesting surveys in conjunction with the breeding bird surveys on May 29, June 19 and July 6, 2013. No evidence of turtles or nesting was found, and the on-site wetlands and wet areas have since been removed. Given the changes on-site, no additional surveys for turtles are	Acceptable response. No further comment.

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					recommended to be required.	
20	5.3.3	Mammals	The EIS text states: *"Based on available background information, 1 mammal SCC and 5 mammal SAR are reported from the vicinity of the study area (Dobbyn 1994; MNRF 2022). No regionally, provincially or federally significant species, or their preferred habitats, were observed within the subject property during the 2014 or 2022 field surveys and none are expected to be present."*	Please include the list of SAR/SCC mammal species and indicate why they are not expected to be present within the study area.	The SAR screening table has been updated based on field work and is included in the appendices of the EIS (and appended to this response), and provides rationale as to why all SAR mammals and their habitat have potential to be present or not present in the study area. With respect to bat SAR, during the recent tree inventory, only one tree was documented to have habitat features suitable for roosting bats (common species or SAR), and this is not considered to meet the habitat requirements of SAR bats.	Response is generally acceptable. Please note that Appendix I indicates that no suitable habitat is present within subject property for Little Brown Myotis, Northern Myotis and Tricolored Bat but the rationale column conflicts with this assessment stating that isolated trees may provide habitat. Please clarify.
21	5.3.4	Butterflies	NRSI states: "NRSI biologists and Abound and Associates did not observe any butterfly species during any of the field investigations."	At least as it applies to NRSI's field surveys, please qualify this statement by indicating that NRSI field surveys were conducted well outside the prime survey windows for documenting butterflies,	No dedicated butterfly surveys were carried out by Aboud & Associates or NRSI. No regionally, provincially or federally significant species were observed within the subject property during	Response is acceptable. Please clarify in the report that dedicated surveys were not carried out, and no incidental observations of these species were recorded.

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				explaining why none were observed. With respect to the surveys conducted by Aboud & Associates, please indicate whether any dedicated butterfly surveys were carried out. If not, please qualify the statement to indicate that and that the results may not be considered reflective of the species present.	the 2022 field surveys and none are expected to be present due to the small size and overall poor quality of the meadow habitat.	
22	5.3.5	Insects	NRSI states: *"No regionally, provincially or federally significant species were observed within the subject property during the 2022 field surveys and none are expected to be present."*	While the conclusion is not necessarily disputed, please provide rationale to support the statement.	No regionally, provincially or federally significant species were observed incidentally within the subject property during field surveys and none are expected to be present due to the lack of preferred habitat.	This comment has been clarified through the Appendix I: SAR/SCC Screening. No further comment.
23	6.0	Significance and Sensitivity	Please note that the discussion regarding wetland complexing is no longer necessary as complexing has been removed from the OWES system as of January 1, 2023.	N/A. See comment 10.		No further comment.

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24	6.0	Significance and Sensitivity	The EIS concludes that *"A 15 m buffer to the wetland is recommended to maintain its limited water balance and to protect it from any direct impacts of the development."* It is later stated that "*The previous depression created a considerably higher than normal groundwater recharge and a lower runoff from the property. These influences are to be factored into the pre-post water balance assessment and in the stormwater management plan to maintain and enhance the groundwater discharge function to Mill Creek.*" Appendix I: TOR notes that a grading limit of 19 m from the wetlands was implemented in 2014 to maintain wetland hydrology. The 2014 EIS indicates that grading would be limited to approximately 19 m or	Please demonstrate that there will be no changes to wetland hydrology of the unevaluated wetlands if a 15 m buffer is applied vs. the recommended 19 m buffer in the 2014 EIS. Justification for the basis of the 15 m buffer should be clearly provided. Also, please note that section 4.1.7 and 4.3.4 of the Planning Justification Report (MHBC, 2023) state that a buffer of 37 m is applied between the development and environmental features (including unevaluated wetlands). This should be reviewed for consistency between reports.	A minimum 15m buffer is applied to the wetland on the site plan. This buffer is considered sufficient to protect the wetland hydrology as the majority of the wetland's surface water catchment is to the east. The on-site portion of the surface water catchment of the wetlands is very small, with the majority of water coming from lands that are higher topographically and east of the subject property. The proposed development is located downslope and outside of the catchment and will have little to no effect on the surface water contribution to the wetlands. The limit of construction is generally more than 15m from the wetlands as can be seen by the fencing limit on the Site Plan. The Planning Report makes reference to the actual 37m	Response is acceptable regarding wetland hydrology. Please see additional comment 26.

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			more from the wetlands in order to cause no impact to wetland hydrology (Aboud & Associates, 2014, page 7).		setback, which is the distance from the wetland to the warehouse building.	
25	6.0	Significance and Sensitivity	The second last paragraph recommends the trees in HR1 be protected at or 1m beyond their surveyed dripline. The last	While we do not disagree with this statement, please include a recommendation that trees should be protected using standard tree protection fencing in which no site alteration or	The Tree Preservation Plan is separate and will be submitted at the Site Plan Application stage. Details of tree	Response is acceptable pending review of the TPP. No further comment.

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			sentence recommends that a Tree Preservation Plan should be prepared to inventory and assess trees and recommend protection measures.	disturbance may occur. A Tree Preservation Plan should be submitted for review at the Site Plan Application/detailed design phase.	protection fencing will be provided in the TPP.	
26	6.0	Significance and Sensitivity	With respect to the Significant Woodland, it is stated that *"a 5m buffer from the new dripline to any grading has been recommended, and an additional 5m buffer be provided to any structures or impervious surfaces."*	Section 4.31 of the Puslinch Zoning By-law requires a 30 m setback for buildings or structures from lands designated "Natural Environment Zone". As per the bylaw mapping, the Significant Woodland is considered Natural Environment Zone, and therefore this setback is applicable. The EIS should clarify whether the proposed development is in compliance with bylaw setback requirements (e.g. the proposed retaining wall is only 10 m from the dripline. If the Township planners consider this a structure, the required setback will need to be considered).	The building is well over 30m from the significant woodland. A low retaining wall (0.2-0.5m in height; not a structure according to the OBC) may be implemented along the northern edge of the parking area to protect adjacent trees from grading impacts. The 1.5m retaining wall along the east edge of the truck parking area has been removed from the design.	Acceptable clarification provided to demonstrate compliance with the Zoning Setback. Please provide additional rationale to demonstrate that a 5 m 'no touch' buffer is adequate to protect the Significant Woodland feature (i.e. tree rooting zones) and its ecological functions which include but are not limited to SWH and SAR habitat (Eastern Wood-Pewee).
27	6.0	Significance and Sensitivity	The EIS states that *"There are no significant species or other habitats present on the property…"*	There is insufficient information to support this conclusion. Presence/absence of significant species cannot be confirmed based on the scope of field surveys completed.	See previous responses to comments regarding significant species and habitats. EIS text updated.	Acceptable response if EIS text has been updated.
28	7.1	Proposed Development	The EIS states: *"A Conceptual Site Plan has*	Please indicate whether land along the southeastern	The lands along the eastern property	Section 7.6 has not been included with this

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			been prepared by Tacoma Engineers (2022) and is superimposed onto the natural feature mapping and shown on Map 3." In addition, a more detailed version of the Conceptual Site Plan is included at the end of Appendix I.	periphery of the property will be dedicated as a terrestrial linkage, to provide connectivity between the natural habitats around the unevaluated wetlands and the SWM pond immediately to the south.	boundary are available for plantings and enhancements. It is agreed that the lands between the woodland and the on-site wetlands are a good opportunity for plantings to enhance connectivity. A new section 7.6 has been added to the EIS to discuss enhancement opportunities. Along the south boundary is not recommended as a linkage as it is not recommended that wildlife be encouraged to travel toward SWM ponds and busy roads. A landscape plan will be prepared at the Site Plan stage.	response. Please forward for review.
29	7.3.1	Tree and Vegetation Removal	It is unclear why a retaining wall would be required "to match grade with root zones of offsite trees". Installation of the retaining wall could negatively impact tree root zones and result in hazard trees. No avoidance/ mitigation measures have been	Clarify why the retaining wall is needed. Elaborate on impacts regarding how the retaining wall could impact tree roots and avoidance/mitigation measures to address this.	The grading plan includes a low retaining wall along the north limit of the parking lot, in order to match grades within the root zones of off-site trees. The use of a retaining wall in this area was proposed in order to protect the root zones of trees along the	Sufficient clarification regarding the retaining wall. Please also see additional comment number 26.

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			recommended to address this potential impact.		shared north property boundary. Detailed elevation surveying along the dripline has since taken place and will be used to refine the grading plan and identify where retaining walls may be necessary. The retaining wall will only be used where the change in grade is such that it would result in fill being placed over an extensive portion of the root zones of adjacent trees and at too great a depth that would result in impacts to those trees. The details of the retaining wall and tree retention will be determined in the Site Plan stage and reported in the Tree Preservation Plan.	
30	7.3.2	Birds and Their Nests	On page 23, the EIS states: *"Should any active nest be identified, …"*	Given that it is not recommended to search vegetatively dense or otherwise complex natural habitats for fear of disturbing nesting birds and contravening the Act, please consider revising the text to read, *"Should any active nest*	Text has been revised.	Sufficient if updated in EIS.

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				be identified, <u>or signs of an active nest be observed</u>, there shall be"…"		
31	7.4.1	Alterations to Drainage and Flow Patterns, Water Quality, Groundwater	This section is missing a discussion of potential hydrological impacts to wetlands. The EIS should clearly demonstrate that wetland hydrology will be maintained.	Please include a clear demonstration that wetland hydrology will be maintained post-development.	The Hydrogeological Report prepared by CVD indicates that the small wetlands on-site and adjacent are expected to be sustained by overland runoff and are often only seasonally wet. The majority of the small wetlands' surface water catchment is off-site and to the east and will remain unchanged. On-site the wetlands' catchment is very small and will be largely retained within the buffer. The proposed development is downslope of the wetland and is not expected to have any impact on this wetland feature. See also previous responses and refer to CVD Hydrogeological Investigation report.	Acceptable response regarding water balance. No further comment.
32	7.4.2	Wildlife Disturbance	The EIS states: *"Common and tolerant species of wildlife were documented*	Please revise the statement to acknowledge the potential presence of the significant	The EIS statement has been revised.	Response pending review of revised EIS.

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			using the wetlands and woodland during the 2014 EIS and this study." While this statement singles out wildlife use of wetlands and woodlands, all wildlife species, regardless of the habitats they use, can be disturbed by the proposed development. In addition, some of the wildlife species documented by Aboud & Associates and NRSI are not considered 'common'. Three Species at Risk were documented (i.e., BANS, BARS, & EAWP), as well as 7 locally significant species (i.e., significant in Wellington County): AMRE, BAOR, EAKI, FISP, NOFL, RBGR, and RBWO. Please refer to Appendix B (Significant Wildlife List for Wellington County) in the Guelph Natural Heritage Strategy, Phase 2: Terrestrial Inventory & Natural Heritage System – Volume 2: Technical	species noted in the 2014 EIS, and discuss any potential impacts to these species resulting from the proposed development.	The wildlife species and individuals that are present in the study area are those which have adapted to the current noise, lighting and disturbance conditions which are present due to the existing adjacent trucking facility, heavy equipment business, Brock Road South traffic and neighboring aggregate operations. This includes the common species as well as the significant species which have been noted or have potential to be present within the on-site and adjacent woodland such as Eastern wood-pewee and SAR bats.	

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			Appendices (2009) for more details.			
33	7.4.2	Wildlife Disturbance	The EIS states: *"To avoid and minimize disturbance to wildlife during operation it is recommended that truck movements and noise be limited to the extent possible during the breeding season for birds and wildlife which includes April to August, including nighttime."* The EIS goes on to state: *"Construction noise [should] be restricted during spring and summer (April to August) to between 7:00 am and 7:00 pm."*	While such a general statement is always desirable, is it feasible given the proposed purpose of the development? If so, please provide examples of tangible restrictions that could be implemented considered to limit truck movement and noise. According to the Township of Puslinch Noise Control bylaw (5001-05), it appears that noise restrictions apply between 9:00 p.m. and 7:00 a.m. Therefore, this recommendation would reduce daily construction noise by of 2 hours. However, given that wildlife species are likely to be more active early in the morning vs. early in the evening, it is recommended that the onset of construction activities be delayed 2 hours in the morning to 9:00 a.m.	The recommended daily construction timing restriction for noise has been edited to between 9:00am and 9:00pm during the spring and summer months (April to August). In terms of operational noise restrictions, the proposed hours of operation of the facility are 8:00am to 5:00pm, Monday to Friday, year round. These hours are not expected to result in noise impacts to breeding birds and other wildlife.	Sufficient if updated in EIS.
34	7.4.2	Wildlife Disturbance	The EIS states: *"Permanent parking lot lighting should be shielded and directed away from the adjacent natural features so as to prevent 'lightwash' of these areas."*	While these recommendations are supported, please also include a recommendation that the height of the light standards be reduced as much as possible, to further reduce the incidence of 'lightwash'.	Noted. Reduction in height of light standards has been included in the recommendations.	Sufficient if updated in EIS.

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35	7.4.3	Erosion and Sedimentation	It is unclear whether there are any possible impacts related to runoff entering the wetlands.	Clarify whether there could be any impacts to the wetlands regarding erosion and sedimentation and how such impacts would be addressed.	The on-site and adjacent wetlands are located upslope from the development and therefore are not at risk of sedimentation during construction, however, erosion/construction limit fencing is recommended along the outer limit of the work area. An Erosion and Sediment Control Plan will be prepared at the Site Plan stage.	Acceptable response. No further comment.
36	7.5	Induced Impacts	Dumping of debris is listed as an example of an induced impact.	Although it seems unlikely intentional dumping would occur during normal operations, please confirm if any mitigation measures are proposed to help ensure debris associated with the normal operation of the facility will not collect in adjacent natural areas.	Debris from the operation of the facility will be contained within the site by a chain link fence as well as routine maintenance and garbage collection, and will not blow into adjacent natural features.	Acceptable response. No further comment.
37	8.0	Summary	The EIS concludes that there will be no negative impacts on natural features onsite or adjacent lands, however this conclusion is premature; adequate field studies to support	See comments 11, 12, 18,21, and 27.	Based on the background review, fall field work, subsequent analysis and the buffers and mitigation measures proposed, our conclusion remains that there will be no negative impacts on natural	Response pending review of revised EIS.

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			the EIS have not been completed.		features onsite or on adjacent lands.	
38	Appendix I	Terms of Reference	Text in the Reporting Section states: *"Recommendations to avoid, or otherwise minimize or mitigate impacts to significant natural features and functions will be presented in the EIS report. Opportunities for ecological enhancement and restoration on the Subject Property, will be highlighted."* Ecological enhancement and restoration opportunities are not mentioned in the EIS.	Given the previous and proposed loss of natural habitat, ecological enhancement and restoration opportunities should be recommended. One area that could be considered for enhancement is the land between the unevaluated wetland at the NE corner of the property and the proposed parking area. In addition, the connection between this same area and the SWM pond to the south could be enhanced.	Enhancement plantings have now been recommended in the east parts of the property including the buffers to the woodland and wetlands as well as gaps between existing vegetation. See new Section 7.6 of the revised EIS. A landscape plan will be prepared at the Site Plan stage.	Response pending review of revised EIS.

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39	Appendix I	SAR/SCC Screening	The table indicates that there is no suitable woodland or treed habitat for: Eastern Small-footed Myotis, Little Brown Myotis, Northern Myotis and Tricolored Bat. However, based on MECP's Survey Protocol for SAR Bats in Treed Habitats (2021), the following ELC codes present suitable habitat for SAR bats: FOD, FOM, FOC, SWD, SWM, SWC. The FOD5 community therefore present potentially suitable habitat for these species. Further, the EIS notes that many mature isolated trees are present within the study area. These trees may provide similar habitat for SAR bats.	Please revise this table to indicate that suitable habitat is present for these species. It is recommended that snag trees be inventoried during the forthcoming Tree Preservation Plan in accordance with MECP survey protocols. Note that an Information Gathering Form (IGF) should be submitted to MECP if impacts to suitable SAR bat habitat are anticipated.	The FOD5 community provides potentially suitable habitat for some SAR bats, as described in the SAR screening table. Isolated trees on-site were assessed for suitable bat habitat during the tree inventory with one being noted.	See response to comment 3.

Comment Number	Section Number	Section Title	D&A Original Comment (January 27, 2023)	D&A Recommendation (January 27, 2023)	Applicant Response (March 9, 2023)	Additional Comments and Clarifications
40	Appendix II	Plant Species List	This table does not include regional/local status information.	Please update to include species status information from the *Guelph Natural Heritage Strategy, Phase 2: Terrestrial Inventory & Natural Heritage System* (D&A, 2009). Any locally significant species and their habitats within the study area should be addressed in the EIS.	Added.	Sufficient if updated in EIS.
41	Appendix II	Plant Species List	Appendix H of the Aboud & Associates report, "*Additional Vegetation Study for Wet Depression in Gravel Pit*" appears to contain additional plant species that were not incorporated into the NRSI report.	Please review Appendix H of the Aboud & Associates report and ensure all plant species are incorporated into the plant species list.	Plant species in Appendix H have been added to the plant species list. However, those species were recorded in the habitats present in the northern portion of the site, associated with the former gravel pit, which have since been removed.	Sufficient if updated in EIS.
42	Appendix II	Plant Species List	False Hop Sedge (*Carex lupuliformis*) is recorded on the plant list and attributed to the Aboud & Associates 2014 study. This is an extremely rare sedge that is easily confused with the much more common Hop Sedge (*Carex lupulina*). A review of Aboud & Associates field data sheets suggests	Please confirm whether False Hop Sedge (*C. lupuliformis*) was reported erroneously and, if so, correct the record to Hop Sedge (*C. lupulina*).	Aboud and Associates confirm that the sedge species could not be identified due to the timing of the survey and it was listed as Carex sp. In their plant list. Carex lupuliformis was included in the NRSI plant species appendix in error, and has been corrected.	Sufficient if updated in EIS.

Comment Number	Section Number	Section Title	D&A Original Comment (January 27, 2023)	D&A Recommendation (January 27, 2023)	Applicant Response (March 9, 2023)	Additional Comments and Clarifications
			that False Hop Sedge was reported erroneously.			

CHUNG & VANDER DOELEN
ENGINEERING LTD.

'SCOPED' HYDROGEOLOGICAL ASSESSMENT
PROPOSED INDUSTRIAL WAREHOUSE
for WELLINGTON MOTOR FREIGHT
128 Brock Road South
Puslinch Township

SUBMITTED TO:
Collaborative Structures Limited
6683 Ellis Road
Cambridge, Ontario
N3C 2V4

ATTENTION:
Mr. Joshua Blackler

FILE NO / G22518 / Dec 22, 2022

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

December 22, 2022
FILE NO.: G22518

Collaborative Structures Limited
Attn: Mr. Joshua Blackler
6683 Ellis Road
Cambridge, Ontario
N3C 2V4

Dear Mr. Blackler:

RE: 'SCOPED' HYDROGEOLOGICAL ASSESSMENT
PROPOSED INDUSTRIAL WAREHOUSE for WELLINGTON MOTOR FREIGHT
128 Brock Road South, Puslinch Township

This 'scoped' hydrogeological assessment report has been prepared to support the proposed industrial warehouse facility for Wellington Motor Freight (WMF) at the property known as 128 Brock Road South in Puslinch Township.

This assessment has a limited scope, specifically addressing the water supply requirements for the facility as well as to providing hydrogeological characterization to support work by other disciplines, including the Geotechnical Investigation (by CVD), the Environmental Impact Study (by NRSI), the Stormwater Management Design (by Meritech), and the Wastewater Servicing Assessment (by FlowSpec).

Should you have any questions or concerns regarding the report, please contact the undersigned.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

[redacted]

William (Sandy) Anderson, M.Sc., P.Eng.
Senior Hydrogeologist and Engineer

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APPENDICES

LIST OF TABLES and FIGURES

1.0 INTRODUCTION

This ‘scoped’ hydrogeological assessment report is meant to be a companion document to the Geotechnical Investigation report by CVD (December 21, 2022). On this basis, reference to the Geotechnical Investigation report is required for complete descriptions of the following matters:

a) the development proposal for the Wellington Motor Freight (WMF) facility,
b) the 2014-2017 soil excavation and filling work that occurred on-site, and
c) the existing topographic and subsurface conditions based on the 2022 investigation results.

This assessment addresses the water supply requirements for the proposed facility and provides hydrogeological characterization to support the Geotechnical Investigation (by CVD), Environmental Impact Study (by NRSI), the Stormwater Management Design (by Meritech), and the Wastewater Servicing Assessment (by FlowSpec).

The scope of the assessment has included the following:

- Review of background information (government geological maps, water well records, Mill Creek Watershed Study, and a 2014 hydrogeological investigation report, by MBN Environmental Engineering Inc., pertaining to a planned on-site soil excavation / filling activity that was eventually completed in 2015 to 2017 for a previous property owner).
- Completion of water level monitoring in October and November 2022 at four monitoring wells installed in October 2022 as part of the CVD geotechnical investigation, as well as the collection of groundwater samples from these wells for lab analysis of chloride and nitrate.
- Characterization of the geological and hydrogeological setting using the background information and the data from the 2022 geotechnical investigation, including the preparation of a water table contour map using the October 2022 groundwater level data.
- An assessment of groundwater function(s) and development impacts with respect to an on-site wetland feature, located in the southeast corner of the property, and regional groundwater receptors, specifically Mill Creek.
- An assessment of the proposed on-site wastewater treatment system in respect to the hydrogeological setting and in relation to the MECP approval process.
- An assessment of water supply requirements and an impact assessment of the water taking.

2.0 ASSESSMENT DATA

2.1 BACKGROUND INFORMATION

Regional-scale mapping of the surficial geology in the area (i.e., the Quaternary Geology by P.F. Karrow, 1987) is presented in Figure 1 (Appendix A). The location of Mill Creek within the area has been highlighted in this figure.

Selected MECP water well records for the subject property and the abutting properties are identified in Figure 2 and the identified records are provided in Appendix B.

MBN Figures 3, 5 and borehole logs from their 2014 hydrogeological investigation report are provided in Appendix C. MBN Figure 3 presents the site topography prior to the excavation and filling work undertaken in 2015-2017. Both Figures 3 and 5 show the location of three MBN monitoring wells MW1, MW2 and MW3 located at the small wetland feature located in the eastern property corner. Figure 5 also shows the interpretation of a shallow 'perched' water table around the wetland as measured in the winter and spring of 2014 at these monitoring wells. These wells were no longer useable during the current investigation and the wetland was observed to be dry in the fall of 2022.

2.2 2022 GEOTECHNICAL INVESTIGATION

The 2022 geotechnical investigation included borehole drilling at twenty (28) locations across the site, test pit excavations at a further five (5) locations, and the installation of four (4) water table monitoring wells in four of the boreholes, BH9, BH20, BH21 and BH28 (Figure 3).

Reference to the CVD Geotechnical Investigation report is required for a full description of the subsurface conditions encountered. Appendix D provides the borehole and test pit logs that summarize the materials encountered at each location as well as the monitoring well installation details. Lab grain size analyses of selected soils samples are also included in Appendix D.

2.3 WATER LEVEL MONITORING AND GROUNDWATER SAMPLING

Water level monitoring rounds were conducted on October 5, October 14, and November 9, 2022. Table 1 (Appendix A) summarizes the water level data in metres below ground surface and in geodetic elevation. Groundwater samples were collected from wells BH20, BH21 and BH28 for lab analysis of nitrate and chloride. Well BH9 remained dry throughout the assessment period. The ALS lab analysis report is provided in Appendix E.

3.0 GEOLOGICAL and HYDROGEOLOGICAL SETTING

3.1 GEOLOGIC SETTING

The surficial geologic mapping (Figure 1) indicates the property is located at the northwestern boundary between the hummocky upland Galt Moraine and the flatter low-lying outwash valley that is oriented from southwest to northeast through the Aberfoyle area.

The Moraine consists primarily of the Wentworth Till (Deposit 5, Figure 1), a typically hard stony sandy silt till, but commonly varying to a sandy till in many areas (Karrow, 1987). The mapping indicates the larger southeastern wing of the property is underlain by the Wentworth Till, while the northwestern wing is underlain by outwash gravel (Deposit 7, Figure 1). It is important to note that while the regional-scale mapping indicates a distinct boundary between the two deposits, it is not uncommon for there to be a transitional zone of variable and interlayered materials ranging from sand & gravel (with variable silt content) to silty sand and/or silt till (with variable stone (i.e., gravel and cobble) content).

The geotechnical test pit and borehole data confirm the variable and interlayered subsurface deposits at the site, consisting primarily of stony sand and silt till with occasional granular interlayers in the southeast and interlayered till and sand & gravel deposits with variable silt content in the northwest.

Well records on and adjacent to the site also confirm the variable overburden materials, ranging from occasional granular deposits and more commonly till deposits. Well Records #3 to #8 (Figure 2 and Appendix C) indicate primarily what is interpreted to be till deposits to the north. On-site Record #1 (or MECP 6704352, Figures 2 and 3 and Appendix C) indicates a 3 m layer of sand & gravel at the base of the former northwest depression and an 'interpreted' till (sand, gravel, and clay) from 3 m to 10 m, before a thin granular material was encountered above bedrock at the 10.7-m depth. This correlates to a top of bedrock elevation of approximately 304 mASL (noting the ground elevation at #1 was about 314.5 mASL when drilled in 1972). Record #2 is the June 2016 extension to the original 12-inch well (Record #1) that was completed before the filling occurred. Well Records #9 and #10, to the immediate southeast, were drilled in 2012 as supply wells for the adjacent Maple Leaf Food facility. These wells indicate approximately 23 m of interpreted till extending to bedrock at this location and this is typical of the thicker till deposit found beneath the Moraine.

3.2 HYDROGEOLOGIC SETTING

The hydrogeological setting in the area has several components, as follows:

- The thick sand/silt Wentworth till aquitard, commonly extending from surface beneath the Moraine.
- The main water table occurring at variable depths beneath the Moraine and at a more consistent level in the higher-permeability, well-drained granular deposits in the outwash valley.
- The seasonally 'perched' shallow groundwater in and around topographic depressions in the upland areas of the Moraine and which are typically underlain by low-permeability till deposits.
- The deep regional aquifer consisting of the hydraulically-connected deeper granular deposits and the underlying dolostone bedrock of the Guelph Formation.

3.2.1 Water Table Configuration

Table 1 (Appendix A) summarizes water table depths at the monitoring wells, with the range of depths being from about 5 to 11 m below ground surface. Notably, well BH9 remained dry to the 8.25 m depth throughout the fall 2022 monitoring.

Figure 3 presents interpreted water table contours using the October 14, 2022 water elevation data. The water table at this property is 'laterally-discontinuous' due to the variable topography and layered geological conditions, ranging from primarily low-permeability sand and silt tills in the southeast and transitioning to an interlayered granular and till in the north and west that are also frequently overlain by fill.

There is a seasonally variable 'perched' water table on top of the till deposit in the southeast corner of the property at the small wetland area. In the spring of 2014, MBN measured the water table elevation there to be about 214.5 mASL (+/-) and it was about 0.5 to 1.0 m lower during the winter of 2014 (see note in Figure 3). The wells there were not usable in 2022, notwithstanding that fact that the wetlands themselves were observed to be dry in the fall of 2022.

There was little evidence of a shallow water table (perched or otherwise) further north and west from the wetlands during the recent drilling program (including at BH23 immediately adjacent to the wetland which observed saturated material at about 318.7 mASL). As shown in the attached Figure 3, a somewhat deeper water table was observed at BH21 (at 318.9 mASL). The BH21 and BH23 information are evidence of a transition from the seasonally 'perched' water table at the southeast wetland to a much lower water table across the remainder of the property to the north and west (i.e., eventually to less than 312 mASL). Based on these data and the elevation of the ponds located west of Brock Road (see note in Figure 3), groundwater flow is interpreted to be directed in a westerly directly across the site and toward these off-site ponds.

3.2.2 Shallow Groundwater Quality

The background chloride and nitrate concentrations in the shallow groundwater beneath the site range from 8 to 154 mg/L for chloride and from 0 to 3.6 mg/L for nitrate. This suggests there is little existing impact from road salt, area septic systems and nutrient applications.

3.3 GROUNDWATER RECEPTORS, INFILTRATION & RECHARGE

The following are identified as groundwater 'receptors' at or adjacent to the property based on the hydrogeological setting described in this report:

- The shallow water table aquifer within the granular deposits found beneath the northwest part of the property and extending westward from the property into the outwash valley. This groundwater ultimately recharges private well supplies in the area and eventually discharges to Mill Creek.
- Mill Creek and its associated riparian wetlands to the northeast, north and west of the property (see Figure 1).
- The deep hydraulically-connected granular and bedrock aquifer that is used for numerous local private industrial and domestic well supplies.

The geological setting dictates that small wetland 'pockets' in the upland areas of the Galt Moraine, such as the small wetland feature located at the easternmost corner of the subject property, are <u>not</u> considered to be groundwater 'receptors', as they are not expected to be sustained by groundwater discharge. More typically, such features are sustained by overland runoff and are often only seasonally wet. The proposed development and the associated grading are not expected to have any impact on this particular wetland feature, since it is sustained by overland runoff (and possibly some shallow interflow) originating from higher topographic areas located further east from the property.

Hydraulic conductivity and infiltration rates for the range of soil materials encountered at the property are provided in the CVD geotechnical report. The hydraulic conductivities range over four orders of magnitude from $1x10^{-6}$ m/s for sand-silt till (with low clay content) to $1x10^{-2}$ m/s for sand & gravel (with modest silt content). These permeabilities correlate to infiltration rates ranging from 12 to 150 mm/yr, based strictly on grain size and texture alone (per MECP guidance). These rates do not include any engineering factors of safety for design purposes and do not consider other matters such as lower-permeability interlayers, elevated clay content (although not expected here), and/or a shallow water table that might exist in a specific location.

Groundwater recharge at the property is expected to have varied considerably over the history of the property. The large depression that had existed in the north end of the property until about 2016-2017 is believed to have been created by a former private or wayside pit in the 1950s or 60s. Prior to that historic excavation, there was likely to have been considerably higher runoff from the site, which was underlain by a mixture of modestly permeable sand-silt till and some more-permeable granular material. As a result, the split (or balance) between recharge and runoff at the site is estimated to have originally been on the order of 50-50%, or each being about 175 to 200 mm/yr, and with evapotranspiration being in the typical range of about 525 to 575 mm/yr. Similarly, due to the 2016-2017 filling of the former pit area with largely sand-silt till materials, the current runoff/recharge rates are expected to also be in the 175 to 200 mm/yr range. During the interim period when the northern depression still existed, there was expected to be a much lower amount of runoff and commensurately higher amounts of both evapotranspiration and recharge, with estimates as follows: 575 to 625 mm/yr evapotranspiration, 275 to 300 mm/yr recharge, and 25 to 50 mm/yr runoff.

3.4 GROUNDWATER USE

The MECP water well record database is the primary source of information on private wells and aquifer capability. All wells in the area obtain water from the deep aquifer. Some older wells in the Aberfoyle area (i.e., Records #3, #4 and #6 to the north) were only drilled a short distance into the bedrock or deep granular materials (10 to 20 m deep) and many of these were deepened or replaced with deeper wells in the 1970s during the initial large water takings from the Aberfoyle Fish-Farm wells (located about 300 m west of the subject property and which are now the wells used by Nestle Bottled Water). Records #1, #5, #7 and #8 are examples of the deeper private bedrock wells (36 to 55 m deep). Typically, newer wells in the area (e.g., Records #9 and #10 drilled in 2012 for Maple Leaf Foods) are consistently drilled into the deeper bedrock.

Each well record includes a pumping rate at which the driller tested the well for the purposes of the owner's use, with test rates ranging widely from 4 to 208 gpm for the selected wells shown in Figure 2 and with an average test rate of approximately 45 gpm. The highest of these test rates (208 gpm) was for the on-site 12-inch Well #1. The actual capacity and yield from this bedrock aquifer is much higher than these driller tests would suggest. For example, the Nestle wells (records not included in this report) are easily capable of pumping rates more than 500 gpm and the Maple Leaf wells were pumped during a 2012 pumping test (by the author of the current report, while employed at Anderson Geologic Limited) for 24-hours at 100 gpm, resulting in only 12 cm of drawdown in the pumping well and no measurable water level lowering at any adjacent private wells.

4.0 SITE SERVICING REQUIREMENTS & IMPACT ASSESSMENT

4.1 WATER SUPPLY & POTENTIAL IMPACT OF WATER TAKING

The water supply for the proposed WMF facility is recommended to be from the bedrock aquifer, either using the existing 12-inch well or using a new water supply well to be drilled closer to the proposed warehouse, if desired. If WMF decides to drill a new well, the existing well should either by managed and protected for possible use as a back-up well or be decommissioned in accordance with the Ontario Wells Regulation.

The proposed facility would be a 'dry' facility, in the sense that the operations would not utilize any significant volumes of water. Fire protection requirements at the facility would be met using a reservoir and not from the instantaneous demand from the proposed well. As a result, the on-going water use at the facility would be almost entirely for 'domestic' purposes (employee washrooms and kitchen, etc.). Based on the expected number of employees at the facility being 150, the Ontario Building Code allowance for this type of facility of 75 L/day/employee, and an allowance for some modest water use at the warehouse, it is expected that the peak-day water demand at the facility would be about 22,620 L/day (Flowspec Engineering, 2022). As a result, the average day demand, being about 2/3rd this amount, would be or approximately 15,000 L/day.

The above average daily water requirement cited above translates to a continuous demand of only about 47 L/min (or 10 gpm). This demand is expected to be easily attainable from the deep aquifer, based on the typical well yields inferred from most neighbouring private wells (e.g., from the high-yield wells located at Nestle, Maple Leaf, and the on-site Well #1). Very little aquifer drawdown would be expected from a facility well operated at an average of only 47 L/min (10 gpm).

It is also noted that most of the water pumped at the facility will be directed to the wastewater treatment system and ultimately returned to the subsurface through the leaching bed. As a result, there will be no net groundwater removal from the property and thus no expected 'quantity' impact to any local groundwater receptors from the proposed water taking.

Water treatment for disinfection, hardness, or other natural constituents like iron, would be evaluated based on any WMF requirements and based on future sampling of the well water.

4.2 WASTEWATER TREATMENT SYSTEM & POTENTIAL IMPACT OF EFFLUENT

The sewage treatment system for the facility will be designed by Flowspec Engineering Ltd. to handle the daily peek flow as described in their report (Flowspec, Dec 2022). This will include the leaching bed design proposed for the location adjacent to the western property boundary and the treatment necessary to meet the requirements of the MECP. These requirements will be determined by Flowspec and MECP during the 2023 approval process and will be supported by this hydrogeological investigation report, which will be provided to the MECP. Notably, the treatment requirements will recognize that the proposed leaching bed would be located at the downgradient property boundary, and this will result in a high level of treatment to protect the groundwater receptors in the area.

4.3 STORMWATER MANAGEMENT AND INFILTRATION

Considering that all runoff and recharge at the property will remain within the catchment area that leads to the west of the property and ultimately becomes recharge that supports the Mill Creek system, there is ample opportunity for groundwater recharge to occur both on and off-site and continue to provide the necessary recharge function to Mill Creek. This is irrespective of the changes in topography and water balance that have occurred throughout the history of this property.

Notwithstanding the above, the objective of the SWM design at the property is to maintain groundwater recharge within the range that has historically occurred. To achieve this, Meritech has included an enhanced recharge facility to recharge clean roof-top water from the facility warehouse. The facility is proposed for location in the area between the warehouse and BH13, where moderately permeable silty sand & gravel soils exist. The design calculations for facility sizing have incorporated a conservative design infiltration rate of 25 mm/hr (correlative with an average soil infiltration rate of 50 mm/hr representative of the soil in this area and a factor of safety of 2.0) and assuming that all storm events up to an including the 25-mm event would be infiltrated (i.e., 90% of annual precipitation). Detailed water balance calculations are provided in the SWM report.

Respectfully submitted,
CHUNG & VANDER DOELEN ENGINEERING LTD.

[redacted]

William (Sandy) Anderson, M.Sc., P.Eng.
Senior Hydrogeologist and Engineer

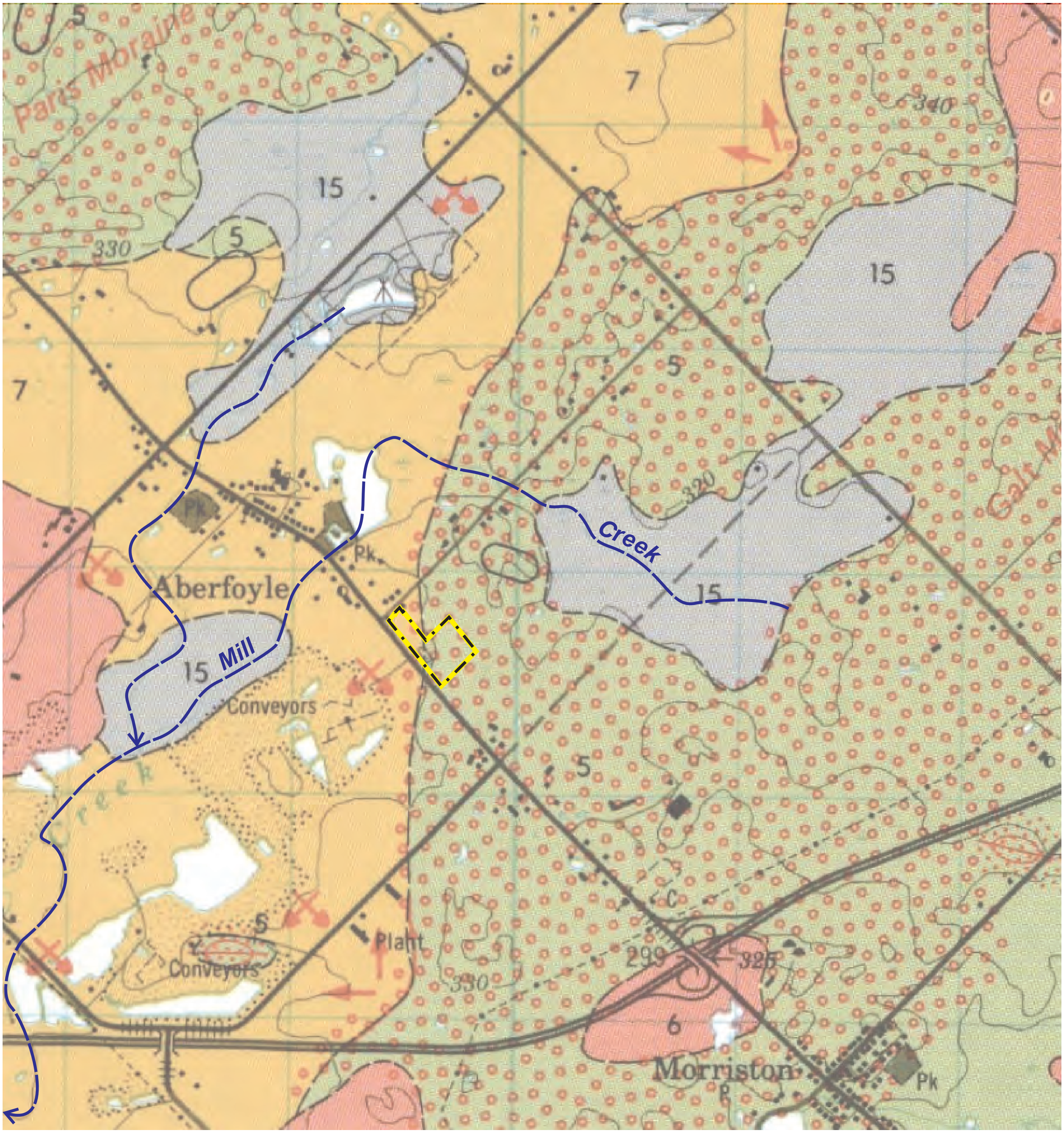
APPENDIX A
Table 1
and Figures 1 to 3

Table 1 - Summary of Water Levels & Elevations

100 Brock Road S, Puslinch Twp
CVD Engineering - G22518

Well	Ground Elevation (m ASL)	Top Pipe Elevation (m ASL)	Water Level (m Below Ground)			Water Elevation (m Above Sea Level)		
			5-Oct-22	14-Oct-22	9-Nov-22	5-Oct-22	14-Oct-22	9-Nov-22
BH 9	320.44	321.38	Dry	Dry	Dry	DRY	Dry	Dry
BH 20	322.22	323.17	10.94	10.96	11.02	311.28	311.26	311.20
BH 21	323.67	324.47	4.72	4.80	5.02	318.95	318.87	318.65
BH 28	319.34	320.25	7.94	7.89	7.97	311.40	311.45	311.37

Notes: 1) All Elevations Referenced to Geodetic Survey



Source: Quaternary Geology, Cambridge Area, P. F. Karrow, (Map 2508), 1987

PHANEROZOIC
CENOZOIC
QUATERNARY
RECENT

17	Lake Ontario deposits: stratified sands, gravel*
16	Stream deposits: gravel, sand, silt, and clay
15	Peat and muck

PLEISTOCENE
LATE WISCONSINAN

14	Alluvial fan gravel*
13	Beach gravel
12	Lacustrine and outwash sand
11	Lake deposits: stratified to varved clay, silt, and fine sand
10	Halton Till: clay or silt till
9	Outcrop complex: bouldery till and bedrock ridges
8	Ice-contact sand: kames and eskers
7	Outwash gravel
6	Ice-contact gravel: kames and eskers
5	Wentworth Till: stony, sandy, silt till
4	Port Stanley Till: silt to sandy silt till
3	Maryhill Till: clayey silt till
2	Catfish Creek Till**: stony, sandy, silt till

PALEOZOIC
ORDOVICIAN AND SILURIAN

1	Shale and dolomite

N

0 250 500 m

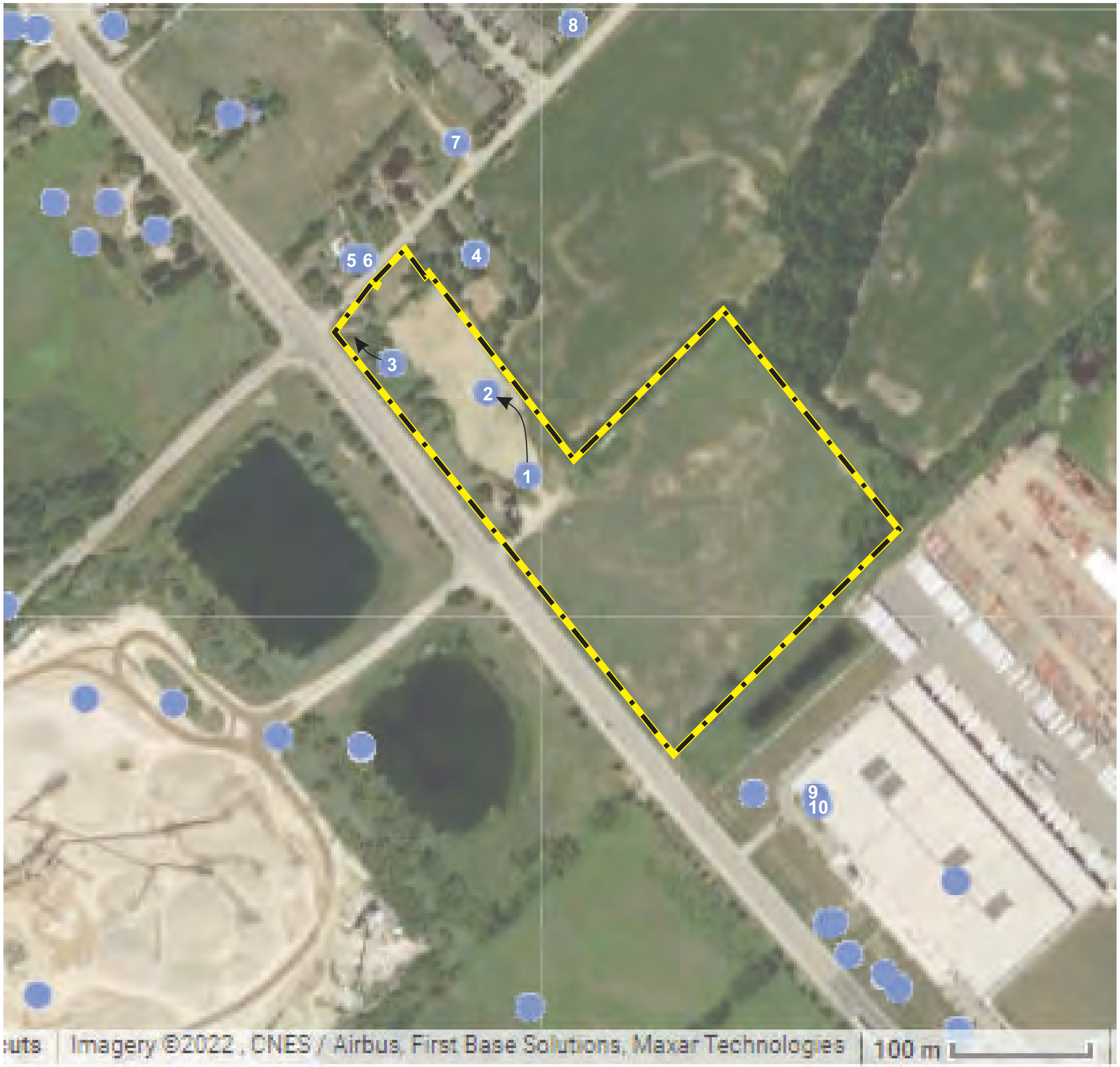
Scale 1:25,000

Figure 1
Site Location & Quaternary Geology

Hydrogeological Assessment
Wellington Motor Freight, Brock Road
Puslinch Township, Ontario

Drawn By: SA	Date: Dec 21 2022	File No. G22518

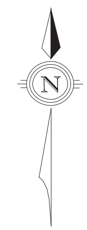
CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 2E1 / 519-742-8979



LEGEND

Development Property

MECP Well Record and Project Identification Number (see Attached Records)



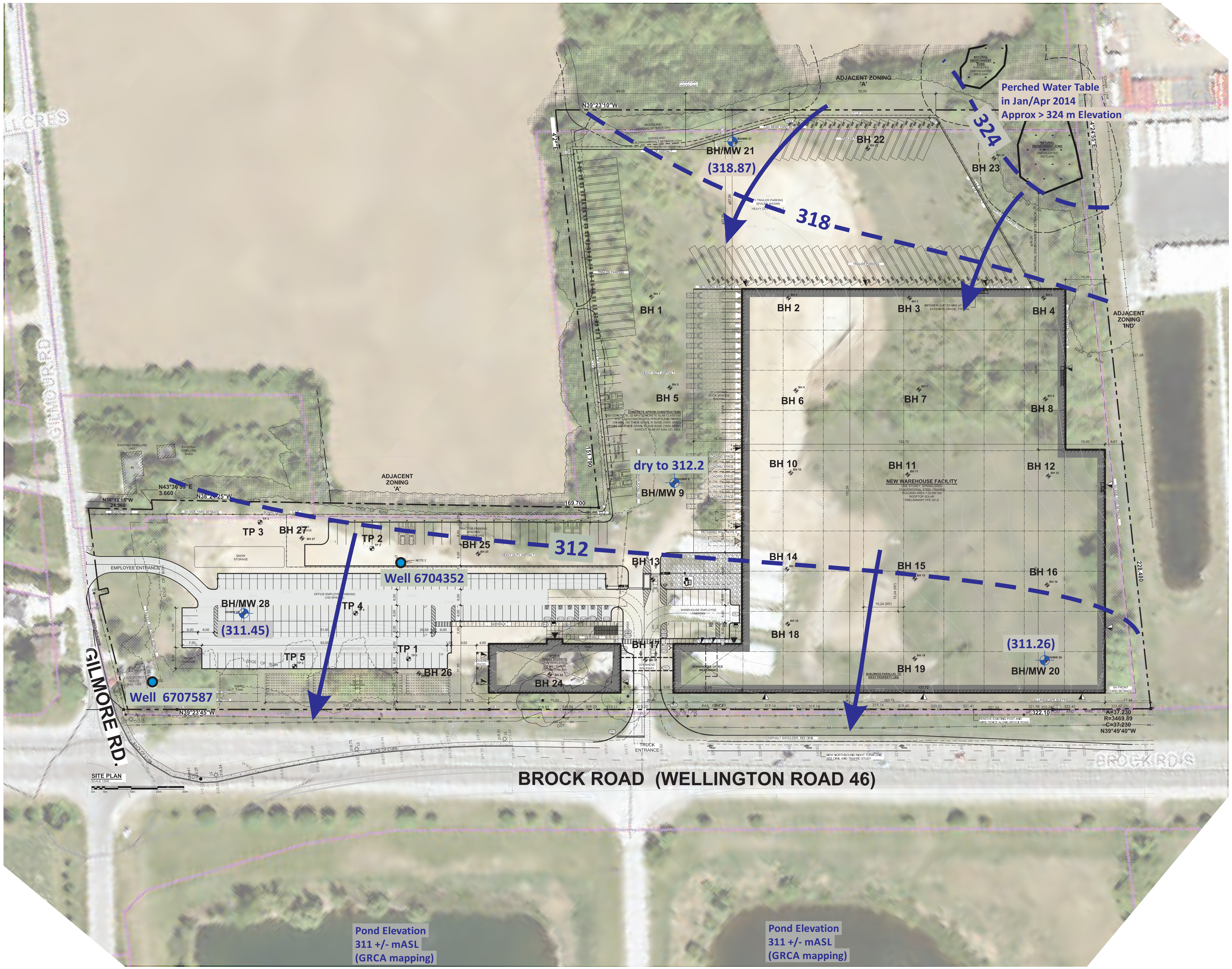
Map Source: MECP On-Line Well Record Mapping (Updated October 2021)

Figure 2
MECP Well Records Map

Hydrogeological Assessment
Wellington Motor Freight, Brock Road
Puslinch Township, Ontario

Drawn By: SA	Date: Dec 21, 2022	File No. G22518

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 2E1 / 519-742-8979



LEGEND

Water Supply Well

CVD Borehole with Well

CVD Borehole (no well)

(307.65) Water Table Level Elevation October 14, 2022 (mASL)

308 Interpreted 'Fall 2022' Water Table Contour (mASL)

Interpreted Shallow Groundwater Flow Direction

Base Drawing: Tacoma Engineering Dec 19, 2022

0 20 40 m

1:1250

Figure 3
Interpreted Fall 2022
Water Table Contours

Hydrogeological Assessment
Wellington Motor Freight, Brock Road
Puslinch Township, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 2E1 / 519-742-8979

Drawn By: SA	Date: Dec 20 2022	File No.: G22518

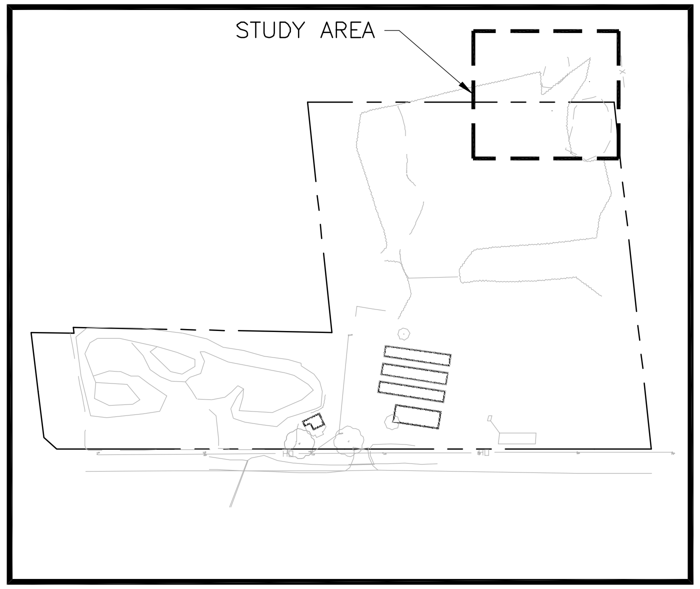
APPENDIX B
Figures 3 and 5
2014 Hydrogeological Investigation
(MBN Environmental Engineers Inc.)

PLAN VIEW
1 : 1250

MBN environmental engineering inc
29 St. Charles Street East, Maryhill, On, N0B 2B0

FIGURE 3
PROPOSED SITE LAYOUT
HYDROGEOLOGIC STUDY
MILAN LESIC HOLDINGS INC.
126 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO

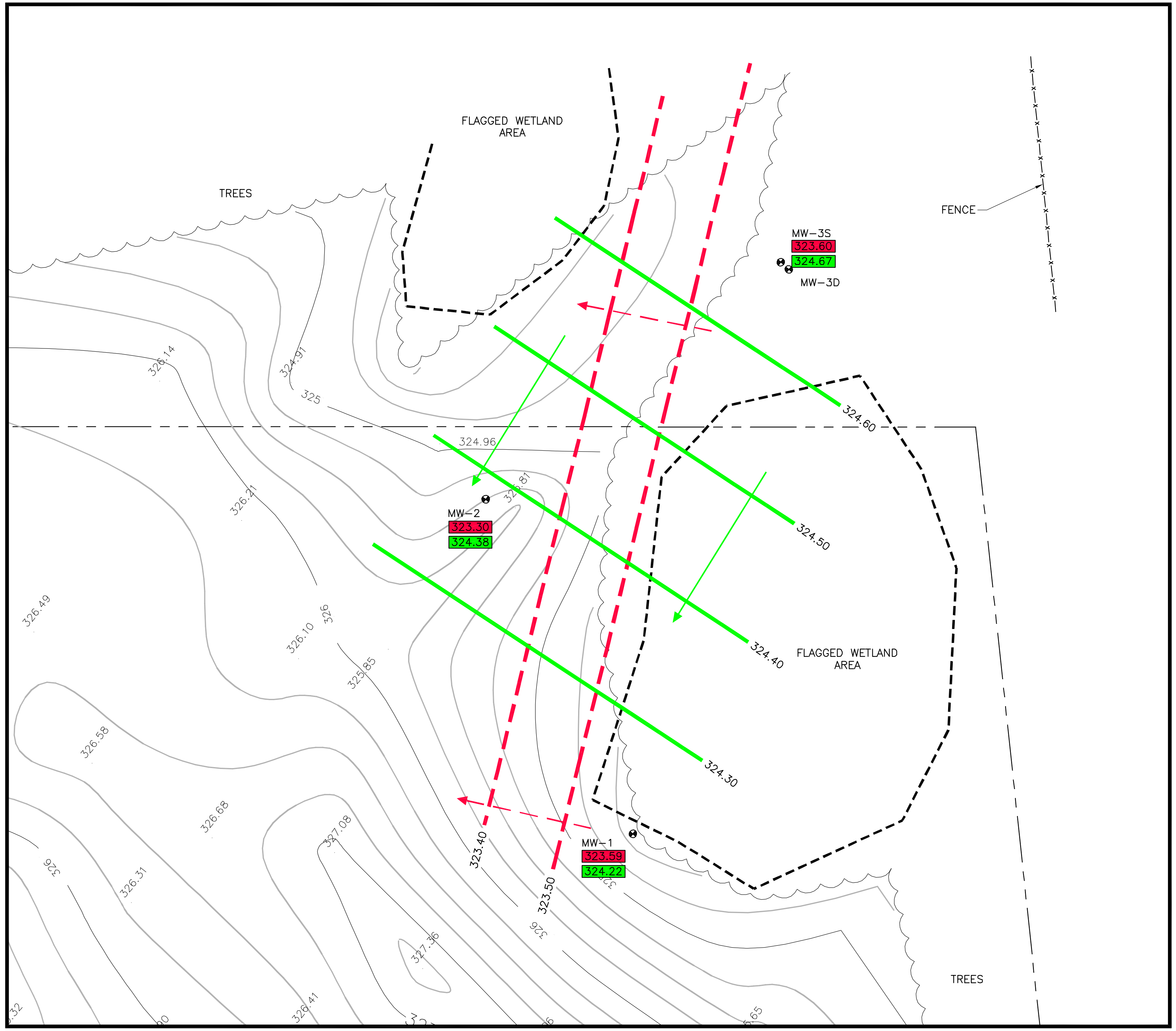
DATE	PROJ. NO.
FEBRUARY 2014	MBN13-274
FILE NO.	DWG. NO.
MBN13-274 – FIGS	FIG-03



KEY PLAN
N.T.S.

LEGEND:

323.50	GROUNDWATER ELEVATION CONTOUR, JANUARY, 24th 2014 (IN M AMSL)
MW-1 323.60	MONITORING WELL WITH GROUNDWATER ELEVATION, JANUARY, 24th 2014
324.20	GROUNDWATER ELEVATION CONTOUR, APRIL 3rd, 2014 (IN M AMSL)
MW-1 324.20	MONITORING WELL WITH GROUNDWATER ELEVATION, APRIL 3rd, 2014
	GROUNDWATER FLOW DIRECTION JANUARY, 24th 2014
	GROUNDWATER FLOW DIRECTION APRIL 3rd, 2014
	FLAGGED WETLAND AREA
	PROPERTY LIMITS
	FENCE
325.09	EXISTING GRADE



PARTIAL PLAN VIEW
1 : 400

SCALE BAR (1 : 400)
0 10m 20m 30m

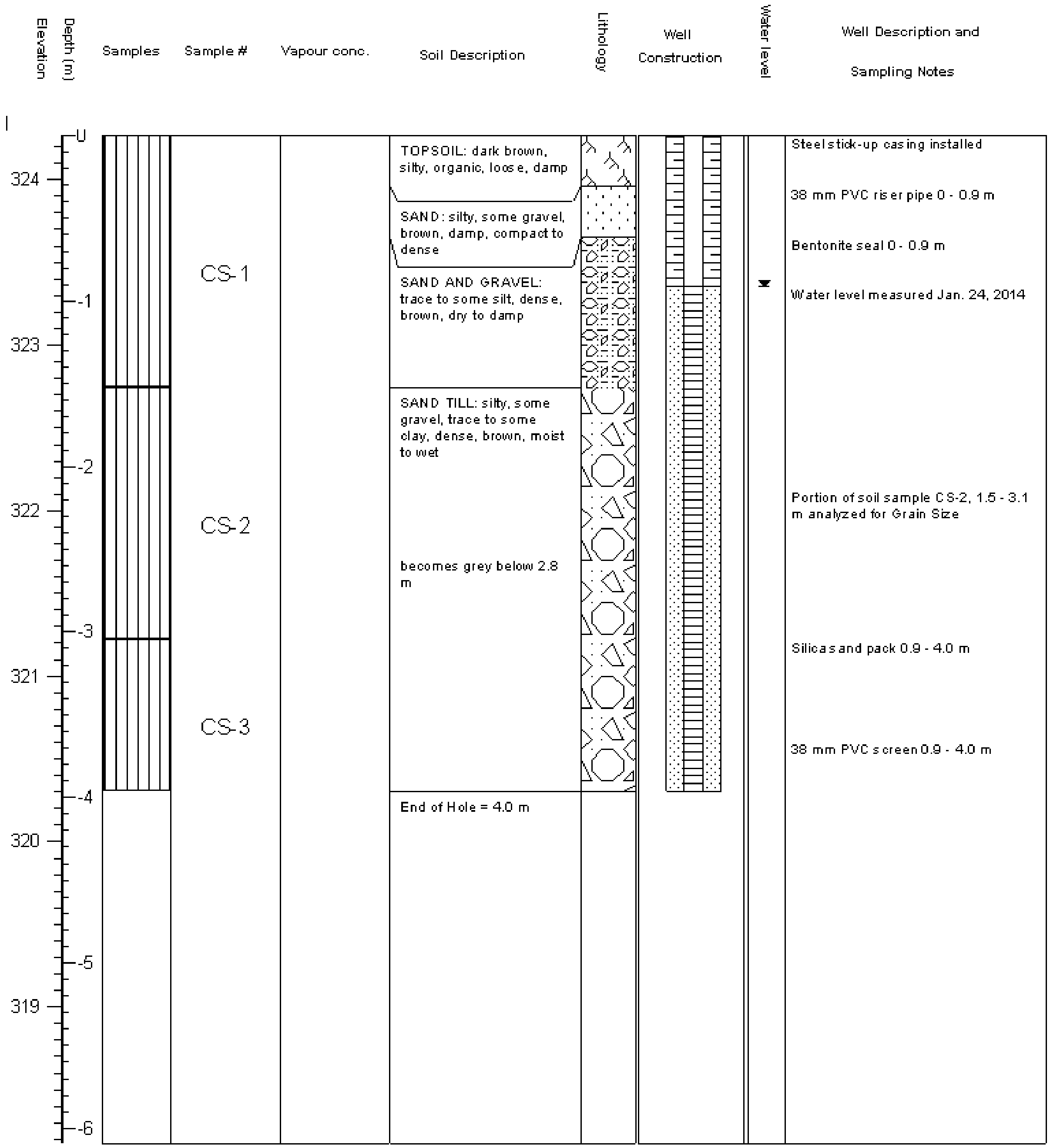
MBN environmental engineering inc 29 St. Charles Street East, Maryhill, On, N0B 2B0	FIGURE 5 GROUNDWATER CONTOURS HYDROGEOLOGIC STUDY MILAN LESIC HOLDINGS INC. 126 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO	DATE FEBRUARY 2014	PROJ. NO. MBN13-274
		FILE NO. MBN13-274 - FIGS	DWG. NO. FIG-05

BOREHOLE LOG

Borehole No.: BH/MW-1
Client: Milan Lesic Holdings
Project Location: 126 Brock Rd. S., Aberfoyle
Drilling Contractor: CMT
Drill Method: Direct Push
Logged by: BJL

MBN Environmental Engineering

Drill Date: Dec. 19, 2013
Ground Surface Elevation: 324.35 m
Top of Riser Elevation: 325.01 m
Job #: MBN13-274

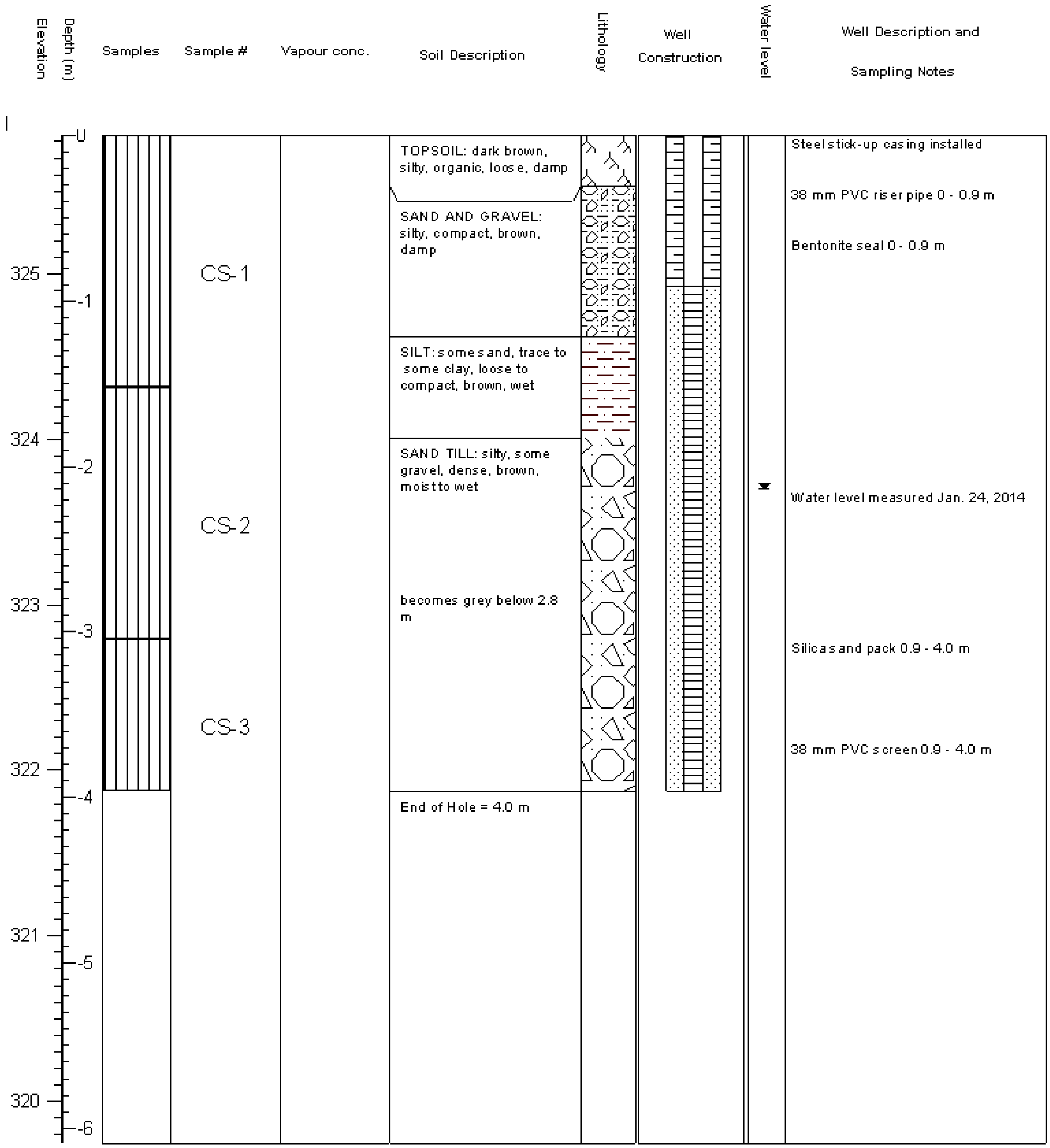


BOREHOLE LOG

MBN Environmental Engineering

Borehole No.: BH/MW-2
Client: Milan Lesic Holdings
Project Location: 126 Brock Rd. S., Aberfoyle
Drilling Contractor: CMT
Drill Method: Direct Push
Logged by: BJL

Drill Date: Dec. 19, 2013
Ground Surface Elevation: 325.92 m
Top of Riser Elevation: 326.41 m
Job #: MBN13-274



BOREHOLE LOG

MBN Environmental Engineering

Borehole No.: BH/MW-3S
Client: Milan Lesic Holdings
Project Location: 126 Brock Rd. S., Aberfoyle
Drilling Contractor: CMT
Drill Method: Direct Push
Logged by: BJL

Drill Date: Dec. 19, 2013
Ground Surface Elevation: 324.85 m
Top of Riser Elevation: 325.58 m
Job #: MBN13-274

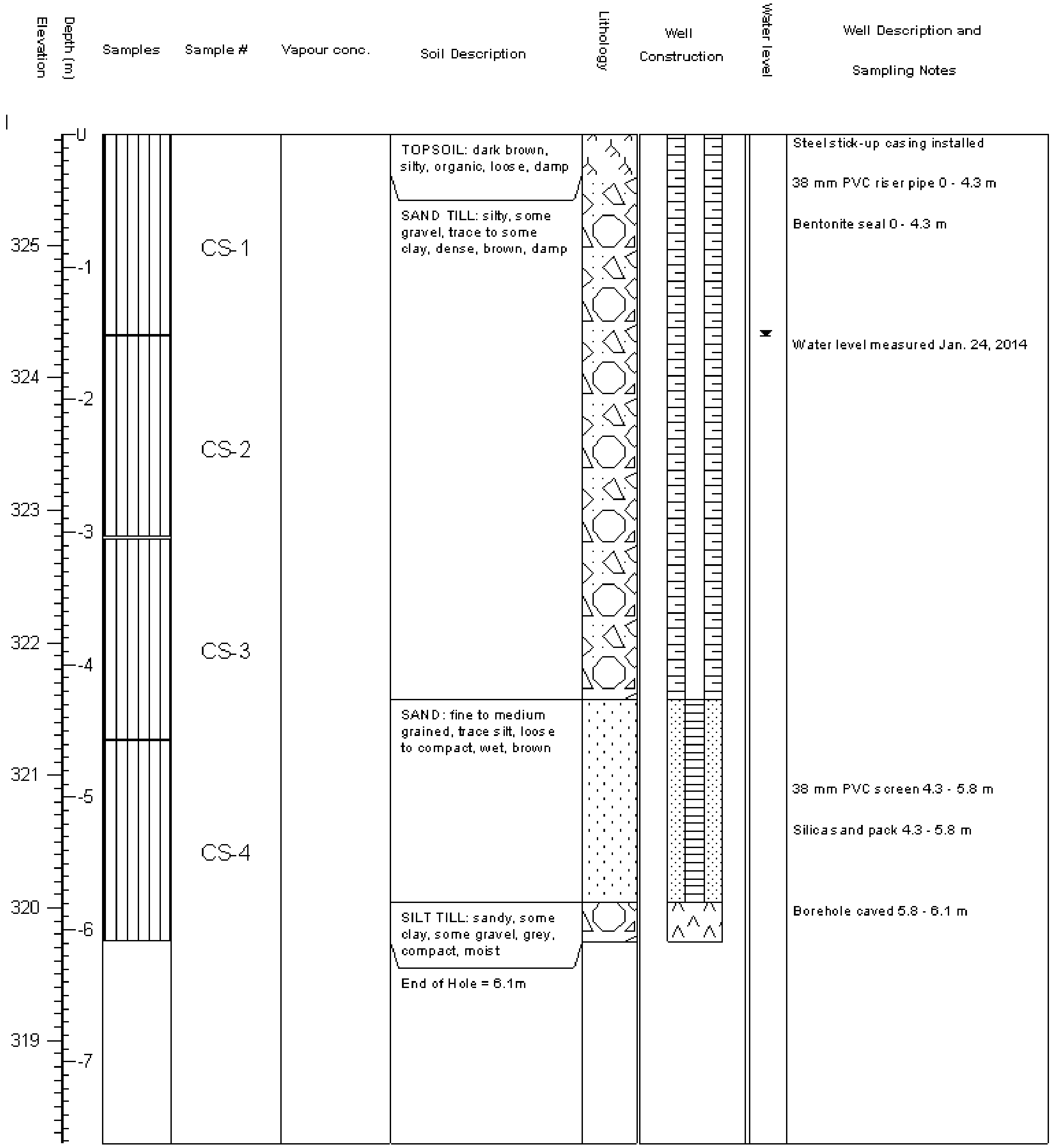
Elevation	Depth (m)	Samples	Sample #	Vapour conc.	Soil Description	Lithology	Well Construction	Water level	Well Description and Sampling Notes
	0				TOPSOIL: dark brown, silty, organic, loose, damp				Steel stick-up casing installed
					SAND TILL: silty, some gravel, trace to some clay, dense, brown, damp				38 mm PVC riser pipe 0 - 0.9 m
									Bentonite seal 0 - 0.9 m
325	-1		CS-1						
									Water level measured Jan. 24, 2014
324	-2		CS-2						
323	-3		CS-3						38 mm PVC screen 0.9 - 4.0 m
									Silica sand pack 0.9 - 4.0 m
322	-4				End of Hole = 4.0m				
321	-5								
320	-6								

BOREHOLE LOG

Borehole No.: BH/MW-3D
Client: Milan Lesic Holdings
Project Location: 126 Brock Rd. S., Aberfoyle
Drilling Contractor: CMT
Drill Method: Direct Push
Logged by: BJL

MBN Environmental Engineering

Drill Date: Dec. 19, 2013
Ground Surface Elevation: 324.85 m
Top of Riser Elevation: 325.82 m
Job #: MBN13-274



APPENDIX C
MECP Water Well Records

The Ontario Water Resources Commission Act

WATER WELL RECORD

40P/8g

WR#1

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6704352 | MUNICIP. 67012 | CON. con | 08

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	8	024

[redacted] suite 13, 1125 Dundas St E,Mississauga

DATE COMPLETED: DAY 1st 01 MO. Aug 08 YR. 72

21 | 17 | 564560 | NORTHING 4812680 | RC. 4 | ELEVATION 1050 | RC. 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
brown	coarse gravel	fine sand		0	10
brown	" "	" "	and clay	10	32
brown	gravel	fine sand		32	35
lt brown	rock			35	45
med. "	rock			45	60
dk "	rock			60	89
grey	rock			89	143

total depth – 143 ft.

1 – 12 inch drive shoe

31 | 0010611108 | 003361110805 | 0035041108 | 0060626 | 0143226

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0044	☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
0135	☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
12	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	.250	0	0036 (~~35~~)
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☒ OPEN HOLE		36	143
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN: SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET | MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

71 PUMPING TEST

PUMPING TEST METHOD: ☒ PUMP | PUMPING RATE 0208 (~~208~~) GPM | DURATION OF PUMPING 00 HOURS 00 MINS (~~24~~ HRS)

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
008 FEET	032 FEET	008 FEET	FEET	FEET	FEET

WATER LEVELS DURING: ☐ PUMPING ☒ RECOVERY

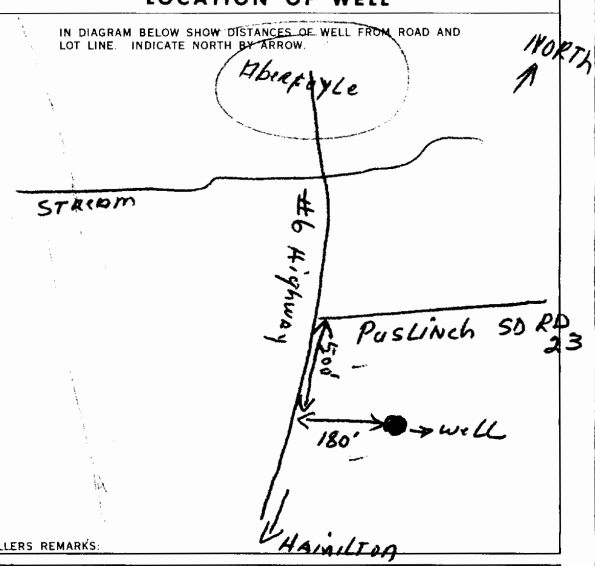
IF FLOWING, GIVE RATE ___ GPM. | PUMP INTAKE SET AT ___ FEET | WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 080 FEET | RECOMMENDED PUMPING RATE 0275 GPM.

___ GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL: ☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED

WATER USE 05: ☐ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☒ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF DRILLING: ☐ CABLE TOOL ☒ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: GRAHAM WELL DRILLING | LICENCE NUMBER: 2406

ADDRESS: R R # 2 Guelph Ont.

NAME OF DRILLER OR BORER: J Hawkins | LICENCE NUMBER

SIGNATURE OF CONTRACTOR: J L Graham per [redacted] | SUBMISSION DATE: DAY 25 MO. Aug YR. 72

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2406 | DATE RECEIVED 260972

DATE OF INSPECTION | INSPECTOR

REMARKS: APL | CSS.S8 | P | WI

OWRC COPY

WR#2

Ontario | Ministry of the Environment and Climate Change

Measurements recorded in: ☑ Metric ☑ Imperial

Well Tag No. (Place Sticker and/or Print Below)

Tag#: A190271

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
126 Brock Rd. S	Puslinch	024	8

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Guelph	Ontario	N1H 6H9

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	569545	4812963		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Finish grade	2.5' stick up	• Extend 12" well casing		
			• 20' extention		
			• Property being Filled		
	17.5' Filled	Bentonite grout	• grout anular space with Bentonite Hole plug.		
			• left 2.5' stick up to Allow For Further grading.		
	Original grade				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
		Bentonite Hole plug	12 bags

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ___ hrs + ___ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☑ Other, specify excavator

Well Use

☐ Public ☑ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify ☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning ☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
12"	steel	.250"	-17.5'	+2.5'

Status of Well

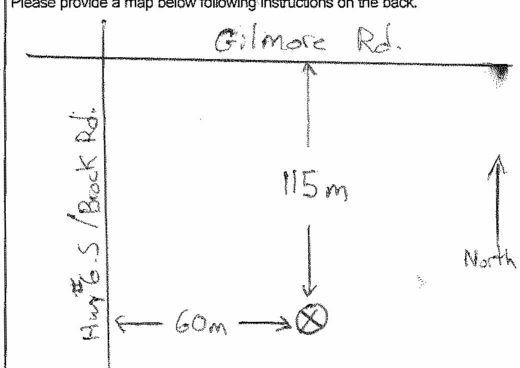
☑ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☑ Other, specify EXTENSION

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Map of Well Location

Please provide a map below following instructions on the back.



Water Details

Water found at Depth ___ (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Water found at Depth ___ (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Water found at Depth ___ (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Hanlon Well Drilling and Plumbing	7156

Business Address (Street Number/Name)	Municipality
5896 Wellington Rd 7 Guelph	

Province	Postal Code	Business E-mail Address
Ont	N1H 6J2	[redacted]

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5197638239	Hanlon, Henry

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
0590	[redacted]	20160627

Comments:

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	20160627	20160627

Ministry Use Only

Audit No. Z243735

Received JAN 17 2017

0506E (2014/11) Ministry's Copy

40P89

WR#3

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6707587 MUNICIP. 67012 CON. CON 08

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	8	024

OWNER (SURNAME FIRST): [redacted]
ADDRESS: RR3 Guelph
DATE COMPLETED: DAY 13 MO Feb YR 81

[redacted] 77 564460 NORTHING 4812760 RC 4 ELEVATION 1040 RC 4 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	clay			0	15
Grey	clay			15	47
Grey	Limestone			47	60

31 0015605 0047205 0060215

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0055	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06 ¼	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0047
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: — DEPTH TO TOP OF SCREEN: FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER
PUMPING RATE: 0012 GPM
DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
022 FEET	060 FEET	022 FEET	022 FEET	022 FEET	022 FEET

WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY
IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 050 FEET
RECOMMENDED PUMPING RATE: 0010 GPM

FINAL STATUS OF WELL: 1

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

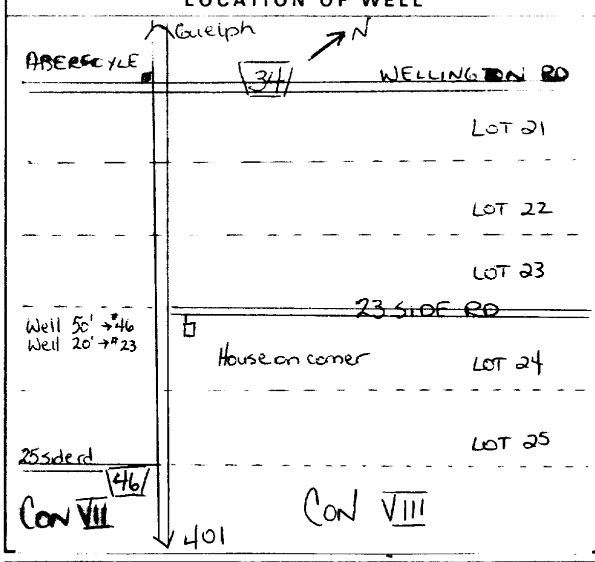
WATER USE: 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING: 4

1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

LOCATION OF WELL



CONTRACTOR

NAME OF WELL CONTRACTOR: [redacted] LICENCE NUMBER: 4208
ADDRESS: RR2 Ancaster
NAME OF DRILLER OR BORER: [redacted] LICENCE NUMBER: 4208
SIGNATURE OF CONTRACTOR: [redacted] SUBMISSION DATE: DAY 13 MO Feb YR 81

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 4208 DATE RECEIVED: 150182
DATE OF INSPECTION: June 20/84 INSPECTOR: KM
REMARKS: CSS.S8

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77 FORM 7

40P8g

WR#4

Ministry of the Environment

Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6707586 MUNICIP. 67012 CON. CON 08

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	8	024

OWNER (SURNAME FIRST): [redacted]

ADDRESS: RR3 Guelph

DATE COMPLETED: DAY 13 MO 02 YR 81

[redacted] 569520 NORTHING 4812840 ELEVATION 1040 RC 4 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	clay			0	15
Grey	clay			15	41
Grey	Limestone			41	45

31 0015605 0041205 0045215

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0042	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06 1/4	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	188	0	0041
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE: 0040 GPM

DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
021 FEET	040 FEET	021 FEET	021 FEET	021 FEET	021 FEET

WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: FEET

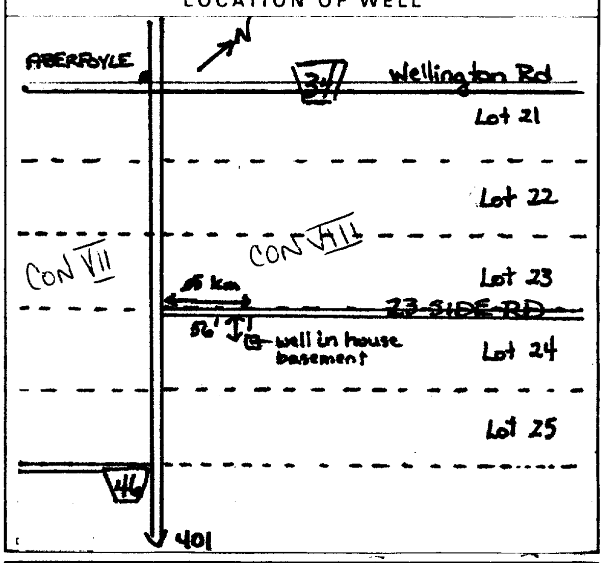
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 040 FEET

RECOMMENDED PUMPING RATE: 0010 GPM

LOCATION OF WELL



FINAL STATUS OF WELL: 1

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE: 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING: 4

1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: [redacted] LICENCE NUMBER: 4208

ADDRESS: RR no 2 Onnington

NAME OF DRILLER OR BORER: [redacted] LICENCE NUMBER: 4208

SIGNATURE OF CONTRACTOR: [redacted]

SUBMISSION DATE: DAY 13 MO Feb YR 81

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 4208 DATE RECEIVED: 150182

DATE OF INSPECTION: June 20/84 INSPECTOR: KM

REMARKS:

VF-14 CSS.S8

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77 FORM 7

WR#5

Ontario Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 | 6713755 | Municipality 67012 | Con. CON 07

32-01 c/o ABERFOYLE SPRINGS

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
WELLINGTON	PUSLINCH TWP	CON 7	23

Owner's surname	First Name	Address	Date completed
[redacted]	[redacted]	RR#3 GUELPH, ONT.	14 (day) 06 (month) 01 (year)

21 | Zone | Easting | Northing | RC | Elevation | RC | Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	SAND	GRAVEL		0	38
GREY	CLAY	SAND - GRAVEL		38	44
BROWN	ROCK			44	95
GREY	ROCK			95	120
			TOTAL DEPTH	120	
		6" DRIVE SHOE			

31

32

41 WATER RECORD

Water found at - feet	Kind of water
118-120	1 ☒ Fresh

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6"	1 ☒ Steel	.188	+1	45
6"	4 ☒ Open hole		45	120

SCREEN

Sizes of opening (Slot No.) | Diameter inches | Length feet
Material and type | Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
0	25	BENTONITE

71 PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
1 ☒ Pump 2 ☐ Bailer	8 GPM	1 Hours 0 Mins

Static level	Water level end of pumping	Water levels during	15 minutes	30 minutes	45 minutes	60 minutes
25 feet	72 feet	1 ☒ Pumping 2 ☐ Recovery	58 feet	69 feet	72 feet	72 feet

If flowing give rate ___ GPM | Pump intake set at ___ feet | Water at end of test: ☒ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☒ Deep | Recommended pump setting: 80 feet | Recommended pump rate: 8 GPM

FINAL STATUS OF WELL

1 ☒ Water supply
2 ☐ Observation well
3 ☐ Test hole
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE

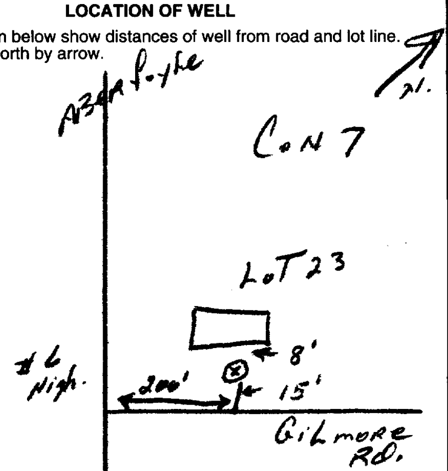
1 ☒ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool
2 ☐ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☒ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



224168

Name of Well Contractor	Well Contractor's Licence No.
GRAHAM WELL DRILLING LTD	2336
Address: RR#5 ROCKWOOD, ONT. N0B-2K0	
Name of Well Technician: JIM WILSON	Well Technician's Licence No.: T-1924
Signature of Technician/Contractor: [redacted]	Submission date: 30 (day) 06 (mo) 01 (yr)

MINISTRY USE ONLY

Data source	Contractor	Date received
	2336	JUL 09 2001
Date of inspection	Inspector	
Remarks		

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0506 (07/00) Front Form 9

WR#6

UTM 15 Z | | | | | E con VIII lot 23

N

Elev. 6 R 1045

Basin 23

67 № 2653

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Wellington Township, Village, Town or City Puslinch

Con. 8 Lot 23 Date completed 2 (day) nov (month) 66 (year)

Owner [redacted] Address Aberfoyle P.O.

Casing and Screen Record

Inside diameter of casing 6¼

Total length of casing 37

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 6¼

Pumping Test

Static level 24

Test-pumping rate 30 G.P.M.

Pumping level 30

Duration of test pumping 1 hr

Water clear or cloudy at end of test clear

Recommended pumping rate 10 G.P.M.

with pump setting of 30 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.
clay loam top soil small stones	0	5
Sand and Gravel in sandy clay	5	34
Gravel	34	37

Water Record

Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
37	fresh

For what purpose(s) is the water to be used? House D.

Is well on upland, in valley, or on hillside? upland (low area)

Drilling or Boring Firm Wesley Packham

Address Ancaster RR2

Licence Number 1986

Name of Driller or Borer [redacted]

Address RR2 Ancaster

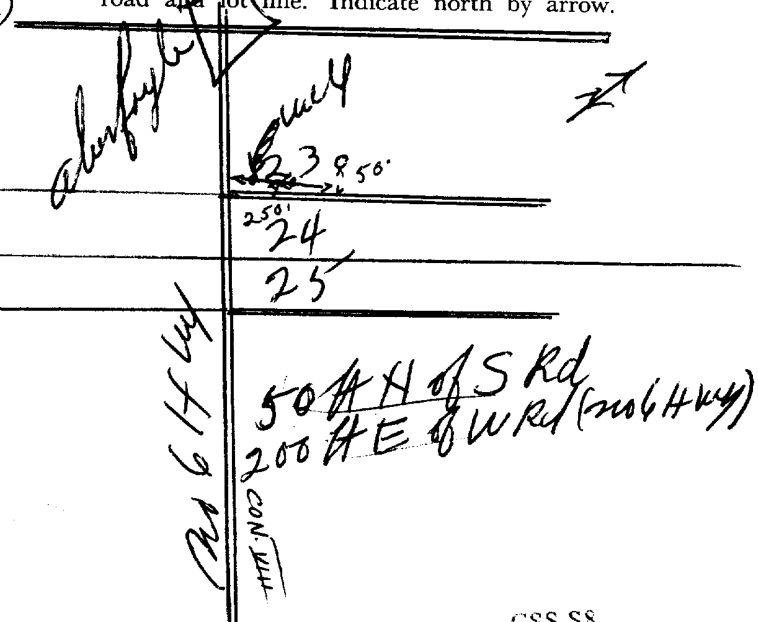
Date Nov 2/66

[redacted]

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

O W R C COPY

CSS.S8

WR#7

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 | 6711997 | Municipality 67012 | Con. CON 08

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Wellington	Puslinch	8	23

First name: [redacted]

Address: RR# 3 Guelph Ontario

Date completed: 8 day May month 96 year

21 | Zone | Easting | Northing | RC | Elevation | RC | Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	To
Brown	clay	stones boulders		0	33
Grey	gravel	stones clay		33	54
White	limestone			54	62
Grey	limestone			62	181

31

32

WATER RECORD

Water found at – feet	Kind of water
150	☒ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	To
6 5/8	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	.188	0	54
6	☐ Steel ☐ Galvanized ☐ Concrete ☒ Open hole ☐ Plastic		54	181
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type | Depth at top of screen feet

PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

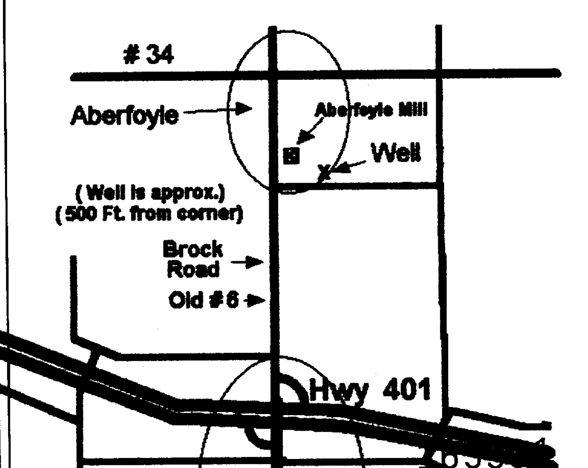
Depth set at – feet From	To	Material and type (Cement grout, bentonite, etc.)

PUMPING TEST

Pumping test method: ☒ Pump ☐ Bailer	Pumping rate: 60 GPM	Duration of pumping: 1 Hours 0 Mins		
Static level	Water level end of pumping	Water levels during ☐ Pumping ☐ Recovery		
		15 minutes	30 minutes	45 minutes / 60 minutes
26 feet	181 feet	30 feet	27 feet	27 feet / 26 feet
If flowing give rate: GPM	Pump intake set at: feet	Water at end of test: ☒ Clear ☐ Cloudy		
Recommended pump type: ☐ Shallow ☒ Deep	Recommended pump setting: 180 feet	Recommended pump rate: 60 GPM		

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



FINAL STATUS OF WELL

☒ Water supply ☐ Observation well ☐ Test hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Abandoned (Other) ☐ Dewatering ☐ Unfinished ☐ Replacement well

WATER USE

☐ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☒ Municipal ☐ Public supply ☐ Cooling & air conditioning ☐ Not used ☐ Other

METHOD OF CONSTRUCTION

☐ Cable tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☒ Rotary (air) ☐ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

Name of Well Contractor: Packham Well Drilling Inc | Well Contractor's Licence No.: 4207

Address: RR# 2 Ancaster Ontario

Name of Well Technician: [redacted] | Well Technician's Licence No.: T0058

Signature of Technician/Contractor: [redacted] | Submission date: day 8 May yr 96

MINISTRY USE ONLY

Data source | Contractor 4207 | Date received JUN 21 1996

Date of inspection | Inspector

Remarks

CSS.ES

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WR#8

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11

6712159

Municipality: 67012 | Con.: CON 08

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Wellington	Puslinch	VIII	23
[redacted]	Address: RR # 3 Guelph Ontario	Date completed: 29 day July month 96 year	

Easting | Northing | RC | Elevation | RC | Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	To
Brown	clay	stones gravel		0	61
Grey	limestone			61	180

WATER RECORD

Water found at – feet	Kind of water
100	☑ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
160	☑ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
170	☑ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	To
6 1/4	☑ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	188	0	61
6	☐ Steel ☐ Galvanized ☐ Concrete ☑ Open hole ☐ Plastic		61	180
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type | Depth at top of screen feet

PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

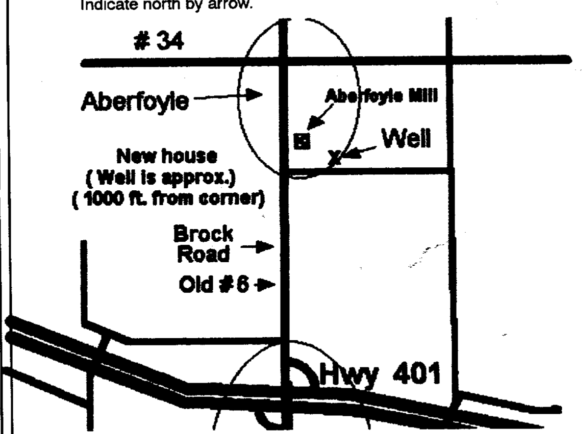
Depth set at – feet From	To	Material and type (Cement grout, bentonite, etc.)

PUMPING TEST

Pumping test method: ☑ Pump ☐ Bailer	Pumping rate: 4 GPM	Duration of pumping: 1 Hours 0 Mins		
Static level: 40 feet	Water level end of pumping: 180 feet	Water levels during ☐ Pumping ☐ Recovery		
15 minutes: 135 feet	30 minutes: 102 feet	45 minutes: 65 feet	60 minutes: 50 feet	
If flowing give rate: GPM	Pump intake set at: feet	Water at end of test: ☑ Clear ☐ Cloudy		
Recommended pump type: ☐ Shallow ☑ Deep	Recommended pump setting: 175 feet	Recommended pump rate: 4 GPM		

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



169286

FINAL STATUS OF WELL

☑ Water supply ☐ Observation well ☐ Test hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Abandoned (Other) ☐ Dewatering ☐ Unfinished ☐ Replacement well

WATER USE

☑ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public supply ☐ Cooling & air conditioning ☐ Not used ☐ Other ....

METHOD OF CONSTRUCTION

☐ Cable tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☑ Rotary (air) ☐ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other ....

Name of Well Contractor: Packham Well Drilling Inc	Well Contractor's Licence No.: 4207
Address: RR # 2 Ancaster Ontario	
Name of Well Technician: Mervyn Packham	Well Technician's Licence No.: T0058
Signature of Technician/Contractor: [redacted]	Submission date: 29 day July mo 96 yr

MINISTRY USE ONLY

Data source	Contractor: 4207	Date received: JAN 15 1997
Date of inspection	Inspector	
Remarks	CSS. S	

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83-12

Ontario Ministry of the Environment

Well Tag Tag#: A136313 A136313

Well Record

Regulation 903 Ontario Water Resources Act

Page ______ of ______

WR#9

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	MORGUARD INVESTMENTS LIMITED		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
55 CITY CENTER DR SUITE 800	MISSISSAUGA	ON	L5B1M3	9052813800

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
7474 McLEAN RD	PUSLINCH	25	8

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON	GUELPH, ON.	Ontario	N1H6H9

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	569789	4812664		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BROWN	CLAY	STONES		0	38
BROWN	GRAVEL	SAND - CLAY		38	72
GREY	CLAY	GRAVEL - SAND		72	75
RED BROWN	ROCK		FRACTURED	75	110
DK. BROWN	ROCK			110	130
GREY	ROCK			130	180
		WELL #1	TOTAL DEPTH	180'	

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE	

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 70FT

Pumping rate (l/min / GPM): 16GPM

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 52FT

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 70FT

Recommended pump rate (l/min / GPM): 16+ GPM.

Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	52FT		
1		1	52FT
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☒ Other, specify AIR ROTARY

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☒ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/8	STEEL	.188	+2	78
6 1/8	OPEN HOLE		78	180

Status of Well

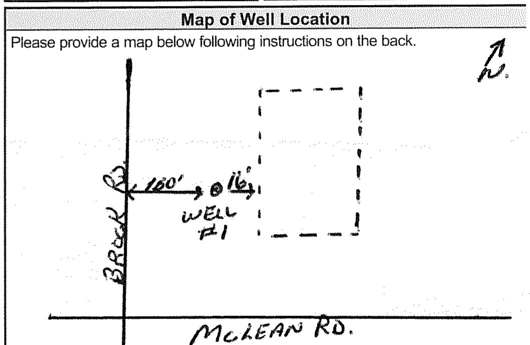
☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Water Details

Water found at Depth	Kind of Water
82' (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify
88' (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify
170' (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	10"
20	180	6 1/8"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
JIM WILSON WELL DRILLING LTD	7385

Business Address (Street Number/Name)	Municipality
551 EBYCREST RD.	WATERLOO

Province	Postal Code	Business E-mail Address
ON.	N2J4G8	

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5196482412	WILSON JAMES.

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3SST 1964	[redacted]	20120928

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	20120912	20120912

Ministry Use Only

Audit No. Z158663

Received OCT 09 2012

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Ministry's Copy

84-12

Ontario Ministry of the Environment

Well Tag N: **Tag#: A136314** A136314

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

WR#10

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	MORGUARD INVESTMENTS LIMITED		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
55 CITY CENTER DR SUITE 800	MISSISSAUGA	ON	L5B1M3	9052813800

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
7474 McLEAN RD	PUSLINCH	25	8

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON	GUELPH	Ontario	N1H6H9

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	569787	4812670		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BROWN	CLAY	STONES		0	40
BROWN	GRAVEL	SAND - CLAY		40	70
GREY	GRAVEL	SAND - CLAY		70	73
MED. BROWN	ROCK			73	108
DK. BROWN	ROCK			108	128
GREY	ROCK			128	180
		WELL #2	TOTAL DEPTH	180 FT	

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE	

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 70 FT

Pumping rate (l/min / GPM): 16 GPM

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 52 FT

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 70 FT

Recommended pump rate (l/min / GPM): 16 +

Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	52 FT		
1		1	52 FT
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☒ Other, specify AIR ROTARY

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☒ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/8	STEEL	.188	+2	75
6 1/8	OPEN HOLE		75	180

Status of Well

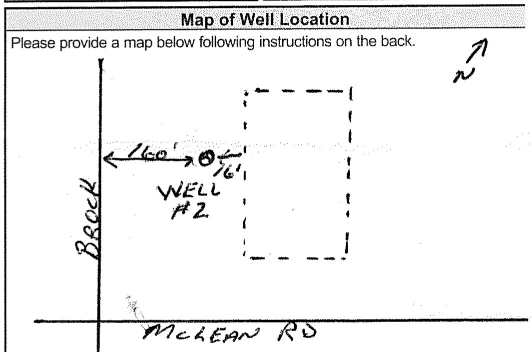
☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Water Details

Water found at Depth	Kind of Water
80 FT (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify
85 FT (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify
170 FT (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	10"
20	180	6 1/8

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
JIM WILSON WELL DRILLING LTD	7385

Business Address (Street Number/Name)	Municipality
551 EBYCREST RD.	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N2J 4G8	

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5196482412	WILSON JAMES.

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T1919	[redacted]	20120928

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	20120913	20120913

Ministry Use Only

Audit No. Z158664

Received OCT 09 2012

APPENDIX D
Geotechnical Borehole Logs
Test Pit Logs & Grain Size Analyses

FILE No: G22518

BOREHOLE No. 1

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 28 - 22**

Ground Elevation: **320.37 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	REMARKS
320.27 / 0.10	100 mm TOPSOIL					
	very loose to compact, brown FILL, sand and silt trace gravel, trace topsoil/rootlets damp to moist	1	SS	16		
		2	SS	5		
318.17 / 2.20		3	SS	3		
	dense to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist	4	SS	61		
		5	SS	53		dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
315.32 / 5.05		6	SS	40		
	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80

WATER CONTENT (%): W_P W W_L; 10 20 30

WELL DATA

DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Enclosure No.: 2
Sheet 1 of 1

FILE No: G22518 BOREHOLE No. 2

Client:	**Collaborative Structures Limited**
Project:	**Proposed Industrial Warehouse Development**
Location:	**128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine:	**Diedrich D50T**
Method:	**Hollow Stem Auger**
Size:	**83 mm I.D.**
Date:	**Sep 27 - 22** TO **Sep 27 - 22**

Ground Elevation: **321.64 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
321.56 / 0.08	75 mm TOPSOIL					
	loose, brown, FILL, sandy silt to sand and silt, trace gravel, moist					
320.94 / 0.70	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to somegravel, trace clay; occ. cobbles; moist	1	SS	60		
		2	SS	40		
		3	SS	28		
		4	SS	42		dry borehole cave-in at 3.95 m bgs upon withdrawal of drilling augers
		5	SS	32		
316.59 / 5.05	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ — 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ — 20 40 60 80
WATER CONTENT (%): W_P W W_L — 10 20 30
WELL DATA

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Enclosure No.: 3
Sheet 1 of 1

FILE No: G22518 — BOREHOLE No. 3

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

SOIL LITHOLOGY

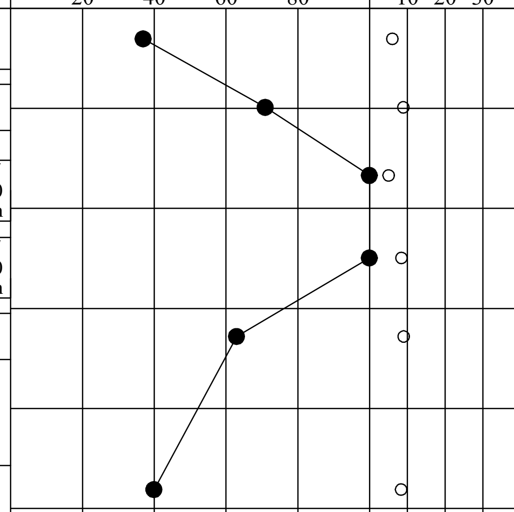
Ground Elevation: **322.53 m**

ELEV./ DEPTH (m)	DESCRIPTION
322.40 / 0.13	125 mm TOPSOIL
	dense to very dense, brown SAND AND SILT trace gravel damp to moist
320.43 / 2.10	very dense to dense, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist
317.48 / 5.05	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	37
2	SS	71
3	SS	50/ 140 mm
4	SS	50/ 100 mm
5	SS	63
6	SS	40

SHEAR STRENGTH (kPa) — FIELD VANE: Peak ⊗ Rem. × — LAB TEST: Unc. ■ P.P. □ — 50 100 150 200
PENETRATION RESISTANCE — STANDARD ● DYN. CONE ○ — 20 40 60 80
WATER CONTENT (%) — W_P W W_L — 10 20 30



WELL DATA

REMARKS

4.0 – dry borehole cave-in at 3.95 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 4

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

Ground Elevation: **323.93 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	DEPTH (m)	REMARKS
323.83 / 0.10	100 mm TOPSOIL					
	very dense, brown SAND AND GRAVEL TO GRAVELLY SAND some silt to silty freq. cobbles damp to moist	1	SS	50	1.0	
		2	SS	59	1.75	
		3	SS	52	2.5	
		4	SS	61	3.25	
319.98 / 3.95	compact, grey SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay moist to wet	5	SS	14	4.75	
					5.5	dry borehole cave-in at 5.50 m bgs upon withdrawal of drilling augers
		6	SS	15	6.25	
317.38 / 6.55	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA

Depth scale (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 5

Client: **Collaborative Structures Limited**
Project: **Proposed Industrial Warehouse Development**
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA
Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **320.24 m**

ELEV./DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	REMARKS
320.14 / 0.10	100 mm TOPSOIL						
	dense to very dense, brown SILTY SAND trace to some gravel occ. cobbles damp	1.0	1	SS	45		
		1.75	2	SS	38		
		2.5	3	SS	50/100 mm		
317.34 / 2.90	dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist	3.3	4	SS	43		
		4.8	5	SS	40		dry borehole cave-in at 4.40 m bgs upon withdrawal of drilling augers
315.19 / 5.05	End of Borehole						

Chart headings: SHEAR STRENGTH (kPa) — FIELD VANE: Peak ⊗ Rem. × — LAB TEST: Unc. ■ P.P. □ — 50 100 150 200; PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ — 20 40 60 80; WATER CONTENT (%) W_P W W_L — 10 20 30; WELL DATA.

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 6

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

SOIL LITHOLOGY — Ground Elevation: **321.25 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
321.15 / 0.10	100 mm TOPSOIL	1	SS	50/ 125 mm	
	dense to very dense, brown SAND AND SILT trace gravel occ. cobbles damp	2	SS	30	
		3	SS	50/ 100 mm	elevated "N"-value due to cobble inclusion
319.10 / 2.15	very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles occ. sand seams moist	4	SS	58	
		5	SS	50/ 125 mm	
		6	SS	50	
		7	SS	52	
316.20 / 5.05	End of Borehole				borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80
WATER CONTENT (%): W_P W W_L; 10 20 30
WELL DATA

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 7

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **322.18 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
322.08 / 0.10	100 mm TOPSOIL						
	dense, brown SAND AND SILT trace to some gravel moist	1.0	1	SS	41		
320.83 / 1.35	dense, brown Fine to Medium SAND some silt, trace to some gravel damp	1.75	2	SS	34		
		2.5	3	SS	31		
		3.25	4	SS	38		
317.63 / 4.55	very dense, brown, SANDY SILT TILL, trace gravel, trace clay, occ. cobbles, moist	4.8	5	SS	58		
317.13 / 5.05	End of Borehole						borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA

PROJECT MANAGER: **JV**

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Enclosure No.: 8
Sheet 1 of 1

FILE No: G22518 BOREHOLE No. 8

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **323.45 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
323.32 / 0.13	125 mm TOPSOIL				
	compact, brown, FILL, silty sand, trace to some gravel, damp	1	SS	26	
322.75 / 0.70	dense, brown SILTY SAND trace to some gravel occ. silt seams damp	2	SS	32	
		3	SS	48	
321.60 / 1.85	compact to dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist	4	SS	33	
		5	SS	26	
		6	SS	30	
318.40 / 5.05	End of Borehole				borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 BOREHOLE No. 9

Client: **Collaborative Structures Limited**
Project: **Proposed Industrial Warehouse Development**
Location: **128 Brock Road South, Puslinch, Ontario**

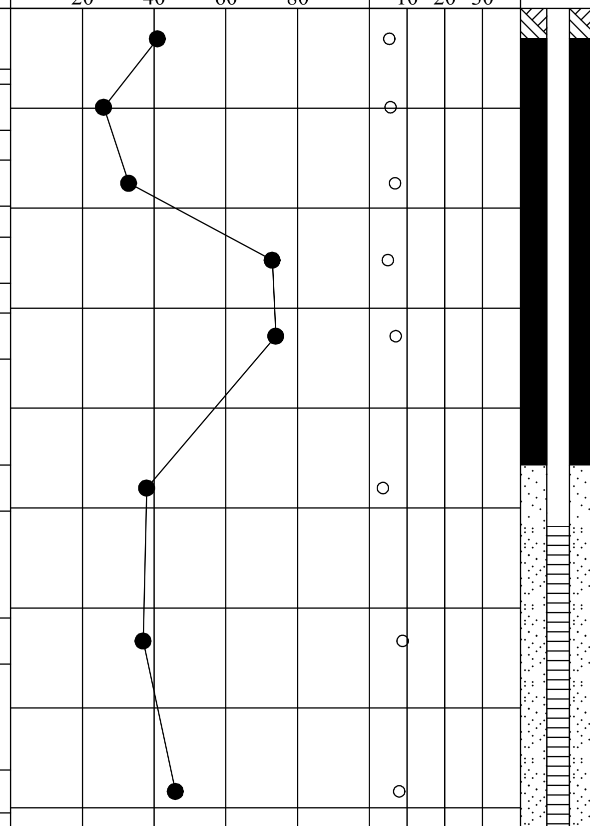
EQUIPMENT DATA
Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 29 - 22** TO **Sep 29 - 22**

SOIL LITHOLOGY

Ground Elevation: **320.44 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
320.34 / 0.10	100 mm TOPSOIL				monument casing set in concrete
	compact to very dense, brown SILTY SAND TO SAND AND SILT trace to some gravel occ. cobbles damp	1	SS	41	
		2	SS	26	
		3	SS	33	bentonite seal/50 mm I.D. PVC riser (2.0 m)
		4	SS	73	
317.54 / 2.90	dense to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. to freq. cobbles moist ------ sand and gravel layer ------	5	SS	74	
		6	SS	38	
		7	SS	37	3.05 m long, 50 mm I.D. PVC screen with sandpack (6.0 m)
		8	SS	46	
312.19 / 8.25	End of Borehole				monitoring well measured dry on October 5, 2022 (13.0 m)

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200
PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80
WATER CONTENT (%) W_P W W_L 10 20 30



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FILE No: G22518

BOREHOLE No. 10

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 29 - 22** TO **Sep 29 - 22**

Ground Elevation: **321.01 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	REMARKS
320.91 / 0.10	100 mm TOPSOIL					
319.66 / 1.35	dense, brown SILTY SAND some gravel, occ. cobbles damp	1	SS	38		
317.81 / 3.20	compact to very dense, brown SAND AND SILT TILL trace gravel, trace clay occ. cobbles moist	2	SS	60		
		3	SS	24		
315.96 / 5.05	compact, brown SILTY SAND AND GRAVEL damp to saturated	4	SS	28		
		5	SS	29		dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

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FILE No: G22518 BOREHOLE No. 11

Client: **Collaborative Structures Limited**
Project: **Proposed Industrial Warehouse Development**
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA
Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 29 - 22**

SOIL LITHOLOGY — Ground Elevation: **321.73 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	REMARKS
321.61 / 0.13	125 mm TOPSOIL					
	dense to very dense, brown SILTY SAND AND GRAVEL occ. cobbles damp	1	SS	60		
		2	SS	36		
		3	SS	57		
319.28 / 2.45	dense to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. to freq. cobbles occ. sand seams moist	4	SS	50		
		5	SS	41		
		6	SS	50/ 100 mm		
316.73 / 5.00	End of Borehole					borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)
WELL DATA

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 12

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **322.94 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
322.86 / 0.08	75 mm TOPSOIL					
321.59 / 1.35	dense, brown SAND AND SILT some gravel damp	1	SS	35		
317.89 / 5.05	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay; occ. to freq. cobbles; moist	2	SS	23		
		3	SS	21		
		4	SS	31		
		5	SS	52		borehole open and dry upon withdrawal of drilling augers
	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 13

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 29 - 22** TO **Sep 29 - 22**

Ground Elevation: **319.74 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
319.71 / 0.03	25 mm TOPSOIL					
	compact to very dense, brown SAND AND GRAVEL TO GRAVELLY SAND some silt, freq. cobbles damp	1	SS	23		
		2	SS	58		
317.64 / 2.10	compact, brown Fine to Medium SAND some silt to silty, trace to some gravel occ. cobbles damp to moist	3	SS	23		
		4	SS	27		
		5	SS	39		dry borehole cave-in at 5.20 m bgs upon withdrawal of drilling augers
		6	SS	50/ 125 mm		
313.34 / 6.40	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80
WATER CONTENT (%): W_P W W_L; 10 20 30
WELL DATA

DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 BOREHOLE No. 14

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 29 - 22** TO **Sep 30 - 22**

SOIL LITHOLOGY

Ground Elevation: **320.40 m**

ELEV./ DEPTH (m)	DESCRIPTION
320.30 / 0.10	100 mm TOPSOIL
319.70 / 0.70	very dense, brown, SILTY SAND, trace gravel, damp
316.45 / 3.95	very dense to compact, brown GRAVELLY SAND TO SAND AND GRAVEL trace to some silt freq. cobbles occ. to freq. silt seams damp to moist -------- wet/saturated silt seam
313.85 / 6.55	dense to compact brown to grey SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist

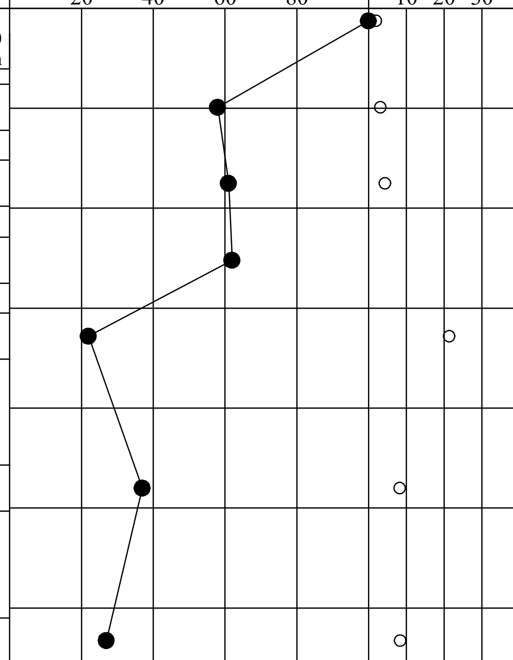
SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	50/ 100 mm
2	SS	58
3	SS	61
4	SS	62
5	SS	22
6	SS	37
7	SS	27

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA



DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

REMARKS

6.5 – borehole open and dry upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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FILE No: G22518 BOREHOLE No. 15

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Sep 30 - 22**

Ground Elevation: **321.41 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
321.28 / 0.13	125 mm TOPSOIL				
	dense to very dense, brown SILTY SAND some gravel occ. cobbles damp	1	SS	32	
		2	SS	44	
		3	SS	50	
318.51 / 2.90	very dense, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles damp to moist	4	SS	50	
		5	SS	55	
316.36 / 5.05	End of Borehole				borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 16

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Sep 30 - 22**

Ground Elevation: **322.49 m**

ELEV./ DEPTH (m)	SOIL LITHOLOGY DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
322.39 / 0.10	100 mm TOPSOIL					
	compact, brown SILTY SAND trace to some gravel occ. cobbles damp	1	SS	27		
		2	SS	23		
		3	SS	49		
		4	SS	34		
		5	SS	37		
318.39 / 4.10	dense, brown, SANDY SILT TILL trace to some gravel, trace clay occ. cobbles moist to wet					dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
		6	SS	40		
317.44 / 5.05	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ — 50, 100, 150, 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ — 20, 40, 60, 80
WATER CONTENT (%): W_P W W_L — 10, 20, 30
WELL DATA

Depth scale (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0

CVD BOREHOLE (2017) G22518 100 BROCK ROAD S, ABERFOYLE.GPJ CVD_ENG.GDT 22-12-21

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 17

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%) | WELL DATA | REMARKS

FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT: W_P W W_L (10, 20, 30)

Ground Elevation: **319.40 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE
	compact to very dense, brown FILL, sand and silt some gravel, trace topsoil/organics occ. cobbles moist	1	SS	16
318.10 / 1.30		2	SS	18
	compact, brown GRAVELLY SAND TO SAND AND GRAVEL trace to some silt occ. cobbles occ. silty lenses/seams damp to moist	3	SS	21
		4	SS	39
		5	SS	50/ 50 mm
314.80 / 4.60	End of Borehole	6	SS	50/ 50 mm

REMARKS: dry borehole cave-in at 2.75 m bgs upon withdrawal of drilling augers

DEPTH (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 18

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Oct 03 - 22**

SOIL LITHOLOGY

Ground Elevation: **320.28 m**

ELEV./ DEPTH (m)	DESCRIPTION
320.18 / 0.10	100 mm TOPSOIL
	compact to dense, brown GRAVELLY SAND TO SAND AND GRAVEL some silt occ. cobbles damp to moist
313.73 / 6.55	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE	Approx. Depth (m)	Water Content (%)
1	SS	15	1.0	~10
2	SS	24	1.75	~10
3	SS	43	2.5	~8
4	SS	34	3.25	~8
5	SS	47	4.75	~8
6	SS	49	6.3	~8

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

REMARKS:
4.0 m — dry borehole cave-in at 3.95 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 19

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Sep 30 - 22**

Ground Elevation: **320.89 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	REMARKS
320.79 / 0.10	100 mm TOPSOIL					
318.79 / 2.10	compact to dense, brown GRAVELLY SAND some silt to silty occ. cobbles damp	1	SS	28		
		2	SS	24		
		3	SS	30		
317.99 / 2.90	compact, brown SILTY SAND, trace gravel damp	4	SS	19		
315.84 / 5.05	compact, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles damp to moist	5	SS	25		
		6	SS	27		dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

PROJECT MANAGER: **JV**

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FILE No: G22518 | **BOREHOLE No. 20**

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

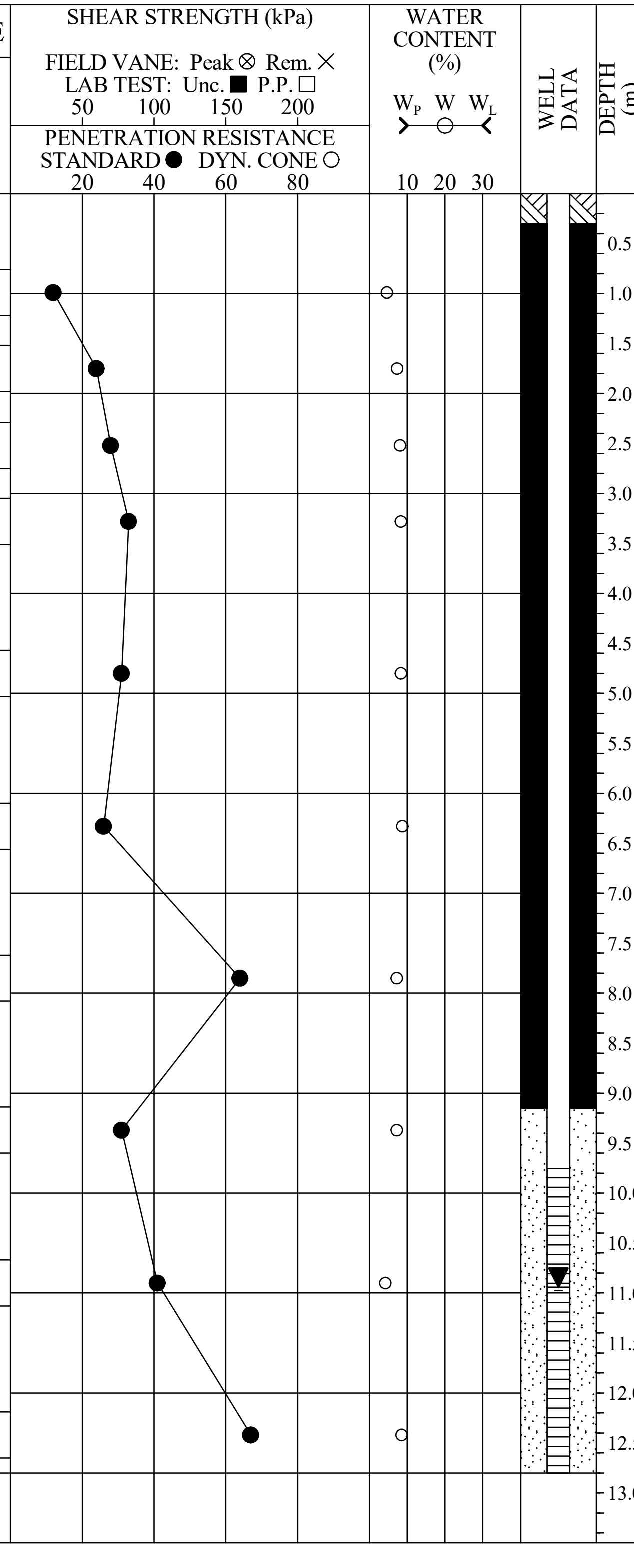
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Oct 03 - 22** TO **Oct 03 - 22**

Ground Elevation: **322.22 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
322.12 / 0.10	100 mm TOPSOIL				monument casing set in concrete
320.12 / 2.10	compact, brown SILTY SAND TO SAND AND SILT trace gravel damp to moist	1	SS	12	
		2	SS	24	
310.62 / 11.60	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay; occ. to freq. cobbles; damp to moist; -------- grey	3	SS	28	
		4	SS	33	bentonite seal/50 mm I.D. PVC riser (3.0)
		5	SS	31	
		6	SS	26	
		7	SS	64	
		8	SS	31	
		9	SS	41	3.05 m long, 50 mm I.D. PVC screen with sandpack (10.0); water level in monitoring well measured to 10.94 m bgs on October 5, 2022 (11.0)
309.42 / 12.80	very dense, brown SILTY SAND AND GRAVEL occ. cobbles saturated	10	SS	67	
	End of Borehole				



PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 21

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

SOIL LITHOLOGY — Ground Elevation: **323.67 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
323.54 / 0.13	125 mm TOPSOIL				monument casing set in concrete
	compact to loose, dark brown FILL, sand and silt to sandy silt trace gravel, trace to some topsoil/rootlets occ. cobbles damp to moist	1	SS	18	
		2	SS	17	
		3	SS	10	bentonite seal/50 mm I.D. PVC riser (at 2.0 m)
		4	SS	6	
320.77 / 2.90	dense to compact, brown SILTY SAND AND GRAVEL occ. cobbles occ. silt seams damp	5	SS	34	
		6	SS	30	
318.97 / 4.70	compact, brown SILT, some sand saturated	7	SS	28	water level in monitoring well measured to 4.72 m bgs on Ocotber 5, 2022
318.17 / 5.50	compact, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist to wet	8	SS	17	3.05 m long, 50 mm I.D. PVC screen with sandpack (at 6.5 m)
		9	SS	22	
315.57 / 8.10	End of Borehole				

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA
DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 22

Client: **Collaborative Structures Limited**
Project: **Proposed Industrial Warehouse Development**
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

Ground Elevation: **323.14 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
323.07 / 0.08	75 mm TOPSOIL					
	compact, dark brown FILL, sandy silt to sand and silt, trace gravel, trace topsoil/rootlets, damp to moist	1	SS	15		
		2	SS	14		
321.84 / 1.30	very dense, brown SILTY SAND AND GRAVEL, occ. cobbles, moist	3	SS	61		
321.04 / 2.10	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL, trace to some gravel, trace clay, occ. cobbles, moist	4	SS	64		
		5	SS	38		
		6	SS	46		
		7	SS	29		dry borehole cave-in at 6.70 m bgs upon withdrawal of drilling augers
		8	SS	41		
315.04 / 8.10	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA

PROJECT MANAGER: **JV**

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Enclosure No.: 23
Sheet 1 of 1

FILE No: G22518 BOREHOLE No. 23

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

Ground Elevation: **323.92 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	WELL DATA	REMARKS
323.85 / 0.08	75 mm TOPSOIL						
	compact to very dense, brown SILTY SAND AND GRAVEL; occ. cobbles; occ. to freq. silt seams; moist	1	SS	40			
		2	SS	74			
		3	SS	26			
		4	SS	87			
		5	SS	50/ 125 mm			
319.92 / 4.00	compact, brown SILTY SAND; trace gravel; occ. coarse sand seams; moist to saturated	6	SS	25		∇ (at 5.20 m)	wet borehole cave-in at 5.20 m bgs upon withdrawal of drilling augers
318.42 / 5.50	compact, grey SANDY SILT TILL TO SAND AND SILT TILL; trace to some gravel, trace clay; moist	7	SS	27			
		8	SS	27			
315.82 / 8.10	End of Borehole						

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80
WATER CONTENT (%): W_P W W_L; 10 20 30
DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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Enclosure No.: 24
Sheet 1 of 1

FILE No: G22518 — BOREHOLE No. 24

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

SOIL LITHOLOGY

Ground Elevation: **319.20 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
319.06 / 0.14	140 mm TOPSOIL				
	compact to very dense, brown SILTY SAND AND GRAVEL occ. cobbles damp	1	SS	28	
		2	SS	14	dry borehole cave-in at 1.20 m bgs upon withdrawal of drilling augers
		3	SS	34	
		4	SS	31	
		5	SS	56	
315.70 / 3.50	End of Borehole				

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

PROJECT MANAGER: **JV**

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FILE No: G22518 BOREHOLE No. 25

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

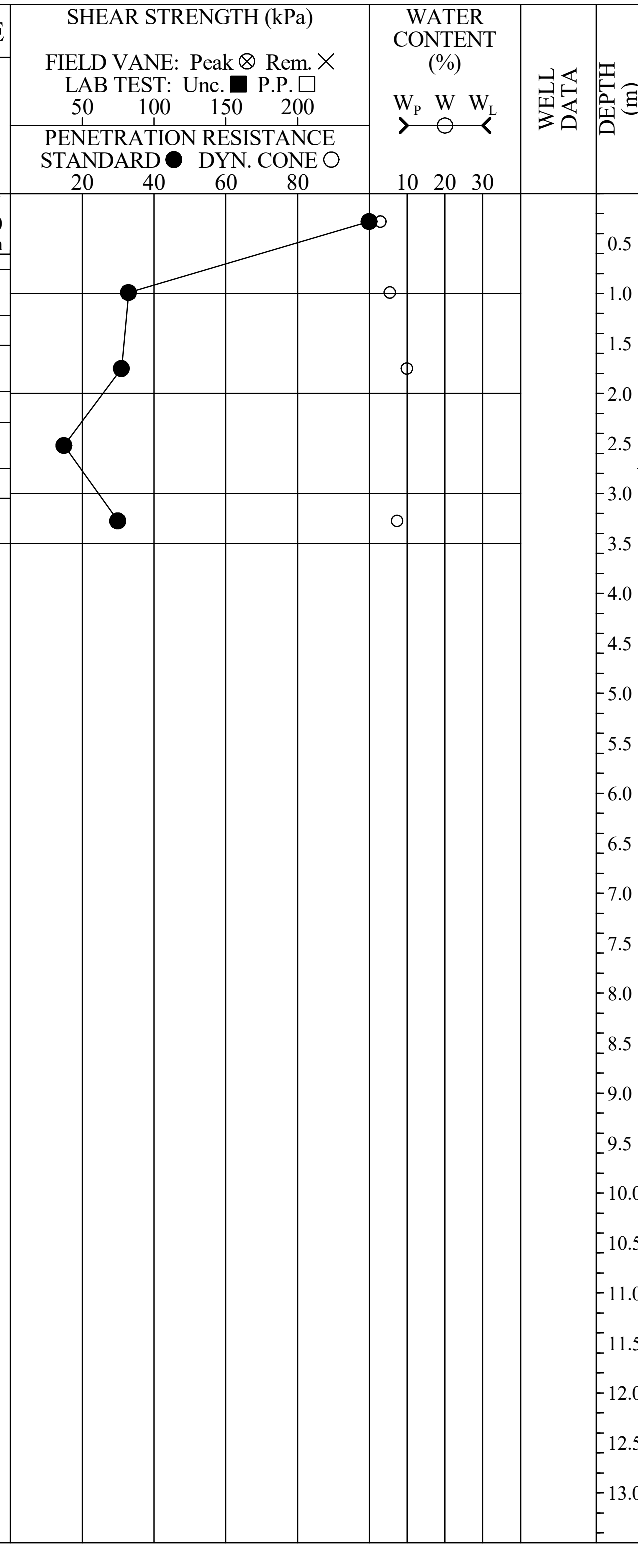
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

Ground Elevation: **319.41 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
	very dense to compact dark brown to brown FILL, silty sand some gravel to gravelly occ. cobbles moist	1	SS	50/ 100 mm	
		2	SS	33	
		3	SS	31	
		4	SS	15	dry borehole cave-in at 2.75 m bgs upon withdrawal of drilling augers
316.51 2.90	dense, brown SILTY SAND AND GRAVEL damp	5	SS	30	
315.91 3.50	End of Borehole				



PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 26

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

Ground Elevation: **317.41 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
317.31 / 0.10	100 mm TOPSOIL				
	dense to very dense, dark brown FILL, silty gravelly sand, trace topsoil/rootlets, occ. cobbles, damp	1	SS	74	
		2	SS	45	dry borehole cave-in at 1.20 m bgs upon withdrawal of drilling augers
315.91 / 1.50	dense to very dense, brown SAND AND GRAVEL some silt to silty damp	3	SS	50/ 125 mm	
		4	SS	61	
		5	SS	33	
313.91 / 3.50	End of Borehole				

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ — 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ — 20 40 60 80
WATER CONTENT (%): W_P W W_L — 10 20 30
WELL DATA

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 27

Client:	**Collaborative Structures Limited**
Project:	**Proposed Industrial Warehouse Development**
Location:	**128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

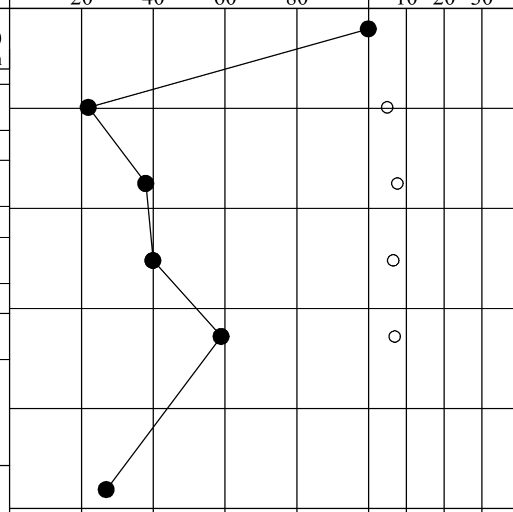
Machine:	**Diedrich D50T**
Method:	**Hollow Stem Auger**
Size:	**57 mm I.D.**
Date:	**Oct 05 - 22** TO **Oct 05 - 22**

SOIL LITHOLOGY — Ground Elevation: **319.30 m**

ELEV./DEPTH (m)	DESCRIPTION	DEPTH (m)
	compact to very dense dark brown FILL, silty sand some gravel to gravelly damp	0.0 – 2.10
317.20 2.10	compact to very dense, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles damp to moist	2.10 – 5.05
314.25 5.05	End of Borehole	

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	50/100 mm
2	SS	22
3	SS	38
4	SS	40
5	SS	59
6	SS	27



WELL DATA

REMARKS: dry borehole cave-in at 3.65 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 28

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

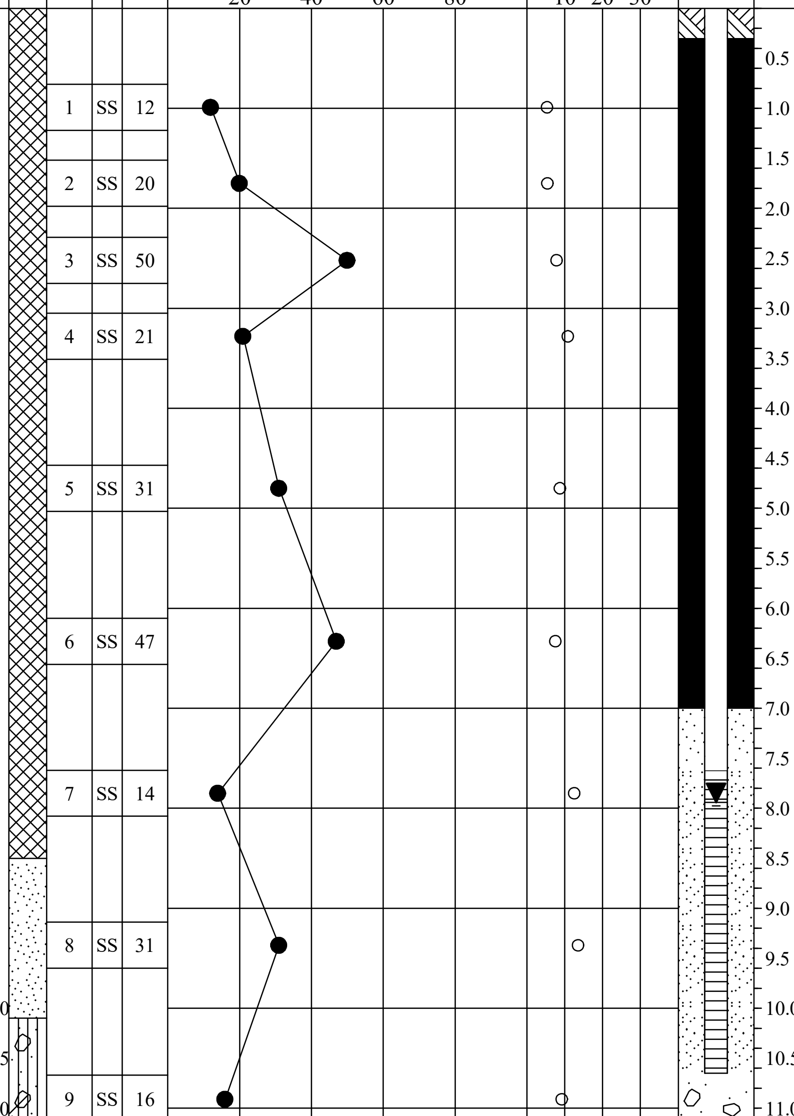
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Oct 03 - 22** TO **Oct 03 - 22**

Ground Elevation: **319.34 m**

ELEV./DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	REMARKS
	compact to very dense brown to dark brown FILL, silty sand to sand and silt trace to some gravel occ. cobbles moist to saturated ------ trace topsoil	0.0				monument casing set in concrete
		1.0	1	SS	12	
		1.75	2	SS	20	
		2.0				bentonite seal/50 mm I.D. PVC riser
		2.5	3	SS	50	
		3.25	4	SS	21	
		4.75	5	SS	31	
		6.25	6	SS	47	
		7.75	7	SS	14	
		8.0				water level in monitoring well measured to 7.94 m bgs on October 5, 2022
310.84 8.50	dense, brown Medium to Coarse SAND trace to some gravel, trace silt occ. cobbles saturated	9.25	8	SS	31	3.05 m long, 50 mm I.D. PVC screen with sandpack
309.24 10.10	compact, grey SANDY SILT TILL trace gravel, trace clay occ. cobbles moist to wet	10.75	9	SS	16	
308.19 11.15	End of Borehole					



PROJECT MANAGER: **JV**

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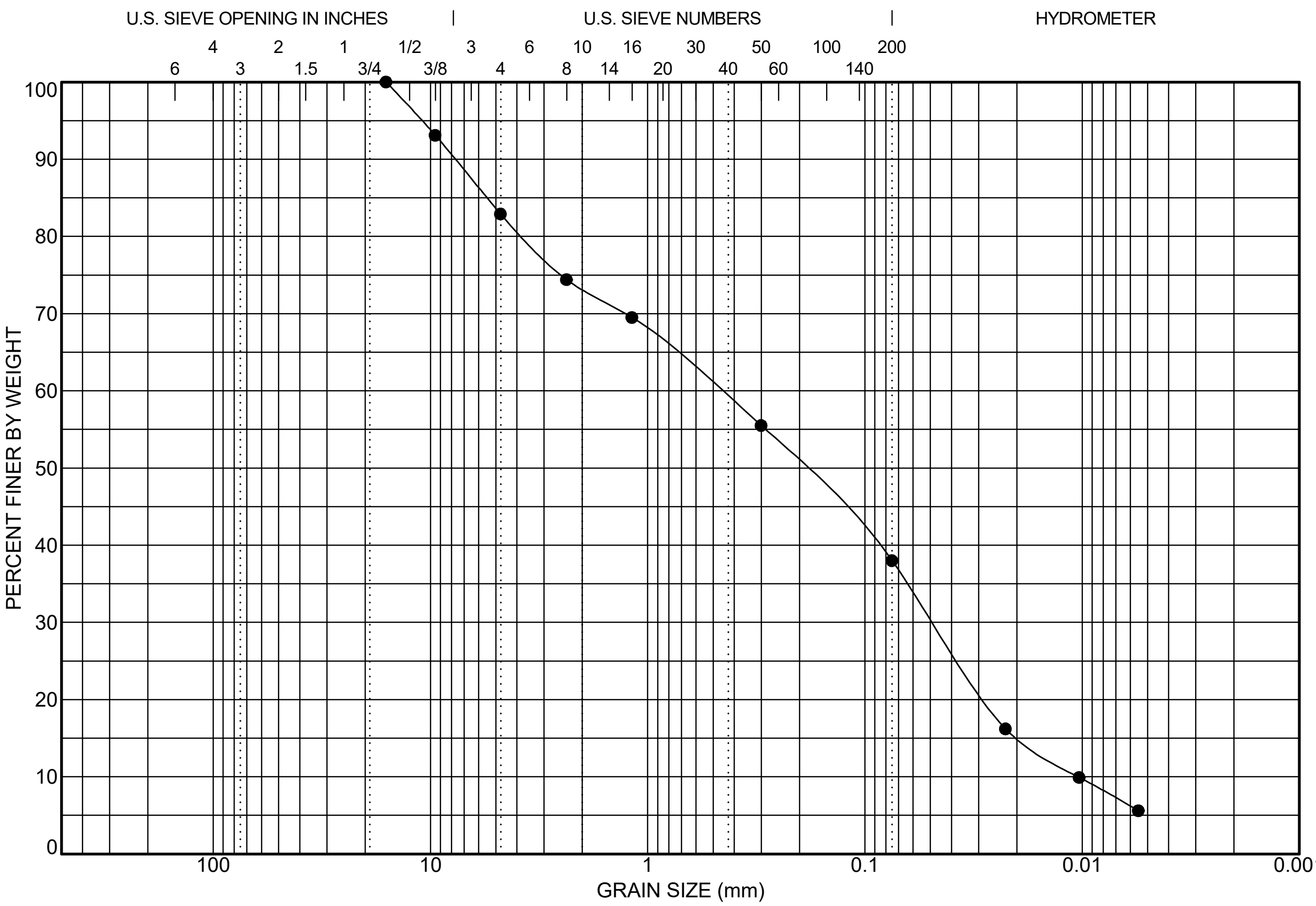

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.48	44.68	16	0.466	0.048	0.01	17.1	44.9	38.0	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 1 - SA 5; 3.05 to 3.51 m depth
Sample No.: 1-5
Date Sampled: Sep. 27 - 2022
Sampled By: DO
Lab No.: 1417
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Silt Till, some gravel

Sieve Size (mm)	Percent Passing	No Specifications

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e-mail: info@cvdengineering.com

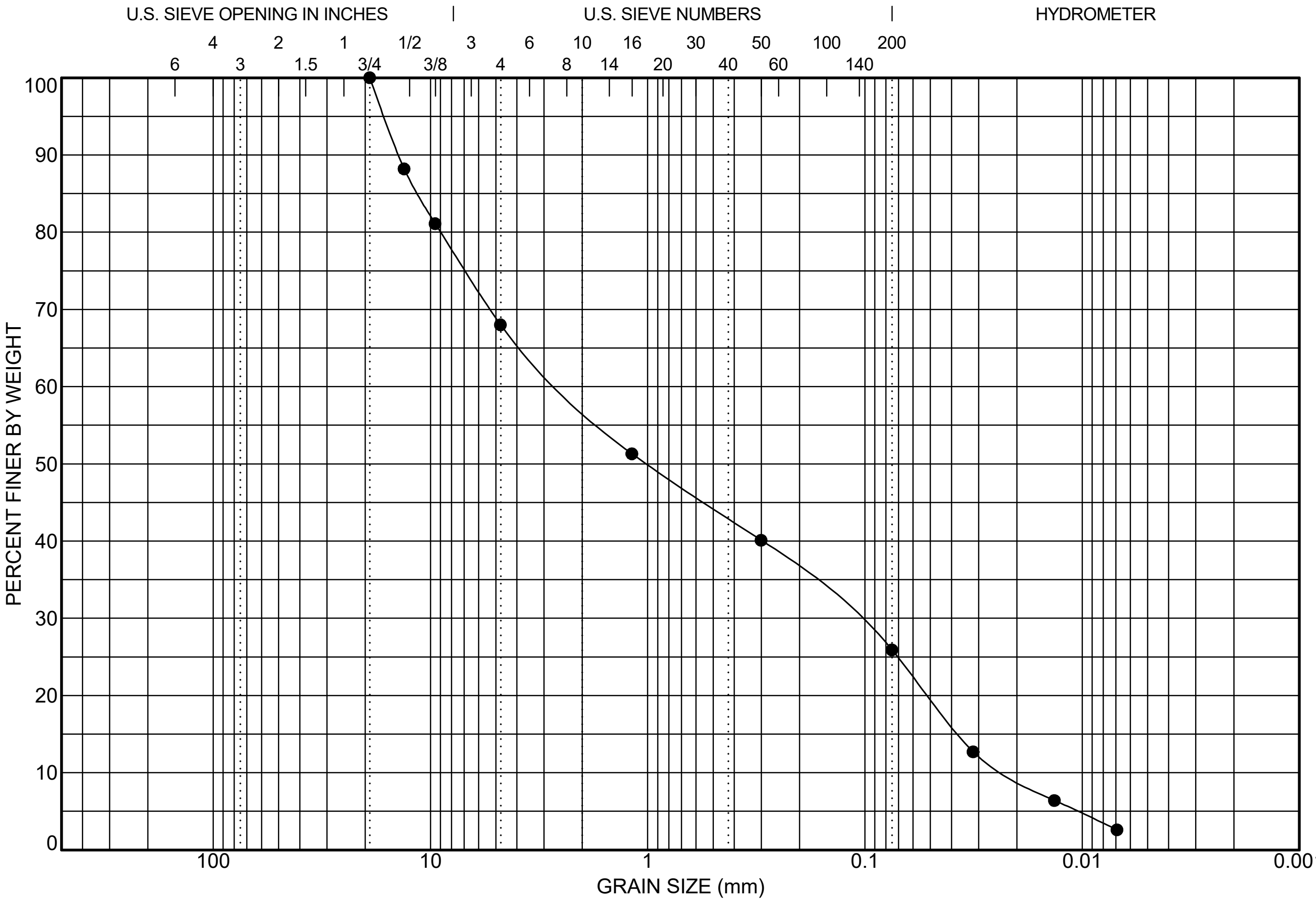
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 34



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.23	111.22	19	2.438	0.112	0.022	32.0	42.1	25.9	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 4 - SA 2; 1.52 to 1.98 m depth
Sample No.: 4-2
Date Sampled: Sep. 27 - 2022
Sampled By: DO
Lab No.: 1418
Date Tested: Oct. 27 - 2022
Type of Material: Silty Gravelly Sand

Sieve Size (mm)	Percent Passing	No Specifications

DM - NO SPECIFICATIONS G22518 100 BROCK ROAD S. ABERFOYLE.GPJ LAW LNDN.GDT 22-12-16

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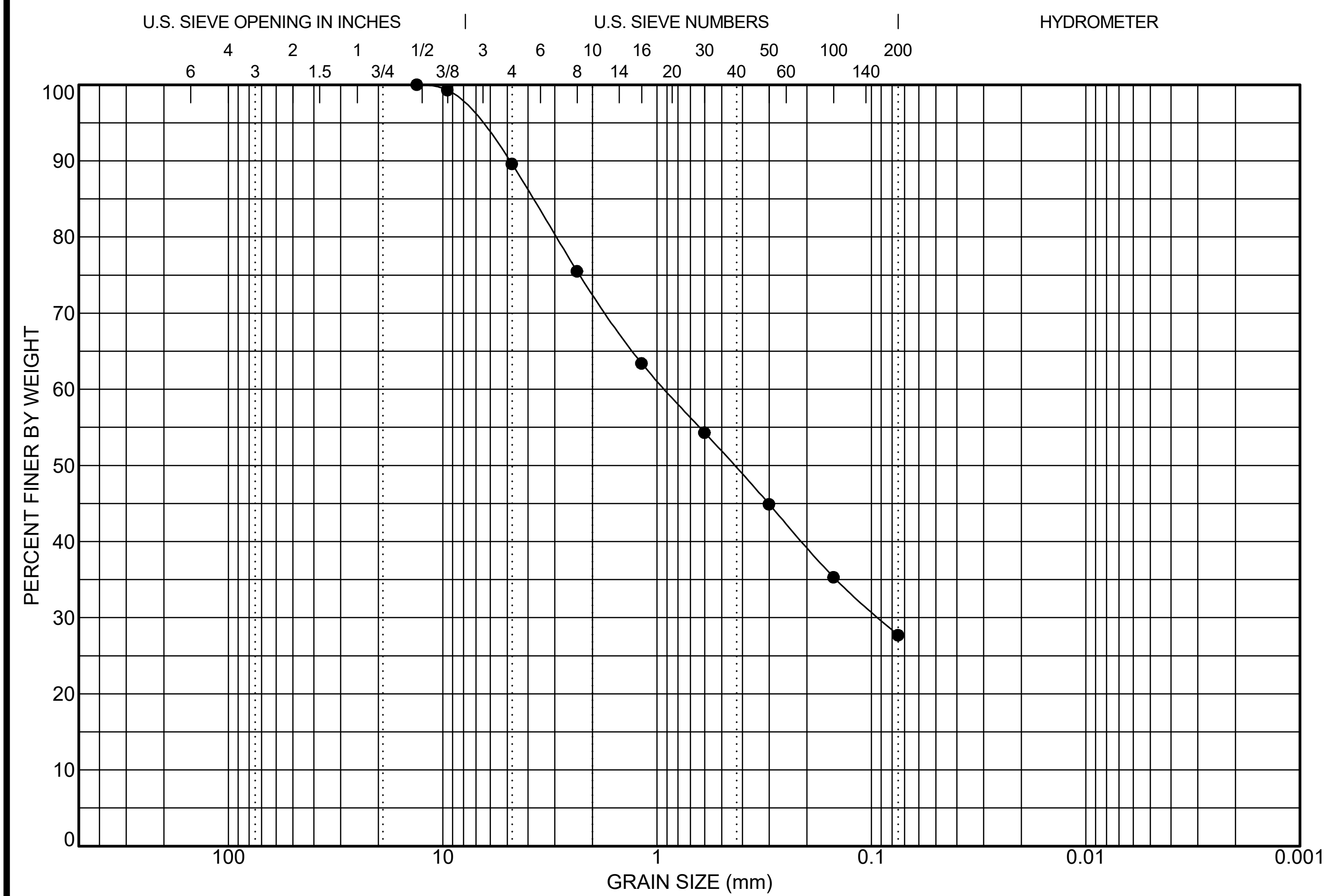
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 35



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<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
</table>

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					13.2	0.917	0.093		10.4	61.9	27.7	

Date: Dec. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 13 - SA 3; 2.29 to 2.74 m depth
Sample No.: 13-3
Date Sampled: Sep. 29 - 2022
Sampled By: DO
Lab No.: 1627
Date Tested: Dec. 06 - 2022
Type of Material: Silty Sand, some gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

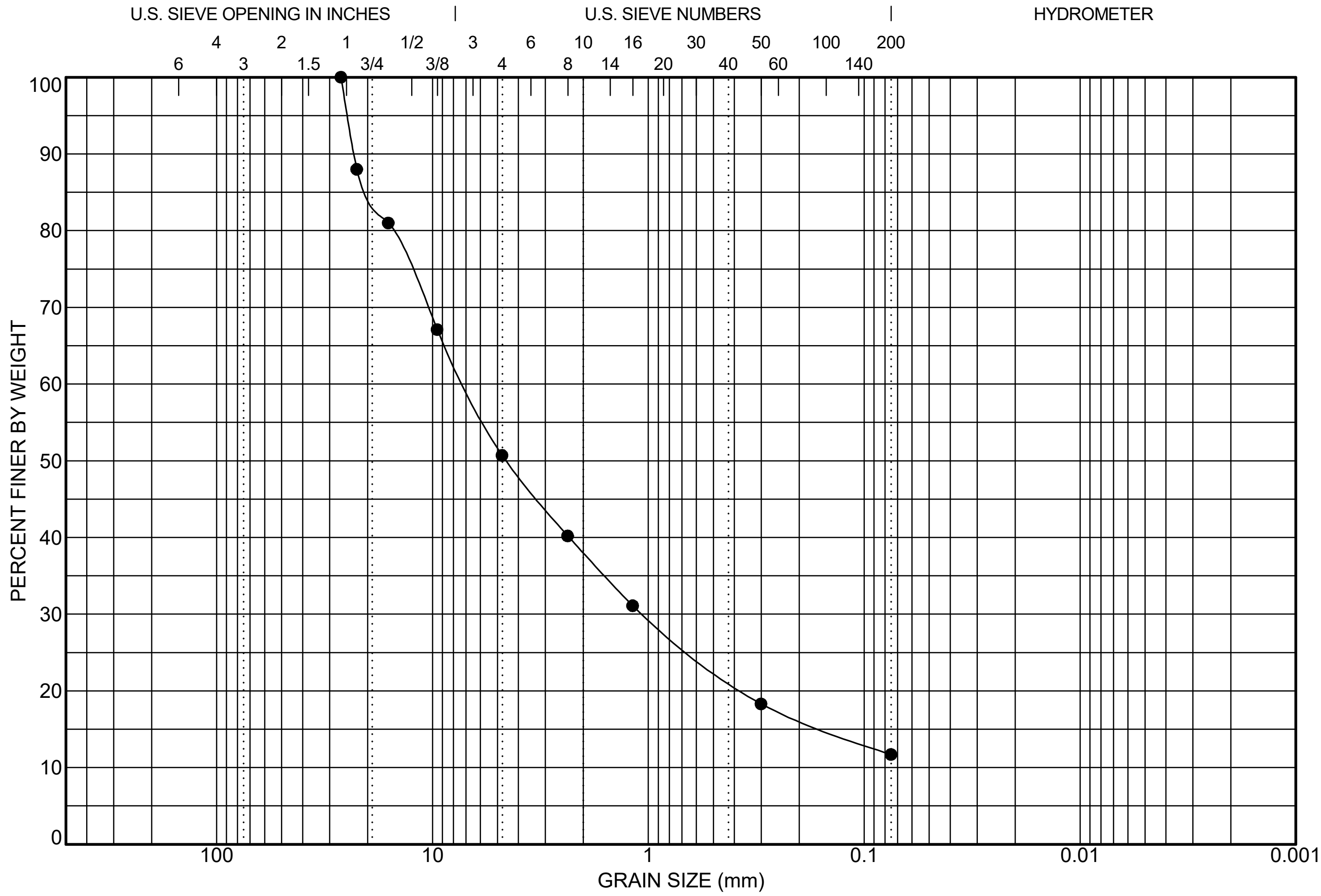
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 36



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			2.98	134.10	26.5	7.037	1.049		49.3	39.0	11.7	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 17 - SA 3; 1.52 to 1.98 m depth
Sample No.: 17-3
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1420
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Gravel, some silt

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

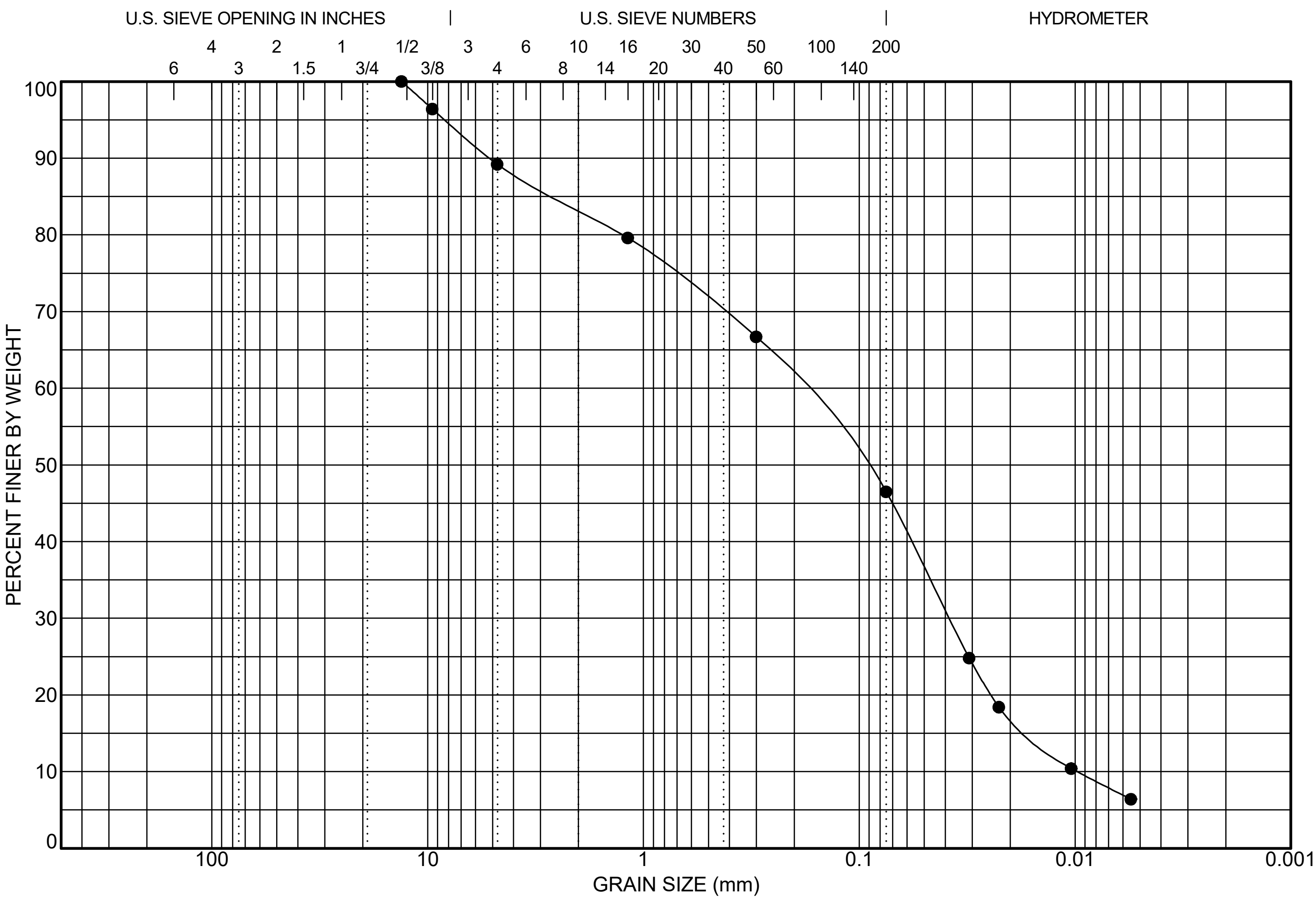
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 37



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.79	19.41	13.2	0.189	0.038	0.01	10.8	42.7	46.5	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 20 - SA 3; 2.29 to 2.74 m depth
Sample No.: 20-3
Date Sampled: Oct. 03 - 2022
Sampled By: DO
Lab No.: 1421
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Silt Till, trace gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

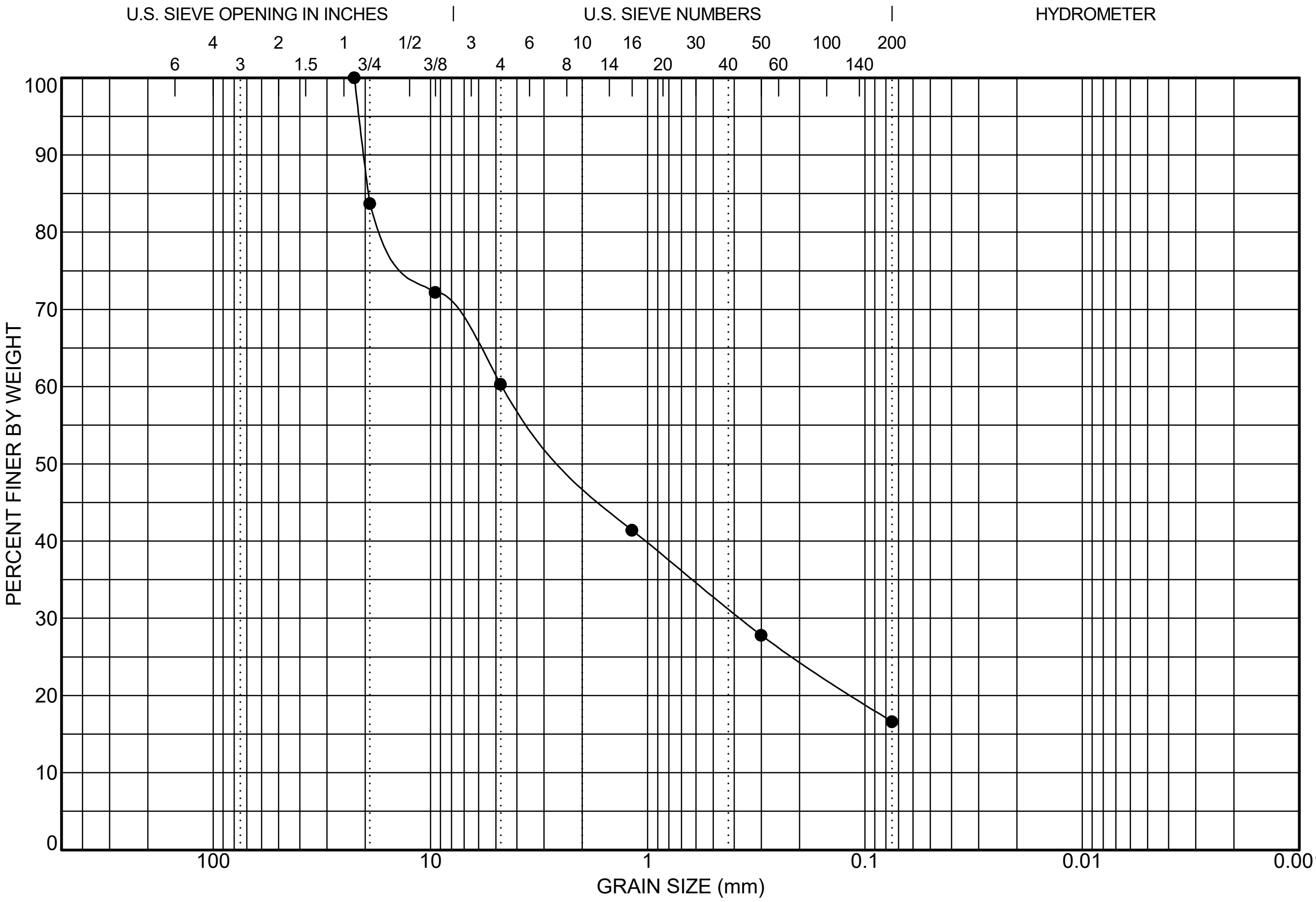
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 38



<table>
<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
</table>

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					22.4	4.646	0.374		39.7	43.7	16.6	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 24 - SA 2; 0.76 to 1.22 m depth
Sample No.: 24-2
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1422
Date Tested: Oct. 27 - 2022
Type of Material: Silty Sand and Gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

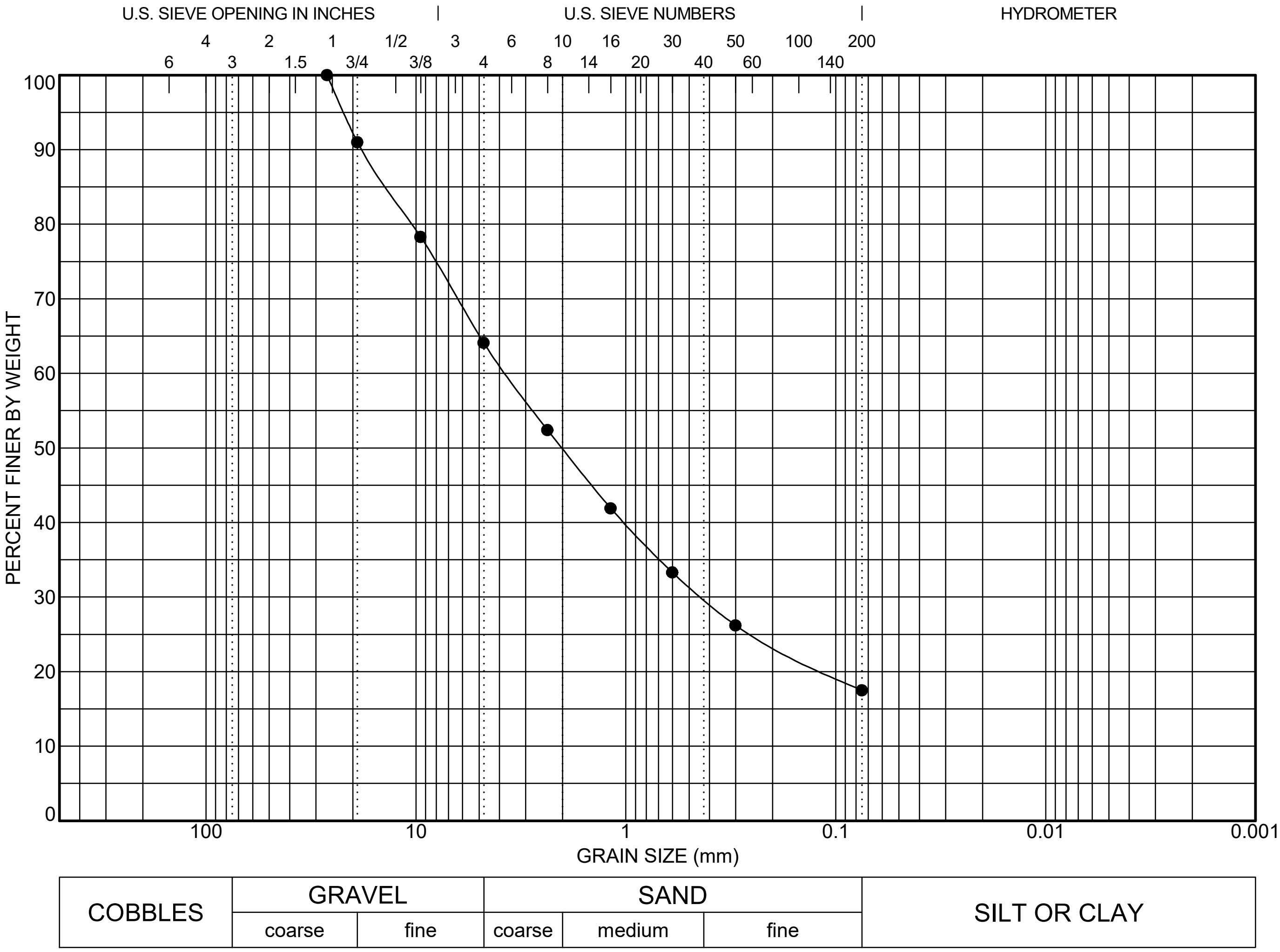
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 39



LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					26.5	3.717	0.435		35.9	46.6	17.5	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 24 - SA 5; 3.05 to 3.51 m depth
Sample No.: 24-5
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1423
Date Tested: Oct. 27 - 2022
Type of Material: Silty Sand and Gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

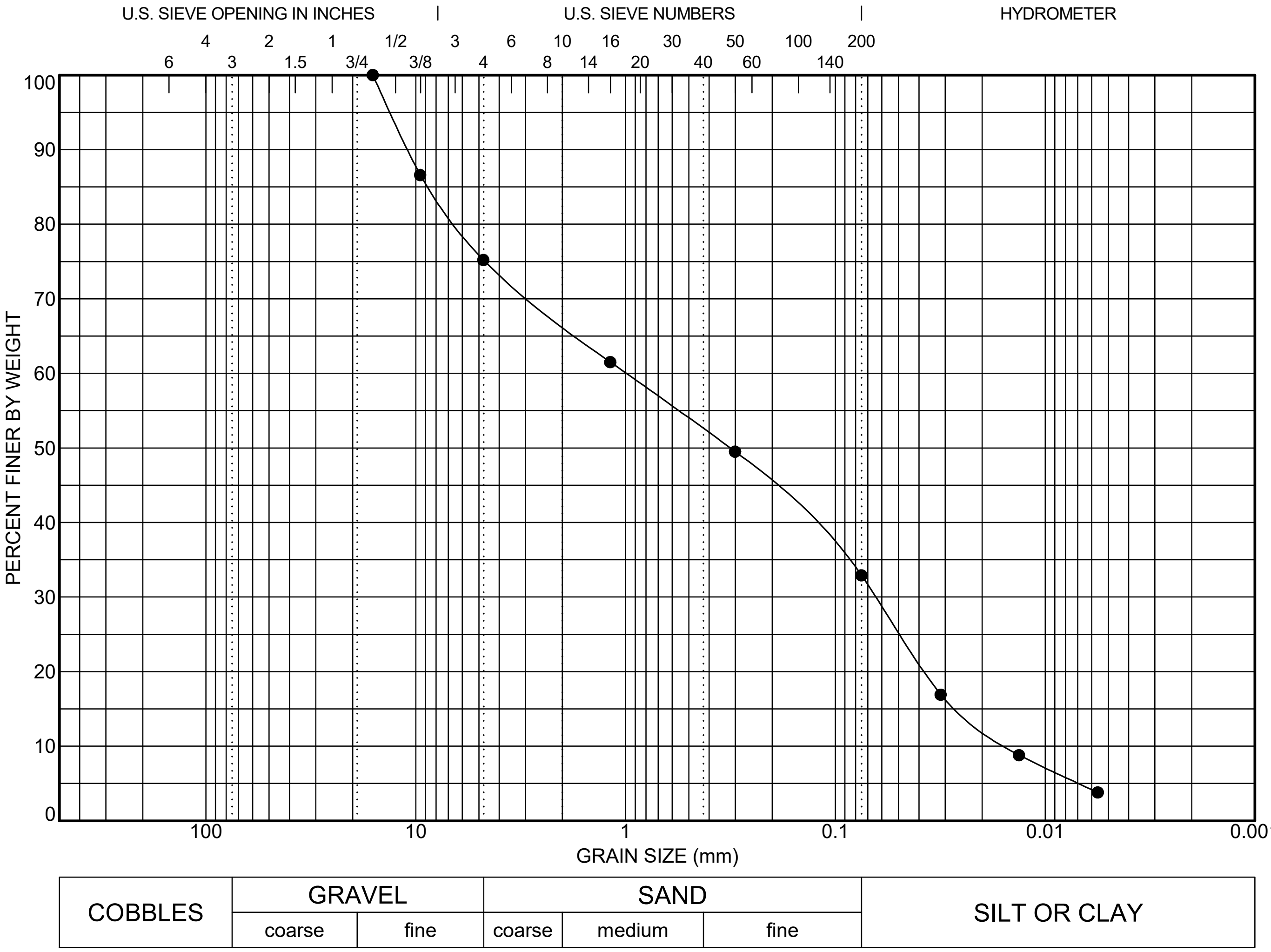
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 40



LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.27	65.83	16	0.994	0.064	0.015	24.8	42.3	32.9	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 25 - SA 3; 1.52 to 1.98 m depth
Sample No.: 25-3
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1419
Date Tested: Oct. 27 - 2022
Type of Material: silty gravelly sand Fill

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

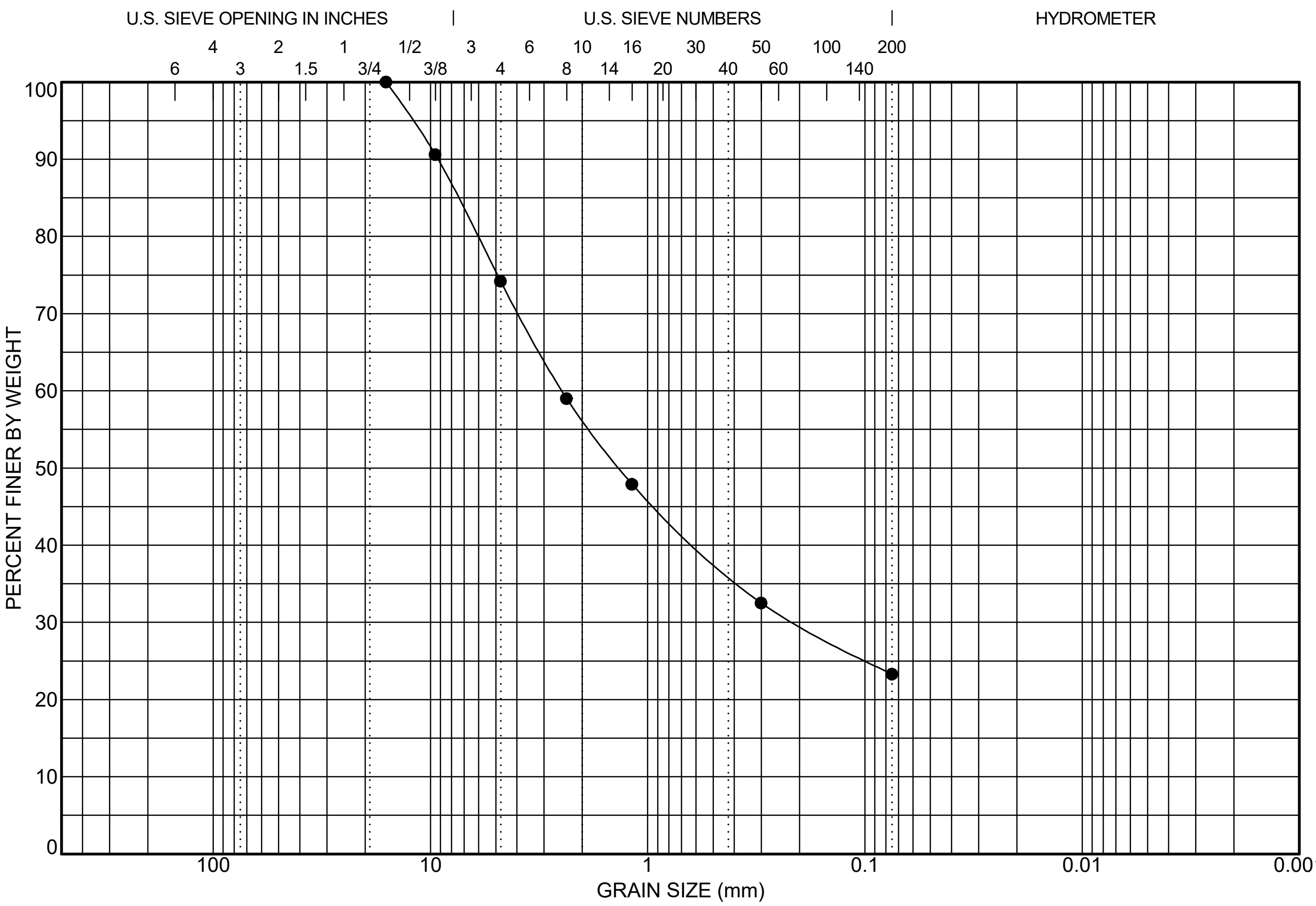
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 41



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					16	2.471	0.206		25.8	50.9	23.3	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 26 - SA 2; 0.76 to 1.22 m depth
Sample No.: 26-2
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1424
Date Tested: Oct. 27 - 2022
Type of Material: silty gravelly sand Fill

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

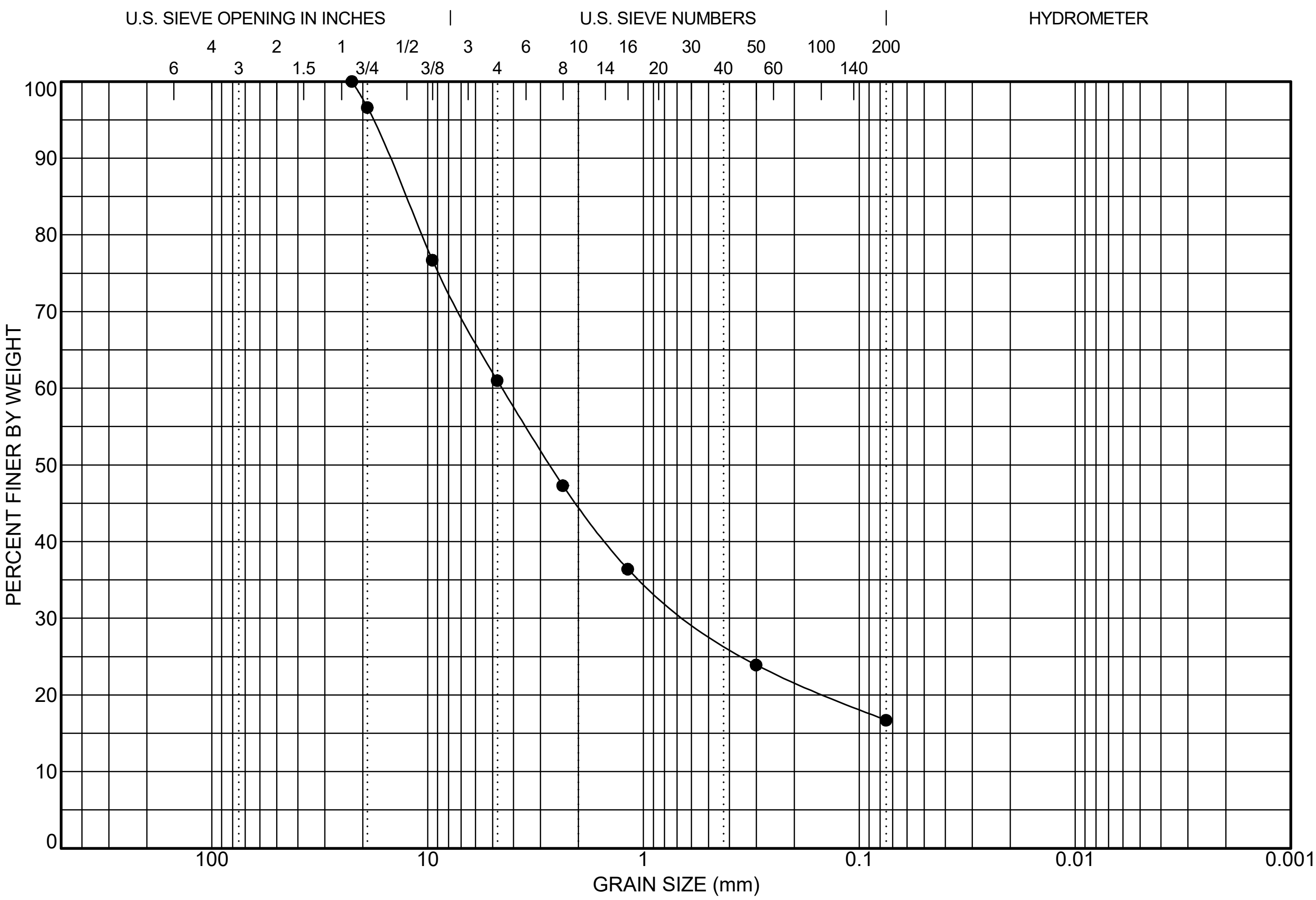
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 42



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					22.4	4.514	0.585		39.0	44.3	16.7	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 26 - SA 4; 2.29 to 2.74 m depth
Sample No.: 26-4
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1425
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Gravel, some silt

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 43

FILE No: G22518

TEST PIT No. 1

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

Ground Elevation: **317.37 m**

ELEV./DEPTH (m)	DESCRIPTION	SYMBOL	SAMPLE ID	TYPE	N-VALUE	REMARKS
317.27 / 0.10	100 mm TOPSOIL					
315.87 / 1.50	compact to dense, brown FILL, silty gravelly sand occ. cobbles; contains paper pieces; damp to moist; -------- trace topsoil/rootlets					
313.72 / 3.65	compact to very dense light brown SAND AND GRAVEL some silt to silty; occ. to freq. cobbles/boulders; moist		1	GS		
313.12 / 4.25	compact, brown Medium SAND trace to some gravel, trace to some silt; occ. fine sand layers; moist		2	GS		
	End of Test Pit					test pit dry and sidewalls stable upon excavation completion

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA
DEPTH (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G22518 — TEST PIT No. 2

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

SOIL LITHOLOGY / SAMPLE / SHEAR STRENGTH (kPa) — FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200 / PENETRATION RESISTANCE — STANDARD ● DYN. CONE ○ ; 20 40 60 80 / WATER CONTENT (%) — W_P W W_L ; 10 20 30 / WELL DATA / DEPTH (m) / REMARKS

Ground Elevation: **319.20 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
	compact to dense dark brown FILL, silty sand to sandy silt some gravel to gravelly freq. cobbles occ. boulders damp to moist -------- trace topsoil/rootlets/wood fragments				
315.70 3.50	dense, brownish grey, SANDY SILT TILL, trace gravel, trace clay, moist				test pit dry and sidewalls stable upon excavation completion
315.40 3.80	End of Test Pit				

Depth scale (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Enclosure No.: 31
Sheet 1 of 1

FILE No: G22518 TEST PIT No. 3

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

SOIL LITHOLOGY / SAMPLE / SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200) / PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80) / WATER CONTENT (%): W_P W W_L (10, 20, 30)

Ground Elevation: **319.12 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH / PENETRATION RESISTANCE	WATER CONTENT	WELL DATA	DEPTH (m)	REMARKS
	compact to dense dark brown FILL, silty sand to sandy silt some gravel to gravelly freq. cobbles occ. boulders damp to moist -------- trace topsoil	0.5 1.0								0.5 1.0	
317.97 1.15	compact to dense, brown SANDY SILT TILL trace gravel, trace clay moist	1.5								1.5	
317.52 1.60	End of Test Pit	2.0 2.5 3.0 3.5 4.0 4.5								2.0 2.5 3.0 3.5 4.0 4.5	test pit dry and sidewalls stable upon excavation completion

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Enclosure No.: 32
Sheet 1 of 1

FILE No: G22518

TEST PIT No. 4

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

ELEV./DEPTH (m)	SOIL LITHOLOGY – DESCRIPTION (Ground Elevation: **319.25 m**)	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) / PENETRATION RESISTANCE	WATER CONTENT (%)	WELL DATA	DEPTH (m)	REMARKS
	compact to dense dark brown to brown FILL, silty sand to sandy silt some gravel to gravelly, trace topsoil/rootlets freq. cobbles occc. boulders damp to moist	0.5 – 3.5								0.5 – 3.5	
315.30 3.95	End of Test Pit	4.0								4.0	test pit dry and sidewalls stable upon excavation completion
		4.5								4.5	

Shear strength legend: FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; scale 50, 100, 150, 200
Penetration resistance legend: STANDARD ● DYN. CONE ○ ; scale 20, 40, 60, 80
Water content: W_P W W_L ; scale 10, 20, 30

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Enclosure No.: 33
Sheet 1 of 1

FILE No: G22518 — TEST PIT No. 5

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

SOIL LITHOLOGY — Ground Elevation: **315.84 m**

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WELL DATA	REMARKS
	350 mm TOPSOIL					
315.49 0.35	compact, light brown SILTY SAND TO SANDY SILT damp to moist	1	GS			
313.49 2.35	dense, brown SANDY SILT TILL TO SAND AND SILT TILL some gravel, trace clay occ. cobbles moist	2	GS			
312.64 3.20	compact, brown SAND AND GRAVEL trace to some silt occ. silty seams occ. cobbles wet to saturated	3	GS		▼	stabilized groundwater encountered at 3.9 m test pit sidewalls stable upon excavation completion
311.89 3.95	End of Test Pit					

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

APPENDIX E
ALS Lab Analysis Report for Groundwater

ALS Canada Ltd.

right solutions. right partner.

CERTIFICATE OF ANALYSIS

Work Order	: **WT2218082**	Page	: 1 of 3
Client	: **Chung and Vander Doelen Engineering Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Brianna Cobbe	Account Manager	: Emily Hansen
Address	: 311 Victoria St. N. Kitchener ON Canada N2H 5E1	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: G22518	Date Samples Received	: 14-Oct-2022 19:35
PO	: ----	Date Analysis Commenced	: 20-Oct-2022
C-O-C number	: 20-948846	Issue Date	: 24-Oct-2022 16:05
Sampler	: CLIENT		
Site	: ----		
Quote number	: Q84362 - Excess Soils		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

					Client sample ID	**BH 20**	**BH 21**	**BH 28**	**----**	**----**
					Client sampling date / time	14-Oct-2022	14-Oct-2022	14-Oct-2022	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**WT2218082-001**	**WT2218082-002**	**WT2218082-003**	**--------**	**--------**
						Result	Result	Result	----	----
Anions and Nutrients										
chloride	16887-00-6	E235.Cl	0.50	mg/L		154 DLDS	8.41 DLDS	47.3	----	----
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L		3.60 DLDS	1.79 DLDS	0.020	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2218082**	Page	: 1 of 5
Client	: **Chung and Vander Doelen Engineering Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Brianna Cobbe	Account Manager	: Emily Hansen
Address	: 311 Victoria St. N. Kitchener ON Canada N2H 5E1	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: G22518	Date Samples Received	: 14-Oct-2022 19:35
PO	: ----	Issue Date	: 24-Oct-2022 16:05
C-O-C number	: 20-948846		
Sampler	: CLIENT		
Site	: ----		
Quote number	: Q84362 - Excess Soils		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 948846

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Page

Environmental Division
Waterloo
Work Order Reference
WT2218082

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	CVD Engineering
Contact:	Brianna Cobbe
Phone:	[redacted]
	Company address below will appear on the final report
Street:	311 Victoria St. N.
City/Province:	Kitchener, ON
Postal Code:	N2H 5E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Reports / Recipients

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax [redacted]

Email 2 [redacted]

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimun

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimui

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimui

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimun

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Addit may apply to rush requests on weekends, statutory holidays and non-rou

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please cc

Project Information

ALS Account # / Quote #: Q84362

Job #: G22518

PO / AFE:

LSD:

ALS Lab Work Order # (ALS use only): WT2218082

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Chloride + Nitrate	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH 20	14-10-22		Water	1	✓			
	BH 21	↓		↓	1	✓			
	BH 28	↓		↓	1	✓			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☑ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 18.3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: [redacted]	Date: Oct. 14, 2022	Time: 5:20pm	Received by:	Date:	Time:	Received by: MA	Date: 2022-10-14	Time: 19:35

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

GC-557

CHUNG & VANDER DOELEN
ENGINEERING LTD.

GEOTECHNICAL INVESTIGATION
PROPOSED INDUSTRIAL WAREHOUSE DEVELOPMENT

128 Brock Road South
Puslinch, Ontario

SUBMITTED TO:
Collaborative Structures Limited
6683 Ellis Road
Cambridge, Ontario
N3C 2V4

ATTENTION:
Joshua Blackler

FILE NO /G22518/December 20, 2022

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

December 20, 2022
File No.: G22518

Collaborative Structures Limited
6683 Ellis Road
Cambridge, Ontario
N3C 2V4

Attention: Joshua Blackler

RE: Geotechnical Investigation
Proposed Industrial Warehouse Development
128 Brock Road South, Puslinch, Ontario

We take pleasure in enclosing one (1) copy of our Geotechnical Investigation Report prepared for the above-referenced site.

If you have any questions or clarifications are required, please contact the undersigned at your convenience.

We thank you for giving us this opportunity to be of service to you.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

[redacted]

Eric Y. Chung, P.Eng., M. Eng.
Principal Engineer

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LIST OF ENCLOSURES

1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained by Collaborative Structures Limited to conduct a geotechnical investigation for the proposed industrial warehouse development to be constructed at 128 Brock Road South in Puslinch, Ontario.

It is understood that the "L"-shaped site with an area of 6.05 ha is to be developed with a single-storey industrial warehouse building with a footprint of 20,690± m^2 for Wellington Motor Freight. The proposed warehouse building is to comprise twenty-one (21) truck loading rooftop solar panels and a warehouse office mezzanine located in the northwest corner. The finished floor elevation of the warehouse building is proposed to be 321.5 m. A 3-storey rectangular-shaped office building without basement and a ground floor footprint of 930± m^2 is also to be constructed to the north of the warehouse building along the western property limit (along Brock Road South). A finished floor elevation for the office building was not provided prior to report preparation.

The proposed buildings are to be serviced with a septic system which is proposed to the north of the office building which will also border the western property limit. Asphalt paved driveways, truck/trailer storage/loading areas and office/staff parking are proposed to north and east of the proposed buildings. A retaining wall is also proposed along the eastern and southern perimeter of the trailer parking area. In addition, a stormwater management feature is proposed immediately to the north of the northwest corner of the warehouse building.

The purpose of this investigation was to determine the subsurface conditions at the site and, based on the findings, to make geotechnical recommendations for:

- Site grading and engineered fill construction;
- Foundation design recommendations;
- Excavation condition;
- Groundwater control during construction;
- Slab-on-grade design;
- Backfilling recommendations;
- Foundation soil classification for seismic design per OBC 2012;
- Foundation and retaining wall design;
- Site servicing; and
- Pavement design and construction

Infiltration rates of the various soil deposits encountered during the investigation will also be provided for stormwater management features.

2.0 FIELD AND LABORATORY WORK

To investigate the subsurface conditions at the site, twenty-eight (28) boreholes were advanced to depths between 3.5 and 12.8 m below existing grade on September 27 to 30 and October 3 and 5, 2022. In addition, as part of a supplemental investigation, five (5) test pits were advanced to depths between

1.65 and 4.25 m below existing grade on November 9, 2022. The borehole and test pit locations are illustrated on the Borehole and Test Pit Location Plan, Drawing No. 1, appended.
The field investigation program was conducted under the supervision of a member of our engineering team, who logged the subsurface conditions encountered at the borehole and test pits, effected the subsurface sampling and testing, and monitored the groundwater conditions. The boreholes were advanced using a track-mounted drilling rig, supplied, and operated by a specialized contractor. The drill rig was equipped with continuous flight augers and standard soil sampling equipment. Underground utilities were located prior to commencing the field work program. The test pit was advanced using a mid-size excavator.

Standard penetration tests (SPTs) in accordance with ASTM Specification D1586, were carried out at frequent intervals of depth, and the results are shown on the Borehole Logs as Penetration Resistance or "N"-values. The compactness condition of the soil strata has been inferred from the test results.

Groundwater conditions were monitored during sampling and upon removal of the drilling augers at all borehole locations. In addition, as part of concurrent hydrogeological assessment by CVD, four (4) monitoring wells were installed at the site to establish the groundwater table and allow for groundwater sampling.

Soil samples collected during the borehole investigation program were examined in the field and subsequently brought to CVD's laboratory for tactile examination. Moisture content determination on all retrieved soil samples was performed. Ten (10) grain size distribution analyses were conducted on representative samples of the encountered soil deposits.

Six (6) soil samples were submitted to AGAT Laboratories of Mississauga, Ontario for analysis of metals and inorganics, Petroleum Hydrocarbons (PHCs F1 to F4) and Benzene-Toluene-Ethylbenzene-Xylene (BTEX). The chemical testing was conducted to initially assess the environmental quality of potential excess soil which may be generated and removed off-site during construction activities.

The location and ground surface elevation of the boreholes and test pits were surveyed by CVD with reference to a local temporary benchmark (TBM). The temporary benchmark elevation and ground surface elevations at the boreholes were surveyed by CVD for the purpose of this report using a Network RTK Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using The UTM Zone 17N Projection, NAD83(CSRS)v7-2010 datum and Canada Geoid Model HT2_2010v70 (CGVD28).

The referenced temporary benchmark (TBM) which is described below:

TBM: Catch basin along northbound lane curb-line of Brock Road South, north of existing site driveway, as shown on Drawing No. 1

Elevation: 319.14 m (Geodetic)

3.0 EXISTING SITE CONDITIONS

The site has been subject to extensive regrading procedures. As per a report titled "Hydrogeologic Investigation, Proposed Site Grading" completed by MBN Environmental Engineering Inc. (June 25, 2014), approximately 24,000± m^3 of soil was moved from the higher eastern wing to the former low-lying undulated northern wing of the site. The regrading of the site took place between 2015 and 2017. Reference to the site grading procedures is detailed on the selected drawings from the MBN hydrogeologic investigation report in Appendix D

The site was once occupied by a centrally located greenhouse development which was demolished in late 2016 to early 2017. The site is currently occupied by residential dwelling located along the western property limit at the approximate midpoint and a dilapidated utility shed that belonged to the former greenhouse development. A second residential dwelling is located at the northwest corner of the northern wing of the site (southeast corner of intersection of Gilmore Road and Brock Road South). Both residences are serviced by private water supply wells. The well for the first residence is located is located centrally within the northern wing of the site and was extended vertically due to the regrading procedures. A wetland area is located in the southeast corner of the site. Mature trees border the site along the property limits and the remainder of the site is covered within occasional to plentiful grass/weed overgrowth.

The ground surface of the site generally gently declines in elevation from east to west within the eastern wing with the exception of the area along the eastern property limit which steeply declines from east to west. The ground surface within the northern wing of the site is generally level in grade in the areas that have been regraded and then declines in elevation from south to north (towards Gilmour Road). An low-lying area exists to the west of the regraded areas within the northern wing of the site with a grade differential of 1.8± to 5.0± m. The ground surface elevations at the borehole and test pit locations ranged between 315.84 and 323.93 m.

4.0 SUBSURFACE CONDITIONS

The subsurface conditions encountered at the boreholes are detailed on the Borehole and Test Pit Log Sheets, Enclosures 1 to 33 of this report. The following notes are intended to amplify and comment on the subsurface data.

The stratigraphic boundaries shown on the borehole logs are inferred from non-continuous sampling conducted during advancement of the borehole drilling procedures and, therefore, represent transitions between soil types rather than exact planes of geologic change. The subsurface conditions will vary between and beyond the borehole locations.

4.1 Topsoil and Pavement

Topsoil was encountered at the ground surface at Boreholes 1 to 16, 18 to 24 and 26 and Test Pits 1 and 5 with measured thicknesses ranging from 25 to 350 mm.

4.2 Fill

Fill materials were encountered underlying the topsoil at Boreholes 1, 2, 8, 21, 22, and 26 and Test Pit 1 at the ground surface at Boreholes 17, 25, 27 and 28 and Test Pits 2 to 4. The fill extended to depths between 0.7 and 8.5 m below existing grades. Test Pit 4 was terminated within the fill which extended to a depth of 3.95 m below existing grade. It is noted that fill materials could be deeper in the vicinity of existing/former building/structure foundations, utility trenches and infill areas as part of the previous regrading procedures.

The fill materials comprised of fine granular soils ranging in composition from silty sand to sandy silt with gravel in the amount of trace to gravelly. Occasional to frequent cobbles were encountered throughout the fill materials and occasional boulders were encountered within the fill at Test Pits 2 to 4.

Traces of topsoil/rootlets/organics were encountered at Boreholes 1, 17, 21, 22, 26, and 28 ad Test Pits 1 to 4. Occasional paper pieces were encountered within the fill at Test Pit 1 and wood fragments were encountered at Test Pit 2. Two (2) grain distribution analyses were conducted on representative samples of the fill from Boreholes 25 to 26 and the results are graphically presented on Enclosures 41 and 42.

Standard penetration testing within the fill yielded “N”-values between 3 and greater than 100 blows per 300 mm of penetration, indicating a variable very loose to very dense compactness condition. Elevated “N”-values are due to the presence of gravel/cobble inclusions. Natural moisture contents were measured between 2 and 20%, indicating a damp to moist moisture condition. Elevated moisture contents are likely to the presence of topsoil/organics within the fill.

4.3 Fine Granular Deposits

Fine granular deposits were encountered underlying the topsoil at Boreholes 3, 5 to 7, 9, 10, 12, 14 to 16, 20 and Test Pit 5, the coarse granular deposits at Boreholes 13, 19, 21, 23 and the fill at Borehole 8. The deposits extended to depths between 0.7 and 5.50 m below existing grade at Boreholes 3, 5 to 10, 12 to 16, 1 to 21 and 23. Borehole 13 was terminated within the deposits at a depth of 6.40 m below existing grade.

The deposits ranged in composition from fine to medium sand with some silt to silt with some sand with trace to some gravel. Occasional cobbles were encountered within the deposits at Boreholes 5, 6, 9, 10, 15, 16, occasional silt seams were encountered at Borehole 8 and occasional coarse sand seams were encountered at Borehole 23. One (1) grain distribution analysis was conducted on a representative sample of the deposits from Borehole 13 and the results are graphically presented on Enclosure 36.

Standard penetration testing within the deposits yielded “N”-values between 12 and greater than 100 blows per 300 mm, indicating a compact to very dense compactness condition. Natural moisture contents were measured between 1 and 25%, indicating a damp to saturated moisture condition.

4.4 Coarse Granular Deposits

Coarse granular deposits were encountered underlying the topsoil at Boreholes 4, 11, 13, 18, 19, 23 and 24, the fill at Boreholes 21, 22, 25 and 26, the fine granular deposits at Borehole 14, and the till deposit at Borehole 10. The deposits extended to depths between 2.1 and 4.7 m below existing grades at Boreholes 4, 11, 13, 14 and 21 to 23. Boreholes 10, 17, 18 and 24 to 26 were terminated within the deposits which extended to depths between 3.5 and 6.55 m below existing grade.

The deposits ranged in composition from gravelly sand to sand and gravel with silt in the range of trace to silty. Occasional to frequent cobbles were encountered throughout the deposits and occasional to frequent silt/silty lenses/seams were encountered within the deposits at Boreholes 14, 17 and 21. Five (5) grain distribution analyses were conducted on representative samples of the deposits from Boreholes 4, 17, 24 (2 samples) and 26 and the results are graphically presented on Enclosures 35, 37, 39, 40 and 43.

Standard penetration testing within the deposits yielded “N”-values between 14 and greater than 100 blows per 300 mm, indicating a compact to very dense compactness condition. Natural moisture contents were measured between 2 and 21%, indicating a damp to saturated moisture condition.

4.5 Till

A till deposit was encountered underlying the fill at Boreholes 1, 2 and 28 and Test Pits 2 and 3, the fine granular deposits at Boreholes 3, 5 to 10, 12, 15, 16, 19 to 21 and 23 and Test Pit 5, the coarse granular deposits at Boreholes 4, 11, 14 and 22 and the lower sand deposit at Borehole 28. The till extended to depths between 3.2 and 11.6 m below existing grade at Boreholes 10 and 20 and Test Pit 5. Boreholes 1 to 9, 11, 12, 14 to 16, 19, 21 to 23 and 27 and Test Pits 2 and 3 were terminated within the fill which extended to depths between 1.6 and 8.25 m below existing grade.

The till composition ranged from sand and silt to sandy silt with trace to some gravel and trace clay. Occasional to frequent cobbles were encountered throughout the deposit and occasional sand seams were encountered within the deposit at Borehole 6. An interbedded sand and gravel layer was encountered within the deposit at Borehole 9 between 4.5± and 5.4± m depth.

Standard penetration testing within the till deposit yielded “N”-values between 14 and greater than 100 blows per 300 mm, indicating a compact to very dense compactness condition. Natural moisture contents were measured between 2 and 21%, indicating a damp to saturated moisture condition.

4.6 Lower Sand

A lower medium to coarse grained sand deposit was encountered underlying the fill at Borehole 28 and the coarse granular deposits at Test Pit 1. The deposit at Borehole 28 extended to a depth of 10.1 m below existing grade. Test Pit 1 was terminated within the deposit which extended to a depth of 4.25 m below existing grade. The deposit contained trace to some gravel and silt. Occasional fine sand seams were encountered in the deposit at Test Pit 1 and occasional cobbles were encountered at Borehole 28.

Standard penetration testing within the lower sand deposit yielded an "N"-value of 31 blows per 300 mm, indicating a dense compactness condition. The natural moisture content at Borehole 28 was measured at 14%, indicating a saturated moisture condition. The deposit at Test Pit 1 exhibited a compact compactness condition and moist moisture condition.

4.7 Lower Sand and Gravel

A lower sand and gravel deposit was encountered underlying the till deposit at Borehole 20 and Test Pit 5. Both test holes were terminated within the deposit which extended to depths between 3.95 and 12.80 m below existing grade. The deposit contained trace to some silt. Occasional cobbles were encountered throughout the deposit and occasional silty seams were encountered at Test Pit 5.

Standard penetration testing within the deposit yielded an "N"-value 67 blows per 300 mm, indicating a very dense compactness condition. The natural moisture content at Borehole 20 was measured at 9%, indicating a saturated moisture condition. The deposit at Test Pit 5 exhibited a compact compactness condition and saturated moisture condition.

4.8 Groundwater

Groundwater conditions were monitored during sampling and upon removal of the drilling augers at all borehole locations and within the test pit upon excavation completion.

In addition, as part of a concurrent hydrogeological assessment by CVD, four (4) monitoring wells were installed at the site to establish the groundwater table and allow for groundwater sampling. The table below summarizes the water level readings in the monitoring well:

Test Hole No.	Existing Ground Elevation (m)	Date	Water Level Below Existing Ground Surface (m)	Water Level Elevation (m)
BH 9	320.44	October 5, 2022	Dry	-
		October 14, 2022	Dry	-
		November 9, 2022	Dry	-
BH 20	322.22	October 5, 2022	10.94	311.28
		October 14, 2022	10.96	311.26
		November 9, 2022	11.02	311.20
BH 21	323.67	October 5, 2022	4.72	318.95
		October 14, 2022	4.80	318.87
		November 9, 2022	5.02	318.65

Test Hole No.	Existing Ground Elevation (m)	Date	Water Level Below Existing Ground Surface (m)	Water Level Elevation (m)
BH 28	319.34	October 5, 2022	7.94	311.40
		October 14, 2022	7.89	311.45
		November 9, 2022	7.97	311.37
TP 5	315.84	November 9, 2022	3.90	311.94

Groundwater levels measured in monitoring wells installed at Boreholes 20, 21 and 28 and Test Pit 5 were at depths between 3.9 and 11.02 m below existing grades, corresponding to elevations between 311.20 and 318.95 m. The monitoring well at Borehole 9 was measured dry, indicating that groundwater exists below a depth of 8.25 m below existing grade corresponding to an elevation below 312.19 m.

Groundwater was encountered within Borehole 23, located adjacent to the eastern wetland area, at a depth of 5.2± m below existing grade upon withdrawal of the drilling augers. Saturated conditions were encountered within Boreholes 10 and 14 at depths between 3.5± and 4.5± m below existing grade.

Based on the measured/observed groundwater levels in the monitoring wells, boreholes upon withdrawal of the drilling augers during sampling, test pits upon excavation completion and measured moisture contents, the groundwater table at the site is considered to be laterally discontinuous and lies at a wide range of depths between 3.5± and 11.0± m below existing grade, corresponding to elevations between 311.2± to 318.9± m. The "shallower" groundwater encountered within the eastern portion of the site at the wetland is indicative of a perched groundwater condition above the sand/silt till (refer to Scoped Hydrogeologic Assessment, CVD Dec 2022).

It is noted that the observed groundwater table will fluctuate seasonally and in response to major weather events.

4.9 Soil Chemistry

Six (6) soil samples were submitted to AGAT Laboratories of Mississauga, Ontario for analysis of metals and inorganics, Petroleum Hydrocarbons (PHCs F1 to F4) and Benzene-Toluene-Ethylbenzene-Xylene (BTEX). The chemical testing was conducted to initially assess the environmental quality of potential excess soil which may be generated and removed off-site during construction activities.

The following table presents the location, depth, description, and parameters analyzed for each soil sample collected and submitted.

Sample I.D.	Sample Depth	Sample Description	Parameters Analysed
BH 1 – SA 1	0.10 to 0.60 mbeg	sand and silt fill	metals, inorganics, PHCs (F1 to F4), BTEX
BH 6 – SA 2	0.75 to 1.20 mbeg	sand and silt	metals, inorganics, PHCs (F1 to F4), BTEX
BH 7 – SA 2	0.75 to 1.20 mbeg	sand	metals, inorganics, PHCs (F1 to F4), BTEX
BH 9 – SA 1	0.10 to 0.60 mbeg	silty sand	metals, inorganics, PHCs (F1 to F4), BTEX
BH 12 – SA 1	0.75 to 1.20 mbeg	sand and silt till	metals, inorganics, PHCs (F1 to F4), BTEX
BH 15 – SA 1	0.75 to 1.20 mbeg	silty sand	metals, inorganics, PHCs (F1 to F4), BTEX

The laboratory certificates of chemical analysis and results of the soil samples submitted to AGAT Laboratories of Mississauga, Ontario are enclosed in Appendix “B”.

5.0 DISCUSSION AND RECOMMENDATIONS

It is understood that the "L"-shaped site with an area of 6.05 ha is to be developed with a single-storey industrial warehouse building with a footprint of 20,690± m^2 for Wellington Motor Freight. The proposed warehouse building is to comprise twenty-one (21) truck loading rooftop solar panels and a warehouse office mezzanine located in the northwest corner. The finished floor elevation of the warehouse building is proposed to be 321.5 m. A 3-storey rectangular-shaped office building without basement and a ground floor footprint of 930± m^2 is also to be constructed to the north of the warehouse building along the western property limit (along Brock Road South). A finished floor elevation for the office building was not provided prior to report preparation.

The proposed buildings are to be serviced with a septic system which is proposed to the north of the office building which will also border the western property limit. Asphalt paved driveways, truck/trailer storage/loading areas and office/staff parking are proposed to north and east of the proposed buildings. A retaining wall is also proposed along the eastern and southern perimeter of the trailer parking area. In addition, a stormwater management feature is proposed immediately to the north of the northwest corner of the warehouse building.

The site has been subject to extensive regrading procedures. As per a report titled "Hydrogeologic Investigation, Proposed Site Grading" completed by MBN Environmental Engineering Inc. (June 25, 2014), approximately 24,000± m^3 of soil was moved from the higher eastern wing to the low-lying undulated northern wing of the site. The regrading of the site took place between 2015 and 2017. Reference to the site grading procedures is detailed on the selected drawings from the hydrogeologic investigation report in Appendix D.

In general, the surficial topsoil was underlain by a layer of fill materials which extended to depths between 0.7± and 8.5± m below existing grades. The deep fill was encountered within the north wing of the site as a result of the regrading procedures which took place between 2015 and 2017. The topsoil and fill materials were underlain by compact to very dense fine granular, coarse granular and sand/silt till deposits which extended to the maximum explored depths of the boreholes and Test Pits.

Based on the measured/observed groundwater levels in the monitoring wells, boreholes upon withdrawal of the drilling augers during sampling, test pits upon excavation completion and measured moisture contents, the groundwater table at the site is considered to be laterally discontinuous and lies at a wide range of depths between 3.5± and 11.0± m below existing grade, corresponding to elevations between 311.2± to 318.9± m. The "shallower" groundwater encountered within the eastern portion of the site at the wetland is indicative of a perched groundwater condition above the sand/silt till (refer to Scoped Hydrogeologic Assessment, CVD Dec 2022).

It is noted that the observed groundwater table will fluctuate seasonally and in response to major weather events.

5.1 Site Grading and Engineered Fill Construction

According to the most recent site plan, cutting procedures in the range of 1± to 4.5± m will occur along the eastern and southern property limits along the proposed south and east building lines and eastern trailer parking lot boundaries where a retaining wall is proposed. In addition, grades are proposed to be raised 4.5± to 5.5± m along the western property limit within the northern wing of the site in order to construct the proposed staff parking lot at more desirable elevations. Grade balancing is anticipated across the remainder of the site.

It is recommended to construct engineered fill in areas where non-suitable founding soil conditions currently exist and in areas to be raised to suitably support the future building foundations, floor slabs and pavement areas. Engineered fill will allow foundation construction to occur at more desirable and conventional depth levels.

It is recommended to salvage inorganic granular-based soil excavated from “cut” and required repair areas and reuse them for site regrading and engineered fill purposes. The natural moisture content of the fill soil to be reused should be within 3% drier of the optimum moisture content in order to achieve the specified degree of compaction. Moisture adjustment of the salvaged fill may be required to produce a suitable moisture content.

Any engineered fill to be constructed below the proposed buildings/structures is recommended to consist of approved onsite granular-based soil or imported OPSS Granular B Type I. It is recommended that any proposed borrow source materials be tested prior to importing to ensure that the environmental quality of the imported fill meets all environmental approval criteria and to ensure that the natural moisture content of the fill is suitable for compaction.

It is recommended that engineered fill be constructed during the summer and early fall months when drier warmer weather conditions typically exist as onsite soils with appreciable amounts of silt and clay are sensitive to moisture and will become difficult to handle and compact to the specified degrees of compaction when wet.

The onsite fine granular soils are frost-susceptible. Constructing engineered fill, backfilling footings, foundation walls and service trenches using the finer grained soils during the winter months is not advisable, unless suitable weather conditions prevail, the soils are at suitable moisture content, and strict procedures are followed and monitored on a full-time basis by the geotechnical engineer.

The onsite soils are susceptible to softening and deformation when exposed to excessive moisture and construction traffic. As a result, it is imperative that the grading/filling operations are planned and maintained to direct surface water run-off to low points and then be positively drained by suitable means. During periods of wet weather, construction traffic should be directed along the designated construction routes so as not to disturb and rut the exposed subgrade soil. Temporary construction roads consisting of clear crushed material (such as crushed stone or recycled concrete) may be required during poor weather conditions such as wet Spring or Fall.

Engineered fill should be constructed in accordance with the following procedures to support building foundations, floor slabs and pavement areas:

1) All topsoil, pavement structure, existing foundations and backfill, fill materials and any deleterious materials, and **loose** native soil are to be excavated/removed from beneath the building footprint. Inorganic granular-based fill soil should be separated and salvaged for reuse to construct engineered fill. Organic and/or deleterious materials are to be discarded from being used as engineered fill;

2) The exposed inorganic earth subgrade is to be thoroughly recompacted by large heavy compaction equipment (10 tonne sheepsfoot compactor is recommended) and inspected by qualified geotechnical personnel. Any loose or soft areas identified should be excavated to the level of competent soil;

3) The required grades can then be achieved by placing approved onsite granular-based fill or imported OPSS Granular B Type I in maximum 300 mm thick loose lifts and compacting to a minimum of 100% Standard Proctor maximum dry density (SPMDD) in areas to support building foundations. The compaction can be reduced to 95% SPMDD to support the floor slabs.

   Use of imported coarse sand and gravel may be required for initial placement procedures if wet/unstable conditions are exposed at the subgrade preparation level. Salvaged fine grained soil (including sand/silt or other approved inorganic earth fill) can be used beneath pavement areas. It can be placed in maximum 300 mm thick loose lifts and compacted to at least 95% SPMDD.

   The moisture content of all fill materials should be within 3% below their optimum moisture contents to achieve the specified degrees of compaction;

4) Engineered fill used to support future building foundations and floor slabs must be placed such that the fill pad extends horizontally outwards from all footings at least the same distance as how thick the engineered fill pad will exist between the underside of future footings and the approved native earth subgrade;

5) All engineered fill placement and compaction operations must be supervised on a full-time basis by qualified geotechnical personnel to approve fill material and ensure the specified degrees of compaction have been achieved.

Vibration could be generated from various construction equipment during construction, such as compactors and rollers which could be harmful to surrounding structures and buildings. Peak particle velocity (PPV) of ground motion is widely accepted as the best descriptor of potential for vibration damage to structures. The safe vibration limit can be set to 10 to 20 mm/s PPV, depending on the sensitivity of surrounding structures to vibration.

Vibration monitoring can be carried out to measure the PPV of ground motion from vibration generated from typical compaction equipment at the beginning of the project in the potentially critical areas. This will set criteria and establish the type of equipment to be used for this project. A pre-construction condition survey could be conducted to document the condition of the existing structures within the possible zone of influence, if necessary.

5.2 Footing Foundations

The proposed warehouse and office buildings can be supported on conventional strip and spread footing foundations. Footings constructed on approved competent native deposits can be designed using a Geotechnical Reaction at SLS of 250 kPa and Factored Geotechnical Resistance at ULS of 400 kPa.

Footings constructed on approved monitored engineered fill (see Section 5.1, Site Grading and Engineered Fill Construction) can be designed using a Geotechnical Reaction at SLS of 200 kPa and Factored Geotechnical Resistance at ULS of 300 kPa.

The following table summarizes the highest founding level and elevation for the footing at each borehole location:

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
Industrial Warehouse Building: SLS = 250 kPa; ULS = 400 kPa			
2	321.64	0.84	320.80
3	322.53	0.43	322.10
4	323.93	0.83	323.10
5	320.24	0.84	319.40
7	322.18	0.78	321.40
8	323.45	0.75	322.70
10	321.01	0.81	320.20
11	321.73	0.43	321.30
12	322.94	0.84	322.10
14	320.40	0.80	319.60
15	321.41	0.91	320.50
16	322.49	0.99	321.50
3-Storey Office Building: SLS = 200 kPa; ULS = 300 kPa			
17	319.40	1.60	317.80
24	319.20	1.60	317.60
Eastern Retaining Walls (Trailer Parking Boundary): SLS = 250 kPa; ULS = 400 kPa			
21	323.67	3.07	320.60

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
22	323.14	1.54	321.60
23	323.92	0.42	323.50

These soil bearing pressures can be achieved provided that the founding subgrade is undisturbed during construction. The majority of the settlements will take place during construction and the first loading cycle of the building.

The maximum total and differential settlements of footings designed to the above recommended soil bearing pressure are expected to be less than 25 and 20 mm, respectively, and these are considered tolerable for the structure being contemplated.

In addition, the footings should be founded below any existing foundations, fill materials and utility trenches, on competent native undisturbed soils. Spacing between adjacent footing steps should not be steeper than 10H to 7V.

Exterior footings and footings in unheated portions of the building should be provided with a soil cover of not less than 1.2 m or equivalent synthetic thermal insulation for adequate frost protection. The founding subgrade soils must be protected from frost penetration during winter construction.

It is recommended that a lean concrete mat be placed over approved footing subgrade in wet to saturated areas to prevent further disturbance to the bearing soils resulting from construction activities.

It is recommended that the footing excavations be inspected by the geotechnical engineer to ensure adequate soil bearing and proper subgrade preparation.

5.3 Earthquake Considerations

In accordance with The Ontario Building Code 2012 (OBC), the proposed structure should be designed to resist earthquake load and effects as per OBC Subsection 4.1.8.

Based on the anticipated condition of the engineered fill materials and the underlying soil condition encountered at the boreholes, the site can be classified as a Site Class C as per OBC Table 4.1.8.4.A (Page B4-24).

5.4 Floor Slab Construction

The floor slab can be constructed as conventional slab-on-grade on the approved compacted engineered fill competent native fine granular, coarse granular and sand/silt till deposits. The exposed subgrade should be proof-rolled with a heavy roller in conjunction with an inspection by the geotechnical engineer at the time of floor slab construction. Any soft and/or unstable areas detected should be replaced with granular fill which should be compacted to at least 95% SPMDD.

It is recommended that a minimum 150 mm thick layer of OPSS Granular "A" be placed and compacted to at least 100% SPMDD beneath the concrete floor slab to provide uniform support.

A modulus of subgrade reaction (k_s) of 50 MN/m^3 may be used for the design of the floor slabs, assuming a stable native sand/silt and/or sand and gravel subgrade.

The floor slab should be separated structurally from the columns and foundation walls. Sawcut control joints should be provided at regular spacing (less than 30 times the concrete slab thickness) and to depths between one-third to one-quarter of the slab thickness.

Care should be taken to ensure that the backfill against foundation walls, interior piers/columns and concrete pits are placed in thin layers and each layer compacted to at least 95% SPMDD. These types of confined areas should be backfilled with excavated granular materials or imported granular soils such as OPSS Granular B Type I.

Moisture migration from the underlying soils through the concrete slab-on-grade will take place via "capillary action" and "diffusion" (due to vapour pressure differential). Although, the Granular "A" layer will provide a capillary break, the low permeance of the concrete slab and floor coverings will result in 100% humidity under the concrete slab and, consequently, the moisture in the concrete will increase over time. The potential effect of the soil moisture should be considered in selecting the floor coverings. A vapour retarder material (such as a 15-mil poly, ASTM E-1745) can be placed to reduce soil moisture migration. Reference is made to ACI 302.

5.5 Excavation and Site Servicing

The industrial warehouse development is to be municipally serviced. Excavation depths for site grading/engineered fill construction, site servicing and building foundations are expected to be in the order of 0.5 to 4.5± m below finished grades.

Excavations for site servicing and building construction will generally be made in Type 3 soils as per the Regulations for Construction Projects Under The Ontario Occupational Health and Safety Act. Excavations are expected to remain stable during the construction period provided that side slopes are shaped to 1H :1V from the bottom of the excavation and suitably protected from erosion processes. Should unstable and/or wet conditions be encountered, side slopes to excavations are to be flattened to a stable configuration. The side slopes should be suitably protected from erosion processes.

Uncontrollable groundwater flows are not expected to be encountered within the anticipated construction excavations. Subsurface seepage and surface water runoff into the excavations may be handled by conventional sump pumping techniques, as and where required. The sump pits should be filtered.

The subgrade is expected to be competent for the support of flexible or rigid pipes if founded in the compact native deposits or approved engineered fill. Any loose, unstable and/or organic soils encountered at the pipe invert should be sub-excavated and replaced with well compacted Granular "A" which should be placed in 150 mm thick layers and compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD). The support of pipes in these areas can also be achieved with non-shrinkable fill if poor soil is encountered at the subgrade level and fully removed.

Pipe bedding should be in accordance with Ontario Provincial Standard Drawings OPSD - 802 series. The bedding shall be Class "B" and consist of at least 150 mm thick Granular "A" compacted to at least 95% SPMDD. Granular "A" should be used to backfill around the pipe to at least 150 mm above the top of the pipe. Particular attention should be given to ensure material placed beneath the haunches of the pipe is adequately compacted.

Excavated inorganic soil is considered suitable for reuse as trench backfill. If necessary, potential mixing of drier and wetter excavated soils in proper ratios or judicious addition of water can be done to produce a suitable mixture near the material’s optimum moisture content to achieve the required compaction specification.

The backfill should be placed in thin layers, 300 mm thick or less dependant on the demonstrated success of compaction based on in-situ density test results. Other types of materials such as organic soils, overly wet soils, boulders, and frozen materials (if work is carried out in the winter months) should not be used for backfilling. All backfill should be compacted to at least 95% SPMDD. Backfilling operations should follow closely after excavation so that only a minimal length of trench slope is exposed at any one time to minimize potential problems. This will potentially minimize over-wetting of the subgrade material.

In wet to saturated subgrade condition, it will be necessary to excavate below founding level and pour a 75 mm thick mud slab of lean concrete to protect the founding soil from disturbance during the installation of reinforcing steel bars and form work.

5.6 Lateral Earth Pressure and Building Drainage

According to the most recent site plan and site grading plan, cutting procedures in the range of 1± to 4.5± m below existing grades will occur along the proposed south and east building lines for footing foundation construction. The final exterior grades along these building walls are currently proposed at 1± to 3.5± m above the proposed finished floor at Elevation 321.50 m.

Based on the results of the boreholes, wet soil conditions were observed within the till soils along the proposed eastern and southern building lines at depths between 4.5± and 6.0± m below existing grade, corresponding to elevations between 317.8± 318.0± m. The wet soil conditions exist 3.5± m to 3.7± m below the proposed building floor slab. Historically in this area of the site, it has been noted that the groundwater can exist at higher elevations during the winter and spring season as a result of perched groundwater conditions. It is recommended to install perimeter weeping tile backfilled with free-draining granular materials along these building wall sections in order to prevent any potential groundwater infiltration into the building.

The unbalanced foundation walls and any other soil retaining structures should be designed to resist the lateral earth pressure acting against these walls. The following formula may be used to calculate the unfactored earth pressure distribution. The factored resistance can be calculated by using a factor of 0.8.

P = K (γ H + q)

where:

P =	Lateral earth pressure	kPa
K =	earth pressure coefficient, 0.5 for non-yielding foundation wall earth pressure coefficient, 0.3 for yielding retaining wall	
γ =	unit weight of granular backfill, compacted to 95% SPMDD	21 kN/m^3
H =	unbalanced height of wall	m
q =	surcharge load at ground surface	kPa

The backfill for the foundation walls and retaining walls should be free-draining granular materials which should have less than 8% silt particles (OPSS Granular "B" Type I). The backfill should be placed in thin layers and compacted to 95% SPMDD. Over-compaction adjacent to the foundation/retaining walls should be avoided. Compaction should be carried out with hand operated equipment within 1 m of the foundation wall or retaining wall. Weeping tiles leading to a frost-free outlet or weep holes should be installed to effect drainage behind the retaining wall.

The sliding resistance of the retaining wall footings should be checked. The unfactored horizontal resistance against sliding between cast-in-place concrete and the various soils can be calculated using a friction coefficient as follows:

Soil	Unit Weight (kN/m^3)	Friction Coefficient
Well-Compacted Granular Backfill	21	0.40
Constructed Engineered Fill	21	0.40
Coarse Granular Deposits	21	0.40
Sand	20	0.35
Fine Granular Deposits	20	0.30

5.7 Driveway Pavement Design and Construction

The earth subgrade in pavement areas is expected to consist of sand, fine granular, coarse granular and sand/silt till soils. The following flexible pavement structures are recommended based on an assumed CBR value, the observed groundwater conditions, and the frost susceptibility of the subgrade soils:

Component	Light Duty Pavement (mm)	Heavy Duty Pavement (mm)
Asphaltic Concrete HL3 Asphaltic Concrete HL8	40 40	40 60
Granular "A" Base	150	150
Granular "B" Sub-base	300	450

Consideration to deletion or reduction of the Granular "B" Type I sub-base course is possible if sand and gravel is exposed at the underside level of the future Granular "A" base course and the sand and gravel is proved to meet the gradational requirements of OPSS 1010.

The pavement design considers that pavement construction will be carried out during the drier time of the year and that the subgrade is stable, not heaving under construction equipment traffic. If the subgrade is wet or unstable, additional granular sub-base may be required.

Prior to the placement of the granular base, the subgrade will be stripped of existing pavements, topsoil, and deleterious materials. The exposed subgrade should be thoroughly recompacted with a heavy vibratory compactor and inspected by a qualified geotechnical inspector. Any soft spots encountered during the process should be excavated to the level of competent soil. The required grades can then be achieved by placing approved on-site soils in maximum 200 to 300 thick lifts which should be compacted to 95% SPMDD.

The base and sub-base materials should be produced in accordance with the current OPSS specifications and placed and uniformly compacted to at least 100% SPMDD. The asphaltic concrete should be placed and compacted in accordance with OPSS.MUNI 310 Table 10 to at least 92% of the Marshall Density (MRD). Frequent in situ density testing by this office should be carried out to verify that the specified degree of compaction is being achieved and maintained.

It should be noted that even well compacted trench backfill could settle for a period of time after construction. In this regard, the surface course of the asphaltic concrete should be placed at least one (1) year after trench backfill is completed to allow any minor settlements to occur within the trench backfill. The incomplete pavement structure may not be capable of supporting construction traffic. Consequently, minor repairs of the sub-base, base and asphaltic concrete may be required prior to paving with the base course and/or the surface course asphaltic concrete.

Adequate drainage of the pavement subgrade is essential for the performance of the pavement. The subgrade should be free of any depressions and sloped at a minimum grade of 2% to provide positive drainage.

The prepared earth subgrade and final pavement surfaces should be graded to direct water runoff away from buildings, sidewalks, and other similar pertinent structures. Positive drainage outlets should be provided at all low points of the prepared subgrade, such as stub drains extended from the catch-basins

5.8 Pavement Drainage System

Based on the results of the boreholes, groundwater was observed in the southeast corner (adjacent to the wetland) of the site at a depth of 5.2± m below existing grade, corresponding to an elevation of 318.72± m. The proposed surface grade elevations in this area of the trailer storage lot are between 323.0± and 324.0± m. Historically in this area of the site, it has been noted that the groundwater can exist at higher elevations during the winter and spring season as a result of perched groundwater conditions draining from the wetland. It is recommended to implement a drainage system within the asphalt paved areas in the trailer storage lot to promote the longevity/integrity of the pavement structure.

The prepared earth subgrade and final pavement surfaces should be graded to direct water runoff away from buildings, sidewalks, and other similar pertinent structures. Positive drainage outlets should be provided for at all low points of the earth subgrade to drain the granular bases by installing a subdrain system connected to the catch-basins. The subdrains should be at least 3 m long and radiating from the catch-basins.

In addition, "frost tapers" consisting of backfilling catch-basins and manholes with free-draining Granular 'B' (similar to OPSD 802.010) are recommended at such underground structures.

Due to the frost-susceptible nature of the subgrade soil and spring/winter high groundwater table, it is recommended that a longitudinal sub-drain system be installed along the edges of the new pavement areas. The sub-drain system should incorporate a 150 mm diameter perforated tile equipped with a factory installed filter sock. The sub-drain will enable water removal, in turn reducing the risk and effects of frost heaving and load transfer in saturated conditions. The sub-drains should be installed in a 300 by 300 mm trench in the subgrade, surrounded by approximately 50 to 75 mm concrete sand. Subdrains must be installed with positive drainage into a catch basin or other suitable outlet and the subgrade must be prepared with positive drainage to the sub-drains.

In addition to the perimeter sub-drain system, an internal sub-drain system should be installed in the subgrade soil at typical spacing of 6 m at a minimum 0.5% gradient. it is recommended that the sub-drains direct the groundwater to the northern end of the site on either side of the proposed basement level where the groundwater table declines in elevation in the order of 1.0± to 1.5± m.

The surface drainage design should be reviewed by the site Civil Engineer to ensure that it is adequate for the scope of the proposed pavement construction.

5.9 Infiltration Rate of Native Soil Deposits

It is understood that a storm water management infiltration facility is to be included at the site.

The top of the infiltration feature should be located below the footing drain/weeper and at least 5 m away from the proposed building footprints. It is noted that infiltration features should have the base located at least 1.0 m above the groundwater table and that a minimum infiltration rate of 15 mm/hr is required.

Based on the results of grain size analyses, the hydraulic conductivity (permeability) and infiltration rate of the native inorganic soil types encountered at the boreholes are estimated and provided in the following table and may be used for storm water management purposes:

MATERIAL	PERMEABILITY (K) (cm/sec)	INFILTRATION RATE (mm/hr)
Sand and Gravel to Gravelly Sand, trace silt (Enclosures 37 & 43)	1×10^{-3} to 1×10^{-2}	75 to 150
Silty Sand, trace gravel to Silty Sand and Gravel (Enclosures 35, 36, 39 & 40)	3×10^{-5} to 1×10^{-3}	40 to 75
Sand and Silt to Silt	3×10^{-6} to 3×10^{-5}	20 to 40
Sand and Silt to Sandy Silt Till (Enclosures 34 & 38)	1×10^{-6} to 1×10^{-4}	12 to 40

It is important to note that the above infiltration rates are based on soil grain size alone and do not include any factor of safety to account for the effects of possible elevated clay content, compaction, sedimentation, the presence of a second lower-permeability soil layer within about 1.5 m of the soil material, and/or the presence of a high water table within about 1.5 m of the soil material. Engineering judgement is necessary (i.e., factors of safety) to adjust the rates for stormwater facility design purposes to account for some or all of these other effects.

6.0 GEO-ENVIRONMENTAL CONSIDERATIONS

Excess soil will be generated and removed off-site during the construction of the proposed industrial warehouse development. The management of excess soil is now governed by O.Reg. 406/19, MECP document entitled “On-Site and Excess Soil Management Regulation”. In accordance with the regulation, the Project Leader is responsible for the handling, storage, reuse, transportation, and removal of all soil. To support off-site removal of excess soil, the following is required:

- Planning Documentation
    - Assessment of Past Use
    - Sampling and Analysis Plan
    - Excess Soil Characterization Report
    - Excess Soil Destination Report
- Tracking
- Registry
- Record Keeping

An initial testing program was conducted during the geotechnical investigation and the analytical results are discussed in the following sections of this report. Additional soil sampling and analysis may be required as per the above-noted MECP document and/or as per the requirement of the receiving site owner(s), depending on the volume of excess soil generated during construction. The analytical results and environmental assessment findings must be disclosed to the receiving site owner(s) and approval by the receiving site owner(s) be obtained prior to exporting/transferring the materials.

It is noted that the soils condition may differ between and beyond the sampled locations. If any impacted soils are discovered during construction, CVD should be contacted for further sampling and testing to determine the limit of the impacted soils.
Any soils identified during construction to have been environmentally impacted are to be separately stockpiled and analysed to determine the appropriate measures for handling and disposal. Waste characterization testing (TCLP) to classify the material for disposal as prescribed in O.Reg. 347/558 is required. Leachate analysis (mSPLP) is to be carried out if the excess soil is to be disposed to receiving sites under O.Reg. 406/19. Similarly, groundwater encountered during construction works must also be suitably assessed and handled.

6.1 Applicable Regulatory Standards

The Soil, Ground Water and Sediment Standards for Use Under the New Soil Rules and Excess Soil Quality Standards established in accordance with the O.Reg. 406/19 as amended were consulted in the assessment of the soil at the project site.

The analytical results for soils were compared to the following “applicable regulatory standards”:

• Table 1 (Full Depth Background Site Condition Standards) for <u>Residential/Parkland/Institutional/ Industrial/Commercial/Community</u> Property Use

• Table 2.1 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for Residential/Parkland/Institutional Property Use

• Table 2.1 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for Industrial/Commercial/Community Property Use

6.2 Handling of Excess Soils

Four (4) soil samples were submitted to AGAT Laboratories of Mississauga, Ontario for analysis of metals, inorganics, Petroleum Hydrocarbons (PHCs F1 to F4) and Benzene-Toluene-Ethylbenzene-Xylene (BTEX). The chemical testing was conducted to initially assess the environmental quality of potential excess soil which may be generated and removed off-site during construction activities.

The results and laboratory certificates of chemical analysis provided by AGAT Laboratories of Mississauga are enclosed in Appendix B. A comparison of the soil chemistry results to the applicable regulatory standard is included in Appendix C.

The analytical results for Electrical Conductivity indicate that the test tested soils do not exceed the allowable concentration limits under Table 1 and Table 2.1 standards.

The analytical results for SAR indicate that the tested soils do not exceed the allowable concentration limits under Table 1 and Table 2.1 standards.

The analytical results for metals and inorganics indicate that the tested soils do not exceed the allowable concentration limits under Table 1 and Table 2.1 standards.

The analytical results for PHCs (F1-F4) indicate that the tested soils do not exceed the allowable concentration limits under Table 1 and Table 2.1 standards.

The analytical results for BTEX indicate that the tested soils do not exceed the allowable concentration limits under Table 1 and Table 2.1 standards.

Any soils identified during construction to have been environmentally impacted are to be separately stockpiled and analysed to determine appropriate measures for handling and disposal. Waste characterization testing (TCLP) to classify the material for disposal as prescribed in Ontario Regulation 347/558 is required.

CVD further recommends that a disposal plan for excess soils be established to manage the quantity, as well as where and how the excess soils can be disposed of off-site.

7.0 CLOSURE

The Limitations of Report, as quoted in Appendix A, is an integral part of this report.

We trust that the information presented in this report is complete within our terms of reference. If there are any further questions concerning this report, please do not hesitate to contact our office.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

[redacted]

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Eric Y. Chung, P.Eng., M. Eng.
Principal Engineer

APPENDIX A

Limitation of Report

APPENDIX “A”

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes and their respective depths may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.

APPENDIX B

Soil Chemistry Results

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ATTENTION TO: Brianna Cobbe

PROJECT: G22518

AGAT WORK ORDER: 22T954493

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager

TRACE ORGANICS REVIEWED BY: Radhika Chakraberty, Trace Organics Lab Manager

DATE REPORTED: Oct 18, 2022

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 22T954493

PROJECT: G22518

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SAMPLING SITE:100 Brock Road South, Aberfoyle

SAMPLED BY:Drake Oldfield

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-10-06

DATE REPORTED: 2022-10-18

					SAMPLE DESCRIPTION:	BH1-SA1	BH6-SA2	BH7-SA2	BH9-SA1	BH12-SA1	BH15-SA1
					SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil
					DATE SAMPLED:	2022-09-27	2022-09-28	2022-09-28	2022-09-29	2022-09-28	2022-09-30
Parameter	Unit	G / S: A	G / S: B	G / S: C	RDL	4388906	4388908	4388909	4388910	4388911	4388912
Antimony	µg/g	1.3	7.5	40	0.8	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]
Arsenic	µg/g	18	18	18	1	6[<A]	5[<A]	5[<A]	5[<A]	5[<A]	5[<A]
Barium	µg/g	220	390	670	2.0	32.2[<A]	27.0[<A]	19.6[<A]	35.8[<A]	28.5[<A]	29.1[<A]
Beryllium	µg/g	2.5	4	8	0.4	<0.4[<A]	<0.4[<A]	<0.4[<A]	<0.4[<A]	<0.4[<A]	<0.4[<A]
Boron	µg/g	36	120	120	5	10[<A]	10[<A]	10[<A]	10[<A]	11[<A]	11[<A]
Boron (Hot Water Soluble)	µg/g	NA	1.5	2	0.10	0.13[<B]	0.11[<B]	<0.10[<B]	0.12[<B]	<0.10[<B]	<0.10[<B]
Cadmium	µg/g	1.2	1.2	1.9	0.5	<0.5[<A]	0.6[<A]	0.6[<A]	0.6[<A]	0.7[<A]	0.6[<A]
Chromium	µg/g	70	160	160	5	11[<A]	9[<A]	7[<A]	12[<A]	9[<A]	8[<A]
Cobalt	µg/g	21	22	80	0.5	6.2[<A]	4.9[<A]	3.8[<A]	5.7[<A]	5.2[<A]	4.7[<A]
Copper	µg/g	92	140	230	1.0	34.9[<A]	24.3[<A]	15.1[<A]	22.9[<A]	20.8[<A]	24.4[<A]
Lead	µg/g	120	120	120	1	26[<A]	38[<A]	32[<A]	42[<A]	26[<A]	23[<A]
Molybdenum	µg/g	2	6.9	40	0.5	<0.5[<A]	0.6[<A]	<0.5[<A]	0.6[<A]	<0.5[<A]	0.7[<A]
Nickel	µg/g	82	100	270	1	13[<A]	10[<A]	8[<A]	12[<A]	11[<A]	9[<A]
Selenium	µg/g	1.5	2.4	5.5	0.8	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]
Silver	µg/g	0.5	20	40	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Thallium	µg/g	1	1	3.3	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Uranium	µg/g	2.5	23	33	0.50	<0.50[<A]	0.51[<A]	<0.50[<A]	0.57[<A]	0.51[<A]	<0.50[<A]
Vanadium	µg/g	86	86	86	0.4	19.1[<A]	17.4[<A]	12.8[<A]	20.0[<A]	16.8[<A]	14.1[<A]
Zinc	µg/g	290	340	340	5	150[<A]	242[<A]	188[<A]	243[<A]	255[<A]	246[<A]
Chromium, Hexavalent	µg/g	0.66	8	8	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Cyanide, WAD	µg/g	0.051	0.051	0.051	0.040	<0.040[<A]	<0.040[<A]	<0.040[<A]	<0.040[<A]	<0.040[<A]	<0.040[<A]
Mercury	µg/g	0.27	0.27	0.27	0.10	<0.10[<A]	<0.10[<A]	<0.10[<A]	<0.10[<A]	<0.10[<A]	<0.10[<A]
Electrical Conductivity (2:1)	mS/cm	0.57	0.7	1.4	0.005	0.162[<A]	0.164[<A]	0.132[<A]	0.174[<A]	0.129[<A]	0.146[<A]
Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	5	12	N/A	0.081[<A]	0.150[<A]	0.083[<A]	0.142[<A]	0.131[<A]	0.178[<A]
pH, 2:1 CaCl2 Extraction	pH Units				NA	7.77	7.92	8.10	7.77	8.01	8.32

Certified By: [redacted]

CHARTERED AMANJOT BHELA CHEMIST

Results relate only to the items tested. Results apply to samples as received.

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AGAT WORK ORDER: 22T954493
PROJECT: G22518

CLIENT NAME: CHUNG AND VANDER DOELEN
SAMPLING SITE:100 Brock Road South, Aberfoyle

ATTENTION TO: Brianna Cobbe
SAMPLED BY:Drake Oldfield

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-10-06 DATE REPORTED: 2022-10-18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg. 406/19 TABLE 1: Full Depth Background Site Condition - RPIC, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

4388906-4388912 EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: [redacted]

CHARTERED
AMANJOT BHELA
CHEMIST

5835 COOPERS AVENUE
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Certificate of Analysis

AGAT WORK ORDER: 22T954493
PROJECT: G22518

CLIENT NAME: CHUNG AND VANDER DOELEN
ATTENTION TO: Brianna Cobbe
SAMPLING SITE:100 Brock Road South, Aberfoyle
SAMPLED BY:Drake Oldfield

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2022-10-06
DATE REPORTED: 2022-10-18

					SAMPLE DESCRIPTION:	BH1-SA1	BH6-SA2	BH7-SA2	BH9-SA1	BH12-SA1	BH15-SA1
					SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil
					DATE SAMPLED:	2022-09-27	2022-09-28	2022-09-28	2022-09-29	2022-09-28	2022-09-30
Parameter	Unit	G / S: A	G / S: B	G / S: C	RDL	4388906	4388908	4388909	4388910	4388911	4388912
Benzene	µg/g	0.02	0.02	0.02	0.02	<0.02[<A]	<0.02[<A]	<0.02[<A]	<0.02[<A]	<0.02[<A]	<0.02[<A]
Toluene	µg/g	0.2	0.2	0.2	0.05	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]
Ethylbenzene	µg/g	0.05			0.05	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]
m & p-Xylene	µg/g				0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	µg/g				0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	0.05	0.091	0.091	0.05	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]
F1 (C6 - C10)	µg/g				5	<5	<5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	25	25	5	<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
F2 (C10 to C16)	µg/g	10	10	26	10	<10[<A]	<10[<A]	<10[<A]	<10[<A]	<10[<A]	<10[<A]
F3 (C16 to C34)	µg/g	240	240	240	50	<50[<A]	<50[<A]	<50[<A]	<50[<A]	<50[<A]	<50[<A]
F4 (C34 to C50)	µg/g	120	2800	3300	50	<50[<A]	<50[<A]	<50[<A]	<50[<A]	<50[<A]	<50[<A]
Gravimetric Heavy Hydrocarbons	µg/g				50	NA	NA	NA	NA	NA	NA
Moisture Content	%				0.1	5.5	5.1	4.6	6.6	6.2	3.2
Surrogate	Unit	Acceptable Limits									
Toluene-d8	% Recovery	60-140				99	112	101	121	77	88
Terphenyl	%	60-140				84	68	64	63	77	75

Certified By: [redacted]

Certificate of Analysis

AGAT WORK ORDER: 22T954493
PROJECT: G22518

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CLIENT NAME: CHUNG AND VANDER DOELEN
SAMPLING SITE: 100 Brock Road South, Aberfoyle

ATTENTION TO: Brianna Cobbe
SAMPLED BY: Drake Oldfield

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2022-10-06

DATE REPORTED: 2022-10-18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg. 406/19 TABLE 1: Full Depth Background Site Condition - RPIC, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

4388906-4388912 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: [redacted]

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Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN
PROJECT: G22518
SAMPLING SITE:100 Brock Road South, Aberfoyle

AGAT WORK ORDER: 22T954493
ATTENTION TO: Brianna Cobbe
SAMPLED BY:Drake Oldfield

Soil Analysis

RPT Date: Oct 18, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	4388906	4388906	<0.8	<0.8	NA	< 0.8	103%	70%	130%	87%	80%	120%	94%	70%	130%
Arsenic	4388906	4388906	6	6	0.0%	< 1	120%	70%	130%	93%	80%	120%	92%	70%	130%
Barium	4388906	4388906	32.2	32.6	1.2%	< 2.0	112%	70%	130%	103%	80%	120%	99%	70%	130%
Beryllium	4388906	4388906	<0.4	<0.4	NA	< 0.4	101%	70%	130%	101%	80%	120%	121%	70%	130%
Boron	4388906	4388906	10	9	NA	< 5	96%	70%	130%	107%	80%	120%	116%	70%	130%
Boron (Hot Water Soluble)	4388906	4388906	0.13	0.15	NA	< 0.10	101%	60%	140%	107%	70%	130%	100%	60%	140%
Cadmium	4388906	4388906	<0.5	<0.5	NA	< 0.5	104%	70%	130%	114%	80%	120%	124%	70%	130%
Chromium	4388906	4388906	11	11	NA	< 5	107%	70%	130%	101%	80%	120%	98%	70%	130%
Cobalt	4388906	4388906	6.2	6.4	3.2%	< 0.5	121%	70%	130%	100%	80%	120%	101%	70%	130%
Copper	4388906	4388906	34.9	34.1	2.3%	< 1.0	99%	70%	130%	114%	80%	120%	114%	70%	130%
Lead	4388906	4388906	26	26	0.0%	< 1	105%	70%	130%	112%	80%	120%	91%	70%	130%
Molybdenum	4388906	4388906	<0.5	<0.5	NA	< 0.5	119%	70%	130%	105%	80%	120%	114%	70%	130%
Nickel	4388906	4388906	13	13	0.0%	< 1	122%	70%	130%	114%	80%	120%	112%	70%	130%
Selenium	4388906	4388906	<0.8	<0.8	NA	< 0.8	85%	70%	130%	100%	80%	120%	106%	70%	130%
Silver	4388906	4388906	<0.5	<0.5	NA	< 0.5	105%	70%	130%	102%	80%	120%	109%	70%	130%
Thallium	4388906	4388906	<0.5	<0.5	NA	< 0.5	119%	70%	130%	102%	80%	120%	95%	70%	130%
Uranium	4388906	4388906	<0.50	0.50	NA	< 0.50	123%	70%	130%	102%	80%	120%	101%	70%	130%
Vanadium	4388906	4388906	19.1	19.9	4.1%	< 0.4	118%	70%	130%	101%	80%	120%	107%	70%	130%
Zinc	4388906	4388906	150	151	0.7%	< 5	100%	70%	130%	101%	80%	120%	109%	70%	130%
Chromium, Hexavalent	4401830		<0.2	<0.2	NA	< 0.2	100%	70%	130%	89%	80%	120%	107%	70%	130%
Cyanide, WAD	4388908	4388908	<0.040	<0.040	NA	< 0.040	91%	70%	130%	108%	80%	120%	108%	70%	130%
Mercury	4388906	4388906	<0.10	<0.10	NA	< 0.10	110%	70%	130%	103%	80%	120%	98%	70%	130%
Electrical Conductivity (2:1)	4389097		4.17	4.17	0.0%	< 0.005	118%	80%	120%	NA			NA		
Sodium Adsorption Ratio (2:1) (Calc.)	4389097		2.70	2.65	1.9%	N/A	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	4389388		7.66	7.80	1.8%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By: [redacted]

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Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN
PROJECT: G22518
SAMPLING SITE:100 Brock Road South, Aberfoyle

AGAT WORK ORDER: 22T954493
ATTENTION TO: Brianna Cobbe
SAMPLED BY:Drake Oldfield

Trace Organics Analysis

RPT Date: Oct 18, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	4401884		<0.02	<0.02	NA	< 0.02	102%	60%	140%	106%	60%	140%	89%	60%	140%
Toluene	4401884		<0.05	<0.05	NA	< 0.05	117%	60%	140%	114%	60%	140%	88%	60%	140%
Ethylbenzene	4401884		<0.05	<0.05	NA	< 0.05	113%	60%	140%	109%	60%	140%	92%	60%	140%
m & p-Xylene	4401884		<0.05	<0.05	NA	< 0.05	111%	60%	140%	109%	60%	140%	95%	60%	140%
o-Xylene	4401884		<0.05	<0.05	NA	< 0.05	102%	60%	140%	98%	60%	140%	89%	60%	140%
F1 (C6 - C10)	4401884		<5	<5	NA	< 5	86%	60%	140%	88%	60%	140%	87%	60%	140%
F2 (C10 to C16)	4391205		<10	<10	NA	< 10	101%	60%	140%	87%	60%	140%	85%	60%	140%
F3 (C16 to C34)	4391205		73	101	NA	< 50	107%	60%	140%	87%	60%	140%	75%	60%	140%
F4 (C34 to C50)	4391205		<50	<50	NA	< 50	87%	60%	140%	109%	60%	140%	97%	60%	140%

Certified By: [redacted]

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Method Summary

CLIENT NAME: CHUNG AND VANDER DOELEN
AGAT WORK ORDER: 22T954493
PROJECT: G22518
ATTENTION TO: Brianna Cobbe
SAMPLING SITE:100 Brock Road South, Aberfoyle
SAMPLED BY:Drake Oldfield

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, WAD	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 7471B and SM 3112 B	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE
Sodium Adsorption Ratio (2:1) (Calc.)	INOR-93-6007	modified from EPA 6010D & Analytical Protocol	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6075	modified from EPA 9045D, MCKEAGUE 3.11 E3137	PC TITRATE

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Method Summary

CLIENT NAME: CHUNG AND VANDER DOELEN
AGAT WORK ORDER: 22T954493
PROJECT: G22518
ATTENTION TO: Brianna Cobbe
SAMPLING SITE:100 Brock Road South, Aberfoyle
SAMPLED BY:Drake Oldfield

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Toluene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Ethylbenzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
m & p-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
o-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Xylenes (Total)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
F1 (C6 - C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID

AGAT Laboratories

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 22T984493

Cooler Quantity: 1 med

Arrival Temperatures: 3.8 | 4.2 | 4.9

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes: [redacted]

Report Information:

Company: Chung & Vander Doelen Engineering Ltd.
Contact: Brianna Cobbe
Address: 311 Victoria Street North
Kitchener, ON, N2H 5E1
Phone: (519)505-6180 Fax:
Reports to be sent to:
1. Email: brianna.cobbe@cvdengineering.com
2. Email: joe.vanderzalm@cvdengineering.com

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table ____ (Indicate One)
☐Ind/Com
☐Res/Park
☐Agriculture
Soil Texture (Check One)
☐Coarse
☐Fine

☑ Excess Soils R406
Table T1 RPIICC (Indicate One)
T2.1 RPI/ICC
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐Sanitary ☐Storm
Region ____
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
____ (Indicate One)

Turnaround Time (TAT) Required:

Regular TAT ☐ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: G22518
Site Location: 100 Brock Road South, Aberfoyle
Sampled By: Drake Oldfield
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☑ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC (Y/N)	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐CrVI, ☐Hg, ☐HWSB	O. Reg 153: BTEX, F1-F4 PHCs Analyze F4G if required ☑Yes ☐No	PAHs	PCBs	VOC	O. Reg 558: Landfill Disposal Characterization TCLP: TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P☐PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐Metals ☐VOCs ☐SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	Potentially Hazardous or High Concentration (Y/N)
BH1-SA1	09/27/22	AM PM	3	S			☑		☑								
BH6-SA2	09/28/22	AM PM	3	S			☑		☑								
BH7-SA2	09/28/22	AM PM	3	S			☑		☑								
BH9-SA1	09/29/22	AM PM	3	S			☑		☑								
BH12-SA1	09/28/22	AM PM	3	S			☑		☑								
BH15-SA1	09/30/22	AM PM	3	S			☑		☑								
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															

Samples Relinquished By (Print Name and Sign): Brianna Cobbe [redacted] Date 10/06/22 Time 12:00 PM

Samples Received By (Print Name and Sign): [redacted] Date Time

Samples Relinquished By (Print Name and Sign): Date Time

Samples Received By (Print Name and Sign): Date Time

Samples Relinquished By (Print Name and Sign): Date Time

Samples Received By (Print Name and Sign): Date Time

Page ____ of ____

Nº:

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Date Issued: March 8, 2021

APPENDIX C

Comparison of Soil Chemistry Results to Applicable Regulatory Criteria

ANALYTICAL RESULTS FOR SOIL

MECP Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, December 17, 2020 (O.Reg. 406/19)

		Table 1 Residential/ Parkland/ Institutional/ Industrial/ Commercial/ Community Property Use Standard	Table 2.1 Residential/ Parkland/ Institutional Property Use Standard	Table 2.1 Industrial/ Commercial/ Community Property Use Standard	BH 1 - SA 1	BH 6 - SA 2	BH 7 - SA 2	BH 9 - SA 1	BH 12 - SA 1	BH 15 - SA 1
Metals & Inorganics	Conductivity (mS/cm)	0.57	0.7	1.4	0.162	0.164	0.132	0.174	0.129	0.146
	% Moisture (%)	-	-	-	5.5	5.1	4.6	6.6	6.2	3.2
	pH (pH units)	-	-	-	7.77	7.92	8.10	7.77	8.01	8.32
	Cyanide, Weak Acid Diss (ug/g)	0.051	0.051	0.051	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
	SAR	2.4	5	12	0.081	0.150	0.083	0.142	0.131	0.178
	Antimony (Sb)	1.3	7.5	40	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
	Arsenic (As)	18	18	18	6	5	5	5	5	5
	Barium (Ba)	220	390	670	32.2	27.0	19.6	35.8	28.5	29.1
	Beryllium (Be)	2.5	4	8	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
	Boron (B)	36	120	120	10	10	10	10	11	11
	Boron (B), Hot Water Ext. Available	36	1.5	2	0.13	0.11	<0.10	0.12	<0.10	<0.10
	Cadmium (Cd)	1.2	1.2	1.9	<0.5	0.6	0.6	0.6	0.7	0.6
	Chromium (Cr)	70	160	160	11	9	7	12	9	8
	Cobalt (Co)	21	22	80	6.2	4.9	3.8	5.7	5.2	4.7
	Copper (Cu)	92	140	230	34.9	24.3	15.1	22.9	20.8	24.4
	Lead (Pb)	120	120	120	26	38	32	42	26	23
	Mercury (Hg)	0.27	0.27	0.27	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Molybdenum (Mo)	2	6.9	40	<0.5	0.6	<0.5	0.6	<0.5	0.7
	Nickel (Ni)	82	100	270	13	10	8	12	11	9
	Selenium (Se)	1.5	2.4	5.5	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
	Silver (Ag)	0.5	20	40	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Thallium (Tl)	1	1	3.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Uranium (U)	2.5	23	33	<0.50	0.51	<0.50	0.57	0.51	<0.50
	Vanadium (V)	86	86	86	19.1	17.4	12.8	20.0	16.8	14.1
	Zinc (Zn)	290	340	340	150	242	188	243	255	246
	Chromium, Hexavalent	0.66	8	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Petroleum Hydrocarbons F1-F4	F1 (C6-C10)	25	25	25	<5	<5	<5	<5	<5	<5
	F1-BTEX	25	25	25	<5	<5	<5	<5	<5	<5
	F2 (C10-C16)	10	10	26	<10	<10	<10	<10	<10	<10
	F3 (C16-C34)	240	240	240	<50	<50	<50	<50	<50	<50
	F4 (C34-C50)	120	2800	3300	<50	<50	<50	<50	<50	<50
BTEX	Benzene	0.02	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Toluene	0.2	0.2	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Xylenes (Total)	0.05	0.091	0.091	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

NOTES:

1. Units = ug/g
2. "-" - Paramater not included in chemical analysis
3. "nv" - no value
4. Test results shown in highlighted text exceed the Table 1 Standard for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
5. Test results shown in highlighted text exceed the Table 2.1 Standard for Volume Independent Soil for Residential/Parkland/Institutional Property Use
6. Test results shown in highlighted text exceed the Table 2.1 Standard for Volume Independent Soil for Industrial/Commercial/Community Property Use

APPENDIX D

Selected Drawings from Hydrogeological Investigation by MBN Environmental Engineering Inc. (MBN13-274)

LEGEND:

HP	HYDRO POLE		SURVEY MONUMENT FOUND
LS	LIGHT STANDARD		SURVEY MONUMENT SET
OH	OVERHEAD HYDRO	IB	IRON BAR
W	WATERMAIN	SIB	STANDARD IRON BAR
X	FENCE	IBØ	ROUND IRON BAR
325.09	EXISTING GRADE	HM	HYDRO METER
BH 1	BORE HOLE	BELL	BELL PEDESTAL
TP2	TEST PIT	CATV	TV PEDESTAL
MW	MONITORING WELL		DECIDUOUS TREE
	CATCH BASIN		CONIFEROUS TREE
MH	MANHOLE		GRAVEL
WV	WATER VALVE		
B	BOLLARD		
	SILT FENCE		
	FLAGGED WETLAND AREA		
	PROPERTY LIMITS		

PLAN VIEW
1 : 1250

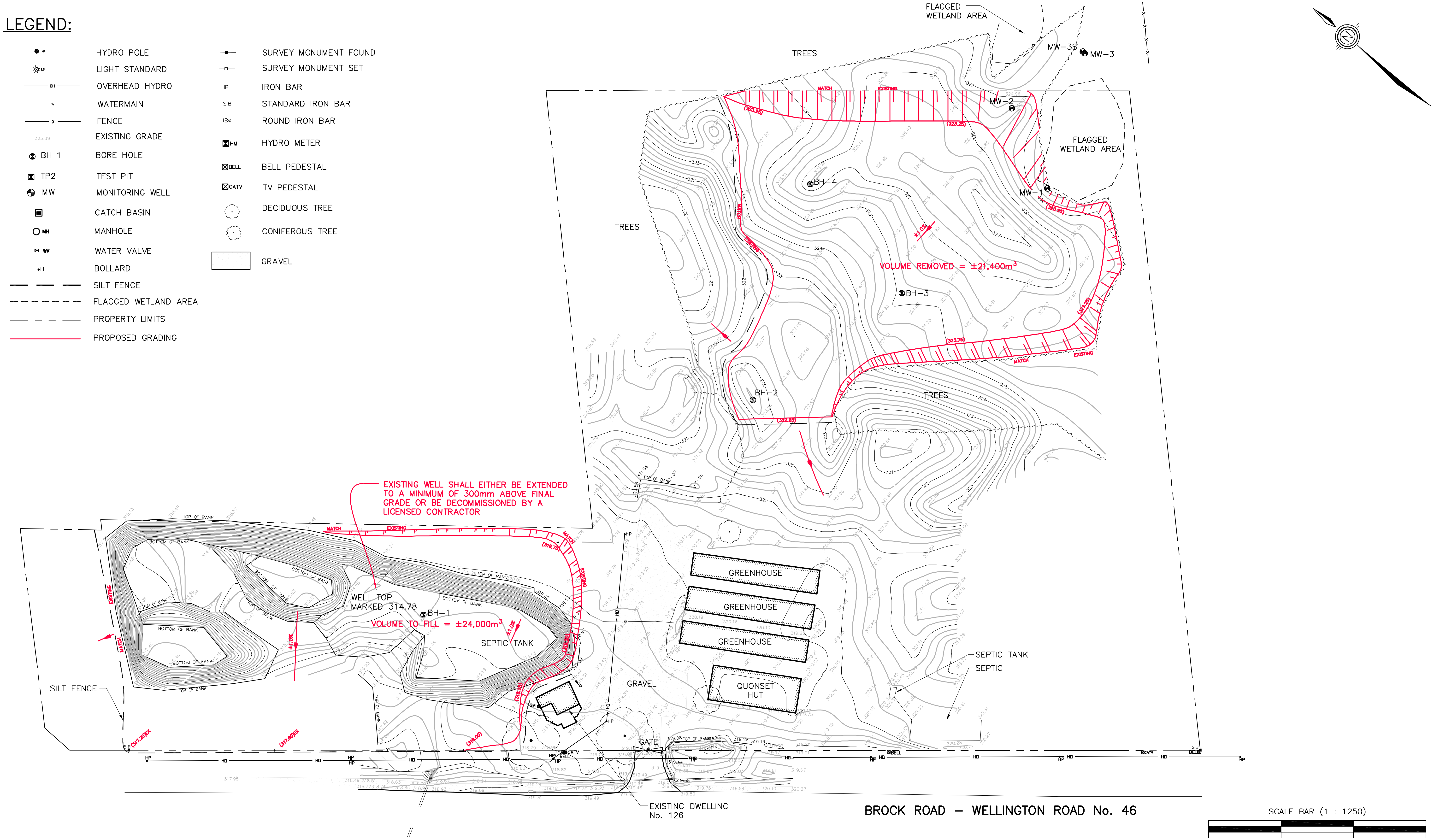
MBN environmental engineering inc
29 St. Charles Street East, Maryhill, On, N0B 2B0

FIGURE 2
CURRENT SITE LAYOUT
HYDROGEOLOGIC STUDY
MILAN LESIC HOLDINGS INC.
126 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO

DATE FEBRUARY 2014	PROJ. NO. MBN13-274
FILE NO. MBN13-274 – FIGS	DWG. NO. FIG-02

LEGEND:

- HYDRO POLE
- LIGHT STANDARD
- OVERHEAD HYDRO
- WATERMAIN
- FENCE
- EXISTING GRADE
- BH 1 — BORE HOLE
- TP2 — TEST PIT
- MW — MONITORING WELL
- CATCH BASIN
- MANHOLE
- WATER VALVE
- BOLLARD
- SILT FENCE
- FLAGGED WETLAND AREA
- PROPERTY LIMITS
- PROPOSED GRADING
- SURVEY MONUMENT FOUND
- SURVEY MONUMENT SET
- IB — IRON BAR
- SIB — STANDARD IRON BAR
- IBø — ROUND IRON BAR
- HM — HYDRO METER
- BELL — BELL PEDESTAL
- CATV — TV PEDESTAL
- DECIDUOUS TREE
- CONIFEROUS TREE
- GRAVEL



PLAN VIEW

1 : 1250

MBN environmental engineering inc

29 St. Charles Street East, Maryhill, On, N0B 2B0

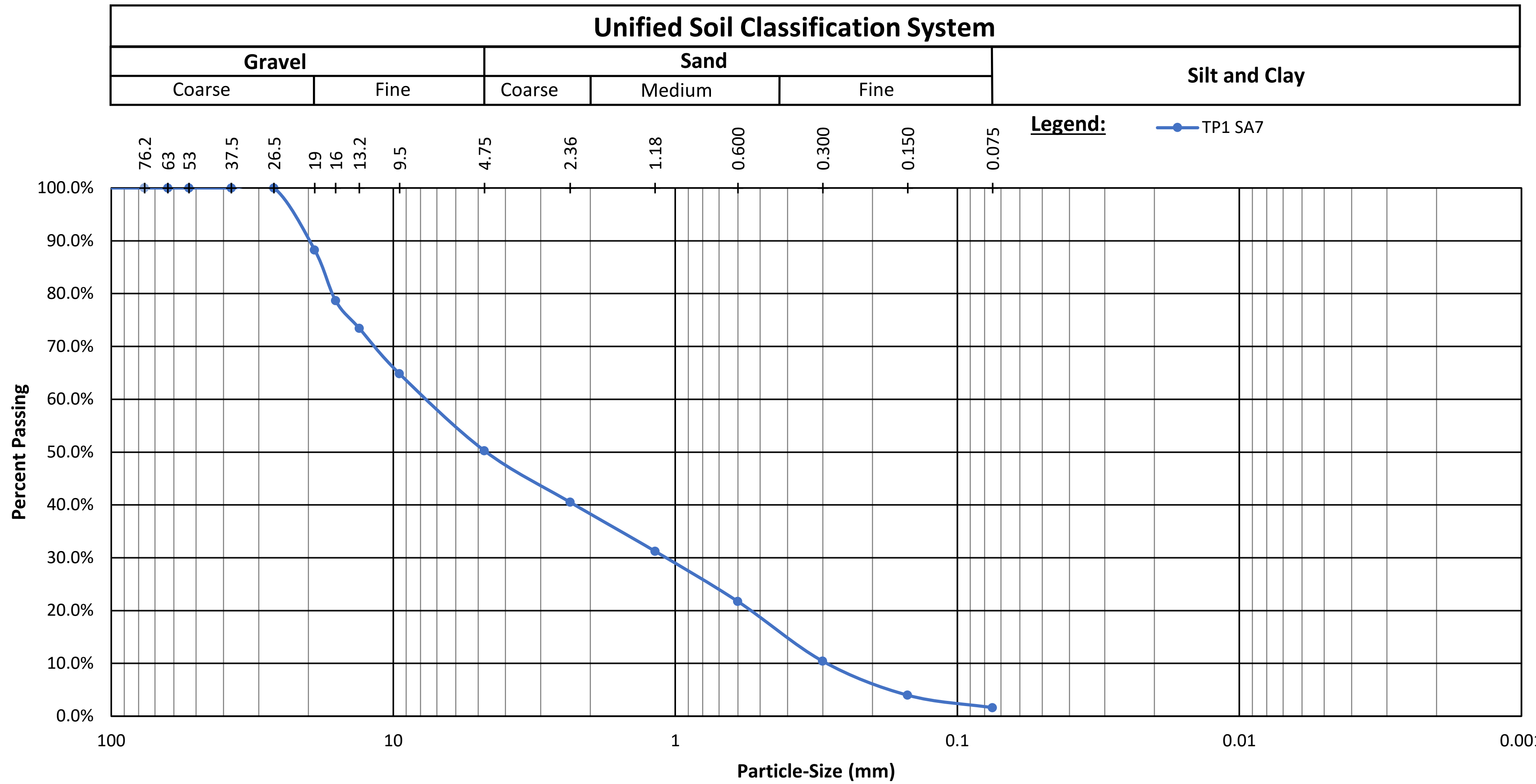
FIGURE 3

PROPOSED SITE LAYOUT
HYDROGEOLOGIC STUDY
MILAN LESIC HOLDINGS INC.
126 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO

DATE	PROJ. NO.
FEBRUARY 2014	MBN13-274
FILE NO.	DWG. NO.
MBN13-274 – FIGS	FIG-03

APPENDIX E

Grain Size Distribution Charts by Flow Spec Engineering

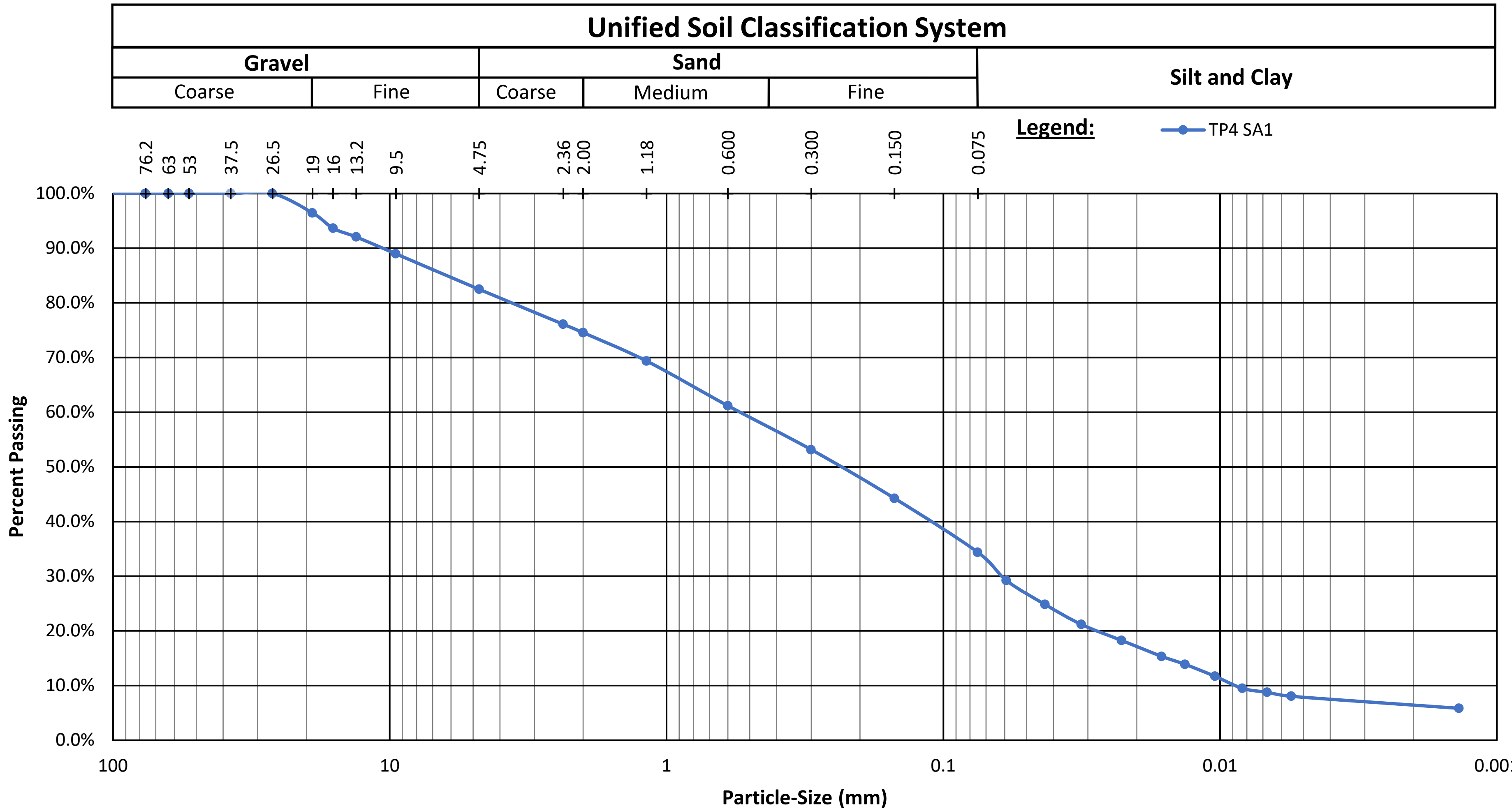


Test Pit No.	Sample No.	Depth (m)	D_{60}	D_{10}	C_U	% Gravel	% Sand	% Silt and Clay	Classification
1	7	4.0 - 4.3				49.7%	48.6%	1.6%	

FlowSpec ENGINEERING

FlowSpec Engineering Ltd., 31 McBrine Drive, Unit 1, Kitchener, ON N2R 1J1
Office: 519-744-9336 Web: www.flowspec.ca

Client:	Tacoma Engineers Inc.	**Particle-Size Distribution**
Project:	Proposed Warehouse Wellington Motor Freight	
Location:	128 Brock Road South Township of Puslinch	File No.: 00835-1



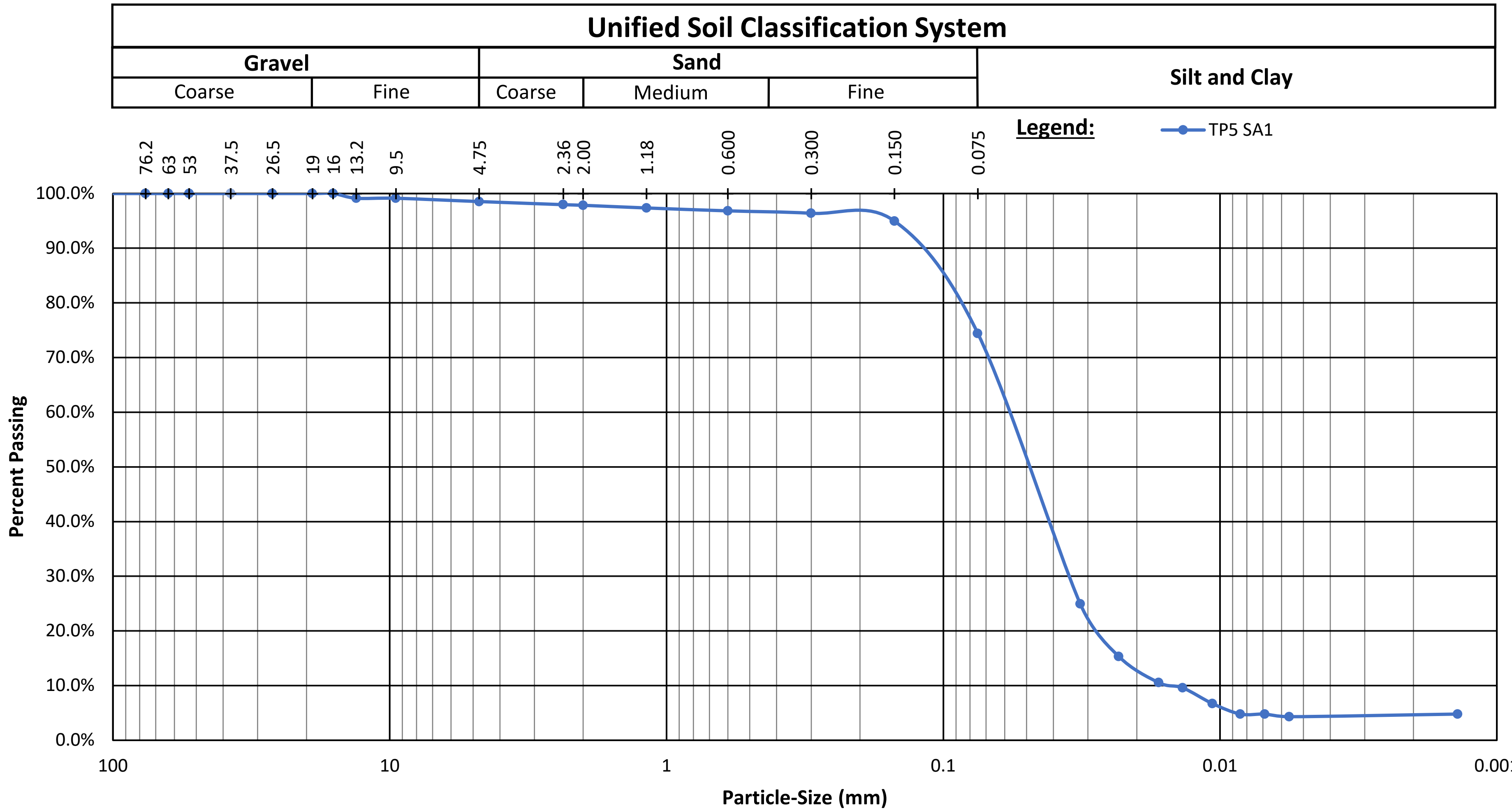
Test Pit No.	Sample No.	Depth (m)	D_{60}	D_{10}	C_U	% Gravel	% Sand	% Silt and Clay
4	1	1.2 - 1.5				17.5%	48.1%	34.4%

FlowSpec ENGINEERING
FlowSpec Engineering Ltd., 31 McBrine Drive, Unit 1, Kitchener, ON N2R 1J1
Office: 519-744-9336 Web: www.flowspec.ca

Client:	Tacoma Engineers Inc.
Project:	Proposed Warehouse Wellington Motor Freight
Location:	128 Brock Road South Township of Puslinch

Particle-Size Distribution

File No.: 00835-1



Test Pit No.	Sample No.	Depth (m)	D_{60}	D_{10}	C_U	% Gravel	% Sand	% Silt and Clay
5	1	0.8 - 1.0				1.5%	24.1%	74.4%

FlowSpec ENGINEERING
FlowSpec Engineering Ltd., 31 McBrine Drive, Unit 1, Kitchener, ON N2R 1J1
Office: 519-744-9336 Web: www.flowspec.ca

Client:	Tacoma Engineers Inc.
Project:	Proposed Warehouse Wellington Motor Freight
Location:	128 Brock Road South Township of Puslinch

Particle-Size Distribution

File No.: 00835-1

ENCLOSURES

Soil Abbreviations and Terms Used on Record of Borehole Sheets

TERMINOLOGY DESCRIBING COMMON SOIL TYPES:

Topsoil	-	mixture of soil and humus capable of supporting vegetation
Peat	-	mixture of visible and invisible fragments of decayed organic matter
Till	-	unstratified glacial deposit which may range from clay to boulders
Fill	-	soil materials identified as being placed anthropologically

CLASSIFICATION (UNIFIED SYSTEM)

Clay	<0.002mm		
Silt	0.002 to .075mm		
Sand	0.075 to 4.75mm		
		Fine	0.075 to 0.425 mm
		Medium	0.425 to 2.0 mm
		Coarse	2.0 to 4.75 mm
Gravel	4.75 to 75mm		
		Fine	4.75 to 19 mm
		Coarse	19 to 75 mm
Cobbles	75 to 300mm		
Boulders	>300mm		

TERMINOLOGY

Soil Composition	% by Weight
"traces"	<10%
"some"(eg. some silt)	10-20%
Adjective (eg. sandy)	20-35%
"and"(eg. sand and gravel)	35-50%

Standard Penetration Resistance (SPT): Standard Penetration Resistance ('N' Values) refers to the number of blows required to advance a standard (ASTM D1586) 51 mm Ø (2 inch) split-spoon sampler by the use of a free falling, 63.5 Kg (140lbs) hammer. The number of blows from the drop weight is recorded for every 15 cm (6 inches). The hammer is dropped from a distance of 0.76m (30 inches) providing 474.5 Joules per blow. When the sampler is driven a total of 45 cm (18 inches) into the soil, the standard penetration index ('N' Value) is the total number of blows for the last 30 cm (12 inches).

Dynamic Cone Penetration Resistance (DCPT): Dynamic Cone Penetration Resistance is similar to a SPT with the 474.5 Joule/blow impulse provided by the free falling hammer where the split-spoon sampler is replaced by a 51 mm Ø, 60˚ conical point and the number of blows is recorded continuously for every 30 cm (12 inches).

COHESIVE SOILS CONSISTENCY

	(kPa)	(P.S.F.)	Nominal 'N' Value
Very Soft	<12	<250	0-2
Soft	12-25	250-500	2-4
Firm	25-50	500-1000	4-8
Stiff	50-100	1000-2000	8-15
Very Stiff	100-200	2000-4000	15-30
Hard	>200	>4000	>30

RELATIVE DENSITY OF COHESIONLESS SOIL

	'N' Value
Very Loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

MOISTURE CONDITIONS:

Cohesive Soil	Cohesionless Soil
DTPL- Drier than plastic limit	Damp
APL- About plastic limit	Moist
WTPL- Wetter than plastic limit	Wet
MWTPL- Much wetter than plastic limit	Saturated

SAMPLE TYPES AND ADDITIONAL FIELD TESTS

SS	Split Spoon Sample (obtained from SPT)	**GS**	Grab Sample	**PP**	Pocket Penetrometer
		BS	Bulk Sample	**VANE**	Peak & Remolded shear
AS	Auger Sample	**TW**	Thin Wall Sample or Shelby Tube	**DMT**	Flat Plate Dilatometer

LABORATORY TESTS

SG	Specific Gravity	**S**	Sieve Analysis	**W**	Water Content
H	Hydrometer	**P**	Field Permeability	**K**	Lab Permeability
W_p	Plastic Limit	**W_l**	Liquid Limit	**I_p**	Plasticity Index
GSA	Grain Size Analysis	**C**	Consolidation	**UNC**	Unconfined compression

CHUNG & VANDER DOELEN
ENGINEERING LTD.

Enclosure A

FILE No: G22518

BOREHOLE No. 1

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 28 - 22**

SOIL LITHOLOGY — Ground Elevation: **320.37 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
320.27 / 0.10	100 mm TOPSOIL				
	very loose to compact, brown FILL, sand and silt, trace gravel, trace topsoil/rootlets, damp to moist	1	SS	16	
		2	SS	5	
		3	SS	3	
318.17 / 2.20	dense to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL, trace to some gravel, trace clay, occ. cobbles, moist	4	SS	61	
		5	SS	53	
		6	SS	40	dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
315.32 / 5.05	End of Borehole				

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)
WELL DATA
DEPTH (m): 0.5 – 13.0

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G22518 — BOREHOLE No. 2

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

SOIL LITHOLOGY — Ground Elevation: **321.64 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	REMARKS
321.56 / 0.08	75 mm TOPSOIL					
320.94 / 0.70	loose, brown, FILL, sandy silt to sand and silt, trace gravel, moist					
	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to somegravel, trace clay occ. cobbles moist	1	SS	60		
		2	SS	40		
		3	SS	28		
		4	SS	42		dry borehole cave-in at 3.95 m bgs upon withdrawal of drilling augers
316.59 / 5.05		5	SS	32		
	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)
WELL DATA

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
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Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Enclosure No.: 3
Sheet 1 of 1

FILE No: G22518 BOREHOLE No. 3

Client: **Collaborative Structures Limited**
Project: **Proposed Industrial Warehouse Development**
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA
Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

SOIL LITHOLOGY — Ground Elevation: **322.53 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT (%)	REMARKS
322.40 / 0.13	125 mm TOPSOIL					
	dense to very dense, brown SAND AND SILT trace gravel damp to moist	1	SS	37		
		2	SS	71		
320.43 / 2.10		3	SS	50/140 mm		
	very dense to dense, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist	4	SS	50/100 mm		
		5	SS	63		dry borehole cave-in at 3.95 m bgs upon withdrawal of drilling augers
317.48 / 5.05		6	SS	40		
	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
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Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

CVD BOREHOLE (2017) G22518 100 BROCK ROAD S, ABERFOYLE.GPJ CVD_ENG.GDT 22-12-21

FILE No: G22518

BOREHOLE No. 4

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

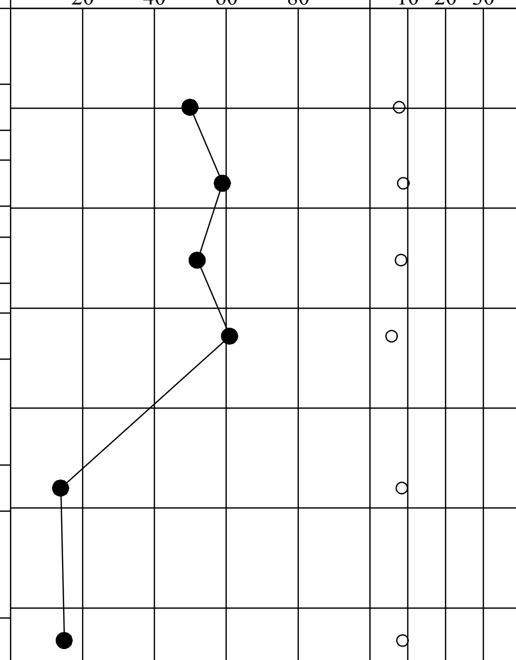
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

Ground Elevation: **323.93 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
323.83 / 0.10	100 mm TOPSOIL				
	very dense, brown SAND AND GRAVEL TO GRAVELLY SAND some silt to silty, freq. cobbles, damp to moist	1	SS	50	
		2	SS	59	
		3	SS	52	
		4	SS	61	
319.98 / 3.95	compact, grey SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay, moist to wet	5	SS	14	
					5.5 – dry borehole cave-in at 5.50 m bgs upon withdrawal of drilling augers
		6	SS	15	
317.38 / 6.55	End of Borehole				



PROJECT MANAGER: **JV**

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Enclosure No.: 5

FILE No: G22518 BOREHOLE No. 5

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

SOIL LITHOLOGY

Ground Elevation: **320.24 m**

ELEV./DEPTH (m)	DESCRIPTION
320.14 / 0.10	100 mm TOPSOIL
	dense to very dense, brown SILTY SAND trace to some gravel occ. cobbles damp
317.34 / 2.90	dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist
315.19 / 5.05	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	45
2	SS	38
3	SS	50/100 mm
4	SS	43
5	SS	40

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

REMARKS: dry borehole cave-in at 4.40 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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311 Victoria Street North
Kitchener, Ontario N2H 5E1
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FILE No: G22518 BOREHOLE No. 6

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **321.25 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
321.15 / 0.10	100 mm TOPSOIL				
	dense to very dense, brown SAND AND SILT, trace gravel, occ. cobbles, damp	1	SS	50/125 mm	
		2	SS	30	
		3	SS	50/100 mm	elevated "N"-value due to cobble inclusion
319.10 / 2.15	very dense, brown SANDY SILT TILL TO SAND AND SILT TILL, trace to some gravel, trace clay, occ. cobbles, occ. sand seams, moist	4	SS	58	
		5	SS	50/125 mm	
		6	SS	50	
		7	SS	52	
316.20 / 5.05	End of Borehole				borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)

WATER CONTENT (%): W_P W W_L (10, 20, 30)

WELL DATA

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G22518

BOREHOLE No. 7

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **322.18 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
322.08 / 0.10	100 mm TOPSOIL				
	dense, brown SAND AND SILT trace to some gravel moist	1	SS	41	
320.83 / 1.35	dense, brown Fine to Medium SAND some silt, trace to some gravel damp	2	SS	34	
		3	SS	31	
		4	SS	38	
317.63 / 4.55	very dense, brown, SANDY SILT TILL, trace gravel, trace clay, occ. cobbles, moist	5	SS	58	
317.13 / 5.05	End of Borehole				borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200

PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G22518 BOREHOLE No. 8

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

SOIL LITHOLOGY

Ground Elevation: **323.45 m**

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
323.32 / 0.13	125 mm TOPSOIL				
322.75 / 0.70	compact, brown, FILL, silty sand, trace to some gravel, damp	1	SS	26	
321.60 / 1.85	dense, brown SILTY SAND trace to some gravel occ. silt seams damp	2	SS	32	
		3	SS	48	
318.40 / 5.05	compact to dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist	4	SS	33	
		5	SS	26	
		6	SS	30	
	End of Borehole				borehole open and dry upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 9

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

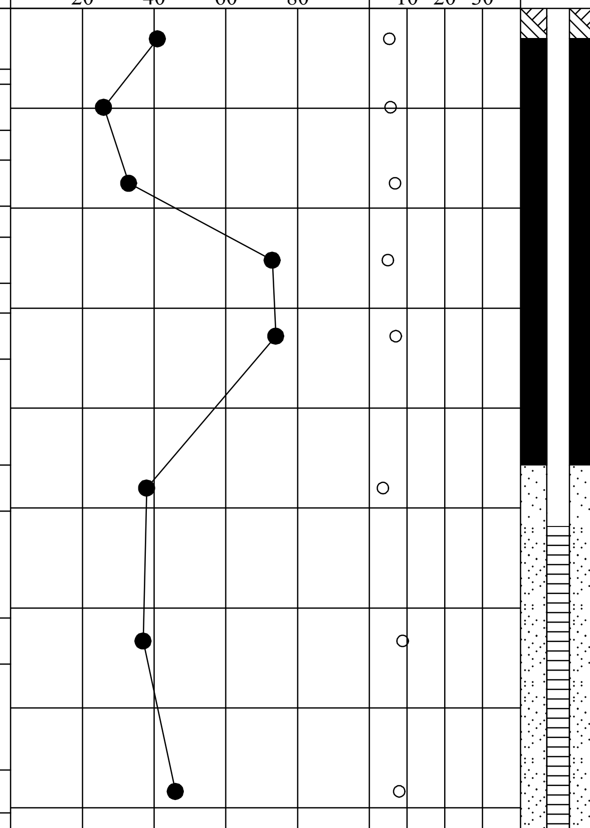
EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 29 - 22** TO **Sep 29 - 22**

Ground Elevation: **320.44 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
320.34 / 0.10	100 mm TOPSOIL				monument casing set in concrete
	compact to very dense, brown SILTY SAND TO SAND AND SILT trace to some gravel occ. cobbles damp	1	SS	41	
		2	SS	26	
		3	SS	33	2.0 – bentonite seal/50 mm I.D. PVC riser
		4	SS	73	
317.54 / 2.90	dense to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. to freq. cobbles moist ------ sand and gravel layer ------	5	SS	74	
		6	SS	38	
		7	SS	37	6.0 – 3.05 m long, 50 mm I.D. PVC screen with sandpack
		8	SS	46	
312.19 / 8.25	End of Borehole				13.0 – monitoring well measured dry on October 5, 2022

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)



PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 10

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 29 - 22** TO **Sep 29 - 22**

Ground Elevation: **321.01 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	DEPTH (m)	REMARKS
320.91 / 0.10	100 mm TOPSOIL					
319.66 / 1.35	dense, brown SILTY SAND some gravel, occ. cobbles damp	1	SS	38	1.0	
317.81 / 3.20	compact to very dense, brown SAND AND SILT TILL trace gravel, trace clay occ. cobbles moist	2	SS	60	1.75	
		3	SS	24	2.5	
315.96 / 5.05	compact, brown SILTY SAND AND GRAVEL damp to saturated	4	SS	28	3.25	
		5	SS	29	4.75	dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

PROJECT MANAGER: **JV**

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FILE No: G22518 BOREHOLE No. 11

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 29 - 22**

Ground Elevation: **321.73 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
321.61 / 0.13	125 mm TOPSOIL				
	dense to very dense, brown SILTY SAND AND GRAVEL occ. cobbles damp	1	SS	60	
		2	SS	36	
		3	SS	57	
319.28 / 2.45	dense to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. to freq. cobbles occ. sand seams moist	4	SS	50	
		5	SS	41	
		6	SS	50/ 100 mm	
316.73 / 5.00	End of Borehole				borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80
WATER CONTENT (%): W_P W W_L; 10 20 30
WELL DATA

DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 12

Client: **Collaborative Structures Limited**
Project: **Proposed Industrial Warehouse Development**
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA
Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **322.94 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
322.86 / 0.08	75 mm TOPSOIL				
	dense, brown SAND AND SILT some gravel damp	1	SS	35	
321.59 / 1.35	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. to freq. cobbles moist	2	SS	23	
		3	SS	21	
		4	SS	31	
		5	SS	52	
317.89 / 5.05	End of Borehole				borehole open and dry upon withdrawal of drilling augers

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA

DEPTH (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0

PROJECT MANAGER: **JV**

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Enclosure No.: 13
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FILE No: G22518 BOREHOLE No. 13

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 29 - 22** TO **Sep 29 - 22**

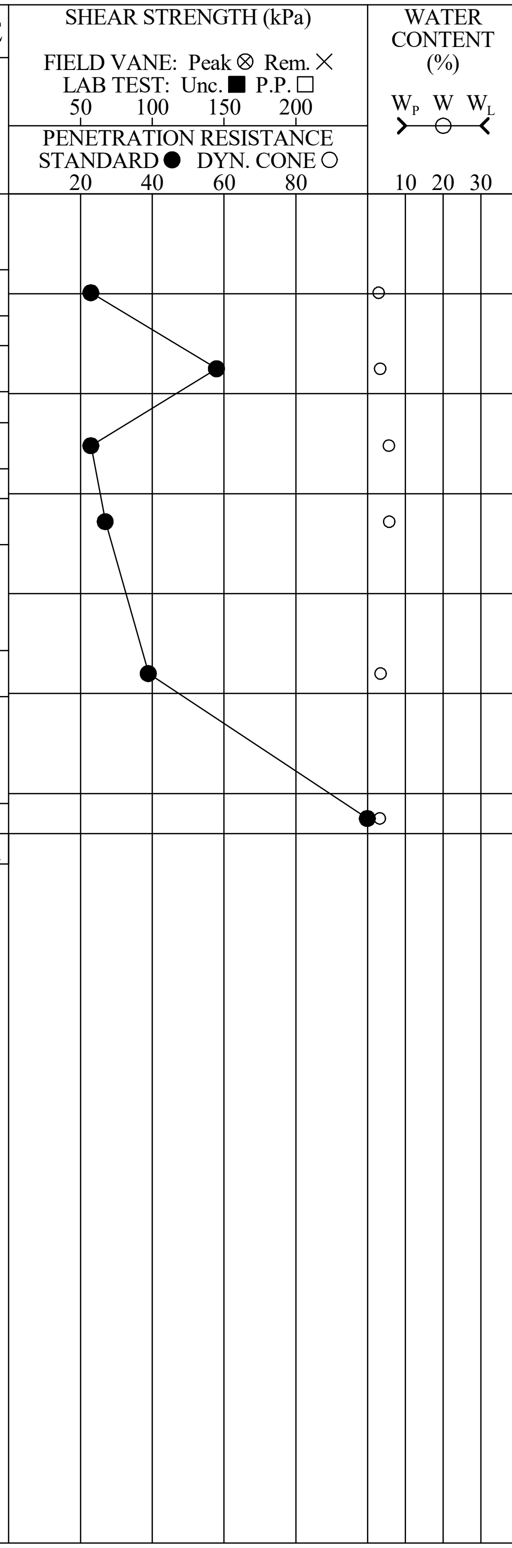
SOIL LITHOLOGY

Ground Elevation: **319.74 m**

ELEV./ DEPTH (m)	DESCRIPTION
319.71 / 0.03	25 mm TOPSOIL
	compact to very dense, brown SAND AND GRAVEL TO GRAVELLY SAND some silt, freq. cobbles damp
317.64 / 2.10	compact, brown Fine to Medium SAND some silt to silty, trace to some gravel occ. cobbles damp to moist
313.34 / 6.40	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE	DEPTH (m) (approx.)
1	SS	23	1.0
2	SS	58	1.75
3	SS	23	2.5
4	SS	27	3.25
5	SS	39	4.75
6	SS	50/ 125 mm	6.25



WELL DATA

REMARKS: dry borehole cave-in at 5.20 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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FILE No: G22518 BOREHOLE No. 14

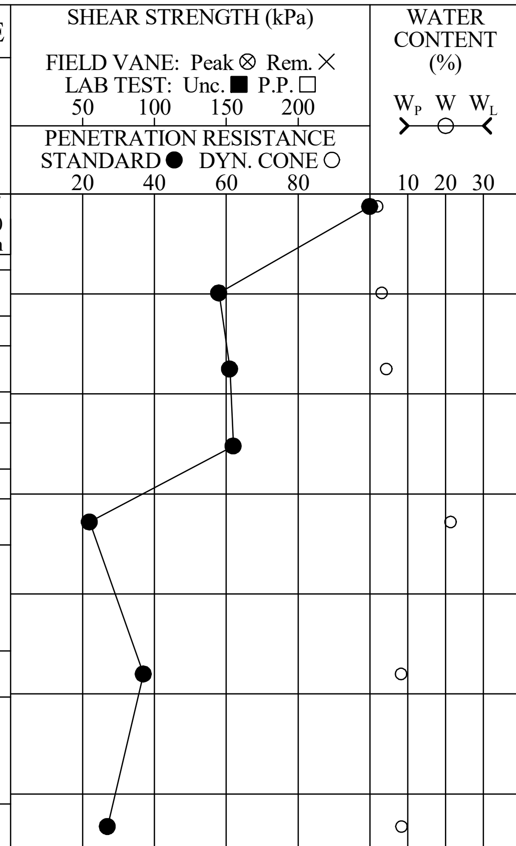
Client:	**Collaborative Structures Limited**
Project:	**Proposed Industrial Warehouse Development**
Location:	**128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine:	**Diedrich D50T**
Method:	**Hollow Stem Auger**
Size:	**57 mm I.D.**
Date:	**Sep 29 - 22** TO **Sep 30 - 22**

Ground Elevation: **320.40 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
320.30 / 0.10	100 mm TOPSOIL				
319.70 / 0.70	very dense, brown, SILTY SAND, trace gravel, damp	1	SS	50/100 mm	
316.45 / 3.95	very dense to compact, brown GRAVELLY SAND TO SAND AND GRAVEL trace to some silt freq. cobbles occ. to freq. silt seams damp to moist -------- wet/saturated silt seam	2	SS	58	
		3	SS	61	
		4	SS	62	
		5	SS	22	
313.85 / 6.55	dense to compact brown to grey SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist	6	SS	37	
		7	SS	27	borehole open and dry upon withdrawal of drilling augers



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FILE No: G22518 BOREHOLE No. 15

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Sep 30 - 22**

Ground Elevation: **321.41 m**

ELEV./DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
321.28 / 0.13	125 mm TOPSOIL						
	dense to very dense, brown SILTY SAND some gravel occ. cobbles damp	1.0	1	SS	32		
		1.75	2	SS	44		
		2.5	3	SS	50		
318.51 / 2.90	very dense, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles damp to moist	3.25	4	SS	50		
		4.75	5	SS	55		
316.36 / 5.05	End of Borehole	5.0					borehole open and dry upon withdrawal of drilling augers

Chart headings: SHEAR STRENGTH (kPa) — FIELD VANE: Peak ⊗ Rem. × — LAB TEST: Unc. ■ P.P. □ — 50 100 150 200; PENETRATION RESISTANCE — STANDARD ● DYN. CONE ○ — 20 40 60 80; WATER CONTENT (%) — W_P W W_L — 10 20 30; WELL DATA; DEPTH (m) 0.5 – 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 16

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Sep 30 - 22**

Ground Elevation: **322.49 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
322.39 / 0.10	100 mm TOPSOIL					
	compact, brown SILTY SAND trace to some gravel occ. cobbles damp	1	SS	27		
		2	SS	23		
		3	SS	49		
		4	SS	34		
		5	SS	37		
318.39 / 4.10	dense, brown, SANDY SILT TILL trace to some gravel, trace clay occ. cobbles moist to wet					dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
		6	SS	40		
317.44 / 5.05	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA

CVD BOREHOLE (2017) G22518 100 BROCK ROAD S, ABERFOYLE.GPJ CVD_ENG.GDT 22-12-21

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 17

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

SOIL LITHOLOGY — Ground Elevation: **319.40 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
	compact to very dense, brown FILL, sand and silt some gravel, trace topsoil/organics occ. cobbles moist	1	SS	16		
		2	SS	18		
318.10 / 1.30	compact, brown GRAVELLY SAND TO SAND AND GRAVEL trace to some silt occ. cobbles occ. silty lenses/seams damp to moist	3	SS	21		
		4	SS	39		dry borehole cave-in at 2.75 m bgs upon withdrawal of drilling augers
		5	SS	50/ 50 mm		
314.80 / 4.60	End of Borehole	6	SS	50/ 50 mm		

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA

DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 18

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Oct 03 - 22**

Ground Elevation: **320.28 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WATER CONTENT	REMARKS
320.18 / 0.10	100 mm TOPSOIL					
	compact to dense, brown GRAVELLY SAND TO SAND AND GRAVEL some silt, occ. cobbles, damp to moist	1	SS	15		
		2	SS	24		
		3	SS	43		
		4	SS	34		
						dry borehole cave-in at 3.95 m bgs upon withdrawal of drilling augers
		5	SS	47		
		6	SS	49		
313.73 / 6.55	End of Borehole					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 19

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Sep 30 - 22** TO **Sep 30 - 22**

Ground Elevation: **320.89 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
320.79 / 0.10	100 mm TOPSOIL				
	compact to dense, brown GRAVELLY SAND some silt to silty occ. cobbles damp	1	SS	28	
		2	SS	24	
		3	SS	30	
318.79 / 2.10	compact, brown SILTY SAND, trace gravel damp	4	SS	19	
317.99 / 2.90	compact, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles damp to moist	5	SS	25	
					dry borehole cave-in at 4.25 m bgs upon withdrawal of drilling augers
		6	SS	27	
315.84 / 5.05	End of Borehole				

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA
DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

PROJECT MANAGER: **JV**

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FILE No: G22518 — BOREHOLE No. 20

Client: **Collaborative Structures Limited**
Project: **Proposed Industrial Warehouse Development**
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA
Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Oct 03 - 22** TO **Oct 03 - 22**

SOIL LITHOLOGY

Ground Elevation: **322.22 m**

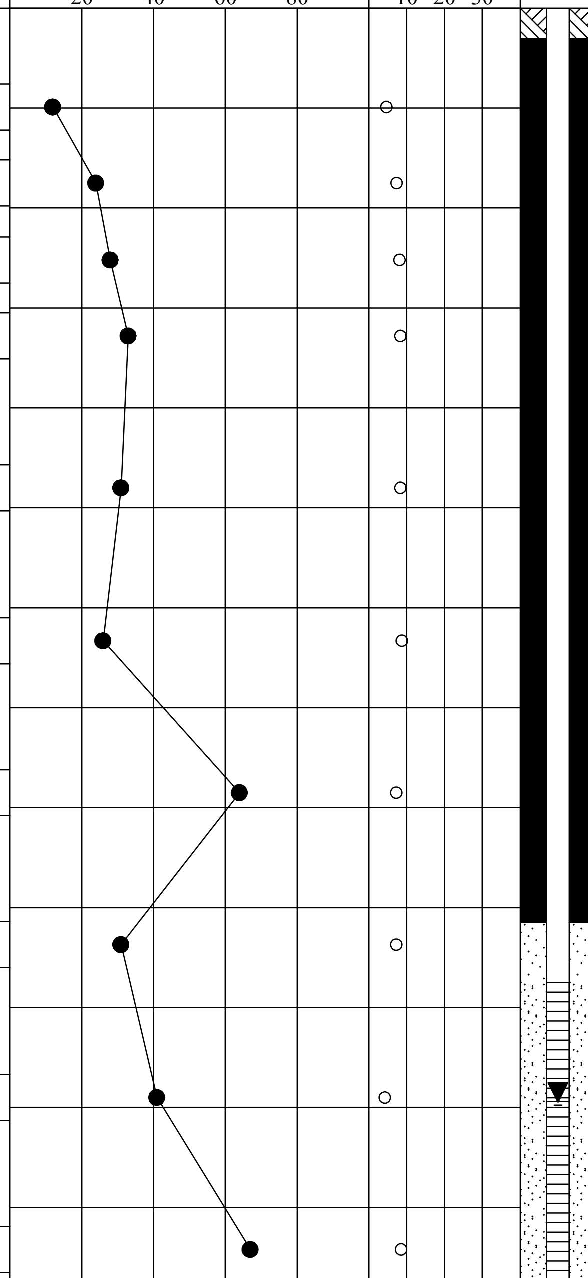
ELEV./DEPTH (m)	DESCRIPTION
322.12 / 0.10	100 mm TOPSOIL
320.12 / 2.10	compact, brown SILTY SAND TO SAND AND SILT trace gravel damp to moist
310.62 / 11.60	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay; occ. to freq. cobbles; damp to moist; -------- grey
309.42 / 12.80	very dense, brown SILTY SAND AND GRAVEL occ. cobbles saturated
	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE	Depth (approx., m)
1	SS	12	1.0
2	SS	24	1.75
3	SS	28	2.5
4	SS	33	3.25
5	SS	31	4.75
6	SS	26	6.3
7	SS	64	7.8
8	SS	31	9.4
9	SS	41	10.9
10	SS	67	12.45

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30



WELL DATA

REMARKS

DEPTH (m)	REMARKS
0.0	monument casing set in concrete
3.0	bentonite seal/50 mm I.D. PVC riser
10.0	3.05 m long, 50 mm I.D. PVC screen with sandpack
11.0	water level in monitoring well measured to 10.94 m bgs on October 5, 2022

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 21

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

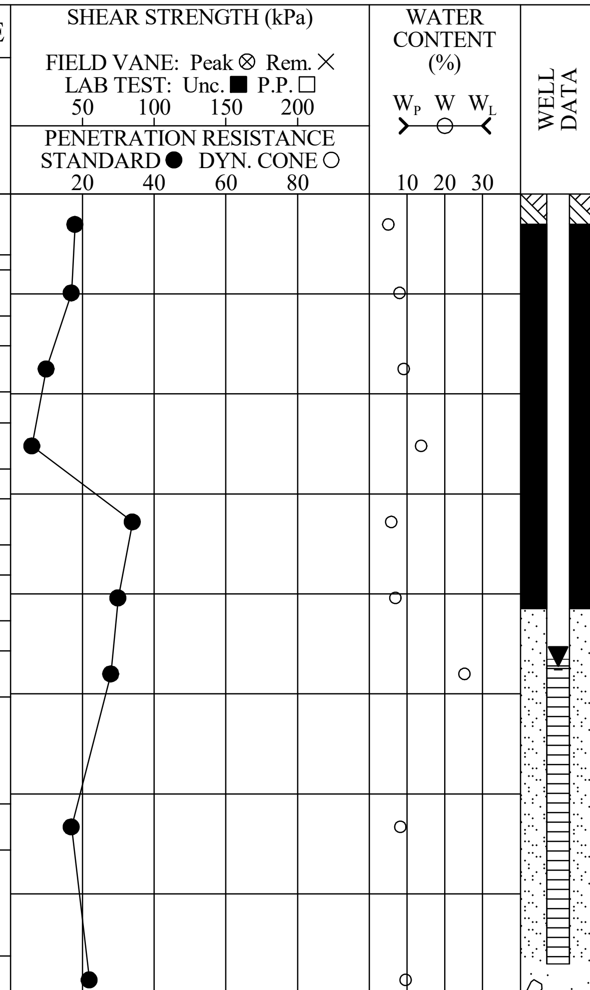
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 28 - 22** TO **Sep 28 - 22**

Ground Elevation: **323.67 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
323.54 / 0.13	125 mm TOPSOIL				monument casing set in concrete
	compact to loose, dark brown FILL, sand and silt to sandy silt trace gravel, trace to some topsoil/rootlets occ. cobbles damp to moist	1	SS	18	
		2	SS	17	
		3	SS	10	bentonite seal/50 mm I.D. PVC riser
		4	SS	6	
320.77 / 2.90	dense to compact, brown SILTY SAND AND GRAVEL occ. cobbles occ. silt seams damp	5	SS	34	
		6	SS	30	
318.97 / 4.70	compact, brown SILT, some sand saturated	7	SS	28	water level in monitoring well measured to 4.72 m bgs on Octber 5, 2022
318.17 / 5.50	compact, brown SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles moist to wet	8	SS	17	3.05 m long, 50 mm I.D. PVC screen with sandpack
		9	SS	22	
315.57 / 8.10	End of Borehole				



PROJECT MANAGER: **JV**

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Enclosure No.: 22
Sheet 1 of 1

FILE No: G22518 — BOREHOLE No. 22

Client:	**Collaborative Structures Limited**
Project:	**Proposed Industrial Warehouse Development**
Location:	**128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine:	**Diedrich D50T**
Method:	**Hollow Stem Auger**
Size:	**83 mm I.D.**
Date:	**Sep 27 - 22** TO **Sep 27 - 22**

Ground Elevation: **323.14 m**

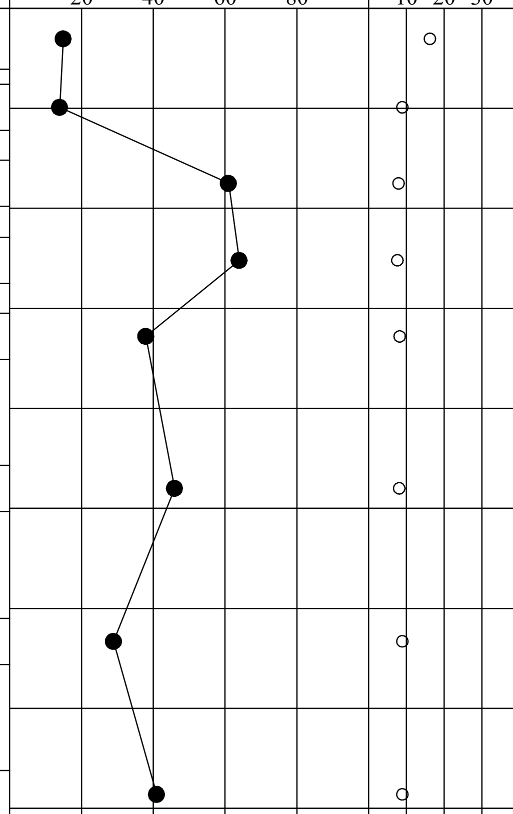
SOIL LITHOLOGY

ELEV./DEPTH (m)	DESCRIPTION
323.07 / 0.08	75 mm TOPSOIL
321.84 / 1.30	compact, dark brown FILL, sandy silt to sand and silt, trace gravel, trace topsoil/rootlets, damp to moist
321.04 / 2.10	very dense, brown SILTY SAND AND GRAVEL, occ. cobbles, moist
315.04 / 8.10	compact to very dense, brown SANDY SILT TILL TO SAND AND SILT TILL, trace to some gravel, trace clay, occ. cobbles, moist
	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	15
2	SS	14
3	SS	61
4	SS	64
5	SS	38
6	SS	46
7	SS	29
8	SS	41

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)
WELL DATA
DEPTH (m)



REMARKS: dry borehole cave-in at 6.70 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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Enclosure No.: 23
Sheet 1 of 1

FILE No: G22518 BOREHOLE No. 23

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Sep 27 - 22** TO **Sep 27 - 22**

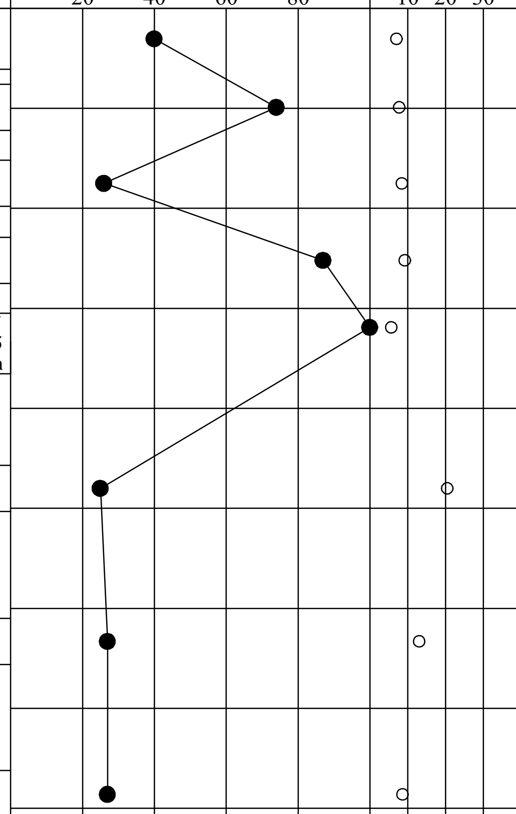
Ground Elevation: **323.92 m**

SOIL LITHOLOGY

ELEV./DEPTH (m)	DESCRIPTION
323.85 / 0.08	75 mm TOPSOIL
	compact to very dense, brown SILTY SAND AND GRAVEL occ. cobbles occ. to freq. silt seams moist
319.92 / 4.00	compact, brown SILTY SAND trace gravel occ. coarse sand seams moist to saturated
318.42 / 5.50	compact, grey SANDY SILT TILL TO SAND AND SILT TILL trace to some gravel, trace clay moist
315.82 / 8.10	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	40
2	SS	74
3	SS	26
4	SS	87
5	SS	50/125 mm
6	SS	25
7	SS	27
8	SS	27



DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

REMARKS: wet borehole cave-in at 5.20 m bgs upon withdrawal of drilling augers

CVD BOREHOLE (2017) G22518 100 BROCK ROAD S, ABERFOYLE.GPJ CVD_ENG.GDT 22-12-21

PROJECT MANAGER: **JV**

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Enclosure No.: 24
Sheet 1 of 1

FILE No: G22518 — BOREHOLE No. 24

Client: Collaborative Structures Limited
Project: Proposed Industrial Warehouse Development
Location: 128 Brock Road South, Puslinch, Ontario

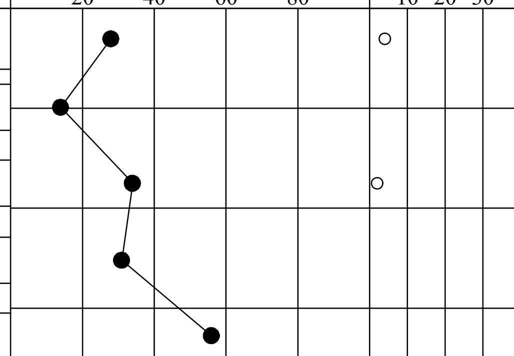
EQUIPMENT DATA
Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

SOIL LITHOLOGY

Ground Elevation: **319.20 m**

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
319.06 / 0.14	140 mm TOPSOIL				
	compact to very dense, brown SILTY SAND AND GRAVEL occ. cobbles damp	1	SS	28	
		2	SS	14	dry borehole cave-in at 1.20 m bgs upon withdrawal of drilling augers
		3	SS	34	
		4	SS	31	
		5	SS	56	
315.70 / 3.50	End of Borehole				

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)



PROJECT MANAGER: **JV**

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Enclosure No.: 25
Sheet 1 of 1

FILE No: G22518 BOREHOLE No. 25

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

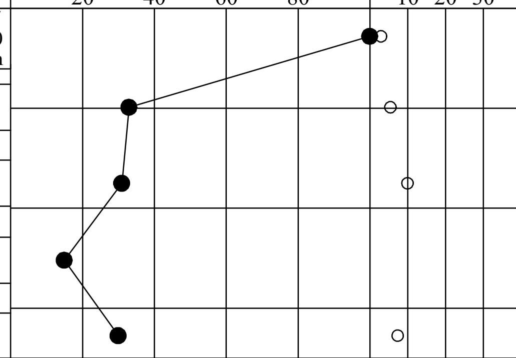
Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

Ground Elevation: **319.41 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE
	very dense to compact dark brown to brown FILL, silty sand some gravel to gravelly occ. cobbles moist	1	SS	50/ 100 mm
		2	SS	33
		3	SS	31
		4	SS	15
316.51 2.90	dense, brown SILTY SAND AND GRAVEL damp	5	SS	30
315.91 3.50	End of Borehole			



REMARKS: dry borehole cave-in at 2.75 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **JV**

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Enclosure No.: 26
Sheet 1 of 1

FILE No: G22518 — BOREHOLE No. 26

Client:	Collaborative Structures Limited
Project:	Proposed Industrial Warehouse Development
Location:	128 Brock Road South, Puslinch, Ontario

EQUIPMENT DATA

Machine:	Diedrich D50T
Method:	Hollow Stem Auger
Size:	57 mm I.D.
Date:	Oct 05 - 22 TO Oct 05 - 22

SOIL LITHOLOGY — Ground Elevation: **317.41 m**

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200)
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ (20, 40, 60, 80)
WATER CONTENT (%): W_P W W_L (10, 20, 30)

ELEV./DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
317.31 / 0.10	100 mm TOPSOIL				
	dense to very dense, dark brown FILL, silty gravelly sand trace topsoil/rootlets occ. cobbles damp	1	SS	74	
		2	SS	45	dry borehole cave-in at 1.20 m bgs upon withdrawal of drilling augers
315.91 / 1.50	dense to very dense, brown SAND AND GRAVEL some silt to silty damp	3	SS	50/125 mm	
		4	SS	61	
		5	SS	33	
313.91 / 3.50	End of Borehole				

PROJECT MANAGER: **JV**

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FILE No: G22518

BOREHOLE No. 27

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **57 mm I.D.**
Date: **Oct 05 - 22** TO **Oct 05 - 22**

SOIL LITHOLOGY

Ground Elevation: **319.30 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
	compact to very dense dark brown FILL, silty sand some gravel to gravelly damp	1	SS	50/ 100 mm	
		2	SS	22	
		3	SS	38	
317.20 / 2.10	compact to very dense, brown SAND AND SILT TILL trace to some gravel, trace clay occ. cobbles damp to moist	4	SS	40	
		5	SS	59	dry borehole cave-in at 3.65 m bgs upon withdrawal of drilling augers
		6	SS	27	
314.25 / 5.05	End of Borehole				

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

WELL DATA

PROJECT MANAGER: **JV**

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Enclosure No.: 28
Sheet 1 of 1

FILE No: G22518 BOREHOLE No. 28

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial Warehouse Development**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Oct 03 - 22** TO **Oct 03 - 22**

SOIL LITHOLOGY

Ground Elevation: **319.34 m**

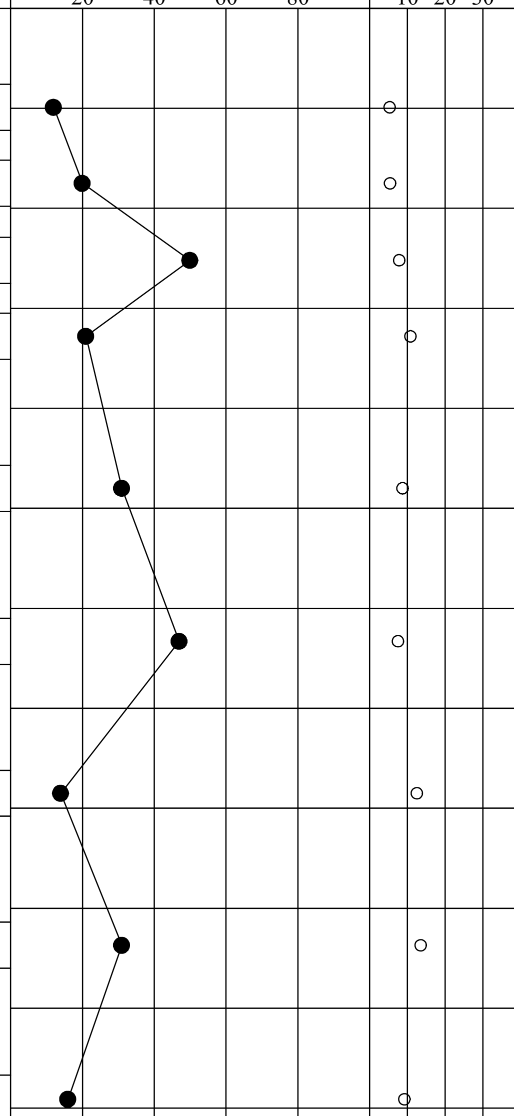
ELEV./ DEPTH (m)	DESCRIPTION
	compact to very dense brown to dark brown FILL, silty sand to sand and silt trace to some gravel occ. cobbles moist to saturated ------ trace topsoil
310.84 8.50	dense, brown Medium to Coarse SAND trace to some gravel, trace silt occ. cobbles saturated
309.24 10.10	compact, grey SANDY SILT TILL trace gravel, trace clay occ. cobbles moist to wet
308.19 11.15	End of Borehole

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	12
2	SS	20
3	SS	50
4	SS	21
5	SS	31
6	SS	47
7	SS	14
8	SS	31
9	SS	16

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30



WELL DATA

DEPTH (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0

REMARKS

- monument casing set in concrete
- bentonite seal/50 mm I.D. PVC riser (2.0 m)
- water level in monitoring well measured to 7.94 m bgs on October 5, 2022 (8.0 m)
- 3.05 m long, 50 mm I.D. PVC screen with sandpack (9.5 m)

PROJECT MANAGER: **JV**

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FILE No: G22518

TEST PIT No. 1

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

Ground Elevation: **317.37 m**

ELEV./DEPTH (m)	DESCRIPTION	SYMBOL	SAMPLE ID	TYPE	N-VALUE	REMARKS
317.27 / 0.10	100 mm TOPSOIL					
315.87 / 1.50	compact to dense, brown FILL, silty gravelly sand occ. cobbles contains paper pieces damp to moist -------- trace topsoil/rootlets					
313.72 / 3.65	compact to very dense light brown SAND AND GRAVEL some silt to silty occ. to freq. cobbles/boulders moist		1	GS		
313.12 / 4.25	compact, brown Medium SAND trace to some gravel, trace to some silt occ. fine sand layers moist		2	GS		test pit dry and sidewalls stable upon excavation completion
	End of Test Pit					

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30
WELL DATA
DEPTH (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

PROJECT MANAGER: **JV**

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Enclosure No.: 30
Sheet 1 of 1

FILE No: G22518 TEST PIT No. 2

Client:	**Collaborative Structures Limited**
Project:	**Proposed Industrial WarehouseDevelopment**
Location:	**128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

ELEV./ DEPTH (m)	DESCRIPTION (Ground Elevation: **319.20 m**)	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) / PENETRATION RESISTANCE	WATER CONTENT (%)	WELL DATA	DEPTH (m)	REMARKS
	compact to dense dark brown FILL, silty sand to sandy silt some gravel to gravelly freq. cobbles occ. boulders damp to moist -------- trace topsoil/rootlets/wood fragments										
315.70 3.50	dense, brownish grey, SANDY SILT TILL, trace gravel, trace clay, moist	3.5								3.5	test pit dry and sidewalls stable upon excavation completion
315.40 3.80	End of Test Pit										

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30

Depth scale (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

PROJECT MANAGER: **JV**

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FILE No: G22518 TEST PIT No. 3

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

ELEV./ DEPTH (m)	DESCRIPTION (Ground Elevation: **319.12 m**)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) / PENETRATION RESISTANCE	WATER CONTENT (%)	WELL DATA	REMARKS
	compact to dense dark brown FILL, silty sand to sandy silt some gravel to gravelly freq. cobbles occ. boulders damp to moist -------- trace topsoil								
317.97 1.15	compact to dense, brown SANDY SILT TILL trace gravel, trace clay moist								
317.52 1.60	End of Test Pit								test pit dry and sidewalls stable upon excavation completion

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30

DEPTH (m): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

PROJECT MANAGER: **JV**

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FILE No: G22518

TEST PIT No. 4

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

Ground Elevation: **319.25 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) / PENETRATION RESISTANCE	WATER CONTENT (%)	WELL DATA	DEPTH (m)	REMARKS
	compact to dense dark brown to brown FILL, silty sand to sandy silt some gravel to gravelly, trace topsoil/rootlets freq. cobbles occ. boulders damp to moist	0.5 – 3.5	FILL							0.5 – 3.5	
315.30 3.95	End of Test Pit	4.0								4.0	test pit dry and sidewalls stable upon excavation completion
		4.5								4.5	

Legend: FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □ (50, 100, 150, 200); PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ (20, 40, 60, 80); WATER CONTENT W_P W W_L (10, 20, 30)

PROJECT MANAGER: **JV**

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FILE No: G22518 TEST PIT No. 5

Client: **Collaborative Structures Limited**

Project: **Proposed Industrial WarehouseDevelopment**

Location: **128 Brock Road South, Puslinch, Ontario**

EQUIPMENT DATA

Machine: **Mid-Size Excavator**
Method:
Size:
Date: **Nov 09 22** TO **Nov 09 02**

Ground Elevation: **315.84 m**

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WELL DATA	REMARKS
	350 mm TOPSOIL					
315.49 0.35	compact, light brown SILTY SAND TO SANDY SILT damp to moist	1	GS			
313.49 2.35	dense, brown SANDY SILT TILL TO SAND AND SILT TILL some gravel, trace clay occ. cobbles moist	2	GS			
312.64 3.20	compact, brown SAND AND GRAVEL trace to some silt occ. silty seams occ. cobbles wet to saturated	3	GS		▼	stabilized groundwater encountered at 3.9 m test pit sidewalls stable upon excavation completion
311.89 3.95	End of Test Pit					

Column headings: SOIL LITHOLOGY; SAMPLE; SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200; PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80; WATER CONTENT (%) W_P W W_L 10 20 30; DEPTH (m) 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5; SYMBOL

PROJECT MANAGER: **JV**

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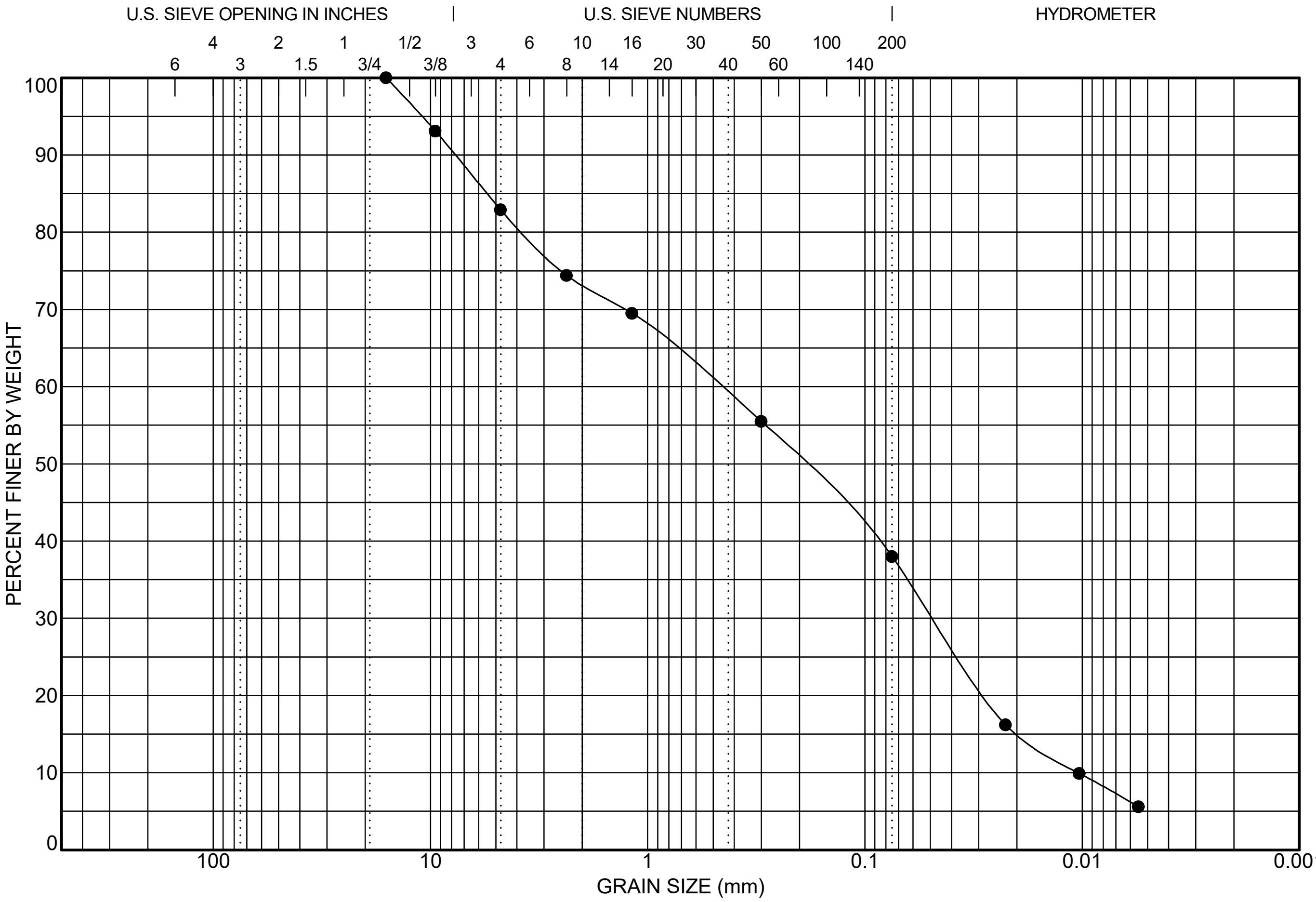

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.48	44.68	16	0.466	0.048	0.01	17.1	44.9	38.0	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 1 - SA 5; 3.05 to 3.51 m depth
Sample No.: 1-5
Date Sampled: Sep. 27 - 2022
Sampled By: DO
Lab No.: 1417
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Silt Till, some gravel

Sieve Size (mm)	Percent Passing	No Specifications

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Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

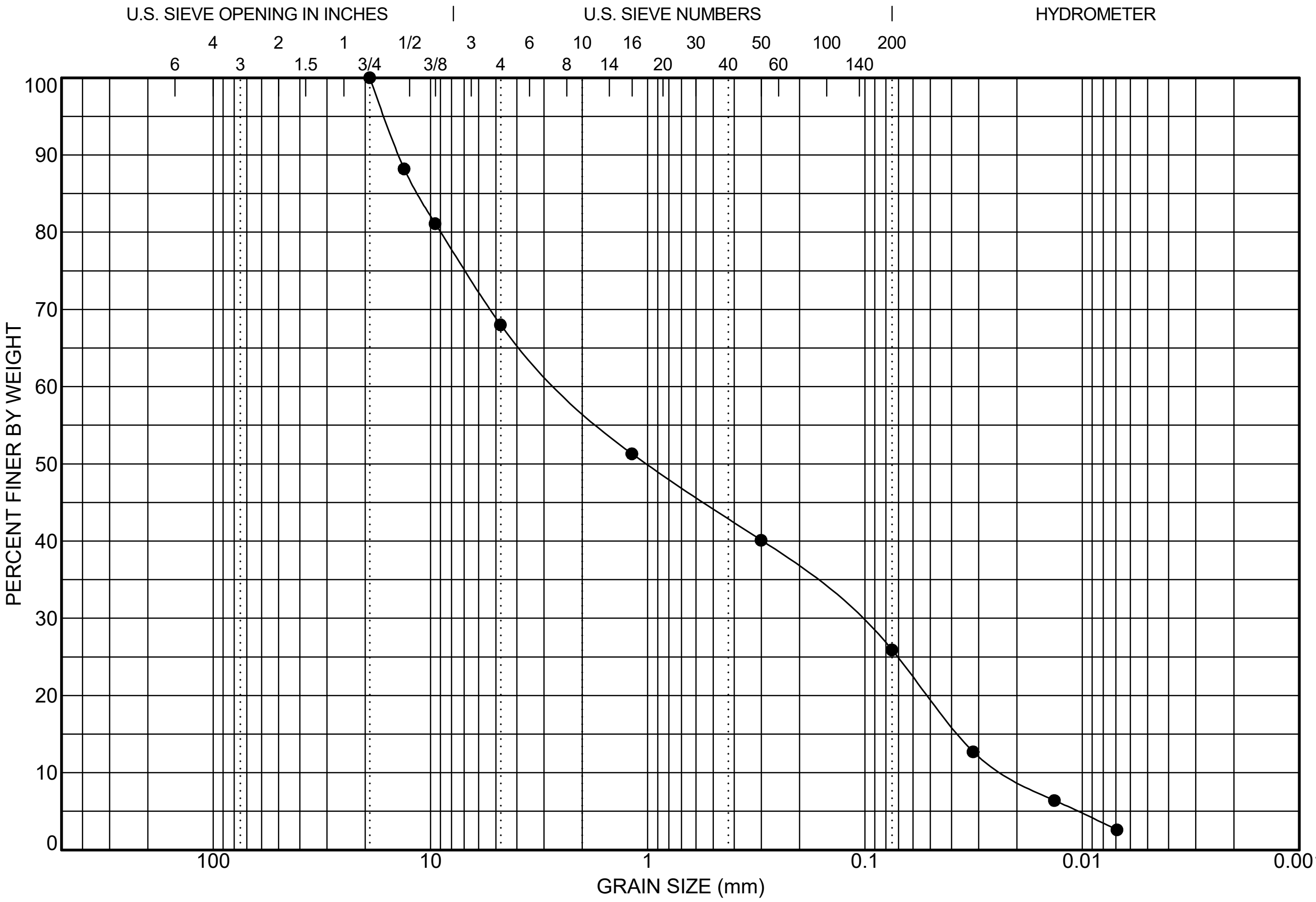
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 34



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.23	111.22	19	2.438	0.112	0.022	32.0	42.1	25.9	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 4 - SA 2; 1.52 to 1.98 m depth
Sample No.: 4-2
Date Sampled: Sep. 27 - 2022
Sampled By: DO
Lab No.: 1418
Date Tested: Oct. 27 - 2022
Type of Material: Silty Gravelly Sand

Sieve Size (mm)	Percent Passing	No Specifications

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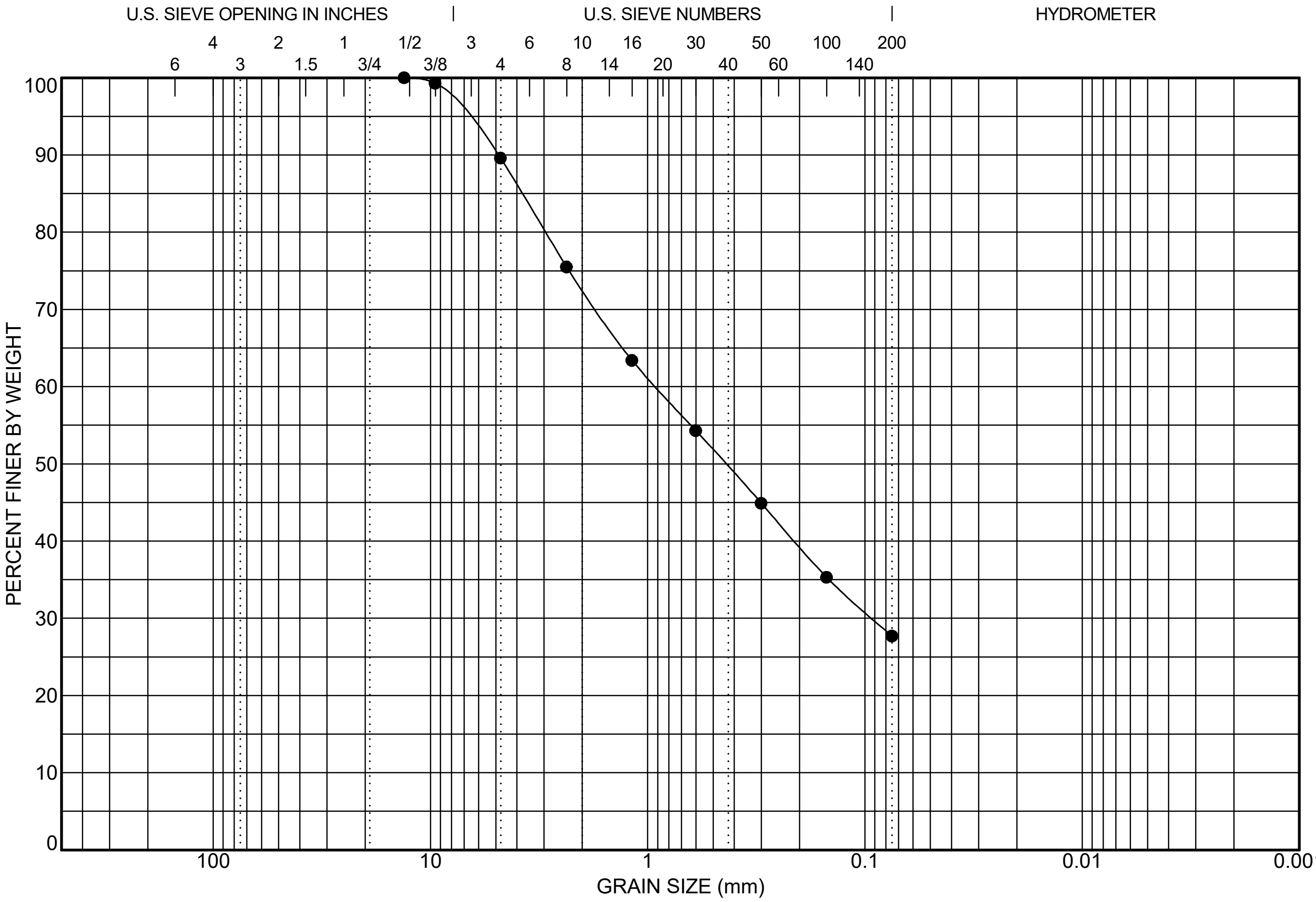
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 35



<table>
<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
</table>

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					13.2	0.917	0.093		10.4	61.9	27.7	

Date: Dec. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 13 - SA 3; 2.29 to 2.74 m depth
Sample No.: 13-3
Date Sampled: Sep. 29 - 2022
Sampled By: DO
Lab No.: 1627
Date Tested: Dec. 06 - 2022
Type of Material: Silty Sand, some gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

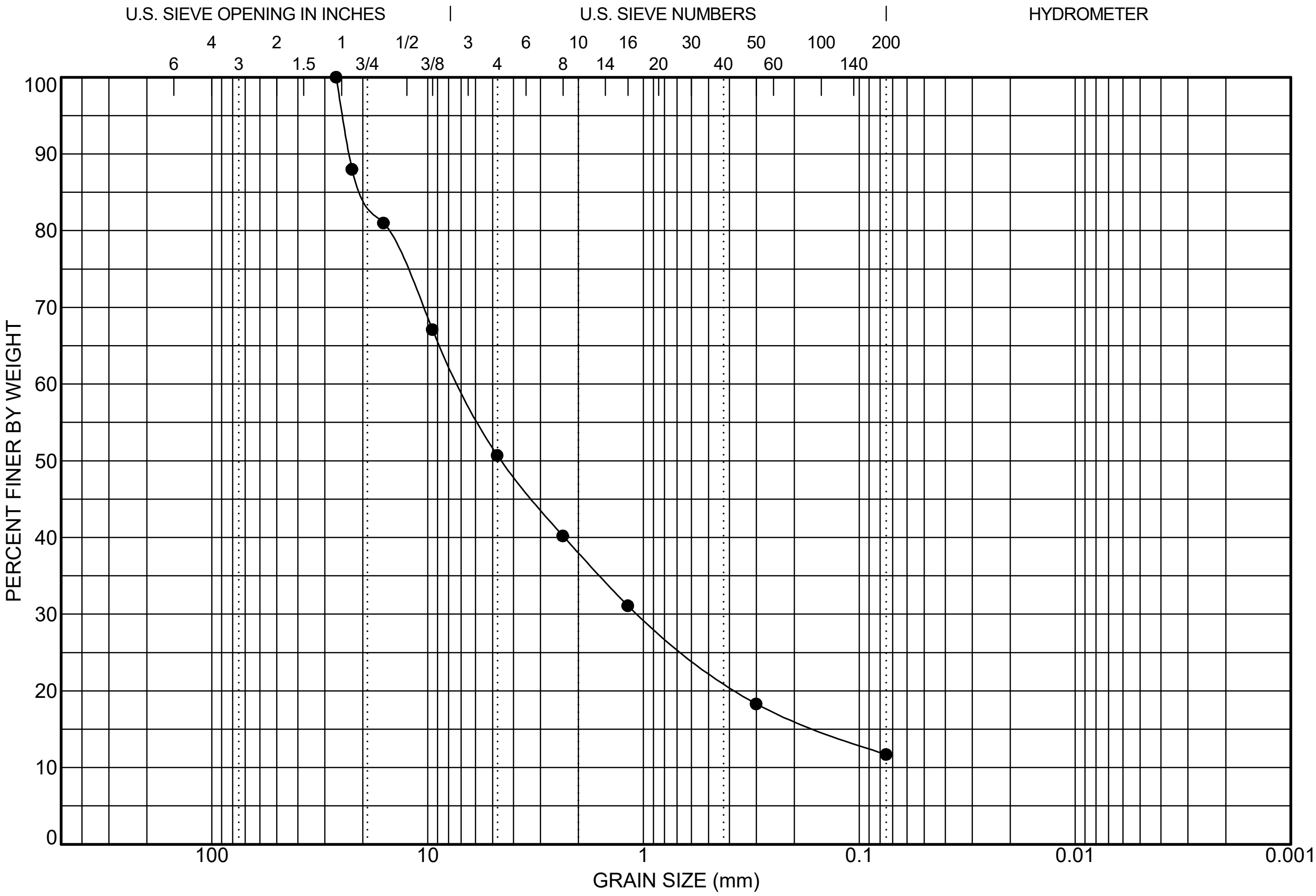
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 36



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			2.98	134.10	26.5	7.037	1.049		49.3	39.0	11.7	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 17 - SA 3; 1.52 to 1.98 m depth
Sample No.: 17-3
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1420
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Gravel, some silt

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

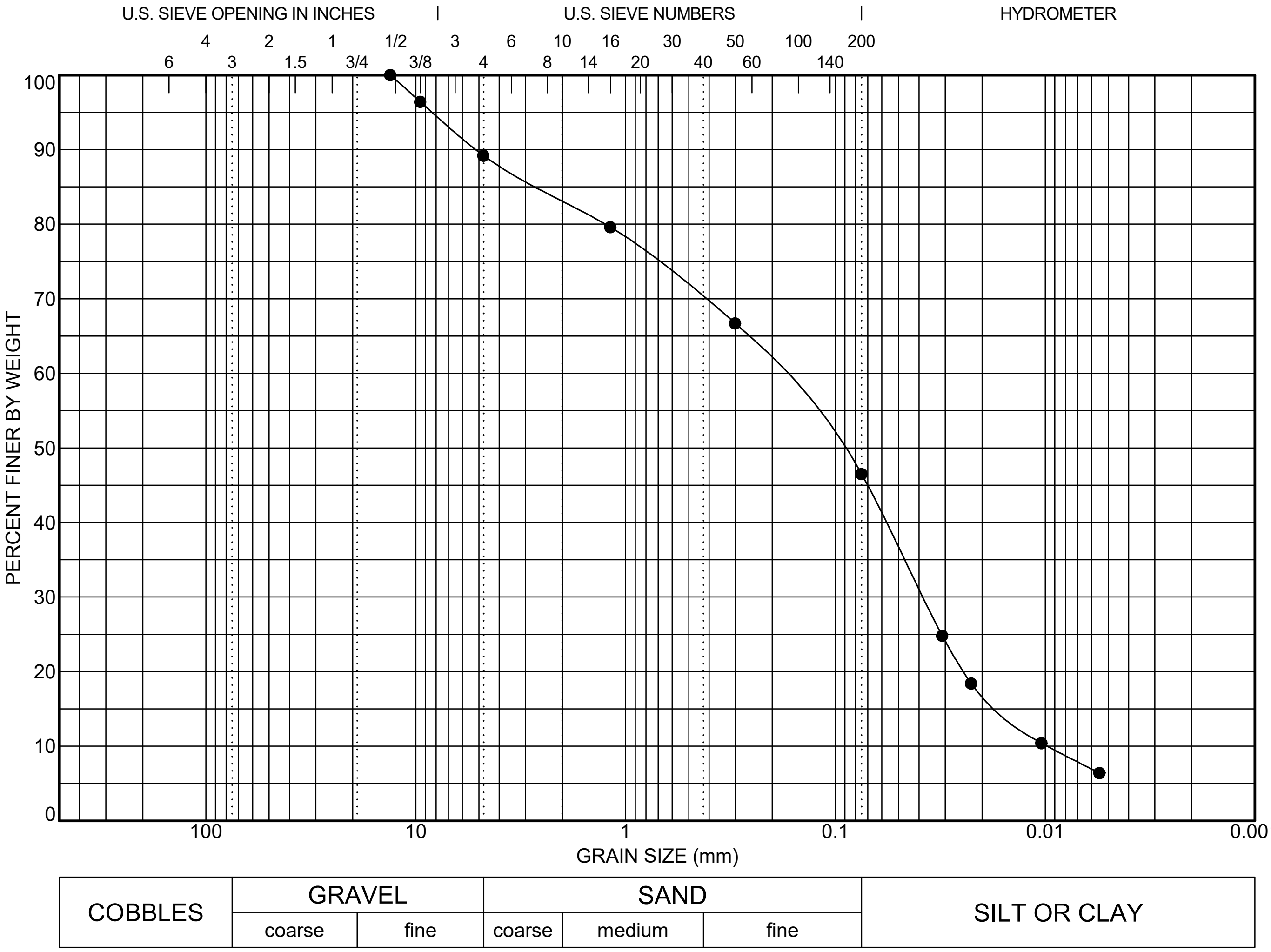
Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 37

DM - NO SPECIFICATIONS G22518 100 BROCK ROAD S. ABERFOYLE.GPJ LAW LNDN.GDT 22-12-16



LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.79	19.41	13.2	0.189	0.038	0.01	10.8	42.7	46.5	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 20 - SA 3; 2.29 to 2.74 m depth
Sample No.: 20-3
Date Sampled: Oct. 03 - 2022
Sampled By: DO
Lab No.: 1421
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Silt Till, trace gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

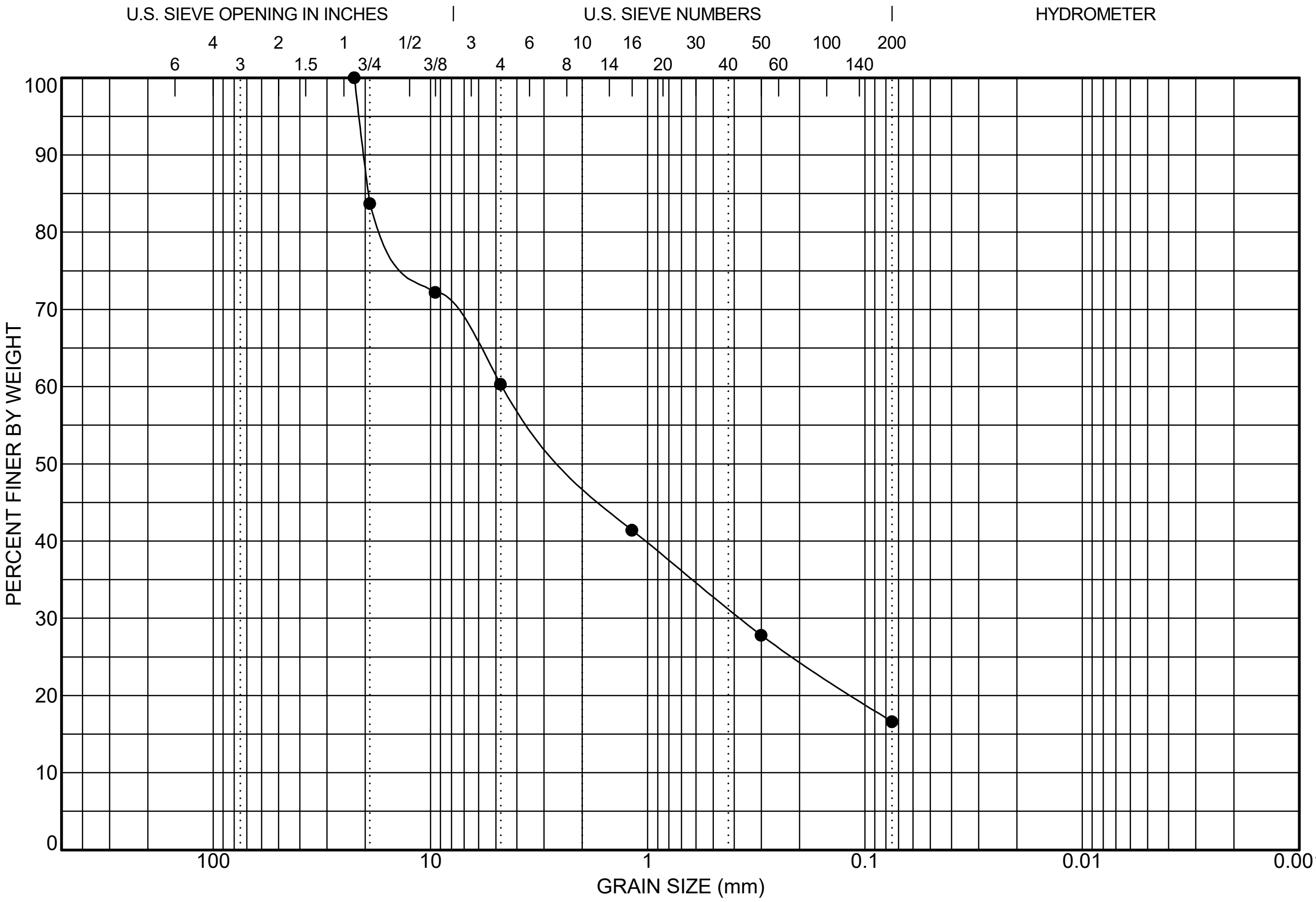
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 38



<table>
<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
</table>

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					22.4	4.646	0.374		39.7	43.7	16.6	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 24 - SA 2; 0.76 to 1.22 m depth
Sample No.: 24-2
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1422
Date Tested: Oct. 27 - 2022
Type of Material: Silty Sand and Gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

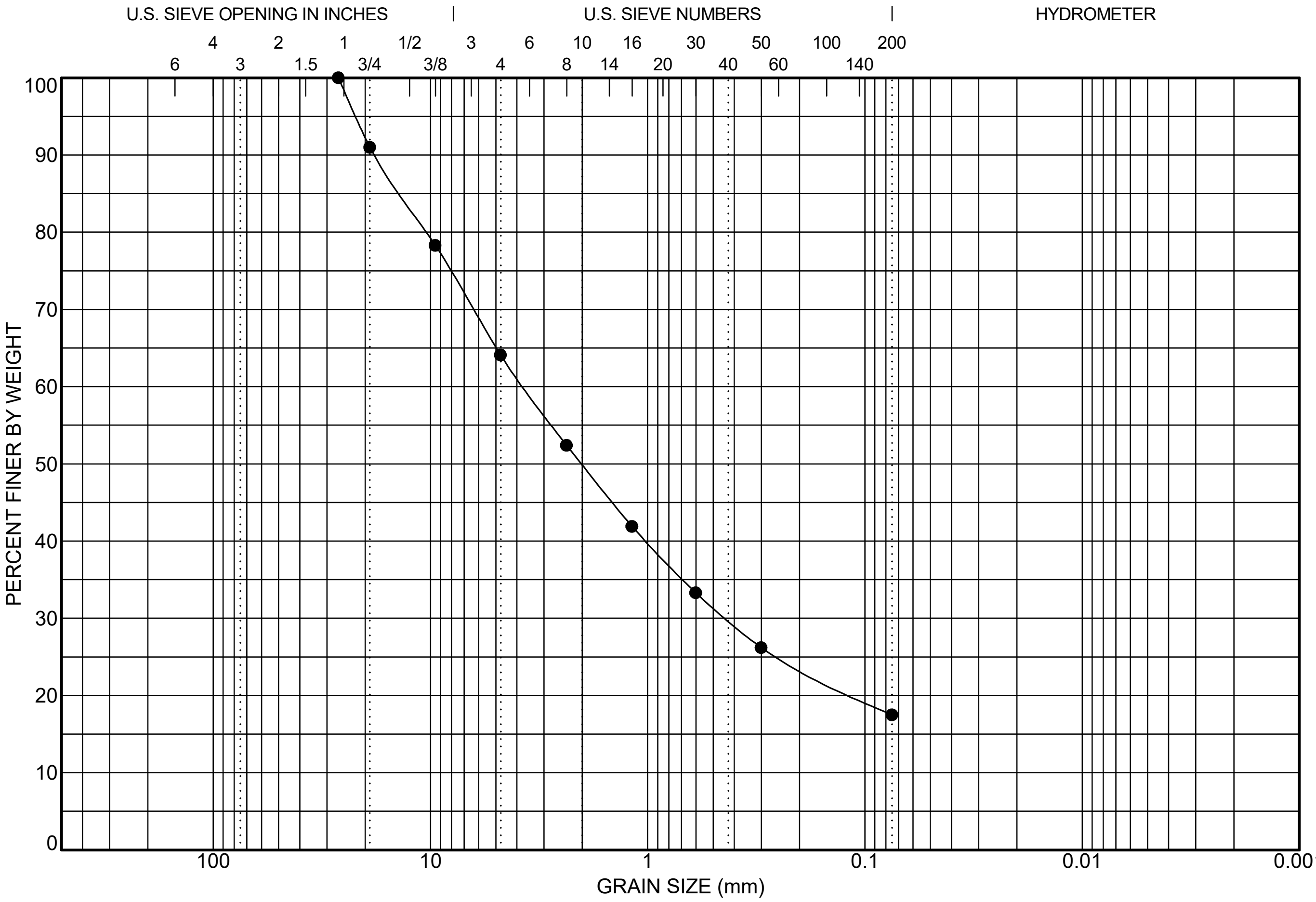
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 39



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					26.5	3.717	0.435		35.9	46.6	17.5	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 24 - SA 5; 3.05 to 3.51 m depth
Sample No.: 24-5
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1423
Date Tested: Oct. 27 - 2022
Type of Material: Silty Sand and Gravel

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

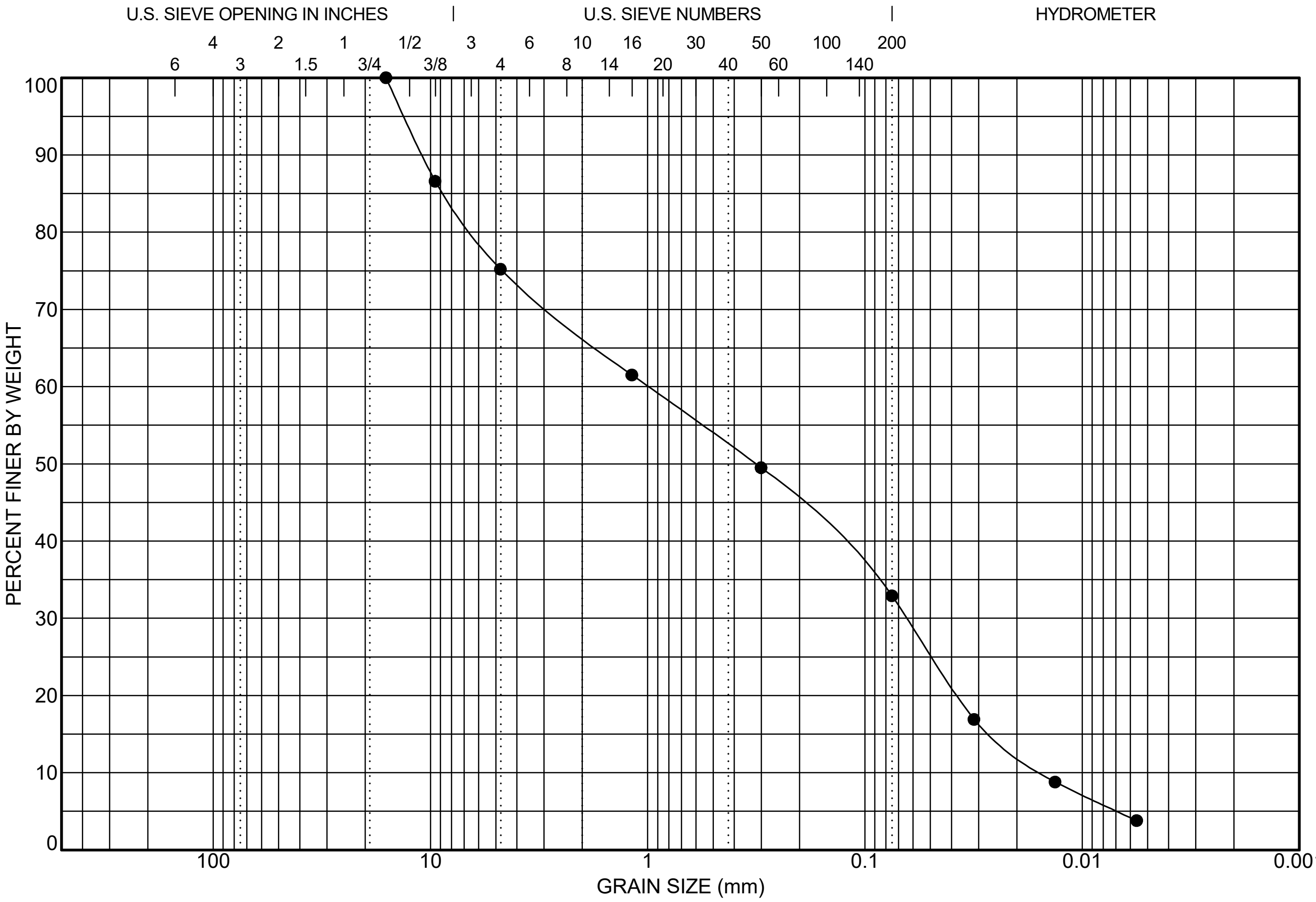
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 40



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.27	65.83	16	0.994	0.064	0.015	24.8	42.3	32.9	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 25 - SA 3; 1.52 to 1.98 m depth
Sample No.: 25-3
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1419
Date Tested: Oct. 27 - 2022
Type of Material: silty gravelly sand Fill

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

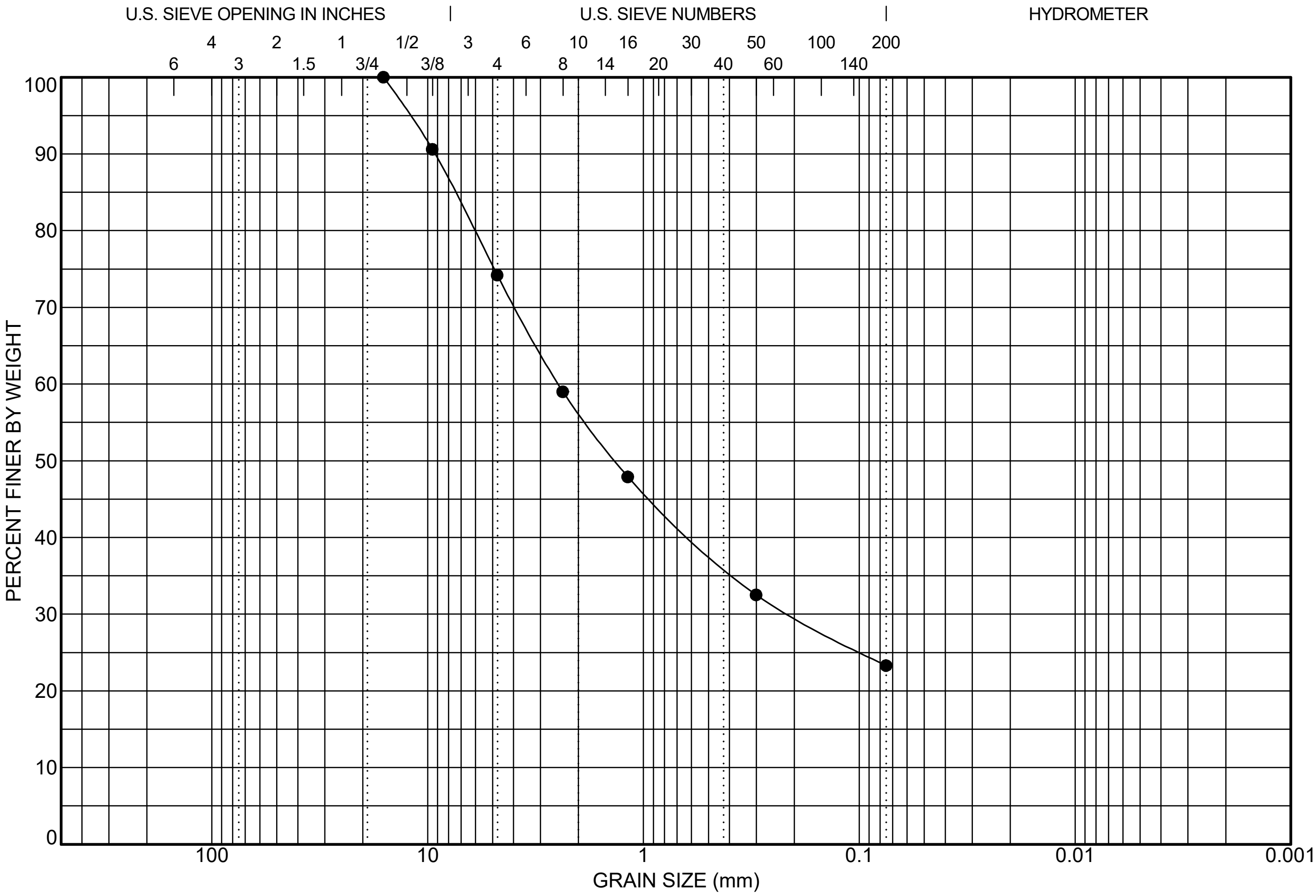
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 41



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					16	2.471	0.206		25.8	50.9	23.3	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 26 - SA 2; 0.76 to 1.22 m depth
Sample No.: 26-2
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1424
Date Tested: Oct. 27 - 2022
Type of Material: silty gravelly sand Fill

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

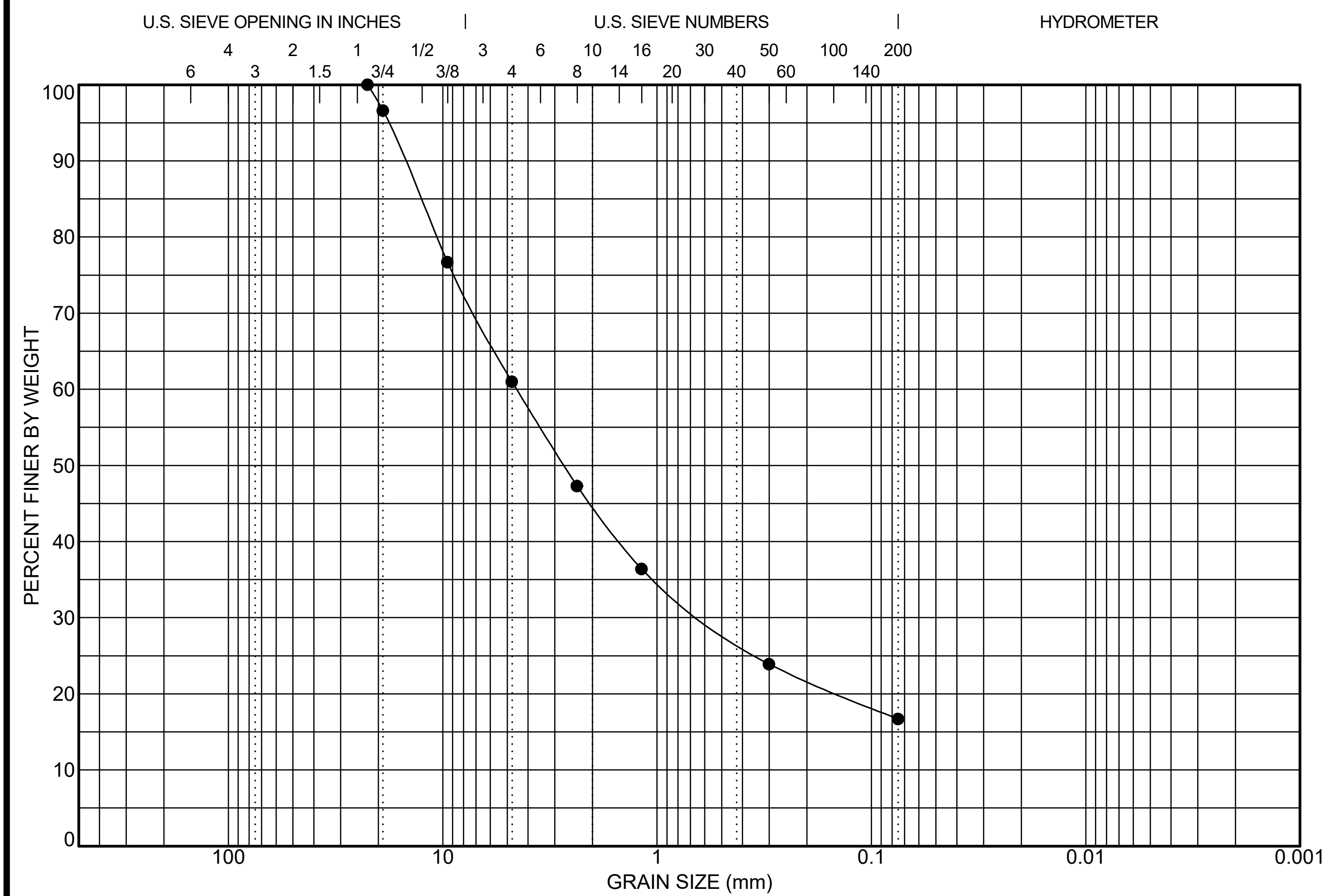
GRAIN SIZE DISTRIBUTION

Project: Proposed Industrial Warehouse Development

Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 42



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					22.4	4.514	0.585		39.0	44.3	16.7	

Date: Nov. 09 - 2022
Client: Collaborative Structures Limited
Contractor:
Source:
Sampled From: BH 26 - SA 4; 2.29 to 2.74 m depth
Sample No.: 26-4
Date Sampled: Oct. 05 - 2022
Sampled By: BC
Lab No.: 1425
Date Tested: Oct. 27 - 2022
Type of Material: Sand and Gravel, some silt

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

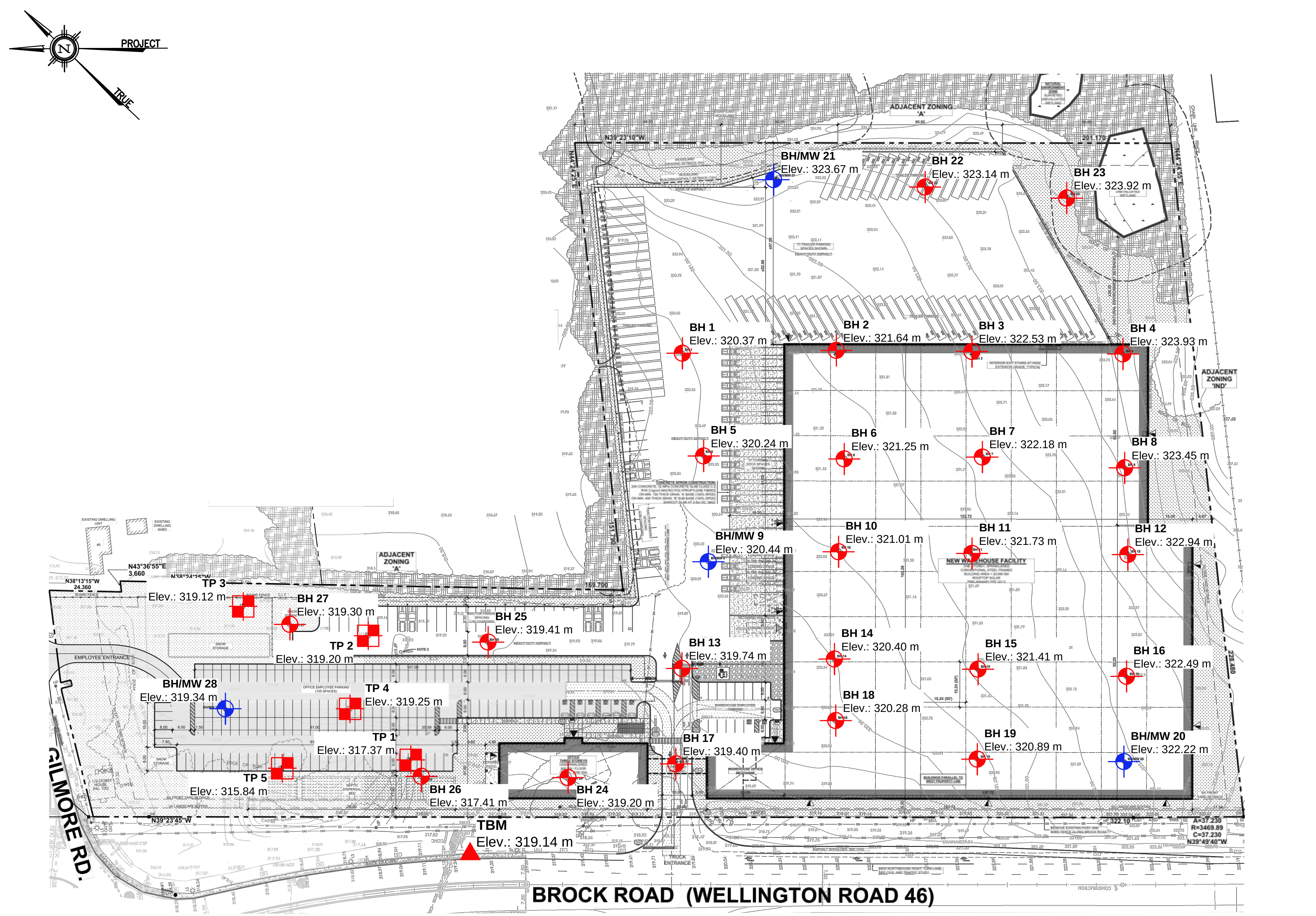
Project: Proposed Industrial Warehouse Development

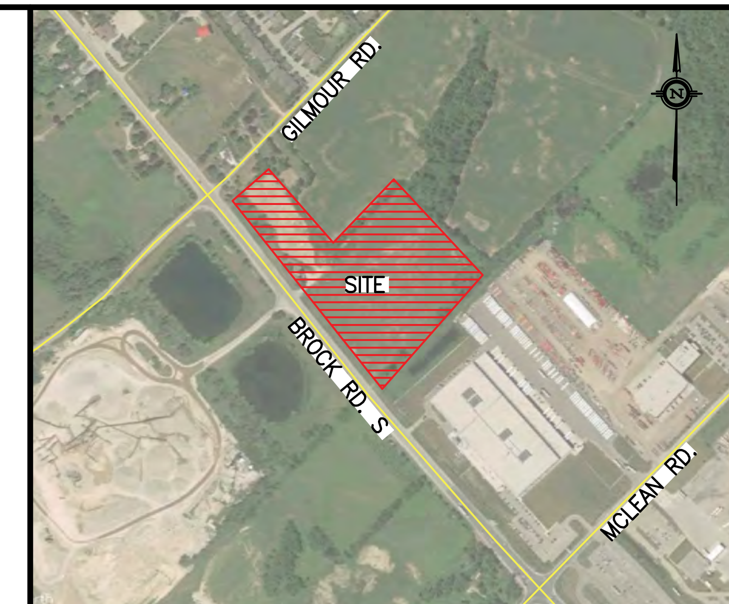
Location: 128 Brock Road South, Puslinch, Ontario

File No.: G22518

Enclosure No.: 43

DM - NO SPECIFICATIONS G22518 100 BROCK ROAD S. ABERFOYLE.GPJ LAW LNDN.GDT 22-12-16





KEY PLAN **SOURCE:** Google Earth

LEGEND

TBM: Catch basin along northbound lane curb-line of Brock Road South, north of existing site driveway Elev.: 319.14 m (Geodetic)

Borehole Location

Borehole and Monitoring Well Location

Test Pit Location

Dwg Ref.: *Tacoma Engineers Dwg No. SP1C, "Wellington Motor Freight - Site Plan", Rev. 2, dated Oct. 20, 2022.*

Elev. Ref.: *The borehole locations and associated ground surface elevations were surveyed using a Leica CC80 Field Tablet and an ICON GPS 70T (Tilt Compensated Network RTK Rover) Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using UTM Zone 17N Projection, NAD83(CSRS)v7-2010 datum and Canada Geoid Model HT2_2010v70 (CGVD28).*

BOREHOLE AND TEST PIT LOCATION PLAN

Proposed Industrial Warehouse Development

128 Brock Road South
Puslinch, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1 / 519-742-8979

Drawn By: DO	Date: November, 2022	File No.: G22518
Checked By: JV	Scale: 1:1500	Drawing No.: 1

paradigm
TRANSPORTATION SOLUTIONS LIMITED

128 Brock Road South
Puslinch ON
Transportation Impact Study

Paradigm Transportation Solutions Limited

December 2022
220579

ptsl.com

Project Summary

Project Number
220579

Date: December 2022
Version 0.1.0

Client
Wellington Motor Freight
c/o MHBC Planning
Kitchener, ON

Client Contact
Pierre Chauvin, MA, MCIP, RPP
Partner

Consultant Project Team
Erica Bayley, P.Eng.
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5A-150 Pinebush Road
Cambridge ON N1R 8J8
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905.381.2229
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128 Brock Road South, Puslinch, ON Transportation Impact Study

<< Original Signed By >>

Erica Bayley, P.Eng.

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Executive Summary

Content

Wellington Motor Freight retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS) for a proposed warehouse development located at 128 Brock Road South in the Township of Puslinch, County of Wellington, Ontario.

This TIS includes an analysis of existing traffic conditions, a description of the proposed development traffic, traffic forecasts for a five-year horizon from assumed opening year (Year 2030), and any recommendations required to improve future traffic conditions.

Development Concept

The property owner is proposed to develop an approximate 207,550 ft^2 warehouse operation with a three-storey office building with approximately 30,000 ft^2.

Vehicle access is proposed via one all-moves access to Brock Road South and one all-moves access to Gilmour Road. The Gilmour Road access will be designated to employees use only while the Brock Road South access will be designated for heavy vehicles.

Conclusions

Based on the investigations carried out, it is concluded that:

- **Existing Traffic Conditions:** The study area intersections are currently operating within acceptable levels of service and not critical movements during the AM and PM peak hours.
- **Development Trip Generation:** The warehouse development is forecast to generate approximately 108 and 112 trips during the AM and PM peak hours, respectively.
- **Background Traffic Conditions:** The study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hours with the following critical movements noted:
  - Brock Road South and McLean Road:
    - The eastbound left-turn queue (95th percentile) is forecast to exceed the available storage during the PM peak hour.
- **Total Traffic Conditions:** The study area intersections are forecast to operate within acceptable levels of service during the

AM and PM peak hours with similar critical movements noted under future background conditions.

- The new driveway connection to Brock Road South is forecast to operate with LOS E and v/c ratio of 0.02 during the AM peak hour. During the PM peak hour, the driveway is forecast to operate at LOS F with v/c ratio of 0.09. The v/c ratio indicates that while there is delay, there remains excess capacity for this movement.
- The new driveway connection to Gilmour Road is forecast to operate within acceptable level of services during the AM and PM peak hour.
- The addition of the site generated traffic increases the overall delay at the study area intersections by one second or less during the AM and PM peak hours.
- **Remedial Measures:** A southbound left-turn lane on Brock Road South and the Site driveway is not warranted during the AM and PM peak hours.
- A northbound right-turn lane on Brock Road South is not warranted during the AM and PM peak hours.

Recommendations

Based on the findings in this study, it is recommended that:

- A northbound right-turn lane with a parallel lane of 80 metres in installed at the site driveway to allow right-turn traffic (specifically heavy vehicles) to safely slow down before making the turn without interfering with through traffic

Contents

Appendices

Figures

Tables

1 Introduction

1.1 Overview

Wellington Motor Freight retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS) for a proposed warehouse development located at 128 Brock Road South in the Township of Puslinch, County of Wellington, Ontario. **Figure 1.1** illustrates the subject development location.

This study determines the impacts of the additional traffic on the surrounding road network, and the remedial measures necessary (if any) to accommodate future traffic in a satisfactory manner. The scope of the study includes:

- Assessment of the current traffic and site conditions within the study area.
- Estimates of background traffic growth.
- Estimates of additional traffic generated by the subject site.
- Analysis of the impact of the future traffic on the surrounding road network; and
- Recommendations necessary to mitigate this future traffic in a satisfactory manner.

The study scope was developed in consultation with the County of Wellington in October 2022. **Appendix A** contains the pre-study consultation material and response from the County of Wellington.

This study has been prepared in accordance with the requirements detailed by the County of Wellington Traffic Impact Study Guidelines[1].

1.2 Study Area

The intersection assessed in this study include:

- Brock Road South (Wellington Road 46) and Gilmour Road (roundabout)
- Brock Road South (Wellington Road 46) and McLean Road (signalized); and
- Proposed access connections to Brock Road South and Gilmour Road.

[1] County of Wellington, *Appendix G Traffic Impact Study Guidelines Road Master Action Plan,* (Dillon Consulting: County of Wellington, 2021).

paradigm TRANSPORTATION SOLUTIONS LIMITED

Site Location and Study Area

128 Brock Road South, Puslinch
220579

Figure 1.1

2 Existing Conditions

2.1 Road Characteristics

The following County of Wellington[2] road near the subject site includes:

- **Brock Road (Wellington Road 46)** is a north-south County Road with a posted speed limit of 50 km/h to south of the roundabout at Gilmour Road where it then changes to 70 km/h. It has a four-lane rural cross-section with no cycling facilities or sidewalks.

The following Township of Puslinch[3] roads near the subject site include:

- **McLean Road** is an east-west local road with a speed limit of 50 km/h in the study area. It has a two-lane rural cross-section with no cycling facilities or sidewalks.
- **Gilmour Road** is a north-south local road with a speed limit of 50 km/h in the study area. Heavy vehicles are prohibited using Gilmour Road. It has a two-lane rural cross-section with no cycling facilities or sidewalks.

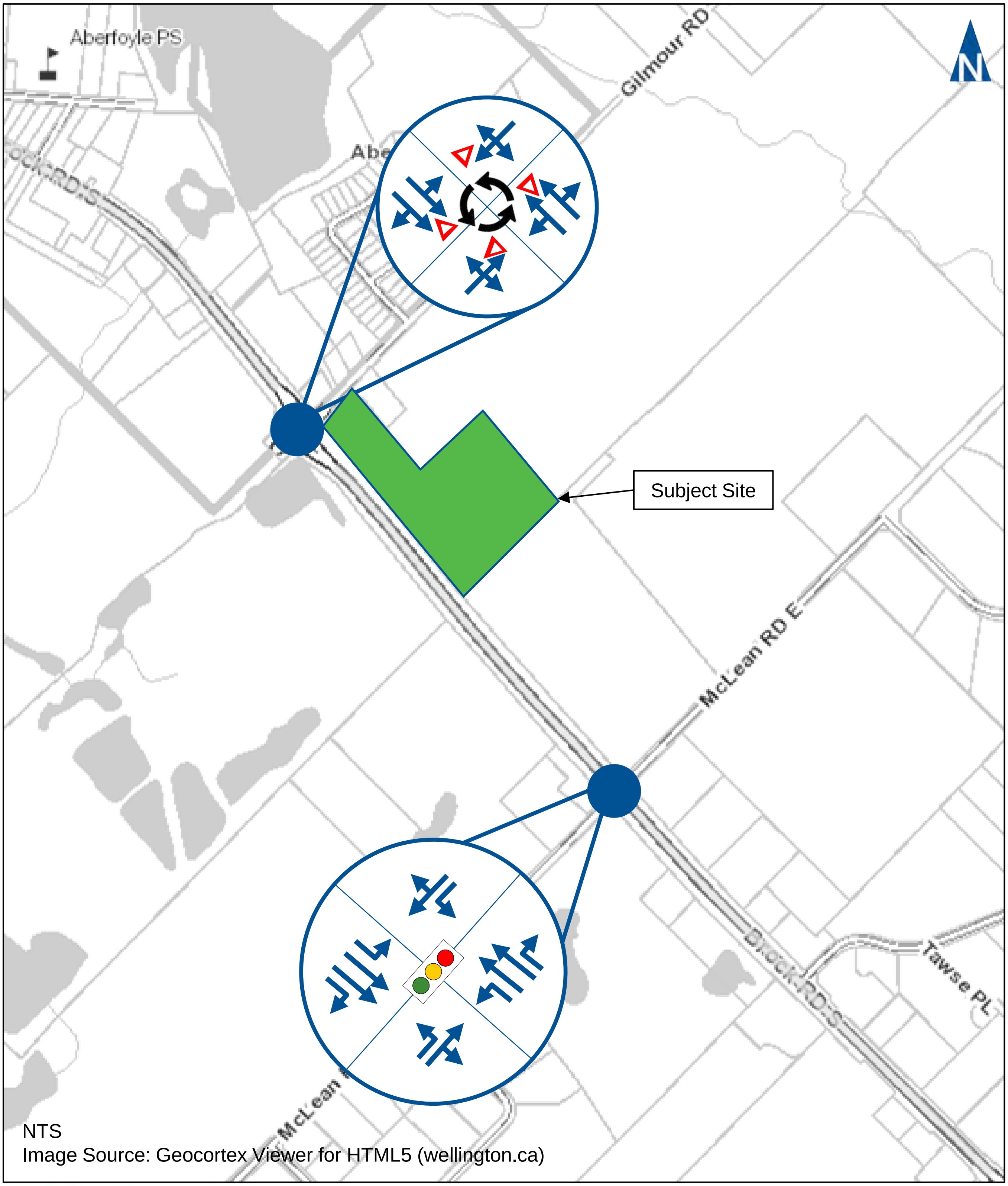
Figure 2.1 details the existing traffic control and lane configurations at the study area intersections.

2.2 Traffic Volumes

Turning movement counts at the study area intersections were conducted in October 2022 to capture the weekday AM and PM peak hours. These turning movement counts provide an ideal representation of the existing conditions on the study area roadways. **Figure 2.2** displays the existing weekday AM and PM peak hour traffic volumes.

Appendix B contains the detailed turning movement counts for the study area intersections.

[2] County of Wellington, *Official Plan,* (Wellington County 2019), Schedule A7: Puslinch.
[3] County of Wellington, *Official Plan,* (Wellington County 2019), Schedule A7: Puslinch.



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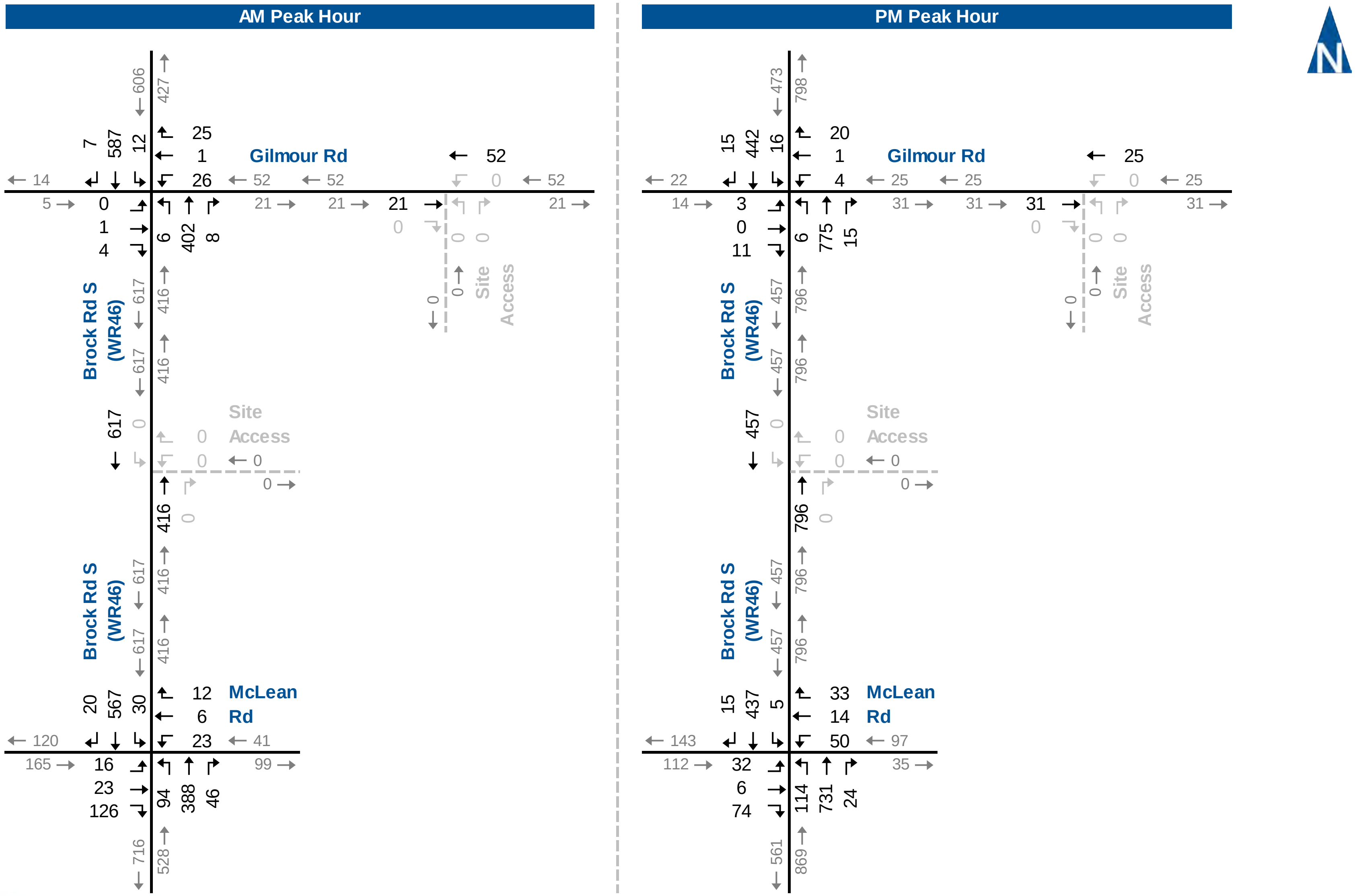
Existing Lane Configuration and Traffic Control

128 Brock Road South, Puslinch
220579

Figure 2.1



Base Year Traffic Volumes

Figure 2.2

2.2 Transit Service

GO Transit operates two routes out of the Aberfoyle Transit station in the southeast corner of the Brock Road (Wellington Road 46) and McLean Road intersection:

- **Route 29 Guelph/Mississauga** operates between Guelph Central Station and the Square One GO Station (Mississauga). The service runs Monday to Friday (5:15 AM to 1:35 AM) with headways approximately every 60 minutes and Saturdays/Sundays (6:40 AM to 1:40 AM) with headways approximately every 60 minutes.
- **Route 48 407 West** operates between the University of Guelph and the Highway 407 Bus Terminal. The service runs Monday to Friday (5:00 AM to 2:29 AM) with headway approximately every 60 minutes. It does not operate on Saturdays and Sundays.

The Aberfoyle GO Station is located approximately 750 metres south (10-minute walk) from the subject site.

2.4 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing various movements. The delay is related to the number of vehicles intending to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on a number of criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal to or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections, 50 seconds for unsignalized intersections or when the volume to capacity ratio is greater than 1.0, the movement is classed as LOS F and remedial measures are usually implemented if they are feasible. LOS E is usually used as a guideline for the determination of road improvement needs on through lanes, while LOS F may be acceptable for left-turn movements at peak times, depending on delays.

The level of service conditions at the study area intersections have been assessed using Synchro 11 and Arcady. Movements are considered critical under the following conditions:

- Volume/capacity (V/C) ratios for overall intersection operations, through movements or shared through/turning movements increased to 0.85 or above at signalized intersections.
- V/C ratios for dedicated turning movements that will exceed 0.90 at signalized intersections.
- Overall intersection level of service is LOS E or F at unsignalized intersections; and
- 95th percentile queue lengths for individual movements exceeds available lane storage.

Table 2.2 summarizes the results of the intersection operational analysis under existing conditions, including the AM and PM peak hour LOS, v/c ratios, and 95th percentile queues.

The results indicate that the study area intersections are operating with acceptable levels of service with no specific problem movements during the AM and PM peak hours.

Appendix C contains the detailed Synchro and Arcady reports.

TABLE 2.2: BASE YEAR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Brock Road South (WR46) & Gilmour Road	RBT	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**7**				**4**				**2**				**2**	**2**
			V/C				**0.01**				**0.05**				**0.19**				**0.28**	
			Q				**7**				**7**				**7**				**7**	
			Ex																	
			Avail.																	
	Brock Road South (WR46) & McLean Road	TCS	LOS	C	C	>	**C**	C	C	>	**C**	A	B	B	**B**	B	B	B	**B**	**B**
			Delay	30	32	>	**32**	27	29	>	**28**	9	13	12	**12**	11	16	13	**16**	**17**
			V/C	0.08	0.25	>		0.17	0.04	>		0.32	0.27	0.03		0.07	0.41	0.02		**0.35**
			Q	7	25	>		9	8	>		16	39	2		6	63	0		
			Ex	50	-	>		50	-	>		65	-	65		65	-	65		
			Avail.	43	-	>		41	-	>		49	-	63		59	-	65		
PM Peak Hour	Brock Road South (WR46) & Gilmour Road	RBT	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**4**				**4**				**2**				**2**	**2**
			V/C				**0.01**				**0.03**				**0.36**				**0.21**	
			Q				**7**				**7**				**7**				**7**	
			Ex																	
			Avail.																	
	Brock Road South (WR46) & McLean Road	TCS	LOS	C	D	>	**C**	C	C	>	**C**	A	B	A	**B**	B	B	B	**B**	**B**
			Delay	31	35	>	**34**	28	33	>	**31**	8	13	10	**12**	13	17	14	**17**	**16**
			V/C	0.14	0.11	>		0.23	0.09	>		0.24	0.43	0.02		0.02	0.33	0.01		**0.38**
			Q	12	15	>		16	13	>		19	78	0		2	48	0		
			Ex	50	-	>		50	-	>		65	-	65		65	-	65		
			Avail.	39	-	>		34	-	>		46	-	65		63	-	65		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control
RBT - Roundabout

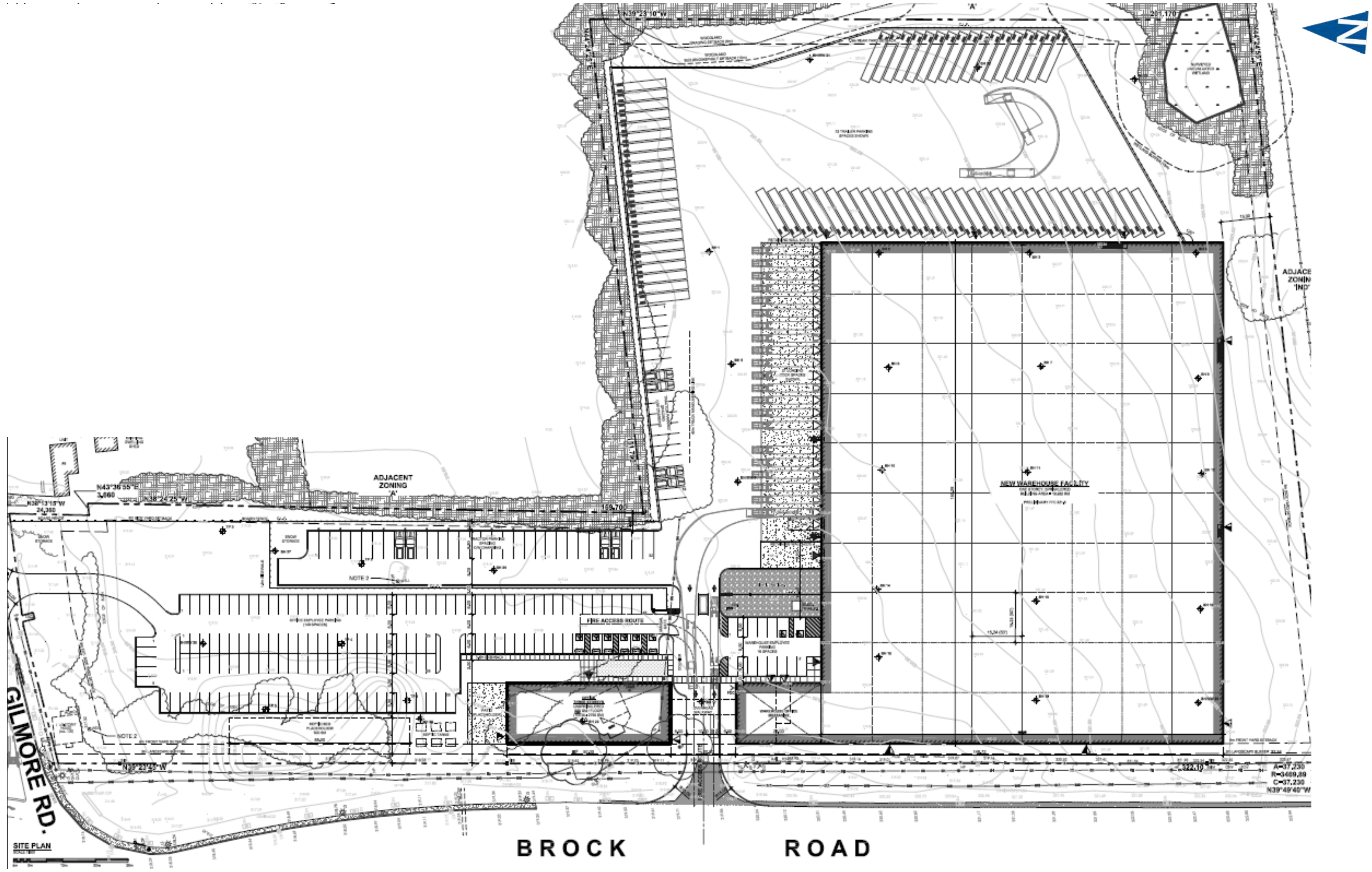
3 Development Concept

3.1 Development Description

The subject site is located at 128 Brock Road South (Wellington Road 46), Puslinch Township, Wellington County. The property owner is proposed to develop an approximate 207,550 ft^2 warehouse operation with a three-storey office building with approximately 30,000 ft^2.

Vehicle access is proposed via one all-moves access to Brock Road South and one all-moves access to Gilmour Road. The Gilmour Road access will be designated to employees use only while the Brock Road South access will be designated for heavy vehicles.

Figure 3.1 illustrates the development concept.



NTS

Concept Plan

128 Brock Road South, Puslinch
220579

Figure 3.1

3.2 Development Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation[4] methods are used to estimate the site trip generation. The following Land Use Codes (LUC) were used to estimate the site generated trips:

- LUC 150 (Warehouse); and
- LUC 710 General Office Building.

Regression equation rates were used to calculate the trips generated by the warehouse use. **Table 3.1** summarizes the estimated trip generation and is estimated to be approximately 108 AM peak hour trips and 112 PM peak hour trips. No reductions for alternative modes of transportation were used in the calculation. **Appendix D** contains the ITE trip generation data sheets.

Table 3.1 summarizes the forecast number of net new trips generated by the proposed development.

TABLE 3.1: TRIP GENERATION

ITE Land Use	Units	Vehicle Type	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
LUC 150 - Warehouse (GFA/1,000ft^2)	207.6	Vehicles	36	9	**45**	11	34	**45**
		Trucks	2	2	**4**	3	3	**6**
LUC 710 - General Office Building (GFA/1,000ft^2)	30.0	Vehicles	52	7	**59**	10	51	**61**
Total Trip Generation			**90**	**18**	**108**	**24**	**88**	**112**

LUC 150: AM T = 0.12(X) + 23.62 | PM T= 0.12(X) + 26.48

LUC 710: AM Ln(T) = 0.87 Ln(X) + 3.05 | PM Ln(T) = 0.83 Ln(X) + 1.29

3.3 Development Trip Distribution and Assignment

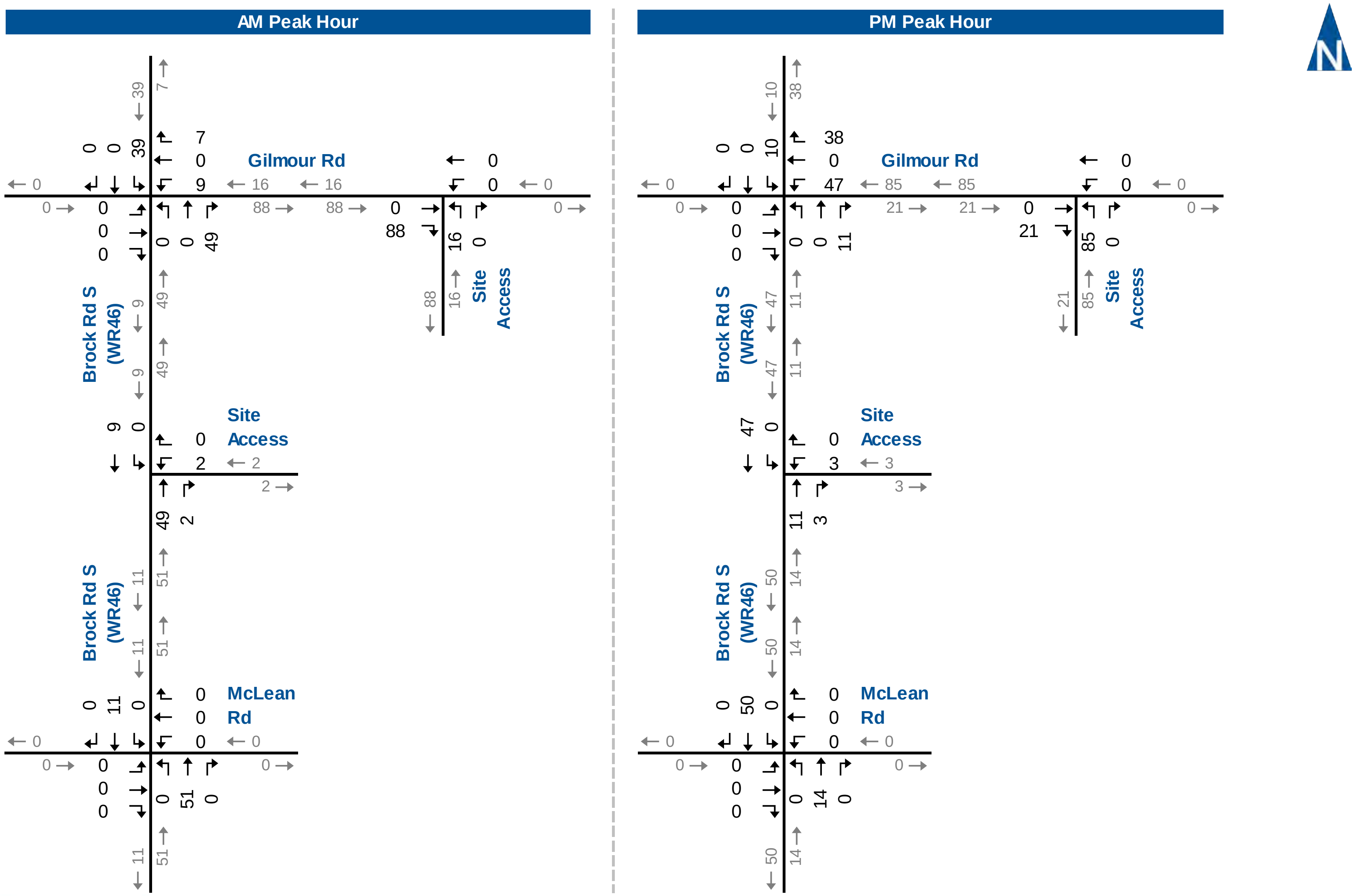
The trip distribution used for this study was based on the existing trip distribution for Brock Road (Wellington Road 46) as the site traffic would likely use this route for trips to/from Guelph and/or Highway 401. The trip distribution is shown in **Table 3.2**.

[4] *Trip Generation Tenth Edition*, Institute of Transportation Engineers, Washington D.C., 2017

TABLE 3.2: TRIP DISTRIBUTION

Direction	AM Peak Hour		PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
North	65%	22%	47%	47%
South	35%	78%	53%	53%
Total	**100%**	**100%**	**100%**	**100%**

The office generated trips and warehouse employees were assigned to the Gilmour Road access. The warehouse generated trucks trips were assigned to the Brock Road South access. In discussions with the Client, all truck trips will be to/from Highway 401 south of the site. **Figure 3.2** contains the AM and PM peak hour trip assignment.



Site Generated Traffic Volumes

Figure 3.2

4 Evaluation of Future Traffic Conditions

The assessment of the future traffic conditions contained in this section includes the traffic forecast as well as the level of service analysis.

4.1 Future Traffic Volumes

A five-year horizon (Year 2030) from assumed full build-out has been assessed to estimate the impact of the subject development and background roadway traffic.

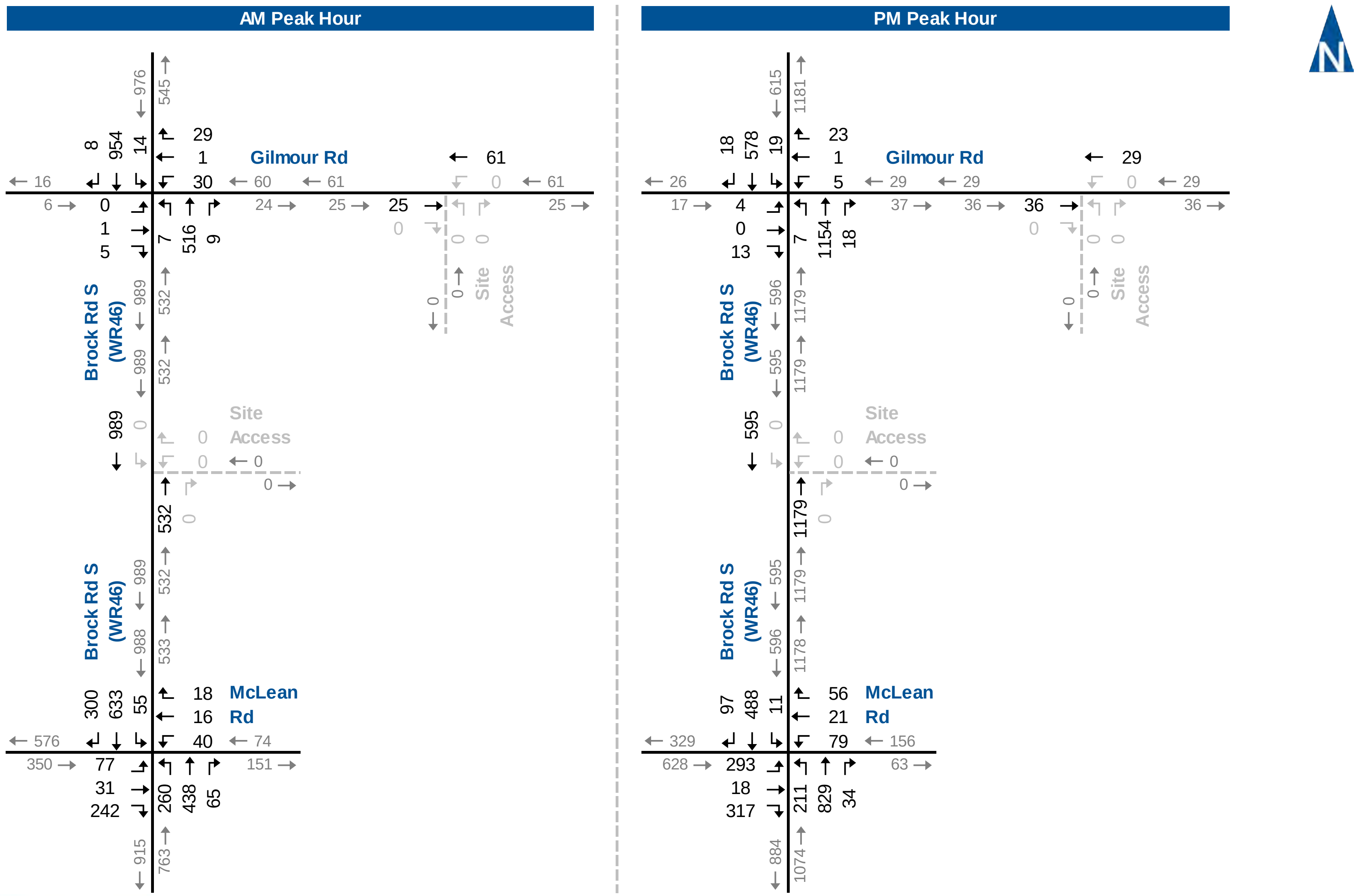
The likely future traffic volumes are estimated to consist of:

- Increased non-site traffic (generalized background traffic growth) estimated to be 2% percent per annum provided by Wellington County.
- Traffic generated by adjacent future developments including:
  - 7504 McLean Road[5] – a 14,836m^2 warehouse facility.
  - Commercial Development[6] with a gas station/convenience market and fast-food restaurant with a drive through window in the northwest corner of Brock Road South and McLean Road.
  - 227 Brock Road South[7] – a self-storage warehouse facility.
  - Industrial development[8] in northwest corner of Brock Road South and McLean Road.
  - Truck Distribution Terminal[9], McLean Road West; and
- Traffic generated by the subject site.

Appendix E contains the detailed traffic forecast for the adjacent development application. The background traffic volumes were obtained from their associated traffic studies.

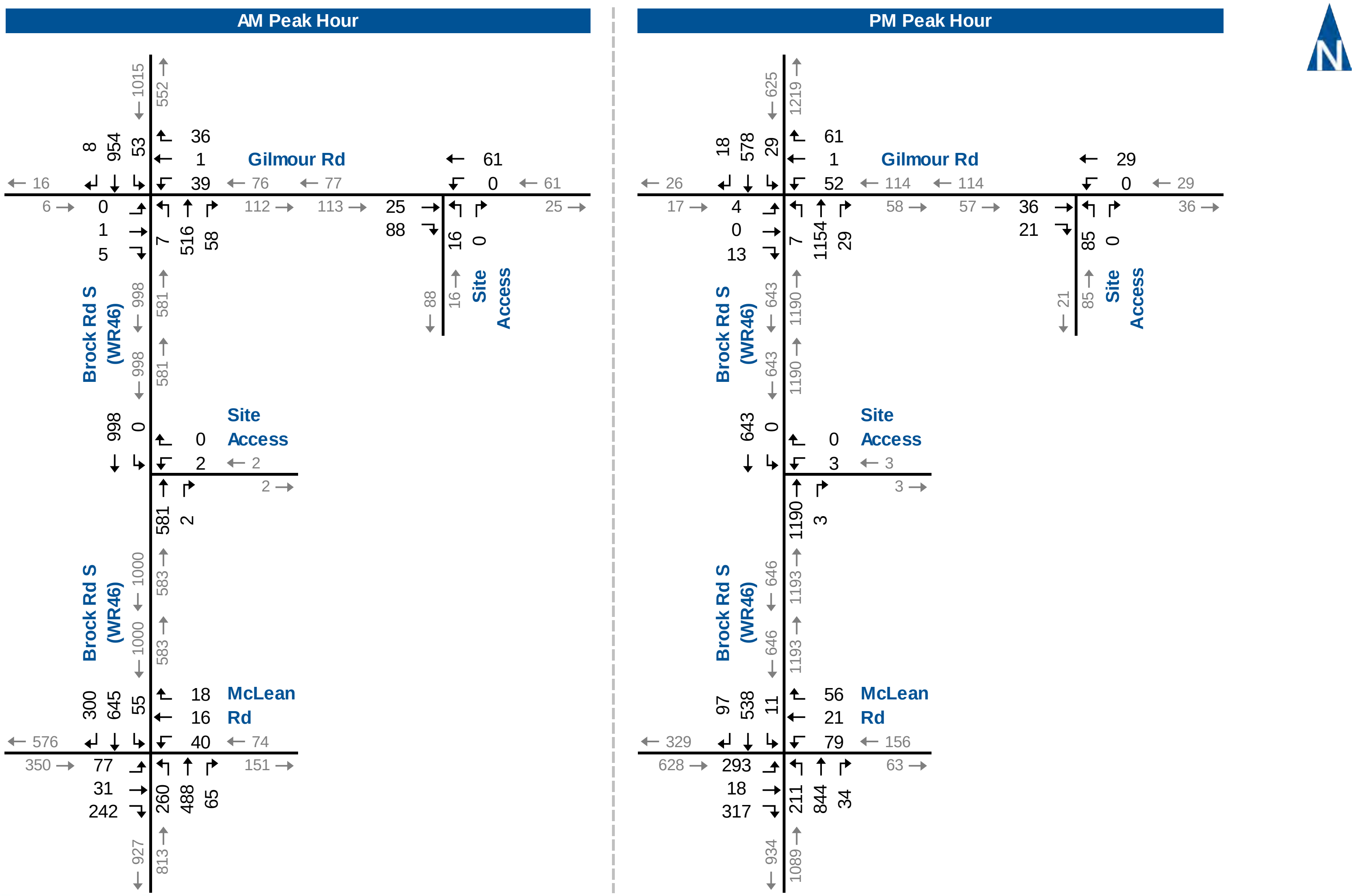
[5] *Mantoria Warehouse, 7504 McLean Road, Puslinch Transportation Impact Study*, Paradigm Transportation Solutions Limited, January 2021.
[6] *Commercial Development, Puslinch, ON Transportation Impact Study*, Paradigm Transportation Solutions Limited, April 2021.
[7] *Storage Facility, 227 Brock Road South, Puslinch, Transportation Impact Study*, Paradigm Transportation Solutions Limited, July 2021.
[8] *Industrial Development, Northwest Quadrant, Brock Road & McLean Road, Township of Puslinch, ON, Transportation Impact Study*, Paradigm Transportation Solutions Limited, DRAFT September 2021.
[9] *Truck Distribution Terminal, Puslinch, Transportation Impact Study,* Paradigm Transportation Solutions Limited, April 2022.

Figure 4.1 illustrates the forecast future background traffic volumes. **Figure 4.2** illustrates the forecast future total traffic volumes.



Future Background Traffic Volumes

Figure 4.1



Future Total Traffic Volumes

Figure 4.2

4.2 Forecast Traffic Operations

The study area intersection operations analyses for the future background and future total traffic forecast followed the same methodology used for existing conditions.

4.2.1 Background Traffic Operations

Table 4.1 summarizes the level of service conditions for the AM and PM peak hours. The following critical movements are noted:

- Brock Road South (Wellington Road 46) and McLean Road:
  - The eastbound left-turn movement is forecast to have a 95^{th} percentile queue length that exceeds the available storage during the PM peak hour.

Appendix F contains the supporting detailed Synchro and Arcady reports.

TABLE 4.1: FUTURE BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Brock Road South (WR46) & Gilmour Road	RBT	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**8**				**4**				**2**				**3**	**3**
			V/C				**0.01**				**0.06**				**0.24**				**0.45**	
			Q				**7**				**7**				**7**				**7**	
			Ex																	
			Avail.																	
	Brock Road South (WR46) & McLean Road	TCS	LOS	C	D	>	**D**	D	D	>	**D**	B	B	B	**B**	B	C	C	**C**	**C**
			Delay	33	54	>	**50**	44	43	>	**44**	17	14	12	**15**	20	30	27	**29**	**28**
			V/C	0.30	0.69	>		0.41	0.14	>		0.69	0.29	0.05		0.16	0.61	0.32		**0.69**
			Q	29	76	>		18	15	>		60	47	5		11	105	38		
			Ex	50	-	>		50	-	>		65	-	65		65	-	65		
			Avail.	21	-	>		32	-	>		5	-	60		54	-	27		
PM Peak Hour	Brock Road South (WR46) & Gilmour Road	RBT	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**5**				**6**				**3**				**2**	**3**
			V/C				**0.02**				**0.05**				**0.54**				**0.28**	
			Q				**7**				**7**				**7**				**7**	
			Ex																	
			Avail.																	
	Brock Road South (WR46) & McLean Road	TCS	LOS	C	D	>	**C**	D	D	>	**D**	B	C	B	**C**	C	C	C	**C**	**C**
			Delay	32	37	>	**35**	44	48	>	**46**	16	21	16	**20**	23	29	25	**28**	**27**
			V/C	0.62	0.33	>		0.46	0.20	>		0.51	0.54	0.03		0.05	0.46	0.08		**0.61**
			Q	85	35	>		25	22	>		53	127	0		5	83	10		
			Ex	50	-	>		50	-	>		65	-	65		65	-	65		
			Avail.	-35	-	>		25	-	>		13	-	65		60	-	55		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control
RBT - Roundabout

4.2.2 Future Total Traffic Operations

Table 4.2 summarizes the level of service conditions for the AM and PM peak hours. The following critical movements are noted:

- Brock Road South (Wellington Road 46) and McLean Road:
  - The eastbound left-turn movement is forecast to have a 95th percentile queue length that exceeds the available storage during the PM peak hour; and

Appendix G contains the supporting detailed Synchro and Arcady reports.

The proposed driveway connection to Brock Road South is forecast to operate with LOS E and v/c ratio of 0.02 during the AM peak hour and LOS F and v/c ratio of 0.09 during the PM peak hour. The v/c ratio indicates that while there is delay, there remains excess capacity for the minor approach. If drivers are finding left-turns from the driveway to be excessive, there is capacity to make a right-turn from the driveway and then a U-turn at the Brock Road South and Gilmour Road roundabout.

The proposed driveway connection to Gilmour Road is forecast to operate with LOS A and v/c ratios of 0.06 or lower during the AM and PM peak hours.

The addition of the site-generated traffic increases the overall delay at the study area intersections by one second or less during the AM and PM peak hours.

TABLE 4.2: FUTURE TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Eastbound Left	Eastbound Through	Eastbound Right	Eastbound Approach	Westbound Left	Westbound Through	Westbound Right	Westbound Approach	Northbound Left	Northbound Through	Northbound Right	Northbound Approach	Southbound Left	Southbound Through	Southbound Right	Southbound Approach	Overall
AM Peak Hour	Brock Road South (WR46) & Gilmour Road	RBT	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**9**				**4**				**2**				**3**	**3**
			V/C				**0.01**				**0.08**				**0.27**				**0.47**	
			Q				**7**				**7**				**7**				**7**	
			Ex																	
			Avail.																	
	Brock Road South (WR46) & McLean Road	TCS	LOS	C	D	>	**D**	D	D	>	**D**	B	B	B	**B**	C	C	C	**C**	**C**
			Delay	33	54	>	**50**	44	44	>	**44**	17	15	12	**15**	20	31	27	**29**	**28**
			V/C	0.30	0.69	>		0.41	0.15	>		0.69	0.32	0.05		0.17	0.63	0.32		**0.69**
			Q	29	76	>		18	15	>		61	53	5		11	108	40		
			Ex	50	-	>		50	-	>		65	-	65		65	-	65		
			Avail.	21	-	>		32	-	>		4	-	60		54	-	25		
	Brock Road South (WR46) & Site Access	TWSC	LOS					E		>	**E**		A	>	**A**	<	A		**A**	**A**
			Delay					48		>	**48**		0	>	**0**	<	0		**0**	**0**
			V/C					0.02		>			0.25	>		<	0.43			
			Q					1		>			0	>		<	0			
			Ex					-		>			-	>		<	-			
			Avail.					-		>			-	>		<	-			
	Gilmour Road & Site Access	TWSC	LOS		A	>	**A**	<	A		**A**	A		>	**A**					**A**
			Delay		0	>	**0**	<	0		**0**	9		>	**9**					**1**
			V/C		0.07	>		<	0.00			0.02		>						
			Q		0	>		<	0			1		>						
			Ex		-	>		<	-			-		>						
			Avail.		-	>		<	-			-		>						
PM Peak Hour	Brock Road South (WR46) & Gilmour Road	RBT	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**5**				**7**				**3**				**2**	**3**
			V/C				**0.02**				**0.18**				**0.54**				**0.29**	
			Q				**7**				**7**				**7**				**7**	
			Ex																	
			Avail.																	
	Brock Road South (WR46) & McLean Road	TCS	LOS	C	D	>	**C**	D	D	>	**D**	B	C	B	**C**	C	C	C	**C**	**C**
			Delay	32	37	>	**35**	44	48	>	**46**	17	21	16	**20**	23	30	25	**29**	**28**
			V/C	0.63	0.33	>		0.46	0.20	>		0.54	0.55	0.03		0.05	0.51	0.08		**0.62**
			Q	86	36	>		26	23	>		52	130	0		5	93	10		
			Ex	50	-	>		50	-	>		65	-	65		65	-	65		
			Avail.	-36	-	>		24	-	>		13	-	65		60	-	55		
	Brock Road South (WR46) & Site Access	TWSC	LOS					F		>	**F**		A	>	**A**	<	A		**A**	**A**
			Delay					121		>	**121**		0	>	**0**	<	0		**0**	**0**
			V/C					0.09		>			0.51	>		<	0.27			
			Q					2		>			0	>		<	0			
			Ex					-		>			-	>		<	-			
			Avail.					-		>			-	>		<	-			
	Gilmour Road & Site Access	TWSC	LOS		A	>	**A**	<	A		**A**	A		>	**A**					**A**
			Delay		0	>	**0**	<	0		**0**	9		>	**9**					**5**
			V/C		0.04	>		<	0.00			0.10		>						
			Q		0	>		<	0			3		>						
			Ex		-	>		<	-			-		>						
			Avail.		-	>		<	-			-		>						

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control
RBT - Roundabout

5 Remedial Measures

5.1 Auxiliary Turn Lanes

5.1.1 Left-Turn Lane

As there are no left-turns into either the Gilmour Road and Brock Road South driveways, left-turn lane warrants are not required.

5.1.2 Right-Turn Lane

The proposed site driveway to Brock Road South was assessed to determine if the forecast traffic volumes warrant installation of auxiliary right-turn lane.

Although right-turns are generally made more efficiently than left-turn movements, exclusive right-turn lanes are often provided for many of the same reasons that left-turn lanes are provided such as a reduction in rear-end collisions and less delay for the through traffic.

MTO guidelines (Geometric Design Standards for Ontario Highways) note that right-turn lanes or tapers may be considered where right-turn volumes exceed 60 vehicles per hour (vph) and where right-turning vehicles create a hazard or reduce capacity at the intersection. The highest forecast right-turn movement at the proposed driveway connection is approximately 3 vph during the AM peak hour.

With Brock Road South having potential for higher vehicle speeds, a northbound right-turn lane should be constructed to allow right-turn traffic (specifically heavy vehicles) to safely slow down before making the turn without interfering with through traffic. The right-turn lane should conform to the design guidelines outlined in the Transportation of Canada Geometric Design Guide for Canadian Roads[10].

The northbound right-turn lane should include a deceleration lane and taper lane. The deceleration lane should measure 60 to 130 metres with a taper lane ratio of 17:1 to 24:1[11].

It is recommended that a northbound right-turn lane with a parallel lane length of 80 metres be constructed on Brock Road South at the

[10] Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, (Ottawa: TAC, 2017),

[11] Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, (Ottawa: TAC, 2017), Table 9.14.2: Right-Turn Taper with Parallel Deceleration Lane Design

proposed site access. This will accommodate the breaking distance for a 80 km/h design speed (73.4 metres).

6 Conclusions and Recommendations

6.1 Conclusions

Based on the investigations carried out, it is concluded that:

- **Existing Traffic Conditions:** The study area intersections are currently operating within acceptable levels of service and not critical movements during the AM and PM peak hours.
- **Development Trip Generation:** The warehouse development is forecast to generate approximately 108 and 112 trips during the AM and PM peak hours, respectively.
- **Background Traffic Conditions:** The study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hours with the following critical movements noted:
  - Brock Road South and McLean Road:
    - The eastbound left-turn queue (95th percentile) is forecast to exceed the available storage during the PM peak hour.
- **Total Traffic Conditions:** The study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hours with similar critical movements noted under future background conditions.
- The new driveway connection to Brock Road South is forecast to operate with LOS E and v/c ratio of 0.02 during the AM peak hour. During the PM peak hour, the driveway is forecast to operate at LOS F with v/c ratio of 0.09. The v/c ratio indicates that while there is delay, there remains excess capacity for this movement.
- The new driveway connection to Gilmour Road is forecast to operate within acceptable level of services during the AM and PM peak hour.
- The addition of the site generated traffic increases the overall delay at the study area intersections by one second or less during the AM and PM peak hours.
- **Remedial Measures:** A southbound left-turn lane on Brock Road South and the Site driveway is not warranted.
- A northbound right-turn lane on Brock Road South is not warranted during the AM and PM peak hours.

6.2 Recommendations

Based on the findings in this study, it is recommended that:

- A northbound right-turn lane with a parallel lane of 80 metres in installed at the site driveway to allow right-turn traffic (specifically heavy vehicles) to safely slow down before making the turn without interfering with through traffic

Appendix A

Pre-Study Consultation

From:	[redacted]
To:	[redacted]
Cc:	[redacted]
Subject:	Re: FW: (220579) 128 Brock Road South (WR46), Puslinch TIS Scope
Date:	October 13, 2022 12:35:45 PM
Attachments:	image001.png Signal Timing - WR46@Mclean.pdf

Good afternoon Andrew,

Thank you for reaching out regarding the planned Transportation Impact Assessment you are looking to prepare for a proposed warehouse facility found at 128 Brock Road South (Wellington Road 46) in the Township of Puslinch. As you may be aware, Dillon Consulting Limited has been retained by the County of Wellington to review the proposed scope of work for various traffic impact studies that may impact the County road network and associated intersections. As a result, this response is being provided on behalf of the County of Wellington for your consideration.

The scope you have identified is generally acceptable, noting that the following needs to be considered in the study.

- Only one driveway access will be able to be provided to the site, as per requirements found within the County's Official Plan, Section 9.8. As a result, all trips generated by the site will need to be assigned to this sole driveway.
- A 2.0% per annum growth rate (compounded annually) should be applied to all road corridors within the study area.
- Beyond what you have identified, the Township of Puslinch will need to be contacted to identify any other background developments and/or associated traffic impact studies that have been previously submitted) that would impact the future traffic volumes that need to be considered in the study.
- No changes to geometry or traffic control are anticipated within the study area.
- The need for a southbound left-turn lane and a northbound right-turn lane at the single proposed driveway access needs to be specifically assessed.
- The signal timing plan at the Brock Road South (Wellington Road 46) and McLean Road intersection has been attached to this email.

Lastly, Wellington County has also recently developed a document with regard to Traffic Impact Study Guidelines. For your reference, this document can be found here: https://www.wellington.ca/en/resident-services/resources/Roads/RMAP/RMAPFinal/Appendix-G---Traffic-Impact-Study-Guidelines-2021Updated.pdf

Thank you,

Tim

Tim Kooistra, C.E.T.
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400

London, Ontario, N6A 5R2
[redacted]
www.dillon.ca

From: Andrew Evans [redacted]
Sent: Monday, September 19, 2022 9:54 AM
To: Pasquale Costanzo [redacted]
Cc: Erica Bayley [redacted] Kelly Ngo [redacted]
Subject: (220579) 128 Brock Road South (WR46), Puslinch TIS Scope

Greetings,

Paradigm Transportation Solutions Limited is preparing the Transportation Impact Assessment for a proposed warehouse facility on the lands 128 Brock Road South, Puslinch Township, ON.

Below is a brief description of the concept and our proposed terms of reference for the TIA study. Please review and provide comment at your earliest convenience.

SITE DESCRIPTION

The property owner is proposing to develop a 197,685 ft^2 warehouse operation. **The concept plan is attached**.

Vehicle access is proposed via two single all-moves access to Brock Road South (Wellington Road 46).

PROPOSED TERMS OF REFERENCE

Study Area Intersections:

- Brock Road South (WR 46) & Gilmour Road (roundabout);
- Brock Road South (WR 46) & McLean Road (signalized); and
- Two proposed driveway connections.

Analysis Periods:

- Weekday AM peak hour
- Weekday PM peak hour

Horizon Year

- Five-years from the assumed full build-out (Year 2030).

Existing Data:

- Eight Hour TMC at the two Brock Road South (WR 46) intersections.
- TMC to be scheduled within the next two weeks.

Analysis Software:

- Synchro 11 & ARCADY

Background Traffic

- Generalized growth rate: **to be provided by County**
- Active Development Applications: **to be confirmed/provided by County**
- Known developments include:
    - 7504 McLean Road West - warehouse facility;
    - 197 Brock Road South - commercial development (gas Station/fast-food restaurant);
    - 227 Brock Road South – self storage facility;
    - Industrial Development – northwest corner of Brock Road South and McLean Road; and
    - Truck Distribution Terminal – McLean Road East

Future Road Improvements: **to be provided by County**

Trip Generation

- ITE Trip Generation Data 11th Edition - LUC 150 Warehouse (GFA/1,000ft^2)
- No modal split reductions.

Site Traffic Distribution

- Existing Traffic Patterns.

Report

- We will document the study methodologies, findings, and conclusions in a report with appendices containing the detailed analysis results and any data collected.

Please let us know your comments on the study.

Thank you and regards.

Andrew Evans, M.Sc.

Transportation Planner

Paradigm Transportation Solutions Limited

5A-150 Pinebush Road Cambridge ON N1R 8J8

[redacted]

[redacted]

e: [redacted]

w: www.ptsl.com

***** *Paradigm is now operating on a 4-day workweek. Our offices are closed Fridays.* ***

Appendix B

Traffic Data

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 1

Turning Movement Data

Start Time	Brock Street Eastbound						Gilmour Road Westbound						Brock Road Northbound						Brock Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
7:00 AM	1	0	2	0	0	3	7	0	0	0	0	7	1	52	2	0	0	55	0	131	0	0	0	131	196
7:15 AM	0	0	1	0	0	1	6	1	1	0	0	8	1	69	1	0	0	71	0	157	2	0	0	159	239
7:30 AM	1	0	0	0	0	1	3	1	3	0	0	7	3	107	1	0	0	111	0	143	3	0	0	146	265
7:45 AM	0	0	1	0	1	1	6	0	2	0	0	8	0	94	2	0	0	96	2	181	2	0	0	185	290
Hourly Total	2	0	4	0	1	6	22	2	6	0	0	30	5	322	6	0	0	333	2	612	7	0	0	621	990
8:00 AM	0	0	1	0	0	1	9	1	9	0	0	19	1	81	3	0	0	85	3	117	2	0	0	122	227
8:15 AM	0	0	2	0	0	2	3	0	8	0	0	11	4	114	1	0	0	119	4	139	1	1	0	145	277
8:30 AM	0	1	0	0	0	1	7	0	6	0	0	13	1	113	2	1	0	117	3	139	2	0	0	144	275
8:45 AM	1	0	2	0	0	3	4	0	5	0	0	9	0	103	1	0	0	104	0	111	5	0	0	116	232
Hourly Total	1	1	5	0	0	7	23	1	28	0	0	52	6	411	7	1	0	425	10	506	10	1	0	527	1011
9:00 AM	0	1	1	0	0	2	2	0	2	0	0	4	2	106	2	0	0	110	4	102	3	0	0	109	225
9:15 AM	0	0	2	0	0	2	3	0	2	0	0	5	2	107	2	1	0	112	0	91	3	0	0	94	213
9:30 AM	0	0	1	0	0	1	2	0	4	0	0	6	4	105	1	0	0	110	0	108	0	0	0	108	225
9:45 AM	1	0	2	0	0	3	2	0	2	0	0	4	3	91	1	0	0	95	1	86	1	1	0	89	191
Hourly Total	1	1	6	0	0	8	9	0	10	0	0	19	11	409	6	1	0	427	5	387	7	1	0	400	854
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	0	0	0	0	0	0	0	0	3	0	0	3	5	98	1	0	0	104	1	90	0	0	0	91	198
11:45 AM	2	0	4	0	0	6	3	0	1	0	0	4	4	105	1	1	0	111	3	91	0	0	0	94	215
Hourly Total	2	0	4	0	0	6	3	0	4	0	0	7	9	203	2	1	0	215	4	181	0	0	0	185	413
12:00 PM	1	1	4	0	0	6	1	0	6	0	0	7	2	112	4	1	0	119	6	115	3	0	0	124	256
12:15 PM	0	1	2	0	0	3	6	0	4	0	0	10	2	101	5	1	0	109	0	93	0	0	0	93	215
12:30 PM	0	0	5	0	0	5	0	0	1	0	0	1	4	114	6	0	0	124	1	88	2	0	0	91	221
12:45 PM	1	1	2	0	0	4	3	2	2	0	0	7	8	92	2	0	0	102	2	122	0	0	0	124	237
Hourly Total	2	3	13	0	0	18	10	2	13	0	0	25	16	419	17	2	0	454	9	418	5	0	0	432	929
1:00 PM	2	0	1	0	0	3	0	1	4	0	0	5	1	107	1	0	0	109	4	109	0	0	0	113	230
1:15 PM	2	0	3	0	0	5	1	0	3	0	0	4	4	85	2	0	0	91	4	100	1	1	0	106	206
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	4	0	4	0	0	8	1	1	7	0	0	9	5	192	3	0	0	200	8	209	1	1	0	219	436
3:00 PM	0	1	3	0	0	4	3	0	0	0	0	3	3	124	4	0	0	131	3	96	0	0	0	99	237
3:15 PM	2	0	3	0	0	5	1	0	2	0	0	3	0	119	10	0	0	129	3	112	2	0	0	117	254
3:30 PM	4	0	4	0	0	8	0	0	2	0	0	2	0	171	5	0	0	176	1	115	2	0	0	118	304
3:45 PM	0	0	2	0	0	2	2	0	4	0	0	6	3	143	5	0	0	151	6	107	0	1	0	114	273
Hourly Total	6	1	12	0	0	19	6	0	8	0	0	14	6	557	24	0	0	587	13	430	4	1	0	448	1068
4:00 PM	5	0	2	0	0	7	2	0	1	0	0	3	0	189	1	1	0	191	1	99	0	2	0	102	303
4:15 PM	0	1	1	0	0	2	4	0	3	0	0	7	2	162	7	0	0	171	1	130	1	0	0	132	312

4:30 PM	3	1	5	0	1	9	1	0	1	0	0	2	3	185	7	0	0	195	2	112	1	0	0	115	321
4:45 PM	1	0	2	0	0	3	1	0	11	0	0	12	0	201	5	0	0	206	5	121	1	0	0	127	348
Hourly Total	9	2	10	0	1	21	8	0	16	0	0	24	5	737	20	1	0	763	9	462	3	2	0	476	1284
5:00 PM	1	0	2	0	0	3	2	1	2	0	0	5	0	197	4	0	0	201	2	92	2	0	0	96	305
5:15 PM	1	0	3	0	0	4	0	0	3	0	0	3	1	195	5	0	0	201	5	108	8	3	0	124	332
5:30 PM	0	0	4	0	0	4	1	0	4	0	0	5	5	182	1	0	0	188	4	121	4	0	0	129	326
5:45 PM	4	0	3	0	0	7	0	0	3	0	0	3	2	194	4	1	0	201	2	111	1	0	0	114	325
Hourly Total	6	0	12	0	0	18	3	1	12	0	0	16	8	768	14	1	0	791	13	432	15	3	0	463	1288
Grand Total	33	8	70	0	2	111	85	7	104	0	0	196	71	4018	99	7	0	4195	73	3637	52	9	0	3771	8273
Approach %	29.7	7.2	63.1	0.0	-	-	43.4	3.6	53.1	0.0	-	-	1.7	95.8	2.4	0.2	-	-	1.9	96.4	1.4	0.2	-	-	-
Total %	0.4	0.1	0.8	0.0	-	1.3	1.0	0.1	1.3	0.0	-	2.4	0.9	48.6	1.2	0.1	-	50.7	0.9	44.0	0.6	0.1	-	45.6	-
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	2	0	0	-	2	2
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.1	0.0	0.0	-	0.1	0.0
Cars & Light Goods	27	7	39	0	-	73	84	6	96	0	-	186	37	3639	95	7	-	3778	66	3258	45	9	-	3378	7415
% Cars & Light Goods	81.8	87.5	55.7	-	-	65.8	98.8	85.7	92.3	-	-	94.9	52.1	90.6	96.0	100.0	-	90.1	90.4	89.6	86.5	100.0	-	89.6	89.6
Buses	0	0	0	0	-	0	0	0	4	0	-	4	0	22	1	0	-	23	7	28	0	0	-	35	62
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	3.8	-	-	2.0	0.0	0.5	1.0	0.0	-	0.5	9.6	0.8	0.0	0.0	-	0.9	0.7
Single-Unit Trucks	3	1	5	0	-	9	1	1	3	0	-	5	2	162	3	0	-	167	0	149	1	0	-	150	331
% Single-Unit Trucks	9.1	12.5	7.1	-	-	8.1	1.2	14.3	2.9	-	-	2.6	2.8	4.0	3.0	0.0	-	4.0	0.0	4.1	1.9	0.0	-	4.0	4.0
Articulated Trucks	3	0	26	0	-	29	0	0	1	0	-	1	32	195	0	0	-	227	0	200	6	0	-	206	463
% Articulated Trucks	9.1	0.0	37.1	-	-	26.1	0.0	0.0	1.0	-	-	0.5	45.1	4.9	0.0	0.0	-	5.4	0.0	5.5	11.5	0.0	-	5.5	5.6
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 3

Brock Road [N]

Out	In	Total
0	2	2
3771	3378	7149
26	35	61
168	150	318
199	206	405
4164	**3771**	**7935**

R	T	L	U	P
0	2	0	0	0
45	3258	66	9	0
0	28	7	0	0
1	149	0	0	0
6	200	0	0	0
52	**3637**	**73**	**9**	**0**

Brock Street [W]

Out	In	Total
0	0	0
88	73	161
0	0	0
4	9	13
38	29	67
130	**111**	**241**

U	L	T	R	P
0	0	0	0	0
0	27	7	39	0
0	0	0	0	0
0	3	1	5	0
0	3	0	26	2
0	**33**	**8**	**70**	**2**

10/13/2022 7:00 AM
Ending At
10/13/2022 6:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gilmour Road [E]

Out	In	Total
0	0	0
168	186	354
8	4	12
4	5	9
0	1	1
180	**196**	**376**

R	T	L	U	P
0	0	0	0	0
96	6	84	0	0
4	0	0	0	0
3	1	1	0	0
1	0	0	0	0
104	**7**	**85**	**0**	**0**

U	L	T	R	P
0	0	0	0	0
7	37	3639	95	0
0	0	22	1	0
0	2	162	3	0
0	32	195	0	0
7	**71**	**4018**	**99**	**0**

Out	In	Total
2	0	2
3388	3778	7166
28	23	51
155	167	322
226	227	453
3799	**4195**	**7994**

Brock Road [S]

Turning Movement Data Plot

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 4

Approach Data

Start Time	Eb Street Eastbound						Wb Street Westbound						Nb Street Northbound						Sb Street Southbound					
	Peds CCW	Peds CW	Circulating	Out	In	Next	Peds CCW	Peds CW	Circulating	Out	In	Next	Peds CCW	Peds CW	Circulating	Out	In	Next	Peds CCW	Peds CW	Circulating	Out	In	Next
7:00 AM	0	0	135	1	2	1	0	0	53	2	6	7	0	0	0	143	55	1	0	0	7	54	129	0
7:15 AM	0	0	164	4	1	0	0	0	71	1	8	6	0	0	0	164	72	1	0	0	8	71	160	0
7:30 AM	0	0	147	7	1	1	0	0	110	1	7	3	0	0	1	146	110	3	0	0	7	113	147	0
7:45 AM	1	0	188	2	1	0	0	0	94	6	7	6	0	0	3	190	96	0	0	0	5	97	185	2
Hourly Total	1	0	634	14	5	2	0	0	328	10	28	22	0	0	4	643	333	5	0	0	27	335	621	2
8:00 AM	0	0	129	4	1	0	0	0	82	6	19	9	0	0	3	128	85	1	0	0	11	90	122	3
8:15 AM	0	0	147	5	2	0	0	0	119	5	11	3	0	0	6	145	119	4	0	0	7	124	145	4
8:30 AM	0	0	146	3	0	0	0	0	115	6	12	7	0	0	4	148	117	1	0	0	7	119	142	3
8:45 AM	0	0	115	5	3	1	0	0	105	1	9	4	0	0	1	117	105	0	0	0	4	110	116	0
Hourly Total	0	0	537	17	6	1	0	0	421	18	51	23	0	0	14	538	426	6	0	0	29	443	525	10
9:00 AM	0	0	108	5	1	0	0	0	110	7	4	2	0	0	4	104	112	2	0	0	4	108	109	4
9:15 AM	0	0	93	5	2	0	0	0	111	2	5	3	0	0	1	98	112	2	0	0	6	110	94	0
9:30 AM	0	0	113	4	1	0	0	0	110	1	7	2	0	0	0	110	111	4	0	0	7	109	110	0
9:45 AM	0	0	89	4	3	1	0	0	95	2	4	2	0	0	3	91	94	3	0	0	5	96	88	1
Hourly Total	0	0	403	18	7	1	0	0	426	12	20	9	0	0	8	403	429	11	0	0	22	423	401	5
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	0	0	93	5	0	0	0	0	103	2	3	0	0	0	1	90	104	5	0	0	6	101	93	1
11:45 AM	0	0	97	4	6	2	0	0	112	4	4	3	0	0	5	101	111	4	0	0	8	107	93	3
Hourly Total	0	0	190	9	6	2	0	0	215	6	7	3	0	0	6	191	215	9	0	0	14	208	186	4
12:00 PM	0	0	124	5	6	1	0	0	117	11	7	1	0	0	8	120	120	2	0	0	4	120	125	6
12:15 PM	0	0	99	2	3	0	0	0	106	6	10	6	0	0	2	103	110	2	0	0	8	104	93	0
12:30 PM	0	0	89	7	5	0	0	0	118	7	1	0	0	0	1	94	124	4	0	0	5	117	91	1
12:45 PM	0	0	127	10	4	1	0	0	103	5	7	3	0	0	5	128	103	8	0	0	13	95	124	2
Hourly Total	0	0	439	24	18	2	0	0	444	29	25	10	0	0	16	445	457	16	0	0	30	436	433	9
1:00 PM	0	0	114	2	3	2	0	0	110	5	5	0	0	0	6	110	109	1	0	0	3	115	113	4
1:15 PM	0	0	106	5	5	2	0	0	91	6	4	1	0	0	7	104	90	4	0	0	5	91	106	4
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	220	7	8	4	0	0	201	11	9	1	0	0	13	214	199	5	0	0	8	206	219	8
3:00 PM	0	0	103	3	4	0	0	0	128	8	3	3	0	0	3	102	132	3	0	0	6	124	100	3
3:15 PM	0	0	116	2	5	2	0	0	121	13	3	1	0	0	5	116	129	0	0	0	1	125	117	3
3:30 PM	0	0	117	3	7	4	0	0	173	6	2	0	0	0	4	120	175	0	0	0	1	178	119	1
3:45 PM	0	0	117	3	2	0	0	0	148	11	6	2	0	0	7	110	152	3	0	0	5	148	115	6
Hourly Total	0	0	453	11	18	6	0	0	570	38	14	6	0	0	19	448	588	6	0	0	13	575	451	13
4:00 PM	0	0	104	0	6	5	0	0	196	2	2	2	0	0	7	104	191	0	0	0	3	197	101	1
4:15 PM	0	0	135	3	2	0	0	0	164	9	7	4	0	0	3	136	171	2	0	0	6	167	132	1

4:30 PM	0	1	115	4	9	3	0	0	193	10	2	1	0	0	6	118	197	3	0	0	4	189	115	2
4:45 PM	0	0	127	2	3	1	0	0	202	10	12	1	0	0	6	124	206	0	0	0	2	213	127	5
Hourly Total	0	1	481	9	20	9	0	0	755	31	23	8	0	0	22	482	765	5	0	0	15	766	475	9
5:00 PM	0	0	96	3	3	1	0	0	197	6	4	2	0	0	3	95	200	0	0	0	3	201	96	2
5:15 PM	0	0	119	9	4	1	0	0	199	9	4	0	0	0	8	110	201	1	0	0	3	202	126	5
5:30 PM	0	0	129	9	5	0	0	0	189	4	5	1	0	0	4	124	189	5	0	0	6	186	131	4
5:45 PM	0	0	114	3	7	4	0	0	202	6	3	0	0	0	7	116	201	2	0	0	2	201	114	2
Hourly Total	0	0	458	24	19	6	0	0	787	25	16	3	0	0	22	445	791	8	0	0	14	790	467	13
Grand Total	1	1	3815	133	107	33	0	0	4147	180	193	85	0	0	124	3809	4203	71	0	0	172	4182	3778	73
Approach %	-	-	93.3	3.3	2.6	0.8	-	-	90.1	3.9	4.2	1.8	-	-	1.5	46.4	51.2	0.9	-	-	2.1	51.0	46.0	0.9
Total %	-	-	15.2	0.5	0.4	0.1	-	-	16.5	0.7	0.8	0.3	-	-	0.5	15.2	16.7	0.3	-	-	0.7	16.7	15.0	0.3
Motorcycles	-	-	2	0	0	0	-	-	0	0	0	0	-	-	0	2	0	0	-	-	0	0	2	0
% Motorcycles	-	-	0.1	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.1	0.0	0.0	-	-	0.0	0.0	0.1	0.0
Cars & Light Goods	-	-	3414	91	69	27	-	-	3715	167	183	84	-	-	108	3391	3773	37	-	-	137	3781	3371	66
% Cars & Light Goods	-	-	89.5	68.4	64.5	81.8	-	-	89.6	92.8	94.8	98.8	-	-	87.1	89.0	89.8	52.1	-	-	79.7	90.4	89.2	90.4
Buses	-	-	38	0	0	0	-	-	23	8	4	0	-	-	7	29	24	0	-	-	0	29	38	7
% Buses	-	-	1.0	0.0	0.0	0.0	-	-	0.6	4.4	2.1	0.0	-	-	5.6	0.8	0.6	0.0	-	-	0.0	0.7	1.0	9.6
Single-Unit Trucks	-	-	157	4	9	3	-	-	171	5	5	1	-	-	5	160	171	2	-	-	4	172	157	0
% Single-Unit Trucks	-	-	4.1	3.0	8.4	9.1	-	-	4.1	2.8	2.6	1.2	-	-	4.0	4.2	4.1	2.8	-	-	2.3	4.1	4.2	0.0
Articulated Trucks	-	-	204	38	29	3	-	-	238	0	1	0	-	-	4	227	235	32	-	-	31	200	210	0
% Articulated Trucks	-	-	5.3	28.6	27.1	9.1	-	-	5.7	0.0	0.5	0.0	-	-	3.2	6.0	5.6	45.1	-	-	18.0	4.8	5.6	0.0
Bicycles on Road	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0
% Bicycles on Road	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0
Bicycles on Crosswalk	1	1	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-
% Bicycles on Crosswalk	100.0	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-
% Pedestrians	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
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Turning Movement Peak Hour Data (7:45 AM)

Start Time	Brock Street Eastbound						Gilmour Road Westbound						Brock Road Northbound						Brock Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
7:45 AM	0	0	1	0	1	1	6	0	2	0	0	8	0	94	2	0	0	96	2	181	2	0	0	185	290
8:00 AM	0	0	1	0	0	1	9	1	9	0	0	19	1	81	3	0	0	85	3	117	2	0	0	122	227
8:15 AM	0	0	2	0	0	2	3	0	8	0	0	11	4	114	1	0	0	119	4	139	1	1	0	145	277
8:30 AM	0	1	0	0	0	1	7	0	6	0	0	13	1	113	2	1	0	117	3	139	2	0	0	144	275
Total	0	1	4	0	1	5	25	1	25	0	0	51	6	402	8	1	0	417	12	576	7	1	0	596	1069
Approach %	0.0	20.0	80.0	0.0	-	-	49.0	2.0	49.0	0.0	-	-	1.4	96.4	1.9	0.2	-	-	2.0	96.6	1.2	0.2	-	-	-
Total %	0.0	0.1	0.4	0.0	-	0.5	2.3	0.1	2.3	0.0	-	4.8	0.6	37.6	0.7	0.1	-	39.0	1.1	53.9	0.7	0.1	-	55.8	-
PHF	0.000	0.250	0.500	0.000	-	0.625	0.694	0.250	0.694	0.000	-	0.671	0.375	0.882	0.667	0.250	-	0.876	0.750	0.796	0.875	0.250	-	0.805	0.922
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	-	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	0	1	1	0	-	2	25	1	21	0	-	47	5	344	6	1	-	356	9	528	6	1	-	544	949
% Cars & Light Goods	-	100.0	25.0	-	-	40.0	100.0	100.0	84.0	-	-	92.2	83.3	85.6	75.0	100.0	-	85.4	75.0	91.7	85.7	100.0	-	91.3	88.8
Buses	0	0	0	0	-	0	0	0	3	0	-	3	0	5	1	0	-	6	3	1	0	0	-	4	13
% Buses	-	0.0	0.0	-	-	0.0	0.0	0.0	12.0	-	-	5.9	0.0	1.2	12.5	0.0	-	1.4	25.0	0.2	0.0	0.0	-	0.7	1.2
Single-Unit Trucks	0	0	0	0	-	0	0	0	1	0	-	1	0	25	1	0	-	26	0	22	0	0	-	22	49
% Single-Unit Trucks	-	0.0	0.0	-	-	0.0	0.0	0.0	4.0	-	-	2.0	0.0	6.2	12.5	0.0	-	6.2	0.0	3.8	0.0	0.0	-	3.7	4.6
Articulated Trucks	0	0	3	0	-	3	0	0	0	0	-	0	1	28	0	0	-	29	0	25	1	0	-	26	58
% Articulated Trucks	-	0.0	75.0	-	-	60.0	0.0	0.0	0.0	-	-	0.0	16.7	7.0	0.0	0.0	-	7.0	0.0	4.3	14.3	0.0	-	4.4	5.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 7

Brock Road [N]		
Out	In	Total
0	0	0
366	544	910
8	4	12
26	22	48
28	26	54
428	**596**	**1024**

0	0	0	0	0
6	528	9	1	0
0	1	3	0	0
0	22	0	0	0
1	25	0	0	0
7	**576**	**12**	**1**	**0**
R	T	L	U	P

Brock Street [W]		
Out	In	Total
0	0	0
12	2	14
0	0	0
0	0	0
2	3	5
14	**5**	**19**

U	L	T	R	P
0	0	0	0	0
0	0	1	1	0
0	0	0	0	0
0	0	0	0	0
0	0	0	3	1
0	**0**	**1**	**4**	**1**

Peak Hour Data

10/13/2022 7:45 AM
Ending At
10/13/2022 8:45 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

R	T	L	U	P
0	0	0	0	0
21	1	25	0	0
3	0	0	0	0
1	0	0	0	0
0	0	0	0	0
25	**1**	**25**	**0**	**0**

Gilmour Road [E]		
Out	In	Total
0	0	0
16	47	63
4	3	7
1	1	2
0	0	0
21	**51**	**72**

U	L	T	R	P
0	0	0	0	0
1	5	344	6	0
0	0	5	1	0
0	0	25	1	0
0	1	28	0	0
1	**6**	**402**	**8**	**0**

0	0	0
555	356	911
1	6	7
22	26	48
28	29	57
606	**417**	**1023**
Out	In	Total
Brock Road [S]		

Turning Movement Peak Hour Data Plot (7:45 AM)

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 8

Turning Movement Peak Hour Data (12:00 PM)

Start Time	Brock Street Eastbound						Gilmour Road Westbound						Brock Road Northbound						Brock Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
12:00 PM	1	1	4	0	0	6	1	0	6	0	0	7	2	112	4	1	0	119	6	115	3	0	0	124	256
12:15 PM	0	1	2	0	0	3	6	0	4	0	0	10	2	101	5	1	0	109	0	93	0	0	0	93	215
12:30 PM	0	0	5	0	0	5	0	0	1	0	0	1	4	114	6	0	0	124	1	88	2	0	0	91	221
12:45 PM	1	1	2	0	0	4	3	2	2	0	0	7	8	92	2	0	0	102	2	122	0	0	0	124	237
Total	2	3	13	0	0	18	10	2	13	0	0	25	16	419	17	2	0	454	9	418	5	0	0	432	929
Approach %	11.1	16.7	72.2	0.0	-	-	40.0	8.0	52.0	0.0	-	-	3.5	92.3	3.7	0.4	-	-	2.1	96.8	1.2	0.0	-	-	-
Total %	0.2	0.3	1.4	0.0	-	1.9	1.1	0.2	1.4	0.0	-	2.7	1.7	45.1	1.8	0.2	-	48.9	1.0	45.0	0.5	0.0	-	46.5	-
PHF	0.500	0.750	0.650	0.000	-	0.750	0.417	0.250	0.542	0.000	-	0.625	0.500	0.919	0.708	0.500	-	0.915	0.375	0.857	0.417	0.000	-	0.871	0.907
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	2	3	6	0	-	11	10	2	11	0	-	23	8	363	16	2	-	389	9	365	4	0	-	378	801
% Cars & Light Goods	100.0	100.0	46.2	-	-	61.1	100.0	100.0	84.6	-	-	92.0	50.0	86.6	94.1	100.0	-	85.7	100.0	87.3	80.0	-	-	87.5	86.2
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	2	0	0	-	2	0	2	0	0	-	2	4
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.5	0.0	0.0	-	0.4	0.0	0.5	0.0	-	-	0.5	0.4
Single-Unit Trucks	0	0	1	0	-	1	0	0	1	0	-	1	0	26	1	0	-	27	0	19	0	0	-	19	48
% Single-Unit Trucks	0.0	0.0	7.7	-	-	5.6	0.0	0.0	7.7	-	-	4.0	0.0	6.2	5.9	0.0	-	5.9	0.0	4.5	0.0	-	-	4.4	5.2
Articulated Trucks	0	0	6	0	-	6	0	0	1	0	-	1	8	28	0	0	-	36	0	32	1	0	-	33	76
% Articulated Trucks	0.0	0.0	46.2	-	-	33.3	0.0	0.0	7.7	-	-	4.0	50.0	6.7	0.0	0.0	-	7.9	0.0	7.7	20.0	-	-	7.6	8.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 9

Peak Hour Data

10/13/2022 12:00 PM
Ending At
10/13/2022 1:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Brock Road [N]

Out	In	Total
0	0	0
376	378	754
2	2	4
27	19	46
29	33	62
434	**432**	**866**

R	T	L	U	P
0	0	0	0	0
4	365	9	0	0
0	2	0	0	0
0	19	0	0	0
1	32	0	0	0
5	**418**	**9**	**0**	**0**

Brock Street [W]

Out	In	Total
0	0	0
14	11	25
0	0	0
0	1	1
9	6	15
23	**18**	**41**

U	L	T	R	P
0	0	0	0	0
0	2	3	6	0
0	0	0	0	0
0	0	0	1	0
0	0	0	6	0
0	**2**	**3**	**13**	**0**

Gilmour Road [E]

Out	In	Total
0	0	0
28	23	51
0	0	0
1	1	2
0	1	1
29	**25**	**54**

R	T	L	U	P
0	0	0	0	0
11	2	10	0	0
0	0	0	0	0
1	0	0	0	0
1	0	0	0	0
13	**2**	**10**	**0**	**0**

U	L	T	R	P
0	0	0	0	0
2	8	363	16	0
0	0	2	0	0
0	0	26	1	0
0	8	28	0	0
2	**16**	**419**	**17**	**0**

Out	In	Total
0	0	0
383	389	772
2	2	4
20	27	47
38	36	74
443	**454**	**897**

Brock Road [S]

Turning Movement Peak Hour Data Plot (12:00 PM)

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 10

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Brock Street Eastbound						Gilmour Road Westbound						Brock Road Northbound						Brock Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
4:45 PM	1	0	2	0	0	3	1	0	11	0	0	12	0	201	5	0	0	206	5	121	1	0	0	127	348
5:00 PM	1	0	2	0	0	3	2	1	2	0	0	5	0	197	4	0	0	201	2	92	2	0	0	96	305
5:15 PM	1	0	3	0	0	4	0	0	3	0	0	3	1	195	5	0	0	201	5	108	8	3	0	124	332
5:30 PM	0	0	4	0	0	4	1	0	4	0	0	5	5	182	1	0	0	188	4	121	4	0	0	129	326
Total	3	0	11	0	0	14	4	1	20	0	0	25	6	775	15	0	0	796	16	442	15	3	0	476	1311
Approach %	21.4	0.0	78.6	0.0	-	-	16.0	4.0	80.0	0.0	-	-	0.8	97.4	1.9	0.0	-	-	3.4	92.9	3.2	0.6	-	-	-
Total %	0.2	0.0	0.8	0.0	-	1.1	0.3	0.1	1.5	0.0	-	1.9	0.5	59.1	1.1	0.0	-	60.7	1.2	33.7	1.1	0.2	-	36.3	-
PHF	0.750	0.000	0.688	0.000	-	0.875	0.500	0.250	0.455	0.000	-	0.521	0.300	0.964	0.750	0.000	-	0.966	0.800	0.913	0.469	0.250	-	0.922	0.942
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	3	0	7	0	-	10	4	1	19	0	-	24	5	740	15	0	-	760	16	394	15	3	-	428	1222
% Cars & Light Goods	100.0	-	63.6	-	-	71.4	100.0	100.0	95.0	-	-	96.0	83.3	95.5	100.0	-	-	95.5	100.0	89.1	100.0	100.0	-	89.9	93.2
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	3	0	0	-	3	4
% Buses	0.0	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.1	0.0	-	-	0.1	0.0	0.7	0.0	0.0	-	0.6	0.3
Single-Unit Trucks	0	0	1	0	-	1	0	0	1	0	-	1	0	13	0	0	-	13	0	19	0	0	-	19	34
% Single-Unit Trucks	0.0	-	9.1	-	-	7.1	0.0	0.0	5.0	-	-	4.0	0.0	1.7	0.0	-	-	1.6	0.0	4.3	0.0	0.0	-	4.0	2.6
Articulated Trucks	0	0	3	0	-	3	0	0	0	0	-	0	1	21	0	0	-	22	0	26	0	0	-	26	51
% Articulated Trucks	0.0	-	27.3	-	-	21.4	0.0	0.0	0.0	-	-	0.0	16.7	2.7	0.0	-	-	2.8	0.0	5.9	0.0	0.0	-	5.5	3.9
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & Gilmour Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 11

Peak Hour Data

10/13/2022 4:45 PM
Ending At
10/13/2022 5:45 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Brock Road [N]

Out	In	Total
0	0	0
765	428	1193
1	3	4
14	19	33
21	26	47
801	**476**	**1277**

R	T	L	U	P
0	0	0	0	0
15	394	16	3	0
0	3	0	0	0
0	19	0	0	0
0	26	0	0	0
15	**442**	**16**	**3**	**0**

Brock Street [W]

Out	In	Total
0	0	0
21	10	31
0	0	0
0	1	1
1	3	4
22	**14**	**36**

U	L	T	R	P
0	0	0	0	0
0	3	0	7	0
0	0	0	0	0
0	0	0	1	0
0	0	0	3	0
0	**3**	**0**	**11**	**0**

Gilmour Road [E]

Out	In	Total
0	0	0
31	24	55
0	0	0
0	1	1
0	0	0
31	**25**	**56**

R	T	L	U	P
0	0	0	0	0
19	1	4	0	0
0	0	0	0	0
1	0	0	0	0
0	0	0	0	0
20	**1**	**4**	**0**	**0**

Brock Road [S]

U	L	T	R	P
0	0	0	0	0
0	5	740	15	0
0	0	1	0	0
0	0	13	0	0
0	1	21	0	0
0	**6**	**775**	**15**	**0**

Out	In	Total
0	0	0
405	760	1165
3	1	4
20	13	33
29	22	51
457	**796**	**1253**

Turning Movement Peak Hour Data Plot (4:45 PM)

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 1

Turning Movement Data

Start Time	McLean Road Eastbound						McLean Road Westbound						Brock Road Northbound				Brock Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
7:00 AM	3	2	38	0	0	43	7	2	7	0	0	16	30	48	15	93	4	126	6	0	0	136	288
7:15 AM	0	7	31	0	0	38	8	2	0	0	0	10	22	67	12	101	9	167	3	0	0	179	328
7:30 AM	3	2	29	0	0	34	11	0	4	0	0	15	28	110	11	149	6	148	3	0	0	157	355
7:45 AM	2	12	38	0	0	52	3	2	3	0	0	8	20	89	12	121	14	170	7	0	0	191	372
Hourly Total	8	23	136	0	0	167	29	6	14	0	0	49	100	314	50	464	33	611	19	0	0	663	1343
8:00 AM	5	3	23	0	0	31	6	3	2	0	0	11	18	85	9	112	6	115	7	0	0	128	282
8:15 AM	6	6	36	0	0	48	3	1	3	0	0	7	28	101	14	143	4	134	3	0	0	141	339
8:30 AM	4	2	26	0	0	32	9	1	2	0	0	12	23	112	7	142	9	128	4	0	0	141	327
8:45 AM	2	5	24	0	0	31	8	4	1	0	0	13	26	104	13	143	9	100	3	0	0	112	299
Hourly Total	17	16	109	0	0	142	26	9	8	0	0	43	95	402	43	540	28	477	17	0	0	522	1247
9:00 AM	2	3	26	0	0	31	7	2	1	0	0	10	35	102	7	144	8	98	3	0	0	109	294
9:15 AM	1	2	24	0	0	27	6	0	3	0	0	9	22	101	6	129	4	95	1	0	0	100	265
9:30 AM	4	6	22	0	0	32	6	1	3	0	0	10	29	91	13	133	7	97	3	0	0	107	282
9:45 AM	2	1	31	0	0	34	14	1	3	0	0	18	30	85	10	125	4	73	1	0	0	78	255
Hourly Total	9	12	103	0	0	124	33	4	10	0	0	47	116	379	36	531	23	363	8	0	0	394	1096
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	3	1	33	1	0	38	14	0	6	0	0	20	28	85	8	121	2	87	0	0	0	89	268
11:45 AM	5	1	34	0	0	40	11	2	7	0	0	20	20	90	8	118	4	83	7	0	1	94	272
Hourly Total	8	2	67	1	0	78	25	2	13	0	0	40	48	175	16	239	6	170	7	0	1	183	540
12:00 PM	4	2	47	0	0	53	18	0	6	0	0	24	25	106	8	139	6	100	4	0	0	110	326
12:15 PM	7	4	29	0	0	40	10	2	7	0	0	19	34	97	15	146	4	96	4	0	0	104	309
12:30 PM	8	8	27	0	0	43	18	1	4	0	0	23	23	104	21	148	7	81	1	0	0	89	303
12:45 PM	4	0	32	0	0	36	7	3	5	0	0	15	38	93	9	140	5	99	9	0	0	113	304
Hourly Total	23	14	135	0	0	172	53	6	22	0	0	81	120	400	53	573	22	376	18	0	0	416	1242
1:00 PM	5	4	33	0	0	42	14	2	5	0	0	21	26	107	11	144	5	112	3	0	0	120	327
1:15 PM	1	0	29	0	0	30	10	0	4	0	0	14	24	74	12	110	2	99	4	0	0	105	259
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	6	4	62	0	0	72	24	2	9	0	0	35	50	181	23	254	7	211	7	0	0	225	586
3:00 PM	5	2	24	0	0	31	17	6	10	0	0	33	37	122	4	163	1	99	3	0	0	103	330
3:15 PM	4	3	21	0	0	28	12	3	6	0	0	21	15	111	8	134	0	102	4	0	0	106	289
3:30 PM	6	2	22	0	0	30	25	3	5	0	0	33	26	167	4	197	4	122	4	0	0	130	390
3:45 PM	5	5	28	0	0	38	8	3	5	0	0	16	14	150	3	167	3	94	2	0	0	99	320
Hourly Total	20	12	95	0	0	127	62	15	26	0	0	103	92	550	19	661	8	417	13	0	0	438	1329
4:00 PM	16	1	21	0	0	38	29	6	19	0	0	54	17	143	2	162	4	90	5	0	0	99	353
4:15 PM	7	1	17	0	0	25	10	4	9	0	1	23	9	154	3	166	4	132	2	0	0	138	352

4:30 PM	14	1	11	0	0	26	9	3	13	0	0	25	18	164	3	185	2	104	3	0	0	109	345
4:45 PM	7	2	18	0	0	27	14	2	6	0	0	22	22	179	9	210	0	117	2	0	0	119	378
Hourly Total	44	5	67	0	0	116	62	15	47	0	1	124	66	640	17	723	10	443	12	0	0	465	1428
5:00 PM	12	1	21	0	0	34	12	6	14	0	0	32	24	197	10	231	1	83	6	0	0	90	387
5:15 PM	6	2	20	0	0	28	13	3	11	0	0	27	25	164	2	191	1	105	3	0	0	109	355
5:30 PM	7	1	15	0	0	23	11	3	2	0	0	16	43	189	3	235	3	127	4	0	0	134	408
5:45 PM	4	6	13	0	0	23	7	3	6	0	0	16	37	175	4	216	3	107	2	0	0	112	367
Hourly Total	29	10	69	0	0	108	43	15	33	0	0	91	129	725	19	873	8	422	15	0	0	445	1517
Grand Total	164	98	843	1	0	1106	357	74	182	0	1	613	816	3766	276	4858	145	3490	116	0	1	3751	10328
Approach %	14.8	8.9	76.2	0.1	-	-	58.2	12.1	29.7	0.0	-	-	16.8	77.5	5.7	-	3.9	93.0	3.1	0.0	-	-	-
Total %	1.6	0.9	8.2	0.0	-	10.7	3.5	0.7	1.8	0.0	-	5.9	7.9	36.5	2.7	47.0	1.4	33.8	1.1	0.0	-	36.3	-
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	1	0	0	-	1	1
% Motorcycles	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	147	71	407	1	-	626	229	64	144	0	-	437	459	3437	204	4100	115	3143	97	0	-	3355	8518
% Cars & Light Goods	89.6	72.4	48.3	100.0	-	56.6	64.1	86.5	79.1	-	-	71.3	56.3	91.3	73.9	84.4	79.3	90.1	83.6	-	-	89.4	82.5
Buses	0	0	0	0	-	0	33	0	17	0	-	50	0	7	0	7	9	20	2	0	-	31	88
% Buses	0.0	0.0	0.0	0.0	-	0.0	9.2	0.0	9.3	-	-	8.2	0.0	0.2	0.0	0.1	6.2	0.6	1.7	-	-	0.8	0.9
Single-Unit Trucks	9	15	95	0	-	119	31	4	9	0	-	44	73	135	32	240	10	133	6	0	-	149	552
% Single-Unit Trucks	5.5	15.3	11.3	0.0	-	10.8	8.7	5.4	4.9	-	-	7.2	8.9	3.6	11.6	4.9	6.9	3.8	5.2	-	-	4.0	5.3
Articulated Trucks	8	12	341	0	-	361	64	6	12	0	-	82	284	187	40	511	11	193	11	0	-	215	1169
% Articulated Trucks	4.9	12.2	40.5	0.0	-	32.6	17.9	8.1	6.6	-	-	13.4	34.8	5.0	14.5	10.5	7.6	5.5	9.5	-	-	5.7	11.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	100.0	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 3

10/13/2022 7:00 AM
Ending At
10/13/2022 6:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Brock Road [N]

Out	In	Total
0	1	1
3728	3355	7083
24	31	55
153	149	302
207	215	422
4112	**3751**	**7863**

R	T	L	U	P
0	1	0	0	0
97	3143	115	0	0
2	20	9	0	0
6	133	10	0	0
11	193	11	0	1
116	**3490**	**145**	**0**	**1**

McLean Road [W]

Out	In	Total
0	0	0
621	626	1247
2	0	2
83	119	202
301	361	662
1007	**1106**	**2113**

U	L	T	R	P
0	0	0	0	0
1	147	71	407	0
0	0	0	0	0
0	9	15	95	0
0	8	12	341	0
1	**164**	**98**	**843**	**0**

McLean Road [E]

Out	In	Total
0	0	0
390	437	827
9	50	59
57	44	101
63	82	145
519	**613**	**1132**

R	T	L	U	P
0	0	0	0	0
144	64	229	0	0
17	0	33	0	0
9	4	31	0	0
12	6	64	0	1
182	**74**	**357**	**0**	**1**

Brock Road [S]

L	T	R
0	0	0
459	3437	204
0	7	0
73	135	32
284	187	40
816	**3766**	**276**

Out	In	Total
1	0	1
3779	4100	7879
53	7	60
259	240	499
598	511	1109
4690	**4858**	**9548**

Turning Movement Data Plot

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022

Turning Movement Peak Hour Data (7:30 AM)

Start Time	McLean Road Eastbound						McLean Road Westbound						Brock Road Northbound				Brock Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
7:30 AM	3	2	29	0	0	34	11	0	4	0	0	15	28	110	11	149	6	148	3	0	0	157	355
7:45 AM	2	12	38	0	0	52	3	2	3	0	0	8	20	89	12	121	14	170	7	0	0	191	372
8:00 AM	5	3	23	0	0	31	6	3	2	0	0	11	18	85	9	112	6	115	7	0	0	128	282
8:15 AM	6	6	36	0	0	48	3	1	3	0	0	7	28	101	14	143	4	134	3	0	0	141	339
Total	16	23	126	0	0	165	23	6	12	0	0	41	94	385	46	525	30	567	20	0	0	617	1348
Approach %	9.7	13.9	76.4	0.0	-	-	56.1	14.6	29.3	0.0	-	-	17.9	73.3	8.8	-	4.9	91.9	3.2	0.0	-	-	-
Total %	1.2	1.7	9.3	0.0	-	12.2	1.7	0.4	0.9	0.0	-	3.0	7.0	28.6	3.4	38.9	2.2	42.1	1.5	0.0	-	45.8	-
PHF	0.667	0.479	0.829	0.000	-	0.793	0.523	0.500	0.750	0.000	-	0.683	0.839	0.875	0.821	0.881	0.536	0.834	0.714	0.000	-	0.808	0.906
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	13	19	63	0	-	95	4	6	5	0	-	15	47	330	40	417	27	522	16	0	-	565	1092
% Cars & Light Goods	81.3	82.6	50.0	-	-	57.6	17.4	100.0	41.7	-	-	36.6	50.0	85.7	87.0	79.4	90.0	92.1	80.0	-	-	91.6	81.0
Buses	0	0	0	0	-	0	4	0	3	0	-	7	0	4	0	4	1	3	1	0	-	5	16
% Buses	0.0	0.0	0.0	-	-	0.0	17.4	0.0	25.0	-	-	17.1	0.0	1.0	0.0	0.8	3.3	0.5	5.0	-	-	0.8	1.2
Single-Unit Trucks	3	3	11	0	-	17	6	0	4	0	-	10	5	19	3	27	1	17	2	0	-	20	74
% Single-Unit Trucks	18.8	13.0	8.7	-	-	10.3	26.1	0.0	33.3	-	-	24.4	5.3	4.9	6.5	5.1	3.3	3.0	10.0	-	-	3.2	5.5
Articulated Trucks	0	1	52	0	-	53	9	0	0	0	-	9	42	32	3	77	1	25	1	0	-	27	166
% Articulated Trucks	0.0	4.3	41.3	-	-	32.1	39.1	0.0	0.0	-	-	22.0	44.7	8.3	6.5	14.7	3.3	4.4	5.0	-	-	4.4	12.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022

Peak Hour Data

10/13/2022 7:30 AM
Ending At
10/13/2022 8:30 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Brock Road [N]

Out	In	Total
0	0	0
348	565	913
7	5	12
26	20	46
32	27	59
413	**617**	**1030**

R	T	L	U	P
0	0	0	0	0
16	522	27	0	0
1	3	1	0	0
2	17	1	0	0
1	25	1	0	0
20	**567**	**30**	**0**	**0**

McLean Road [W]

Out	In	Total
0	0	0
69	95	164
1	0	1
7	17	24
43	53	96
120	**165**	**285**

U	L	T	R	P
0	0	0	0	0
0	13	19	63	0
0	0	0	0	0
0	3	3	11	0
0	0	1	52	0
0	**16**	**23**	**126**	**0**

McLean Road [E]

Out	In	Total
0	0	0
86	15	101
1	7	8
7	10	17
5	9	14
99	**41**	**140**

R	T	L	U	P
0	0	0	0	0
5	6	4	0	0
3	0	4	0	0
4	0	6	0	0
0	0	9	0	0
12	**6**	**23**	**0**	**0**

Brock Road [S]

L	T	R
0	0	0
47	330	40
0	4	0
5	19	3
42	32	3
94	**385**	**46**

Out	In	Total
0	0	0
589	417	1006
7	4	11
34	27	61
86	77	163
716	**525**	**1241**

Turning Movement Peak Hour Data Plot (7:30 AM)

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 6

Turning Movement Peak Hour Data (12:15 PM)

Start Time	McLean Road Eastbound						McLean Road Westbound						Brock Road Northbound				Brock Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
12:15 PM	7	4	29	0	0	40	10	2	7	0	0	19	34	97	15	146	4	96	4	0	0	104	309
12:30 PM	8	8	27	0	0	43	18	1	4	0	0	23	23	104	21	148	7	81	1	0	0	89	303
12:45 PM	4	0	32	0	0	36	7	3	5	0	0	15	38	93	9	140	5	99	9	0	0	113	304
1:00 PM	5	4	33	0	0	42	14	2	5	0	0	21	26	107	11	144	5	112	3	0	0	120	327
Total	24	16	121	0	0	161	49	8	21	0	0	78	121	401	56	578	21	388	17	0	0	426	1243
Approach %	14.9	9.9	75.2	0.0	-	-	62.8	10.3	26.9	0.0	-	-	20.9	69.4	9.7	-	4.9	91.1	4.0	0.0	-	-	-
Total %	1.9	1.3	9.7	0.0	-	13.0	3.9	0.6	1.7	0.0	-	6.3	9.7	32.3	4.5	46.5	1.7	31.2	1.4	0.0	-	34.3	-
PHF	0.750	0.500	0.917	0.000	-	0.936	0.681	0.667	0.750	0.000	-	0.848	0.796	0.937	0.667	0.976	0.750	0.866	0.472	0.000	-	0.888	0.950
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	1	0	0	-	1	1
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-	-	0.2	0.1
Cars & Light Goods	22	13	52	0	-	87	32	6	19	0	-	57	51	354	45	450	18	343	15	0	-	376	970
% Cars & Light Goods	91.7	81.3	43.0	-	-	54.0	65.3	75.0	90.5	-	-	73.1	42.1	88.3	80.4	77.9	85.7	88.4	88.2	-	-	88.3	78.0
Buses	0	0	0	0	-	0	5	0	1	0	-	6	0	1	0	1	1	1	0	0	-	2	9
% Buses	0.0	0.0	0.0	-	-	0.0	10.2	0.0	4.8	-	-	7.7	0.0	0.2	0.0	0.2	4.8	0.3	0.0	-	-	0.5	0.7
Single-Unit Trucks	2	2	15	0	-	19	2	1	0	0	-	3	18	16	3	37	0	16	1	0	-	17	76
% Single-Unit Trucks	8.3	12.5	12.4	-	-	11.8	4.1	12.5	0.0	-	-	3.8	14.9	4.0	5.4	6.4	0.0	4.1	5.9	-	-	4.0	6.1
Articulated Trucks	0	1	54	0	-	55	10	1	1	0	-	12	52	30	8	90	2	27	1	0	-	30	187
% Articulated Trucks	0.0	6.3	44.6	-	-	34.2	20.4	12.5	4.8	-	-	15.4	43.0	7.5	14.3	15.6	9.5	7.0	5.9	-	-	7.0	15.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022
Page No: 7

Peak Hour Data

10/13/2022 12:15 PM
Ending At
10/13/2022 1:15 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Brock Road [N]

Out	In	Total
0	1	1
395	376	771
2	2	4
18	17	35
31	30	61
446	**426**	**872**

R	T	L	U	P
0	1	0	0	0
15	343	18	0	0
0	1	1	0	0
1	16	0	0	0
1	27	2	0	0
17	**388**	**21**	**0**	**0**

McLean Road [W]

Out	In	Total
0	0	0
72	87	159
0	0	0
20	19	39
54	55	109
146	**161**	**307**

U	L	T	R	P
0	0	0	0	0
0	22	13	52	0
0	0	0	0	0
0	2	2	15	0
0	0	1	54	0
0	**24**	**16**	**121**	**0**

McLean Road [E]

Out	In	Total
0	0	0
76	57	133
1	6	7
5	3	8
11	12	23
93	**78**	**171**

R	T	L	U	P
0	0	0	0	0
19	6	32	0	0
1	0	5	0	0
0	1	2	0	0
1	1	10	0	0
21	**8**	**49**	**0**	**0**

Brock Road [S]

L	T	R
0	0	0
51	354	45
0	1	0
18	16	3
52	30	8
121	**401**	**56**

Out	In	Total
1	0	1
427	450	877
6	1	7
33	37	70
91	90	181
558	**578**	**1136**

Turning Movement Peak Hour Data Plot (12:15 PM)

Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge Ontario Canada N1R 8J8
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022

Turning Movement Peak Hour Data (4:45 PM)

Start Time	McLean Road Eastbound						McLean Road Westbound						Brock Road Northbound				Brock Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:45 PM	7	2	18	0	0	27	14	2	6	0	0	22	22	179	9	210	0	117	2	0	0	119	378
5:00 PM	12	1	21	0	0	34	12	6	14	0	0	32	24	197	10	231	1	83	6	0	0	90	387
5:15 PM	6	2	20	0	0	28	13	3	11	0	0	27	25	164	2	191	1	105	3	0	0	109	355
5:30 PM	7	1	15	0	0	23	11	3	2	0	0	16	43	189	3	235	3	127	4	0	0	134	408
Total	32	6	74	0	0	112	50	14	33	0	0	97	114	729	24	867	5	432	15	0	0	452	1528
Approach %	28.6	5.4	66.1	0.0	-	-	51.5	14.4	34.0	0.0	-	-	13.1	84.1	2.8	-	1.1	95.6	3.3	0.0	-	-	-
Total %	2.1	0.4	4.8	0.0	-	7.3	3.3	0.9	2.2	0.0	-	6.3	7.5	47.7	1.6	56.7	0.3	28.3	1.0	0.0	-	29.6	-
PHF	0.667	0.750	0.881	0.000	-	0.824	0.893	0.583	0.589	0.000	-	0.758	0.663	0.925	0.600	0.922	0.417	0.850	0.625	0.000	-	0.843	0.936
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	31	3	56	0	-	90	34	14	31	0	-	79	98	709	12	819	5	392	12	0	-	409	1397
% Cars & Light Goods	96.9	50.0	75.7	-	-	80.4	68.0	100.0	93.9	-	-	81.4	86.0	97.3	50.0	94.5	100.0	90.7	80.0	-	-	90.5	91.4
Buses	0	0	0	0	-	0	3	0	1	0	-	4	0	0	0	0	0	2	0	0	-	2	6
% Buses	0.0	0.0	0.0	-	-	0.0	6.0	0.0	3.0	-	-	4.1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	-	-	0.4	0.4
Single-Unit Trucks	0	2	10	0	-	12	5	0	0	0	-	5	6	9	6	21	0	19	0	0	-	19	57
% Single-Unit Trucks	0.0	33.3	13.5	-	-	10.7	10.0	0.0	0.0	-	-	5.2	5.3	1.2	25.0	2.4	0.0	4.4	0.0	-	-	4.2	3.7
Articulated Trucks	1	1	8	0	-	10	8	0	1	0	-	9	10	11	6	27	0	19	3	0	-	22	68
% Articulated Trucks	3.1	16.7	10.8	-	-	8.9	16.0	0.0	3.0	-	-	9.3	8.8	1.5	25.0	3.1	0.0	4.4	20.0	-	-	4.9	4.5
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

paradigm
Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd
Cambridge, Ontario, Canada N1R 8J8
[redacted]

Count Name: Brock Road & McLean Road
Site Code: 220579
Start Date: 10/13/2022

Peak Hour Data

10/13/2022 4:45 PM
Ending At
10/13/2022 5:45 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Brock Road [N]

Class	Out	In	Total
Motorcycles	0	0	0
Cars & Light Goods	771	409	1180
Buses	1	2	3
Single-Unit Trucks	9	19	28
Other	13	22	35
Total	**794**	**452**	**1246**

Class	R	T	L	U	P
Motorcycles	0	0	0	0	0
Cars & Light Goods	12	392	5	0	0
Buses	0	2	0	0	0
Single-Unit Trucks	0	19	0	0	0
Other	3	19	0	0	0
Total	**15**	**432**	**5**	**0**	**0**

McLean Road [W]

Class	Out	In	Total
Motorcycles	0	0	0
Cars & Light Goods	124	90	214
Buses	0	0	0
Single-Unit Trucks	6	12	18
Other	13	10	23
Total	**143**	**112**	**255**

Class	U	L	T	R	P
Motorcycles	0	0	0	0	0
Cars & Light Goods	0	31	3	56	0
Buses	0	0	0	0	0
Single-Unit Trucks	0	0	2	10	0
Other	0	1	1	8	0
Total	**0**	**32**	**6**	**74**	**0**

McLean Road [E]

Class	Out	In	Total
Motorcycles	0	0	0
Cars & Light Goods	20	79	99
Buses	0	4	4
Single-Unit Trucks	8	5	13
Other	7	9	16
Total	**35**	**97**	**132**

Class	R	T	L	U	P
Motorcycles	0	0	0	0	0
Cars & Light Goods	31	14	34	0	0
Buses	1	0	3	0	0
Single-Unit Trucks	0	0	5	0	0
Other	1	0	8	0	0
Total	**33**	**14**	**50**	**0**	**0**

Brock Road [S]

Class	L	T	R
Motorcycles	0	0	0
Cars & Light Goods	98	709	12
Buses	0	0	0
Single-Unit Trucks	6	9	6
Other	10	11	6
Total	**114**	**729**	**24**

Class	Out	In	Total
Motorcycles	0	0	0
Cars & Light Goods	482	819	1301
Buses	5	0	5
Single-Unit Trucks	34	21	55
Other	35	27	62
Total	**556**	**867**	**1423**

Turning Movement Peak Hour Data Plot (4:45 PM)

Wellington County 1-12 46 & Mclean rd 11/4/2013 15:30

Configuration

Controller Sequence Priority

	1	2		3	4		5	6		7	8	9	10	11	12
Ring 1 Phases . .	1	2	|	3	4	|	9	10	|	0	0	0	0	0	0
Ring 2 Phases . .	5	6	|	7	8	|	11	12	|	0	0	0	0	0	0

Phase

	1	2	3	4	5	6	7	8	9	10	11	12
In Use.	X	X	.	X	X	X	.	X	.	.	.	.
Exclusive Ped . .	.	.	.	.	.	.	.	.	.	.	.	.
Direction												

Overlap

	A	B	C	D
Direction . . .				

Load Switch Channel/Driver Group Assign (Info Only):

Load Switch (MMU) Channel	Signal Driver Phase/ Ovlap	Signal Group Ped
1	1	.
2	2	.
3	3	.
4	4	.
5	5	.
6	6	.
7	7	.
8	8	.
9	2	X
10	4	X
11	6	X
12	8	X
13	A	.
14	B	.
15	C	.
16	D	.

```
Configuration Continued
-----------------------------------------------------------------

               Enable BIU: 1  2  3  4  5  6  7  8
Terminal/Facilities. . . . . .  .  .  .  .  .  .  .
Detector Rack. . . . . . . . .  .  .  .  .  .  .  .

Type 2 Runs as Type 1. . . .
MMU Disable. . . . . . . .  X
Diagnostic Enable. . . . . .
Peer-Peer Comm Enable. . .  .

                              1    2    3    4    5    6    7    8    9   10
Peer To Peer Addresses . . 255  255  255  255  255  255  255  255  255  255


Port 2:

Port 2 Protocol . . . . . . . . . Terminal
Port 2 Enable . . . . . . . . . . YES
AB3418 Address. . . . . . . . . . 0
AB3418 Group Address. . . . . . . 0
AB3418 Response Delay . . . . . . 0
AB3418 Single Flag Enable . . . . NO
AB3418 Drop-Out Time. . . . . . . 0
AB3418 TOD SF Select. . . . . . . 0
Data Rate . . . . . . . . . . . . 1200 bps
Data, Parity, Stop. . . . . . . . 8, 0, 1


Port 3:

Port 3 Protocol . . . . . . . . . Telemetry
Port 3 Enable . . . . . . . . . . NO
Telemetry Address . . . . . . . . 0
System Detector 9-16 Address. . . 0
Telemetry Response Delay. . . . . 6000
AB3418 Address. . . . . . . . . . 0
AB3418 Group Address. . . . . . . 0
AB3418 Response Delay . . . . . . 0
AB3418 Single Flag Enable . . . . NO
AB3418 Drop-Out Time. . . . . . . 0
AB3418 TOD SF Select. . . . . . . 0
Duplex. . . . . . . . . . . . . . Full
Data Rate . . . . . . . . . . . . 1200 bps
Data, Parity, Stop. . . . . . . . 8, 0, 1
```

Configuration Continued

Event Enabling		Alarm Enabling	
Critical RFE'S (MMU/TF)	.	ALARM 1	.
Non-Critical RFE'S (DET/TEST) . . .	.	ALARM 2	.
Detector Errors	.	ALARM 3	.
Coordination Errors	.	ALARM 4	.
MMU Flash Faults.	.	ALARM 5	.
Local Flash Faults.	.	ALARM 6	.
Preempt	.	ALARM 7	.
Power On/Off.	.	ALARM 8	.
Low Battery	.	ALARM 9	.
		ALARM 10.	.
		ALARM 11.	.
		ALARM 12.	.
		ALARM 13.	.
		ALARM 14.	.
		ALARM 15.	.
		ALARM 16.	.

Supervisor Access Code. . . ****
Data Change Access Code . . ****

MMU Compatibility Program (Info Only)

Channel	Is Allowed to Time With Channel														
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
1 . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2 . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
3 . . .	.	.	.	.	.	.	.	.	.	.	.	.	.		
4 . . .	.	.	.	.	.	.	.	.	.	.	.	.			
5 . . .	.	.	.	.	.	.	.	.	.	.	.				
6 . . .	.	.	.	.	.	.	.	.	.	.					
7 . . .	.	.	.	.	.	.	.	.	.						
8 . . .	.	.	.	.	.	.	.	.							
9 . . .	.	.	.	.	.	.	.								
10. . .	.	.	.	.	.	.									
11. . .	.	.	.	.	.										
12. . .	.	.	.	.											
13. . .	.	.	.												
14. . .	.	.													
15. . .	.														

Version Info:

Software Assy.	Part No.	Version
Boot	27831	2.83
Program	45561	7.9
Application		. 3
Help	27891	6.23
Configuration	27908	C000┌

Wellington County 1-12 46 & Mclean rd 11/4/2013 15:30

By-Phase Timing Data

	Phase 1	2	3	4	5	6	7	8	9	10	11	12
Direction												
Minimum Green	8	40	5	15	8	40	5	15	5	5	5	5
Bike Min Green	0	0	0	0	0	0	0	0	0	0	0	0
Cond Serv Min Grn	0	0	0	0	0	0	0	0	0	0	0	0
Walk	0	5	0	5	0	5	0	5	0	10	0	10
Ped Clearance	0	7	0	7	0	7	0	7	0	16	0	16
Veh Extension	3.0	5.0	5.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0
Alt Veh Exten	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Extension	0	0	0	0	0	0	0	0	0	0	0	0
Max 1	14	40	35	24	14	40	35	24	35	35	35	35
Max 2	40	40	40	20	40	40	40	20	40	40	40	40
Max 3	0	0	0	0	0	0	0	0	0	0	0	0
Det. Fail Max	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Change	3.0	5.0	3.0	5.0	3.0	5.0	3.0	5.0	3.0	3.0	3.0	3.0
Red Clearance	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Act. B4 Init	0	0	0	0	0	0	0	0	0	0	0	0
Sec/Actuation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Initial	30	30	30	30	30	30	30	30	30	30	30	30
Time B4 Reduction	0	0	0	0	0	0	0	0	0	0	0	0
Cars Waiting	0	0	0	0	0	0	0	0	0	0	0	0
Time To Reduce	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Wellington County 1-12 46 & Mclean rd 11/4/2013 15:30

No-Serve Phases

	Phase Cannot Serve With Phase										
Phase	12	11	10	9	8	7	6	5	4	3	2
1. . .	.	.	.	.	.	.	.	.	.	.	.
2. . .	.	.	.	.	.	.	.	.	.	.	
3. . .	.	.	.	.	.	.	.	.	.		
4. . .	.	.	.	.	.	.	.	.			
5. . .	.	.	.	.	.	.	.				
6. . .	.	.	.	.	.	.					
7. . .	.	.	.	.	.						
8. . .	.	.	.	.							
9. . .	.	.	.								
10. . .	.	.									
11. . .	.										

Wellington County 1-12 46 & Mclean rd 11/4/2013 15:30

Ped Carryover

Ped Start Phase	Carry Over Phase
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0

Vehicle/Ped Phase as Overlap

Ped Phase As Overlap Consists of Ped Phases

Ped Ovlap Phase	1	2	3	4	5	6	7	8	9	10	11	12
1	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.

Veh Phase As Overlap Consists of Veh Phases

Veh Ovlap Phase	1	2	3	4	5	6	7	8	9	10	11	12
1	X	.	.	.	.	.	.	.	.	.	.	.
2	.	X	.	.	.	.	.	.	.	.	.	.
3	.	.	X	.	.	.	.	.	.	.	.	.
4	.	.	.	X	.	.	.	.	.	.	.	.
5	.	.	.	.	X	.	.	.	.	.	.	.
6	.	.	.	.	.	X	.	.	.	.	.	.
7	.	.	.	.	.	.	X	.	.	.	.	.
8	.	.	.	.	.	.	.	X	.	.	.	.
9	.	.	.	.	.	.	.	.	X	.	.	.
10	.	.	.	.	.	.	.	.	.	X	.	.
11	.	.	.	.	.	.	.	.	.	.	X	.
12	.	.	.	.	.	.	.	.	.	.	.	X

Overlap Data

Overlap A	Phase: 1	2	3	4	5	6	7	8	9	10	11	12
Standard	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.
Permitted	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lag	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lead	.	.	.	.	.	.	.	.	.	.	.	.
Spare	.	.	.	.	.	.	.	.	.	.	.	.

Advance Green Timer 0.0

	Green	Yellow	Red
Lag/Lead Timers	0.0	0.0	0.0

Overlap B	Phase: 1	2	3	4	5	6	7	8	9	10	11	12
Standard	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.
Permitted	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lag	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lead	.	.	.	.	.	.	.	.	.	.	.	.
Spare	.	.	.	.	.	.	.	.	.	.	.	.

Advance Green Timer 0.0

	Green	Yellow	Red
Lag/Lead Timers	0.0	0.0	0.0

Overlap C	Phase: 1	2	3	4	5	6	7	8	9	10	11	12
Standard	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.
Permitted	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lag	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lead	.	.	.	.	.	.	.	.	.	.	.	.
Spare	.	.	.	.	.	.	.	.	.	.	.	.

Advance Green Timer 0.0

	Green	Yellow	Red
Lag/Lead Timers	0.0	0.0	0.0

Overlap D	Phase: 1	2	3	4	5	6	7	8	9	10	11	12
Standard	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.
Permitted	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lag	.	.	.	.	.	.	.	.	.	.	.	.
Enable Lead	.	.	.	.	.	.	.	.	.	.	.	.
Spare	.	.	.	.	.	.	.	.	.	.	.	.

Advance Green Timer 0.0

	Green	Yellow	Red
Lag/Lead Timers	0.0	0.0	0.0

Wellington County 1-12 46 & Mclean rd 11/4/2013 15:30

Power Start, Remote Flash

	Phase 1	2	3	4	5	6	7	8	9	10	11	12	Overlap A	B	C	D
Power Start.	.	X	.	.	.	.	.	.	.	.	.	.				
External Start . . .	.	X	.	.	.	.	.	.	.	.	.	.				
Into Remote Flash. .	.	X	.	.	.	.	.	.	.	.	.	.				
Exit Remote Flash. .	.	X	.	.	.	.	.	.	.	.	.	.				
Remote Flash Yellow.	.	.	.	.	.	.	.	.	.	.	.	.				
Flash Together . . .	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X

Initialization Interval:
Power Start . . . . Yellow
External Start. . . . . Yellow

Power Start All Red Time. . 0
Power Start Flash Time. . . 0

Remote Flash Options:

Out of Flash Yellow . . . . NO
Out of Flash All Red. . . . NO
Minimum Recall. . . . . . . NO
Alternate Flash . . . . . . NO
Flash Thru Load Switches. . NO
Cycle Through Phases. . . . NO

Option Data

	Phase 1	2	3	4	5	6	7	8	9	10	11	12
Guaranteed Passage	.	.	.	.	.	.	.	.	.	.	.	.
Call To NonActuated 1	.	X	.	.	.	X	.	.	.	.	.	.
Call To NonActuated 2	.	.	.	X	.	.	.	X	.	.	.	.
Dual Entry	.	X	.	X	.	X	.	X	.	X	.	X
Conditional Service	X	.	X	.	X	.	X	.	X	.	X	.
Conditional Reservice	.	.	.	.	.	.	.	.	.	.	.	.
Actuated Rest in Walk	.	.	.	.	.	.	.	.	.	.	.	.
Flashing Walk	.	.	.	.	.	.	.	.	.	.	.	.

Enable Programmable Options

Dual Entry.	ON	Backup Protection Group 1	ON
Conditional Service	OFF	Backup Protection Group 2	OFF
Ped Clearance Protection. . . .	OFF	Backup Protection Group 3	OFF
Special Preempt Overlap Flash .	OFF	Simultaneous Gap Group 1.	OFF
Cond Service Det Cross Switch .	OFF	Simultaneous Gap Group 2.	OFF
Lock Detectors in Red Only. . .	OFF	Simultaneous Gap Group 3.	OFF

Five Section Left Turn Control

Phases:	5-2	7-4	1-6	3-8	11-10	9-12
Left Turn Head. . . .	.	.	.	.	.	.

Recall Data, Dimming

	Phase 1	2	3	4	5	6	7	8	9	10	11	12
Locking Detector. . . .	.	.	.	.	.	.	.	.	.	.	.	.
Vehicle Recall.	.	X	.	.	.	X	.	.	.	.	.	.
Pedestrian Recall . . .	.	.	.	.	.	.	.	.	.	.	.	.
Recall To Max	.	.	.	.	.	.	.	.	.	.	.	.
Soft Recall	.	.	.	.	.	.	.	.	.	.	.	.
Don't Rest Here	.	.	.	.	.	.	.	.	.	.	.	.
Ped Dark if No Call . .	.	.	.	.	.	.	.	.	.	.	.	.

Dimming:

	Load Switch 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Green/Walk. . . .	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Yellow/Ped Clear.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Red/Don't Walk. .	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

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Detector Type/Timers

Det.	Locking Memory	Log Enable	Timers Extend	Timers Delay	Don't Reset Extend	Type
1	NO	NO	0.0	0	.	1 - Extend/Delay
2	NO	NO	0.0	0	.	1 - Extend/Delay
3	NO	NO	0.0	0	.	1 - Extend/Delay
4	NO	NO	0.0	7	.	1 - Extend/Delay
5	NO	NO	0.0	0	.	1 - Extend/Delay
6	NO	NO	0.0	0	.	1 - Extend/Delay
7	NO	NO	0.0	0	.	1 - Extend/Delay
8	NO	NO	0.0	7	.	1 - Extend/Delay
9	NO	NO	0.0	0	.	0 - Normal
10	NO	NO	0.0	0	.	0 - Normal
11	NO	NO	0.0	0	.	0 - Normal
12	NO	NO	0.0	0	.	0 - Normal
13	NO	NO	0.0	0	.	0 - Normal
14	NO	NO	0.0	0	.	0 - Normal
15	NO	NO	0.0	0	.	0 - Normal
16	NO	NO	0.0	0	.	0 - Normal
17	NO	NO	0.0	0	.	0 - Normal
18	NO	NO	0.0	0	.	0 - Normal
19	NO	NO	0.0	0	.	0 - Normal
20	NO	NO	0.0	0	.	0 - Normal
21	NO	NO	0.0	0	.	0 - Normal
22	NO	NO	0.0	0	.	0 - Normal
23	NO	NO	0.0	0	.	0 - Normal
24	NO	NO	0.0	0	.	0 - Normal
25	NO	NO	0.0	0	.	0 - Normal
26	NO	NO	0.0	0	.	0 - Normal
27	NO	NO	0.0	0	.	0 - Normal
28	NO	NO	0.0	0	.	0 - Normal
29	NO	NO	0.0	0	.	0 - Normal
30	NO	NO	0.0	0	.	0 - Normal
31	NO	NO	0.0	0	.	0 - Normal
32	NO	NO	0.0	0	.	0 - Normal

Detector Names

Det 1: Detector 1
Det 2: Detector 2
Det 3: Detector 3
Det 4: Detector 4
Det 5: Detector 5
Det 6: Detector 6
Det 7: Detector 7
Det 8: Detector 8
Det 9: Detector 9
Det 10: Detector 10
Det 11: Detector 11
Det 12: Detector 12
Det 13: Detector 13
Det 14: Detector 14
Det 15: Detector 15
Det 16: Detector 16
Det 17: Detector 17
Det 18: Detector 18
Det 19: Detector 19
Det 20: Detector 20
Det 21: Detector 21
Det 22: Detector 22
Det 23: Detector 23
Det 24: Detector 24
Det 25: Detector 25
Det 26: Detector 26
Det 27: Detector 27
Det 28: Detector 28
Det 29: Detector 29
Det 30: Detector 30
Det 31: Detector 31
Det 32: Detector 32

Detector Type/Timers

33	NO	NO	0.0	0	.	0 - Normal
34	NO	NO	0.0	0	.	0 - Normal
35	NO	NO	0.0	0	.	0 - Normal
36	NO	NO	0.0	0	.	0 - Normal
37	NO	NO	0.0	0	.	0 - Normal
38	NO	NO	0.0	0	.	0 - Normal
39	NO	NO	0.0	0	.	0 - Normal
40	NO	NO	0.0	0	.	0 - Normal
41	NO	NO	0.0	0	.	0 - Normal
42	NO	NO	0.0	0	.	0 - Normal
43	NO	NO	0.0	0	.	0 - Normal
44	NO	NO	0.0	0	.	0 - Normal
45	NO	NO	0.0	0	.	0 - Normal
46	NO	NO	0.0	0	.	0 - Normal
47	NO	NO	0.0	0	.	0 - Normal
48	NO	NO	0.0	0	.	0 - Normal
49	NO	NO	0.0	0	.	0 - Normal
50	NO	NO	0.0	0	.	0 - Normal
51	NO	NO	0.0	0	.	0 - Normal
52	NO	NO	0.0	0	.	0 - Normal
53	NO	NO	0.0	0	.	0 - Normal
54	NO	NO	0.0	0	.	0 - Normal
55	NO	NO	0.0	0	.	0 - Normal
56	NO	NO	0.0	0	.	0 - Normal
57	NO	NO	0.0	0	.	0 - Normal
58	NO	NO	0.0	0	.	0 - Normal
59	NO	NO	0.0	0	.	0 - Normal
60	NO	NO	0.0	0	.	0 - Normal
61	NO	NO	0.0	0	.	0 - Normal
62	NO	NO	0.0	0	.	0 - Normal
63	NO	NO	0.0	0	.	0 - Normal
64	NO	NO	0.0	0	.	0 - Normal

Detector Names

Det 33: Detector 33
Det 34: Detector 34
Det 35: Detector 35
Det 36: Detector 36
Det 37: Detector 37
Det 38: Detector 38
Det 39: Detector 39
Det 40: Detector 40
Det 41: Detector 41
Det 42: Detector 42
Det 43: Detector 43
Det 44: Detector 44
Det 45: Detector 45
Det 46: Detector 46
Det 47: Detector 47
Det 48: Detector 48
Det 49: Detector 49
Det 50: Detector 50
Det 51: Detector 51
Det 52: Detector 52
Det 53: Detector 53
Det 54: Detector 54
Det 55: Detector 55
Det 56: Detector 56
Det 57: Detector 57
Det 58: Detector 58
Det 59: Detector 59
Det 60: Detector 60
Det 61: Detector 61
Det 62: Detector 62
Det 63: Detector 63
Det 64: Detector 64

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Detector Phase Assignment

Det.	1	2	3	4	5	6	7	8	9	10	11	12
1	X	.	.	.	.	.	.	.	.	.	.	.
2	.	X	.	.	.	.	.	.	.	.	.	.
3	.	.	X	.	.	.	.	.	.	.	.	.
4	.	.	.	X	.	.	.	.	.	.	.	.
5	.	.	.	.	X	.	.	.	.	.	.	.
6	.	.	.	.	.	X	.	.	.	.	.	.
7	.	.	.	.	.	.	X	.	.	.	.	.
8	.	.	.	.	.	.	.	X	.	.	.	.
9	.	.	.	.	.	.	.	.	X	.	.	.
10	.	.	.	.	.	.	.	.	.	X	.	.
11	.	.	.	.	.	.	.	.	.	.	X	.
12	.	.	.	.	.	.	.	.	.	.	.	X
13	.	.	.	.	.	.	.	.	.	.	.	.
14	.	.	.	.	.	.	.	.	.	.	.	.
15	.	.	.	.	.	.	.	.	.	.	.	.
16	.	.	.	.	.	.	.	.	.	.	.	.
17	.	.	.	.	.	.	.	.	.	.	.	.
18	.	.	.	.	.	.	.	.	.	.	.	.
19	.	.	.	.	.	.	.	.	.	.	.	.
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22	.	.	.	.	.	.	.	.	.	.	.	.
23	.	.	.	.	.	.	.	.	.	.	.	.
24	.	.	.	.	.	.	.	.	.	.	.	.
25	.	.	.	.	.	.	.	.	.	.	.	.
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31	.	.	.	.	.	.	.	.	.	.	.	.
32	.	.	.	.	.	.	.	.	.	.	.	.

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Detector Cross Switching

Det.	Phase 1	2	3	4	5	6	7	8	9	10	11	12
1	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.
13	.	.	.	.	.	.	.	.	.	.	.	.
14	.	.	.	.	.	.	.	.	.	.	.	.
15	.	.	.	.	.	.	.	.	.	.	.	.
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17	.	.	.	.	.	.	.	.	.	.	.	.
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30	.	.	.	.	.	.	.	.	.	.	.	.
31	.	.	.	.	.	.	.	.	.	.	.	.
32	.	.	.	.	.	.	.	.	.	.	.	.

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Detector Cross Switching

	Phase											
Det.	1	2	3	4	5	6	7	8	9	10	11	12
33	.	.	.	.	.	.	.	.	.	.	.	.
34	.	.	.	.	.	.	.	.	.	.	.	.
35	.	.	.	.	.	.	.	.	.	.	.	.
36	.	.	.	.	.	.	.	.	.	.	.	.
37	.	.	.	.	.	.	.	.	.	.	.	.
38	.	.	.	.	.	.	.	.	.	.	.	.
39	.	.	.	.	.	.	.	.	.	.	.	.
40	.	.	.	.	.	.	.	.	.	.	.	.
41	.	.	.	.	.	.	.	.	.	.	.	.
42	.	.	.	.	.	.	.	.	.	.	.	.
43	.	.	.	.	.	.	.	.	.	.	.	.
44	.	.	.	.	.	.	.	.	.	.	.	.
45	.	.	.	.	.	.	.	.	.	.	.	.
46	.	.	.	.	.	.	.	.	.	.	.	.
47	.	.	.	.	.	.	.	.	.	.	.	.
48	.	.	.	.	.	.	.	.	.	.	.	.
49	.	.	.	.	.	.	.	.	.	.	.	.
50	.	.	.	.	.	.	.	.	.	.	.	.
51	.	.	.	.	.	.	.	.	.	.	.	.
52	.	.	.	.	.	.	.	.	.	.	.	.
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58	.	.	.	.	.	.	.	.	.	.	.	.
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61	.	.	.	.	.	.	.	.	.	.	.	.
62	.	.	.	.	.	.	.	.	.	.	.	.
63	.	.	.	.	.	.	.	.	.	.	.	.
64	.	.	.	.	.	.	.	.	.	.	.	.

Ped/SD Local Assign,Log Interval

	Phase Ped Detector											
	1	2	3	4	5	6	7	8	9	10	11	12
Is Ped Detector No.	1	2	3	4	5	6	7	8	9	10	11	12

	*Local System Detector No.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Is Local Detector No. . . .	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Detector Log Interval . . 0

*NOTE: System master designations cross referenced to local system detector numbers are:

SDA1 = 1 & 9
SDA2 = 2 & 10
SDB1 = 3 & 11
SDB2 = 4 & 12
SDC1 = 5 & 13
SDC2 = 6 & 14
SDD1 = 7 & 15
SDD2 = 8 & 16

Diagnostic Plans/Fail Action

Plan		Detector 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
*Fail Action		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Plan		Detector 17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
*Fail Action		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*NOTE: 0 = No Action, 1 = Min Recall, 2 = Max Recall in Effect
3 = Detector Fail Max Tiime from By-Phase Timing Data

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Diagnostic Plans/Fail Action

Plan		Detector 33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
*Fail Action		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Plan		Detector 49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
1	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
*Fail Action		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*NOTE: 0 = No Action, 1 = Min Recall, 2 = Max Recall in Effect
3 = Detector Fail Max Tiime from By-Phase Timing Data

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Ped Diagnostic Plans

Plan		1	2	3	4	5	6	7	8	9	10	11	12
1	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1
2	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1
3	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1
4	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1
5	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1
6	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1
7	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1
8	Diagnostic	0	0	0	0	0	0	0	0	0	0	0	0
	Scaling	1	1	1	1	1	1	1	1	1	1	1	1

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Detector Diagnostic Intervals

Diagnostic Number	*No-Activity Diagnostic Interval	*Max Presence Diagnostic Interval	Erratic Counts
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
32	0	0	0

*NOTE: Scaling is specified in each detector diagnostic plan.

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Speed Detectors

One Detector Speed:	Local Speed Detector 1	2	3	4	5	6	7	8
Local Detector Number. . . .	0	0	0	0	0	0	0	0
Vehicle Length	0	0	0	0	0	0	0	0
Loop Length.	0	0	0	0	0	0	0	0
Two Detector Speed:								
Local Detector Number. . . .	0	0	0	0	0	0	0	0
Speed Trap Length.	0	0	0	0	0	0	0	0

One Detector Speed:	Local Speed Detector 9	10	11	12	13	14	15	16
Local Detector Number. . . .	0	0	0	0	0	0	0	0
Vehicle Length	0	0	0	0	0	0	0	0
Loop Length.	0	0	0	0	0	0	0	0
Two Detector Speed:								
Local Detector Number. . . .	0	0	0	0	0	0	0	0
Speed Trap Length.	0	0	0	0	0	0	0	0

Units. . . . . Inches

NOTE: Speed Detector 1 = STA, Speed Detector 2 = STB

Coordinator Manual Command and Options

Manual Enable . . . . .   Pattern 0

Split Units . . . . . Percent   OffsetUnits . . . . . Percent
Interconnect Format . STD   Interconnect Source . NIC
Transition. . . . . . SMOOTH   Dwell Period. 0
Resync Count. 0

Actuated Coord Phase . . . . . Actuated Walk Rest . . . . .
Inhibit Max Timing . . . . . Max 2 Select . . . .
Floating Force Off . . . . . Multisync. . . . .

Split Demand:	Call Time	Cyc Count	Phase 1	2	3	4	5	6	7	8	9	10	11	12
Demand 1 . .	0	0	.	.	.	.	.	.	.	.	.	.	.	.
Demand 2 . .	0	0	.	.	.	.	.	.	.	.	.	.	.	.

	Phase 1	2	3	4	5	6	7	8	9	10	11	12
Auto Permissive Min Green .	0	0	0	0	0	0	0	0	0	0	0	0

	A	B	C	D	E	F
Free Alternate Sequence . .	.	.	.	.	.	.

Coordination Patterns

```
Preemptors
-----------------------------------------------------------------
Preemptor 1
Active . . . . . . . . . . . . .  Det Lock. . . . . .  .  Ped Dark . . . . . .  .
Priority Preemption. . . . . . .  Yel-Red To Grn. .  .  Ped Active . . . . .  .
Outputs Only During Hold . . . .  Flash All Outputs  .  Zero Ped Clr Time.  .
Terminate Overlap ASAP . . . . .  Terminate Phases.  .  Ped Clr Thru Yel .  .
Don't Override Flash . . . . . .  Duration Time. . .   0
Flash During Hold. . . . . . . .  Delay Time . . . .   0
No CVM in Flash. . . . . . . . .  Inhibit Time . . .   0
Fast Flash Grn on Hold Phase. .  Min Ped Clear. . .   0
Enable Max Time. . . . . . . . .  Max Time . . . . .   0
                                  Exit Max . . . . .   0
                                  Min Hold Time. . .   0
                                  Hold Delay Time. .   0

                     Green       Yellow       Red
Minimum . . . . . .     0          0.0         0.0
Track Clear . . . .     0          0.0         0.0
Hold. . . . . . . .                0.0         0.0

            Phase/Overlap  1  2  3  4  5  6  7  8  9 10 11 12/ A  B  C  D
Terminate Overlap . . . .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Track Clearance Phase . .  .  .  .  .  .  .  .  .  .  .  .  .
Hold Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Calls on Phase . . .  .  .  .  .  .  .  .  .  .  .  .  .

Out of Flash Color for Exit Phases . . . . Green
                ----------------------------------------
Preemptor 2
Active . . . . . . . . . . . . .  Det Lock. . . . . .  .  Ped Dark . . . . . .  .
Priority Preemption. . . . . . .  Yel-Red To Grn. .  .  Ped Active . . . . .  .
Outputs Only During Hold . . . .  Flash All Outputs  .  Zero Ped Clr Time.  .
Terminate Overlap ASAP . . . . .  Terminate Phases.  .  Ped Clr Thru Yel .  .
Don't Override Flash . . . . . .  Duration Time. . .   0
Flash During Hold. . . . . . . .  Delay Time . . . .   0
No CVM in Flash. . . . . . . . .  Inhibit Time . . .   0
Fast Flash Grn on Hold Phase. .  Min Ped Clear. . .   0
Enable Max Time. . . . . . . . .  Max Time . . . . .   0
                                  Exit Max . . . . .   0
                                  Min Hold Time. . .   0
                                  Hold Delay Time. .   0

                     Green       Yellow       Red
Minimum . . . . . .     0          0.0         0.0
Track Clear . . . .     0          0.0         0.0
Hold. . . . . . . .                0.0         0.0

            Phase/Overlap  1  2  3  4  5  6  7  8  9 10 11 12/ A  B  C  D
Terminate Overlap . . . .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Track Clearance Phase . .  .  .  .  .  .  .  .  .  .  .  .  .
Hold Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Calls on Phase . . .  .  .  .  .  .  .  .  .  .  .  .  .

Out of Flash Color for Exit Phases . . . . Green
Linked Preemptor . . . .  0
                ----------------------------------------
```

```
Preemptors
-----------------------------------------------------------------
Preemptor 3
Active . . . . . . . . . . . .  Det Lock. . . . . .  Ped Dark . . . . . .
Priority Preemption. . . . . .  Yel-Red To Grn. .  .  Ped Active . . . . .
Outputs Only During Hold . . .  Flash All Outputs  .  Zero Ped Clr Time.  .
Terminate Overlap ASAP . . . .  Terminate Phases.  .  Ped Clr Thru Yel .  .
Don't Override Flash . . . . .  Duration Time. . .   0
Flash During Hold. . . . . . .  Delay Time . . . .   0
No CVM in Flash. . . . . . . .  Inhibit Time . . .   0
Fast Flash Grn on Hold Phase. .  Min Ped Clear. . .   0
Enable Max Time. . . . . . . .  Max Time . . . . .   0
                                Exit Max . . . . .   0
                                Min Hold Time. . .   0
                                Hold Delay Time. .   0

                     Green       Yellow       Red
Minimum . . . . . .     0          0.0        0.0
Track Clear . . . .     0          0.0        0.0
Hold. . . . . . . .                0.0        0.0

            Phase/Overlap  1  2  3  4  5  6  7  8  9 10 11 12/ A  B  C  D
Terminate Overlap . . . .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Track Clearance Phase . .  .  .  .  .  .  .  .  .  .  .  .  .
Hold Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Calls on Phase . . .  .  .  .  .  .  .  .  .  .  .  .  .

Out of Flash Color for Exit Phases . . . . Green
Linked Preemptor . . . .  0
                ----------------------------------------
Preemptor 4
Active . . . . . . . . . . . .  Det Lock. . . . . .  Ped Dark . . . . . .
Priority Preemption. . . . . .  Yel-Red To Grn. .  .  Ped Active . . . . .
Outputs Only During Hold . . .  Flash All Outputs  .  Zero Ped Clr Time.  .
Terminate Overlap ASAP . . . .  Terminate Phases.  .  Ped Clr Thru Yel .  .
Don't Override Flash . . . . .  Duration Time. . .   0
Flash During Hold. . . . . . .  Delay Time . . . .   0
No CVM in Flash. . . . . . . .  Inhibit Time . . .   0
Fast Flash Grn on Hold Phase. .  Min Ped Clear. . .   0
Enable Max Time. . . . . . . .  Max Time . . . . .   0
                                Exit Max . . . . .   0
                                Min Hold Time. . .   0
                                Hold Delay Time. .   0

                     Green       Yellow       Red
Minimum . . . . . .     0          0.0        0.0
Track Clear . . . .     0          0.0        0.0
Hold. . . . . . . .                0.0        0.0

            Phase/Overlap  1  2  3  4  5  6  7  8  9 10 11 12/ A  B  C  D
Terminate Overlap . . . .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Track Clearance Phase . .  .  .  .  .  .  .  .  .  .  .  .  .
Hold Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Calls on Phase . . .  .  .  .  .  .  .  .  .  .  .  .  .

Out of Flash Color for Exit Phases . . . . Green
Linked Preemptor . . . .  0
                ----------------------------------------
```

Preemptors

Preemptor 5

```
Active . . . . . . . . . . . . .  Det Lock. . . . . .  .  Ped Dark . . . . . .  .
Priority Preemption. . . . . .  .  Yel-Red To Grn. .  .  Ped Active . . . . .  .
Outputs Only During Hold . . .  .  Flash All Outputs  .  Zero Ped Clr Time.  .
Terminate Overlap ASAP . . . .  .  Terminate Phases.  .  Ped Clr Thru Yel .  .
Don't Override Flash . . . . .  .  Duration Time. . .   0
Flash During Hold. . . . . . .  .  Delay Time . . . .   0
No CVM in Flash. . . . . . . .  .  Inhibit Time . . .   0
Fast Flash Grn on Hold Phase. .  Min Ped Clear. . .   0
Enable Max Time. . . . . . . .  .  Max Time . . . . .   0
                                   Exit Max . . . . .   0
                                   Min Hold Time. . .   0
                                   Hold Delay Time. .   0

                     Green       Yellow       Red
Minimum . . . . . .    0          0.0         0.0
Track Clear . . . .    0          0.0         0.0
Hold. . . . . . . .               0.0         0.0

            Phase/Overlap  1  2  3  4  5  6  7  8  9 10 11 12/ A  B  C  D
Terminate Overlap . . . .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Track Clearance Phase . .  .  .  .  .  .  .  .  .  .  .  .  .
Hold Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Calls on Phase . . .  .  .  .  .  .  .  .  .  .  .  .  .

Out of Flash Color for Exit Phases . . . . Green
Linked Preemptor . . . .  0
```

Preemptor 6

```
Active . . . . . . . . . . . . .  Det Lock. . . . . .  .  Ped Dark . . . . . .  .
Priority Preemption. . . . . .  .  Yel-Red To Grn. .  .  Ped Active . . . . .  .
Outputs Only During Hold . . .  .  Flash All Outputs  .  Zero Ped Clr Time.  .
Terminate Overlap ASAP . . . .  .  Terminate Phases.  .  Ped Clr Thru Yel .  .
Don't Override Flash . . . . .  .  Duration Time. . .   0
Flash During Hold. . . . . . .  .  Delay Time . . . .   0
No CVM in Flash. . . . . . . .  .  Inhibit Time . . .   0
Fast Flash Grn on Hold Phase. .  Min Ped Clear. . .   0
Enable Max Time. . . . . . . .  .  Max Time . . . . .   0
                                   Exit Max . . . . .   0
                                   Min Hold Time. . .   0
                                   Hold Delay Time. .   0

                     Green       Yellow       Red
Minimum . . . . . .    0          0.0         0.0
Track Clear . . . .    0          0.0         0.0
Hold. . . . . . . .               0.0         0.0

            Phase/Overlap  1  2  3  4  5  6  7  8  9 10 11 12/ A  B  C  D
Terminate Overlap . . . .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Track Clearance Phase . .  .  .  .  .  .  .  .  .  .  .  .  .
Hold Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Phases . . . . . . .  .  .  .  .  .  .  .  .  .  .  .  .
Exit Calls on Phase . . .  .  .  .  .  .  .  .  .  .  .  .  .

Out of Flash Color for Exit Phases . . . . Green
Linked Preemptor . . . .  0
```

Bus Preemptors

	Bus Preemptor 1	2	3	4
Preemptor Active.	.	.	.	.
Detector Lock	.	.	.	.
Maximum Time.	0	0	0	0
Reservice Time.	0	0	0	0
Delay Time.	0	0	0	0
Inhibit Time.	0	0	0	0
Entrance Green.	0	0	0	0
Entrance Ped Clearance.	0	0	0	0
Entrance Yellow	0.0	0.0	0.0	0.0
Entrance Red.	0.0	0.0	0.0	0.0
Minimum Hold Time	0	0	0	0

Hold Phases	1	2	3	4	5	6	7	8	9	10	11	12
Preemptor 1	.	.	.	.	.	.	.	.	.	.	.	.
Preemptor 2	.	.	.	.	.	.	.	.	.	.	.	.
Preemptor 3	.	.	.	.	.	.	.	.	.	.	.	.
Preemptor 4	.	.	.	.	.	.	.	.	.	.	.	.

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NIC/TOD Clock/Calendar

Manual NIC Program Step   0

Manual TOD Program Step   0

NIC Resync Time 0000

Sync Reference is . . . . Reference Time

Week 1 Begins on 1st Sunday . . . . . . NO If NO, then week containing Jan. 1

Disable Daylight Savings Time . . . . . NO

Daylight Savings
Begins Last Sunday in March . . . . . . NO If NO, then Second Sunday as per 2007 DST Law

Wellington County 1-12 46 & Mclean rd 11/4/2013 15:30

TOD Weekly/Yearly

Weekly Program Numbers

	1	2	3	4	5	6	7	8	9	10	
Sunday . . .	1	1	1	1	1	1	1	1	1	1	Program No.
Monday . . .	1	1	1	1	1	1	1	1	1	1	Program No.
Tuesday. . .	1	1	1	1	1	1	1	1	1	1	Program No.
Wednesday. .	1	1	1	1	1	1	1	1	1	1	Program No.
Thursday . .	1	1	1	1	1	1	1	1	1	1	Program No.
Friday . . .	1	1	1	1	1	1	1	1	1	1	Program No.
Saturday . .	1	1	1	1	1	1	1	1	1	1	Program No.

Week of Year

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Prog	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Prog	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Prog	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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Holiday Programs

Holiday	Type	Month	Day of Week/ Day of Month	Week of Year/ Year	Program
1	Fixed	0	0	0	0
2	Fixed	0	0	0	0
3	Fixed	0	0	0	0
4	Fixed	0	0	0	0
5	Fixed	0	0	0	0
6	Fixed	0	0	0	0
7	Fixed	0	0	0	0
8	Fixed	0	0	0	0
9	Fixed	0	0	0	0
10	Fixed	0	0	0	0
11	Fixed	0	0	0	0
12	Fixed	0	0	0	0
13	Fixed	0	0	0	0
14	Fixed	0	0	0	0
15	Fixed	0	0	0	0
16	Fixed	0	0	0	0
17	Fixed	0	0	0	0
18	Fixed	0	0	0	0
19	Fixed	0	0	0	0
20	Fixed	0	0	0	0
21	Fixed	0	0	0	0
22	Fixed	0	0	0	0
23	Fixed	0	0	0	0
24	Fixed	0	0	0	0
25	Fixed	0	0	0	0
26	Fixed	0	0	0	0
27	Fixed	0	0	0	0
28	Fixed	0	0	0	0
29	Fixed	0	0	0	0
30	Fixed	0	0	0	0
31	Fixed	0	0	0	0
32	Fixed	0	0	0	0
33	Fixed	0	0	0	0
34	Fixed	0	0	0	0
35	Fixed	0	0	0	0
36	Fixed	0	0	0	0

Wellington County 1-12 46 & Mclean rd 11/4/2013 15:30

NIC Program Steps

Step	Program	Step Begins	Pattern	Override

TOD Program Steps

Appendix C

Base Year Traffic Operations Reports

Base Year - 2022
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	23	126	23	6	12	94	388	46	30	567	20
Future Volume (vph)	16	23	126	23	6	12	94	388	46	30	567	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	65.0		65.0	65.0		65.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	50.0			50.0			75.0			100.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.873			0.902				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1517	1145	0	986	1245	0	1203	3167	1429	1641	3343	1346
Flt Permitted	0.744			0.564			0.355			0.506		
Satd. Flow (perm)	1188	1145	0	586	1245	0	450	3167	1429	874	3343	1346
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		137			13				94			125
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		545.8			677.0			575.9			822.8	
Travel Time (s)		39.3			48.7			41.5			59.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	19%	17%	50%	83%	0%	58%	50%	14%	13%	10%	8%	20%
Adj. Flow (vph)	17	25	137	25	7	13	102	422	50	33	616	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	162	0	25	20	0	102	422	50	33	616	22
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Base Year - 2022
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		8.0	40.0	40.0	8.0	40.0	40.0
Minimum Split (s)	9.5	25.0		9.5	25.0		12.5	47.0	47.0	12.5	47.0	47.0
Total Split (s)	40.0	20.0		40.0	20.0		40.0	66.0	66.0	14.0	40.0	40.0
Total Split (%)	28.6%	14.3%		28.6%	14.3%		28.6%	47.1%	47.1%	10.0%	28.6%	28.6%
Maximum Green (s)	36.0	13.0		36.0	13.0		36.0	59.0	59.0	10.0	33.0	33.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	None		None	None		None	None	None	None	None	None
Act Effct Green (s)	19.4	13.2		21.0	16.0		50.6	41.9	41.9	47.2	38.0	38.0
Actuated g/C Ratio	0.24	0.16		0.26	0.20		0.62	0.52	0.52	0.58	0.47	0.47
v/c Ratio	0.05	0.54		0.13	0.08		0.28	0.26	0.06	0.06	0.39	0.03
Control Delay	22.8	17.2		24.3	19.8		9.3	13.9	0.9	7.6	17.3	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	17.2		24.3	19.8		9.3	13.9	0.9	7.6	17.3	0.1
LOS	C	B		C	B		A	B	A	A	B	A
Approach Delay		17.7			22.3			11.9			16.3	
Approach LOS		B			C			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 81.1	
Natural Cycle: 95	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.54	
Intersection Signal Delay: 14.9	Intersection LOS: B
Intersection Capacity Utilization 74.1%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Brock Rd S & McLean Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	17	162	25	20	102	422	50	33	616	22
v/c Ratio	0.05	0.54	0.13	0.08	0.28	0.26	0.06	0.06	0.39	0.03
Control Delay	22.8	17.2	24.3	19.8	9.3	13.9	0.9	7.6	17.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	17.2	24.3	19.8	9.3	13.9	0.9	7.6	17.3	0.1
Queue Length 50th (m)	2.2	3.4	3.3	1.0	4.5	18.7	0.0	1.4	30.0	0.0
Queue Length 95th (m)	7.0	24.8	9.3	7.8	16.2	39.1	1.7	6.4	62.5	0.0
Internal Link Dist (m)		521.8		653.0		551.9			798.8	
Turn Bay Length (m)	50.0		50.0		65.0		65.0	65.0		65.0
Base Capacity (vph)	686	301	446	256	626	2347	1083	621	1564	696
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.54	0.06	0.08	0.16	0.18	0.05	0.05	0.39	0.03

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	23	126	23	6	12	94	388	46	30	567	20
Future Volume (vph)	16	23	126	23	6	12	94	388	46	30	567	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87		1.00	0.90		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1517	1145		986	1245		1203	3167	1429	1641	3343	1346
Flt Permitted	0.74	1.00		0.56	1.00		0.36	1.00	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1188	1145		585	1245		450	3167	1429	873	3343	1346
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	25	137	25	7	13	102	422	50	33	616	22
RTOR Reduction (vph)	0	115	0	0	11	0	0	0	26	0	0	12
Lane Group Flow (vph)	17	47	0	25	9	0	102	422	24	33	616	10
Heavy Vehicles (%)	19%	17%	50%	83%	0%	58%	50%	14%	13%	10%	8%	20%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	15.5	13.9		19.7	16.0		49.3	41.9	41.9	43.3	38.9	38.9
Effective Green, g (s)	15.5	13.9		19.7	16.0		49.3	41.9	41.9	43.3	38.9	38.9
Actuated g/C Ratio	0.18	0.16		0.23	0.19		0.57	0.49	0.49	0.50	0.45	0.45
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	220	185		151	231		323	1544	697	479	1513	609
v/s Ratio Prot	0.00	c0.04		c0.01	0.01		c0.03	0.13		0.00	c0.18	
v/s Ratio Perm	0.01			0.03			0.15		0.02	0.03		0.01
v/c Ratio	0.08	0.25		0.17	0.04		0.32	0.27	0.03	0.07	0.41	0.02
Uniform Delay, d1	29.2	31.5		26.2	28.7		8.8	13.0	11.5	10.8	15.8	13.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		1.1	0.1		0.6	0.2	0.0	0.1	0.4	0.0
Delay (s)	29.5	32.2		27.3	28.7		9.4	13.2	11.5	10.8	16.1	13.0
Level of Service	C	C		C	C		A	B	B	B	B	B
Approach Delay (s)		31.9			27.9			12.4			15.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	85.9	Sum of lost time (s)	22.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	4	26	1	25	6	402	8	12	587	7
Future Volume (vph)	0	1	4	26	1	25	6	402	8	12	587	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.892			0.935			0.997			0.998	
Flt Protected					0.976			0.999			0.999	
Satd. Flow (prot)	0	942	0	0	1610	0	0	3173	0	0	3320	0
Flt Permitted					0.976			0.999			0.999	
Satd. Flow (perm)	0	942	0	0	1610	0	0	3173	0	0	3320	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		245.4			507.3			822.8			276.5	
Travel Time (s)		17.7			36.5			59.2			19.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	100%	75%	0%	0%	16%	17%	13%	25%	25%	8%	14%
Adj. Flow (vph)	0	1	4	28	1	27	7	437	9	13	638	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	5	0	0	56	0	0	453	0	0	659	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type: Other

Control Type: Roundabout

Intersection Capacity Utilization 41.4% ICU Level of Service A

Analysis Period (min) 15

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]

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The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

Filename: Brock Road and Gilmour Road.arc8
Path: [redacted]
Report generation date: 2022-11-08 9:04:03 AM

Summary of intersection performance

	AM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Base						
Leg North	0.41	~1	2.24	0.28	A	2.26	A
Leg West	0.01	358.97	6.53	0.01	A		
Leg South	0.26	~1	2.07	0.19	A		
Leg East	0.06	~1	3.62	0.05	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Base, AM " model duration: 8:00 AM - 9:30 AM
"D2 - Base, PM" model duration: 4:00 PM - 5:30 PM
"D3 - Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2022-11-08 9:04:03 AM

File summary

Title	(untitled)
Location	
Site Number	
Date	2022-11-08
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Base, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Base, AM	Base	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East				2.26	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Brock Road South	
West	West	Private Driveway	
South	South	Brock Road South	
East	East	Gilmour Road	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
North	0.00	99999.00		0.00
West	0.00	99999.00		0.00
South	0.00	99999.00		0.00
East	0.00	99999.00		0.00

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
North	7.00	8.00	30.00	20.00	55.00	25.00	
West	3.50	4.50	30.00	20.00	55.00	25.00	
South	7.00	8.00	30.00	20.00	55.00	25.00	

East	3.50	4.50	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.723	2436.345
West		(calculated)	(calculated)	0.527	1357.445
South		(calculated)	(calculated)	0.723	2436.345
East		(calculated)	(calculated)	0.527	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	606.00	100.000
West	ONE HOUR	✓	5.00	100.000
South	ONE HOUR	✓	416.00	100.000
East	ONE HOUR	✓	52.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	7.000	587.000	12.000
	West	0.000	0.000	4.000	1.000
	South	402.000	6.000	0.000	8.000
	East	25.000	1.000	26.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.01	0.97	0.02
	West	0.00	0.00	0.80	0.20
	South	0.97	0.01	0.00	0.02
	East	0.48	0.02	0.50	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.140	1.080	1.250
	West	1.000	1.000	1.750	2.000
	South	1.130	1.170	1.000	1.250
	East	1.160	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	14.0	8.0	25.0
	West	0.0	0.0	75.0	100.0
	South	13.0	17.0	0.0	25.0
	East	16.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
North	0.28	2.24	0.41	~1	A	556.08	834.11	29.36	2.11	0.33	29.36	2.11
West	0.01	6.53	0.01	358.97	A	4.59	6.88	0.71	6.17	0.01	0.71	6.17
South	0.19	2.07	0.26	~1	A	381.73	572.59	19.06	2.00	0.21	19.06	2.00
East	0.05	3.62	0.06	~1	A	47.72	71.57	4.14	3.47	0.05	4.14	3.47

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	456.23	114.06	455.22	320.75	24.76	0.00	2418.45	2365.27	0.189	0.00	0.25	1.986	A
West	3.76	0.94	3.74	10.52	469.47	0.00	1110.10	93.28	0.003	0.00	0.01	5.839	A
South	313.19	78.30	312.52	463.44	9.76	0.00	2429.29	2389.00	0.129	0.00	0.17	1.926	A
East	39.15	9.79	39.00	15.77	306.51	0.00	1195.96	122.98	0.033	0.00	0.04	3.332	A

Main results: (08:15-08:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	544.78	136.20	544.53	383.70	29.65	0.00	2414.91	2365.27	0.226	0.25	0.31	2.085	A
West	4.49	1.12	4.49	12.58	561.59	0.00	1061.56	93.28	0.004	0.01	0.01	6.112	A
South	373.98	93.49	373.82	554.40	11.68	0.00	2427.90	2389.00	0.154	0.17	0.21	1.984	A
East	46.75	11.69	46.71	18.87	366.63	0.00	1164.28	122.98	0.040	0.04	0.04	3.449	A

Main results: (08:30-08:45)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	667.22	166.80	666.82	469.89	36.30	0.00	2410.10	2365.27	0.277	0.31	0.41	2.237	A
West	5.51	1.38	5.50	15.41	687.72	0.00	995.11	93.28	0.006	0.01	0.01	6.528	A
South	458.02	114.51	457.80	678.91	14.30	0.00	2426.00	2389.00	0.189	0.21	0.26	2.071	A
East	57.25	14.31	57.20	23.11	448.99	0.00	1120.89	122.98	0.051	0.04	0.06	3.624	A

Main results: (08:45-09:00)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	667.22	166.80	667.22	470.13	36.33	0.00	2410.08	2365.27	0.277	0.41	0.41	2.237	A
West	5.51	1.38	5.50	15.41	688.13	0.00	994.89	93.28	0.006	0.01	0.01	6.530	A
South	458.02	114.51	458.02	679.33	14.31	0.00	2426.00	2389.00	0.189	0.26	0.26	2.071	A
East	57.25	14.31	57.25	23.12	449.21	0.00	1120.77	122.98	0.051	0.06	0.06	3.624	A

Main results: (09:00-09:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	544.78	136.20	545.17	384.11	29.70	0.00	2414.88	2365.27	0.226	0.41	0.32	2.088	A
West	4.49	1.12	4.50	12.59	562.27	0.00	1061.21	93.28	0.004	0.01	0.01	6.116	A
South	373.98	93.49	374.20	555.08	11.70	0.00	2427.89	2389.00	0.154	0.26	0.21	1.986	A
East	46.75	11.69	46.80	18.89	367.01	0.00	1164.08	122.98	0.040	0.06	0.04	3.450	A

Main results: (09:15-09:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	456.23	114.06	456.48	321.63	24.86	0.00	2418.37	2365.27	0.189	0.32	0.25	1.989	A
West	3.76	0.94	3.77	10.55	470.80	0.00	1109.40	93.28	0.003	0.01	0.01	5.845	A
South	313.19	78.30	313.34	464.78	9.79	0.00	2429.26	2389.00	0.129	0.21	0.17	1.928	A
East	39.15	9.79	39.18	15.82	307.32	0.00	1195.53	122.98	0.033	0.04	0.04	3.336	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	3.72	0.25	1.986	A	A
West	0.09	0.01	5.839	A	A
South	2.48	0.17	1.926	A	A
East	0.53	0.04	3.332	A	A

Queueing Delay results: (08:15-08:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	4.67	0.31	2.085	A	A
West	0.11	0.01	6.112	A	A
South	3.06	0.20	1.984	A	A
East	0.66	0.04	3.449	A	A

Queueing Delay results: (08:30-08:45)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	6.13	0.41	2.237	A	A
West	0.15	0.01	6.528	A	A
South	3.91	0.26	2.071	A	A
East	0.85	0.06	3.624	A	A

Queueing Delay results: (08:45-09:00)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	6.21	0.41	2.237	A	A
West	0.15	0.01	6.530	A	A
South	3.95	0.26	2.071	A	A
East	0.86	0.06	3.624	A	A

Queueing Delay results: (09:00-09:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

North	4.80	0.32	2.088	A	A
West	0.12	0.01	6.116	A	A
South	3.13	0.21	1.986	A	A
East	0.68	0.05	3.450	A	A

Queueing Delay results: (09:15-09:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	3.83	0.26	1.989	A	A
West	0.09	0.01	5.845	A	A
South	2.54	0.17	1.928	A	A
East	0.55	0.04	3.336	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.41	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	0.00	0.00	>199	>199			N/A	N/A
South	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.41	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
						Percentiles could not be calculated. This may			

South	0.26	~1	~1	~1	~1	be because the mean queue is very small or very big.		N/A	N/A
East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	6	74	50	14	33	114	731	24	5	437	15
Future Volume (vph)	32	6	74	50	14	33	114	731	24	5	437	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	65.0		65.0	65.0		65.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	50.0			50.0			75.0			100.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.862			0.894				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1299	0	1367	1630	0	1583	3505	1077	1805	3312	1346
Flt Permitted	0.724			0.559			0.423			0.351		
Satd. Flow (perm)	1336	1299	0	805	1630	0	705	3505	1077	667	3312	1346
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		80			36				94			125
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		545.8			677.0			575.9			822.8	
Travel Time (s)		39.3			48.7			41.5			59.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	50%	24%	32%	0%	6%	14%	3%	50%	0%	9%	20%
Adj. Flow (vph)	35	7	80	54	15	36	124	795	26	5	475	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	35	87	0	54	51	0	124	795	26	5	475	16
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		8.0	40.0	40.0	8.0	40.0	40.0
Minimum Split (s)	9.5	25.0		9.5	25.0		12.5	47.0	47.0	12.5	47.0	47.0
Total Split (s)	40.0	20.0		40.0	20.0		40.0	66.0	66.0	14.0	40.0	40.0
Total Split (%)	28.6%	14.3%		28.6%	14.3%		28.6%	47.1%	47.1%	10.0%	28.6%	28.6%
Maximum Green (s)	36.0	13.0		36.0	13.0		36.0	59.0	59.0	10.0	33.0	33.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	None		None	None		None	None	None	None	None	None
Act Effct Green (s)	20.8	13.6		23.4	16.9		52.3	49.3	49.3	46.7	35.1	35.1
Actuated g/C Ratio	0.25	0.17		0.29	0.21		0.64	0.60	0.60	0.57	0.43	0.43
v/c Ratio	0.09	0.31		0.18	0.14		0.22	0.38	0.04	0.01	0.33	0.02
Control Delay	21.1	13.6		22.3	17.1		10.2	14.0	0.1	9.0	19.7	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	13.6		22.3	17.1		10.2	14.0	0.1	9.0	19.7	0.1
LOS	C	B		C	B		B	B	A	A	B	A
Approach Delay		15.8			19.8			13.2			18.9	
Approach LOS		B			B			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 81.8	
Natural Cycle: 95	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 15.5	Intersection LOS: B
Intersection Capacity Utilization 67.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Brock Rd S & McLean Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	35	87	54	51	124	795	26	5	475	16
v/c Ratio	0.09	0.31	0.18	0.14	0.22	0.38	0.04	0.01	0.33	0.02
Control Delay	21.1	13.6	22.3	17.1	10.2	14.0	0.1	9.0	19.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	13.6	22.3	17.1	10.2	14.0	0.1	9.0	19.7	0.1
Queue Length 50th (m)	4.1	1.1	6.4	2.3	9.5	41.8	0.0	0.4	31.2	0.0
Queue Length 95th (m)	11.5	15.1	15.9	13.0	18.8	77.8	0.0	1.9	48.3	0.0
Internal Link Dist (m)		521.8		653.0		551.9			798.8	
Turn Bay Length (m)	50.0		50.0		65.0		65.0	65.0		65.0
Base Capacity (vph)	808	283	631	366	855	2557	811	543	1421	648
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.31	0.09	0.14	0.15	0.31	0.03	0.01	0.33	0.02

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	6	74	50	14	33	114	731	24	5	437	15
Future Volume (vph)	32	6	74	50	14	33	114	731	24	5	437	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.86		1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1299		1367	1630		1583	3505	1077	1805	3312	1346
Flt Permitted	0.72	1.00		0.56	1.00		0.42	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	1335	1299		805	1630		705	3505	1077	667	3312	1346
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	7	80	54	15	36	124	795	26	5	475	16
RTOR Reduction (vph)	0	71	0	0	31	0	0	0	12	0	0	9
Lane Group Flow (vph)	35	16	0	54	20	0	124	795	14	5	475	7
Heavy Vehicles (%)	3%	50%	24%	32%	0%	6%	14%	3%	50%	0%	9%	20%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	15.4	10.3		20.6	12.9		52.5	47.1	47.1	40.0	38.6	38.6
Effective Green, g (s)	15.4	10.3		20.6	12.9		52.5	47.1	47.1	40.0	38.6	38.6
Actuated g/C Ratio	0.17	0.12		0.23	0.15		0.59	0.53	0.53	0.45	0.44	0.44
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	256	151		236	237		516	1865	573	319	1444	587
v/s Ratio Prot	0.01	0.01		c0.02	0.01		c0.03	c0.23		0.00	0.14	
v/s Ratio Perm	0.02			c0.03			0.12		0.01	0.01		0.01
v/c Ratio	0.14	0.11		0.23	0.09		0.24	0.43	0.02	0.02	0.33	0.01
Uniform Delay, d1	30.8	35.0		27.2	32.7		8.1	12.5	9.8	13.3	16.4	14.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.3		1.0	0.2		0.2	0.3	0.0	0.0	0.3	0.0
Delay (s)	31.3	35.3		28.2	32.9		8.4	12.9	9.8	13.3	16.7	14.2
Level of Service	C	D		C	C		A	B	A	B	B	B
Approach Delay (s)		34.2			30.5			12.2			16.6	
Approach LOS		C			C			B			B	

Intersection Summary

HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	88.5	Sum of lost time (s)	22.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]

For sales and distribution information, program advice and maintenance, contact TRL: [redacted] [redacted] Web: http://www.trlsoftware.co.uk

Filename: Brock Road and Gilmour Road.arc8
Path: [redacted]
Report generation date: 2022-11-08 9:04:46 AM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Base						
Leg North	0.30	~1	2.06	0.21	A	2.36	A
Leg West	0.02	~1	4.23	0.01	A		
Leg South	0.59	1.05	2.45	0.36	A		
Leg East	0.03	~1	4.28	0.03	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Base, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Base, PM " model duration: 4:00 PM - 5:30 PM
"D3 - Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2022-11-08 9:04:45 AM

File summary

Title	(untitled)
Location	
Site Number	
Date	2022-11-08
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Base, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Base, PM	Base	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East				2.36	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Brock Road South	
West	West	Private Driveway	
South	South	Brock Road South	
East	East	Gilmour Road	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
North	0.00	99999.00		0.00
West	0.00	99999.00		0.00
South	0.00	99999.00		0.00
East	0.00	99999.00		0.00

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
North	7.00	8.00	30.00	20.00	55.00	25.00	
West	3.50	4.50	30.00	20.00	55.00	25.00	
South	7.00	8.00	30.00	20.00	55.00	25.00	

East	3.50	4.50	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.723	2436.345
West		(calculated)	(calculated)	0.527	1357.445
South		(calculated)	(calculated)	0.723	2436.345
East		(calculated)	(calculated)	0.527	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	473.00	100.000
West	ONE HOUR	✓	14.00	100.000
South	ONE HOUR	✓	796.00	100.000
East	ONE HOUR	✓	25.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	15.000	442.000	16.000
	West	3.000	0.000	11.000	0.000
	South	775.000	6.000	0.000	15.000
	East	20.000	1.000	4.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.03	0.93	0.03
	West	0.21	0.00	0.79	0.00
	South	0.97	0.01	0.00	0.02
	East	0.80	0.04	0.16	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.100	1.000
	West	1.000	1.000	1.360	1.000
	South	1.050	1.170	1.000	1.000
	East	1.050	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	10.0	0.0
	West	0.0	0.0	36.0	0.0
	South	5.0	17.0	0.0	0.0
	East	5.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
North	0.21	2.06	0.30	~1	A	434.03	651.05	21.47	1.98	0.24	21.47	1.98
West	0.01	4.23	0.02	~1	A	12.85	19.27	1.30	4.06	0.01	1.30	4.06
South	0.36	2.45	0.59	1.05	A	730.42	1095.64	41.20	2.26	0.46	41.20	2.26
East	0.03	4.28	0.03	~1	A	22.94	34.41	2.27	3.95	0.03	2.27	3.95

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	356.10	89.02	355.35	599.37	8.26	0.00	2430.38	2405.49	0.147	0.00	0.19	1.895	A
West	10.54	2.63	10.49	16.53	347.08	0.00	1174.58	119.79	0.009	0.00	0.01	3.904	A
South	599.27	149.82	597.90	343.31	14.27	0.00	2426.03	2358.96	0.247	0.00	0.34	2.066	A
East	18.82	4.71	18.75	23.29	588.88	0.00	1047.19	124.50	0.018	0.00	0.02	3.638	A

Main results: (16:15-16:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	425.22	106.30	425.04	717.00	9.88	0.00	2429.20	2405.49	0.175	0.19	0.23	1.962	A
West	12.59	3.15	12.58	19.77	415.15	0.00	1138.72	119.79	0.011	0.01	0.01	4.035	A
South	715.59	178.90	715.21	410.66	17.07	0.00	2424.00	2358.96	0.295	0.34	0.44	2.211	A
East	22.47	5.62	22.45	27.86	704.43	0.00	986.31	124.50	0.023	0.02	0.02	3.882	A

Main results: (16:30-16:45)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	520.78	130.20	520.52	877.98	12.10	0.00	2427.60	2405.49	0.215	0.23	0.30	2.062	A
West	15.41	3.85	15.40	24.21	508.41	0.00	1089.58	119.79	0.014	0.01	0.02	4.231	A
South	876.41	219.10	875.79	502.90	20.91	0.00	2421.23	2358.96	0.362	0.44	0.59	2.444	A
East	27.53	6.88	27.49	34.11	862.59	0.00	902.98	124.50	0.030	0.02	0.03	4.274	A

Main results: (16:45-17:00)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	520.78	130.20	520.78	878.61	12.11	0.00	2427.59	2405.49	0.215	0.30	0.30	2.062	A
West	15.41	3.85	15.41	24.22	508.67	0.00	1089.45	119.79	0.014	0.02	0.02	4.231	A
South	876.41	219.10	876.41	503.16	20.92	0.00	2421.22	2358.96	0.362	0.59	0.59	2.446	A
East	27.53	6.88	27.53	34.13	863.20	0.00	902.66	124.50	0.030	0.03	0.03	4.276	A

Main results: (17:00-17:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	425.22	106.30	425.48	718.01	9.90	0.00	2429.19	2405.49	0.175	0.30	0.23	1.963	A
West	12.59	3.15	12.60	19.79	415.59	0.00	1138.49	119.79	0.011	0.02	0.01	4.038	A
South	715.59	178.90	716.20	411.10	17.09	0.00	2423.99	2358.96	0.295	0.59	0.44	2.213	A
East	22.47	5.62	22.51	27.89	705.40	0.00	985.80	124.50	0.023	0.03	0.02	3.886	A

Main results: (17:15-17:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	356.10	89.02	356.28	601.17	8.29	0.00	2430.35	2405.49	0.147	0.23	0.19	1.899	A
West	10.54	2.63	10.55	16.57	347.99	0.00	1174.10	119.79	0.009	0.01	0.01	3.907	A
South	599.27	149.82	599.65	344.23	14.31	0.00	2426.00	2358.96	0.247	0.44	0.35	2.069	A
East	18.82	4.71	18.84	23.35	590.61	0.00	1046.27	124.50	0.018	0.02	0.02	3.644	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	2.77	0.18	1.895	A	A
West	0.17	0.01	3.904	A	A
South	5.08	0.34	2.066	A	A
East	0.28	0.02	3.638	A	A

Queueing Delay results: (16:15-16:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	3.44	0.23	1.962	A	A
West	0.21	0.01	4.035	A	A
South	6.50	0.43	2.211	A	A
East	0.36	0.02	3.882	A	A

Queueing Delay results: (16:30-16:45)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	4.42	0.29	2.062	A	A
West	0.27	0.02	4.231	A	A
South	8.78	0.59	2.444	A	A
East	0.48	0.03	4.274	A	A

Queueing Delay results: (16:45-17:00)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	4.47	0.30	2.062	A	A
West	0.27	0.02	4.231	A	A
South	8.91	0.59	2.446	A	A
East	0.49	0.03	4.276	A	A

Queueing Delay results: (17:00-17:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

North	3.52	0.23	1.963	A	A
West	0.22	0.01	4.038	A	A
South	6.70	0.45	2.213	A	A
East	0.37	0.02	3.886	A	A

Queueing Delay results: (17:15-17:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	2.85	0.19	1.899	A	A
West	0.17	0.01	3.907	A	A
South	5.24	0.35	2.069	A	A
East	0.29	0.02	3.644	A	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.30	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.59	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.30	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

South	0.59	0.00	0.00	0.00	1.05			N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Appendix D

ITE Trip Generation Sheets

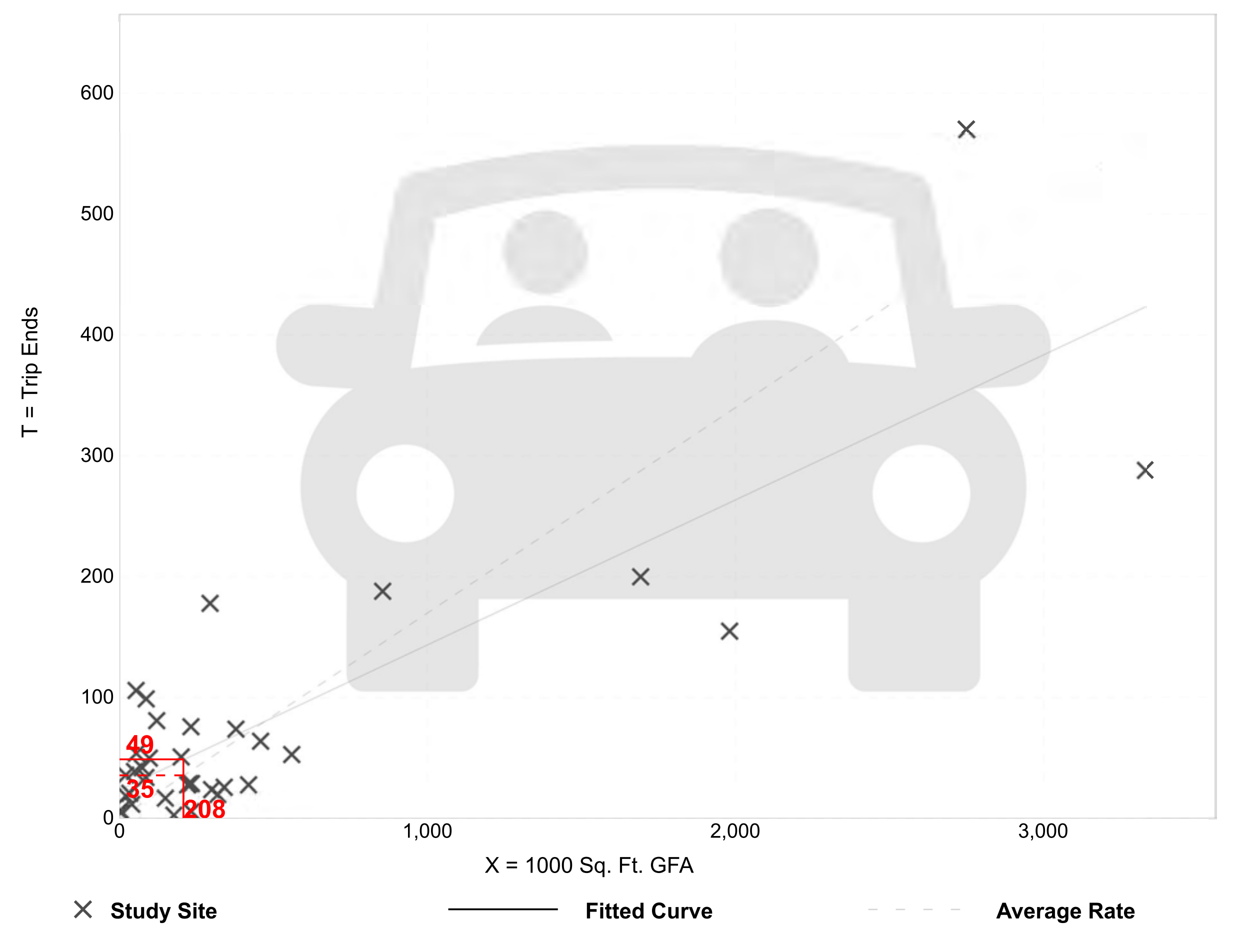
Warehousing
(150)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	36
Avg. 1000 Sq. Ft. GFA:	448
Directional Distribution:	77% entering, 23% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.02 - 1.93	0.19

Data Plot and Equation



Fitted Curve Equation: T = 0.12(X) + 23.62 **R^2= 0.69**

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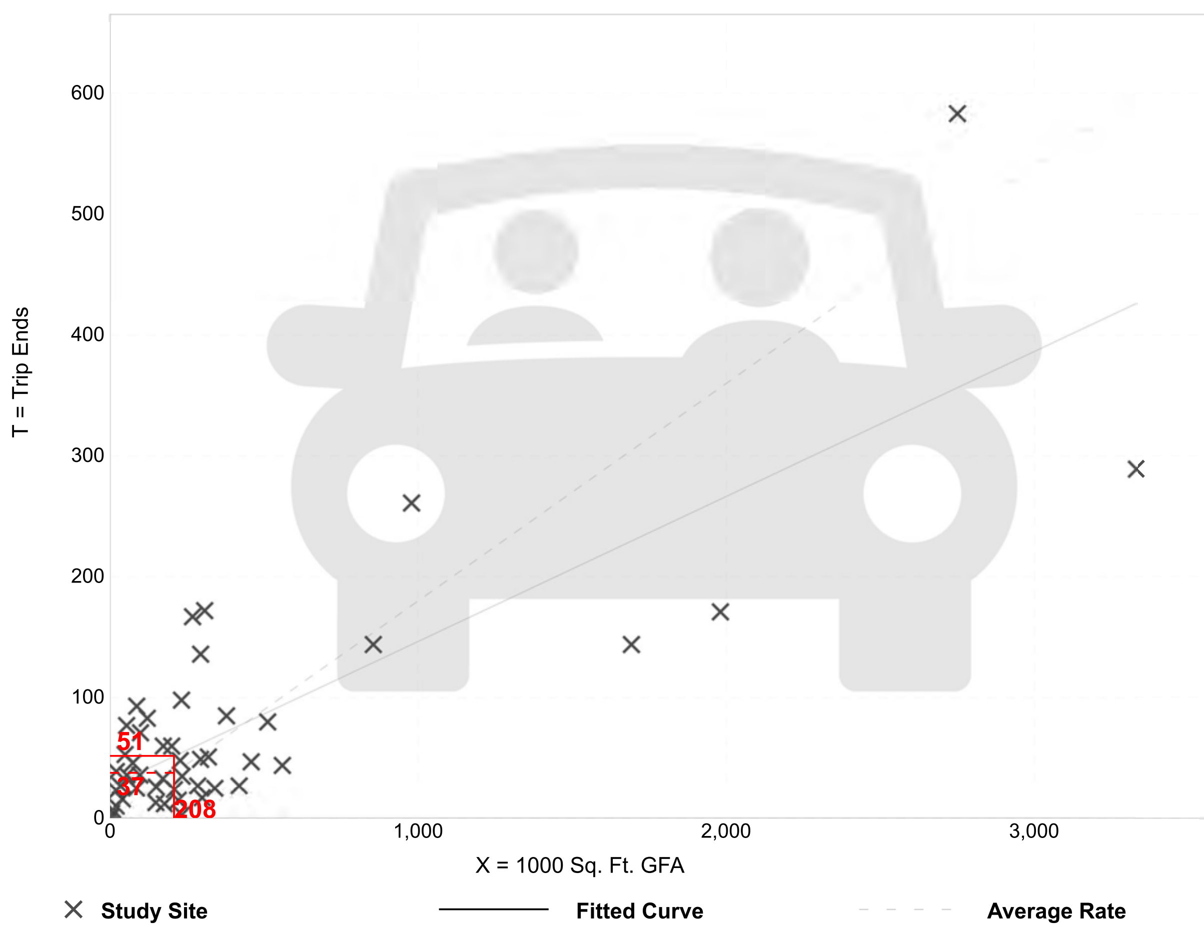
Warehousing
(150)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	49
Avg. 1000 Sq. Ft. GFA:	400
Directional Distribution:	28% entering, 72% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.18	0.01 - 1.80	0.18

Data Plot and Equation



Fitted Curve Equation: T = 0.12(X) + 26.48 **R^2= 0.65**

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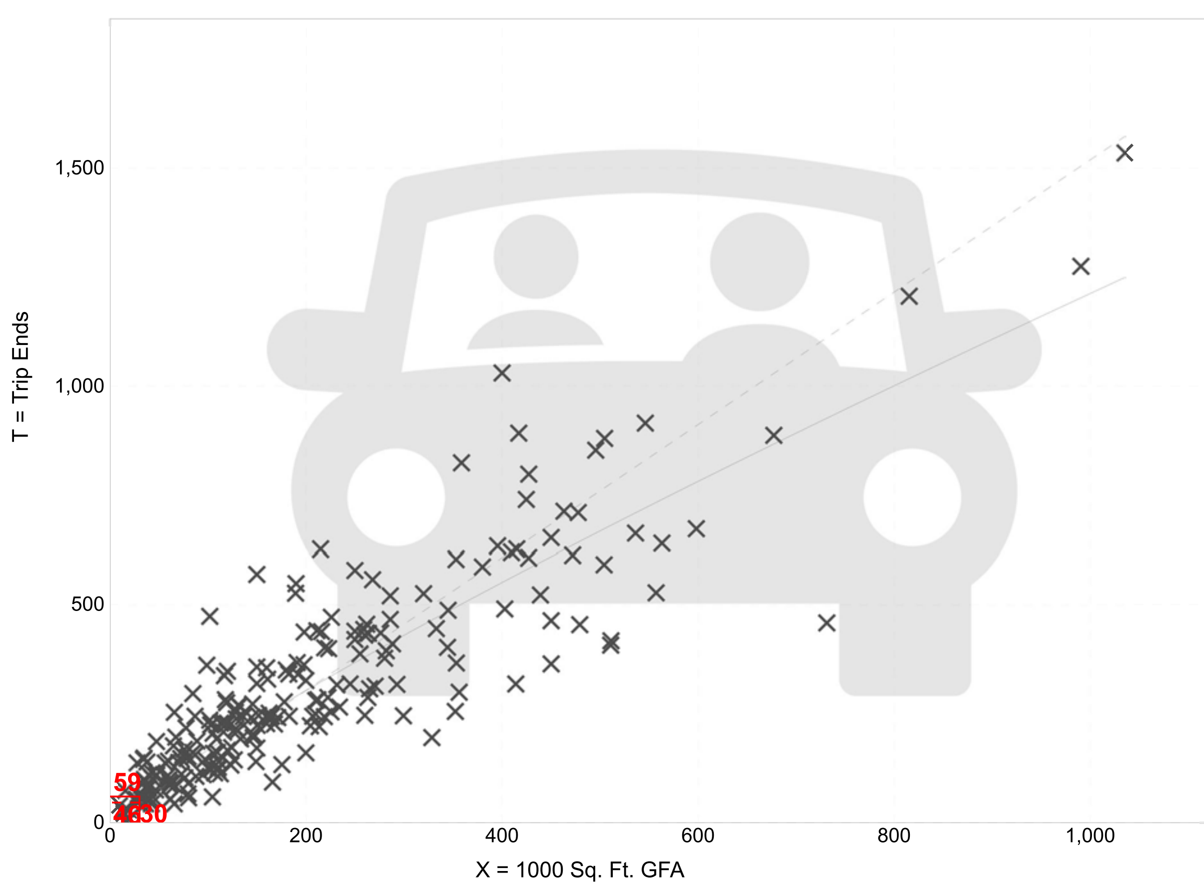
General Office Building
(710)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	221
Avg. 1000 Sq. Ft. GFA:	201
Directional Distribution:	88% entering, 12% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.52	0.32 - 4.93	0.58

Data Plot and Equation



× **Study Site** —— **Fitted Curve** - - - **Average Rate**

Fitted Curve Equation: $Ln(T) = 0.86\ Ln(X) + 1.16$ **R^2= 0.78**

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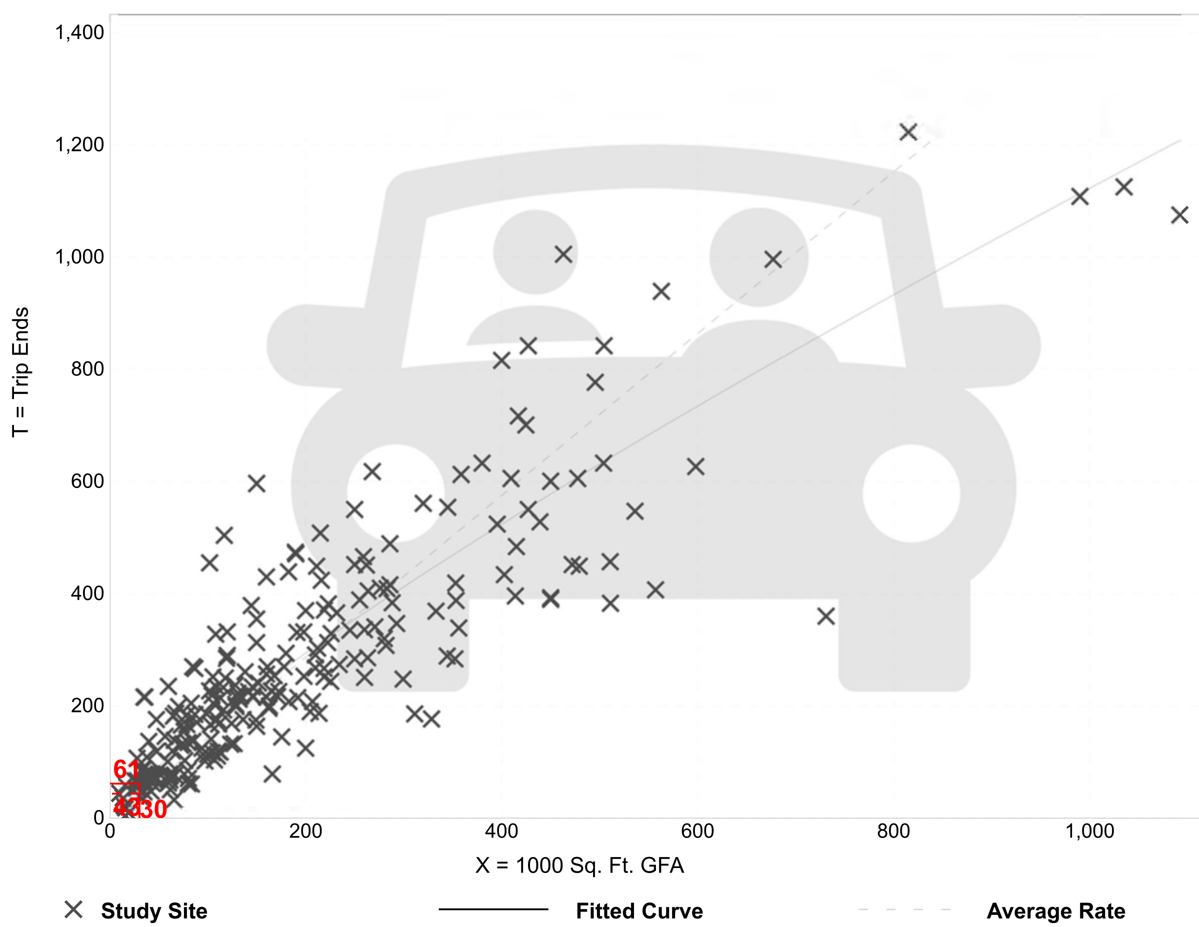
General Office Building
(710)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	232
Avg. 1000 Sq. Ft. GFA:	199
Directional Distribution:	17% entering, 83% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.44	0.26 - 6.20	0.60

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.83 Ln(X) + 1.29 **R^2= 0.77**

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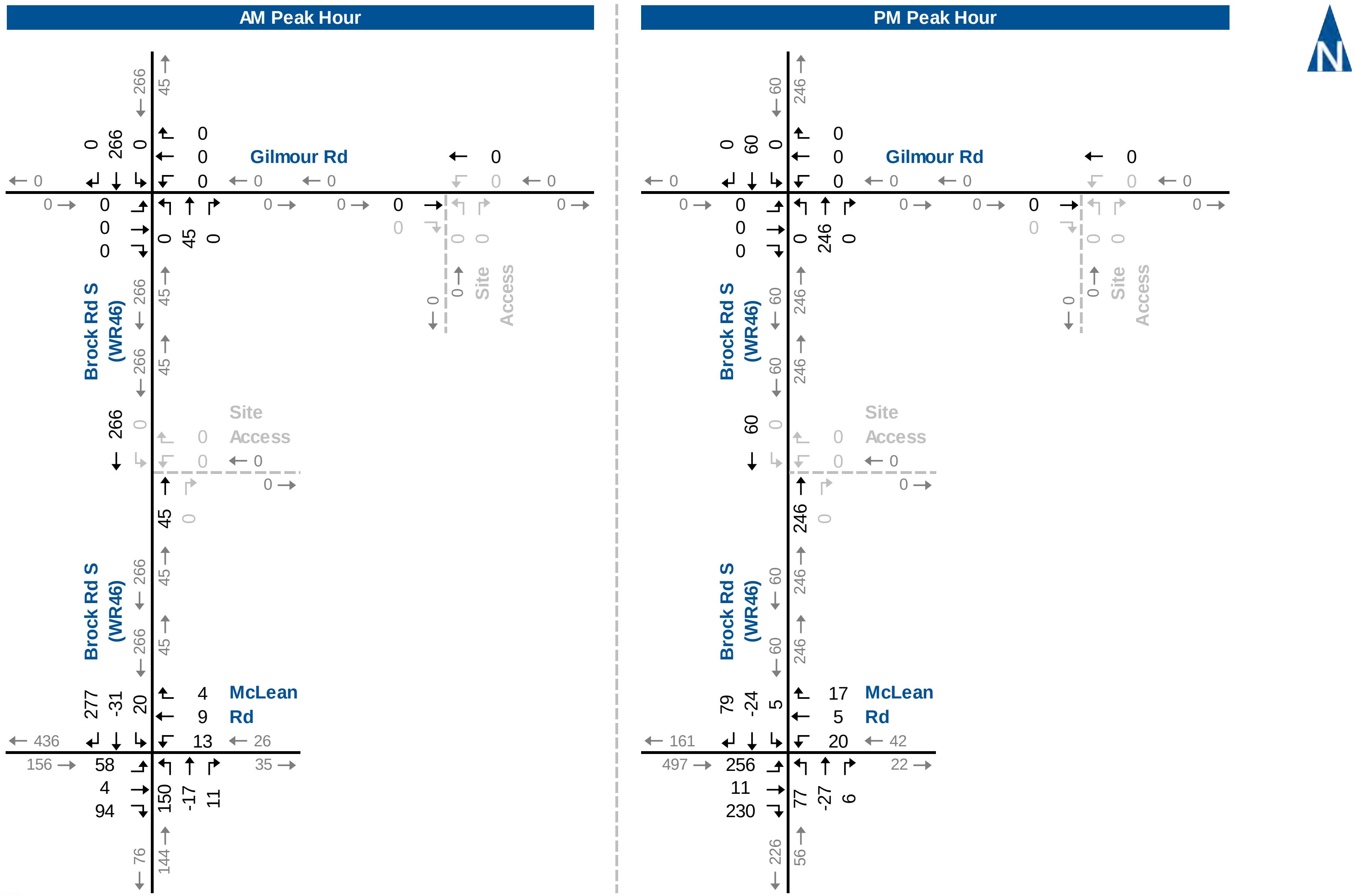
Appendix E

Background Development Traffic Volumes



paradigm
TRANSPORTATION SOLUTIONS LIMITED

Background Developments Traffic Volumes

128 Brock Road South, Puslinch
220579

Figure 1

Appendix F

Background Traffic Operations Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	31	242	40	16	18	260	438	65	55	633	300
Future Volume (vph)	77	31	242	40	16	18	260	438	65	55	633	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	65.0		65.0	65.0		65.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	50.0			50.0			75.0			100.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.867			0.919				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1517	1127	0	986	1329	0	1203	3167	1429	1641	3343	1346
Flt Permitted	0.528			0.388			0.246			0.480		
Satd. Flow (perm)	843	1127	0	403	1329	0	312	3167	1429	829	3343	1346
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		219			20				94			276
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		545.8			677.0			575.9			822.8	
Travel Time (s)		39.3			48.7			41.5			59.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	19%	17%	50%	83%	0%	58%	50%	14%	13%	10%	8%	20%
Adj. Flow (vph)	84	34	263	43	17	20	283	476	71	60	688	326
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	297	0	43	37	0	283	476	71	60	688	326
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		8.0	40.0	40.0	8.0	40.0	40.0
Minimum Split (s)	9.5	25.0		9.5	25.0		12.5	47.0	47.0	12.5	47.0	47.0
Total Split (s)	40.0	20.0		40.0	20.0		40.0	66.0	66.0	14.0	40.0	40.0
Total Split (%)	28.6%	14.3%		28.6%	14.3%		28.6%	47.1%	47.1%	10.0%	28.6%	28.6%
Maximum Green (s)	36.0	13.0		36.0	13.0		36.0	59.0	59.0	10.0	33.0	33.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	None		None	None		None	None	None	None	None	None
Act Effct Green (s)	24.6	14.0		21.8	13.4		66.7	54.3	54.3	45.5	34.0	34.0
Actuated g/C Ratio	0.24	0.14		0.22	0.13		0.66	0.54	0.54	0.45	0.34	0.34
v/c Ratio	0.28	0.86		0.29	0.19		0.66	0.28	0.09	0.14	0.61	0.51
Control Delay	33.1	38.8		36.0	30.7		19.2	15.1	1.9	12.2	34.2	10.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.1	38.8		36.0	30.7		19.2	15.1	1.9	12.2	34.2	10.1
LOS	C	D		D	C		B	B	A	B	C	B
Approach Delay		37.5			33.6			15.4			25.7	
Approach LOS		D			C			B			C	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 101.1	
Natural Cycle: 95	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 24.2	Intersection LOS: C
Intersection Capacity Utilization 86.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 3: Brock Rd S & McLean Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	84	297	43	37	283	476	71	60	688	326
v/c Ratio	0.28	0.86	0.29	0.19	0.66	0.28	0.09	0.14	0.61	0.51
Control Delay	33.1	38.8	36.0	30.7	19.2	15.1	1.9	12.2	34.2	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.1	38.8	36.0	30.7	19.2	15.1	1.9	12.2	34.2	10.1
Queue Length 50th (m)	13.7	16.5	6.9	3.4	28.1	32.2	0.0	4.8	69.2	7.9
Queue Length 95th (m)	28.7	#75.8	17.6	14.9	59.7	47.1	4.7	10.7	105.3	38.3
Internal Link Dist (m)		521.8		653.0		551.9			798.8	
Turn Bay Length (m)	50.0		50.0		65.0		65.0	65.0		65.0
Base Capacity (vph)	557	345	362	193	533	1914	900	471	1125	636
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.86	0.12	0.19	0.53	0.25	0.08	0.13	0.61	0.51

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	31	242	40	16	18	260	438	65	55	633	300
Future Volume (vph)	77	31	242	40	16	18	260	438	65	55	633	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1517	1127		986	1329		1203	3167	1429	1641	3343	1346
Flt Permitted	0.53	1.00		0.39	1.00		0.25	1.00	1.00	0.48	1.00	1.00
Satd. Flow (perm)	843	1127		403	1329		312	3167	1429	829	3343	1346
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	84	34	263	43	17	20	283	476	71	60	688	326
RTOR Reduction (vph)	0	188	0	0	18	0	0	0	34	0	0	183
Lane Group Flow (vph)	84	109	0	43	19	0	283	476	37	60	688	143
Heavy Vehicles (%)	19%	17%	50%	83%	0%	58%	50%	14%	13%	10%	8%	20%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	25.6	14.7		17.2	10.3		64.6	54.3	54.3	41.4	35.1	35.1
Effective Green, g (s)	25.6	14.7		17.2	10.3		64.6	54.3	54.3	41.4	35.1	35.1
Actuated g/C Ratio	0.25	0.14		0.17	0.10		0.62	0.52	0.52	0.40	0.34	0.34
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	280	158		105	131		411	1650	744	378	1126	453
v/s Ratio Prot	0.03	c0.10		c0.03	0.01		c0.17	0.15		0.01	0.21	
v/s Ratio Perm	0.04			0.04			c0.26		0.03	0.05		0.11
v/c Ratio	0.30	0.69		0.41	0.14		0.69	0.29	0.05	0.16	0.61	0.32
Uniform Delay, d1	31.5	42.6		38.2	42.9		12.2	14.1	12.3	19.6	28.8	25.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	11.8		5.4	0.5		4.8	0.2	0.1	0.2	1.4	0.8
Delay (s)	32.7	54.4		43.5	43.4		16.9	14.3	12.3	19.8	30.3	26.5
Level of Service	C	D		D	D		B	B	B	B	C	C
Approach Delay (s)		49.6			43.5			15.0			28.5	
Approach LOS		D			D			B			C	

Intersection Summary

HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	104.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	5	30	1	29	7	516	9	14	954	8
Future Volume (vph)	0	1	5	30	1	29	7	516	9	14	954	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.887			0.935			0.997			0.999	
Flt Protected					0.976			0.999			0.999	
Satd. Flow (prot)	0	941	0	0	1609	0	0	3175	0	0	3327	0
Flt Permitted					0.976			0.999			0.999	
Satd. Flow (perm)	0	941	0	0	1609	0	0	3175	0	0	3327	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		245.4			507.3			822.8			276.5	
Travel Time (s)		17.7			36.5			59.2			19.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	100%	75%	0%	0%	16%	17%	13%	25%	25%	8%	14%
Adj. Flow (vph)	0	1	5	33	1	32	8	561	10	15	1037	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	6	0	0	66	0	0	579	0	0	1061	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type: Other
Control Type: Roundabout
Intersection Capacity Utilization 53.4% ICU Level of Service A
Analysis Period (min) 15

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]

For sales and distribution information, program advice and maintenance, contact TRL:
[redacted]

The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

Filename: Brock Road and Gilmour Road.arc8
Path: [redacted]
Report generation date: 2022-11-08 9:13:49 AM

Summary of intersection performance

	AM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Background						
Leg North	0.87	~1	2.93	0.45	A	2.74	A
Leg West	0.02	~1	8.33	0.01	A		
Leg South	0.36	~1	2.22	0.24	A		
Leg East	0.07	~1	3.90	0.06	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Base, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Base, PM" model duration: 4:00 PM - 5:30 PM
"D3 - Background, AM " model duration: 8:00 AM - 9:30 AM
"D4 - Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2022-11-08 9:13:49 AM

File summary

Title	(untitled)
Location	
Site Number	
Date	2022-11-08
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Background, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Background, AM	Background	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East				2.74	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Brock Road South	
West	West	Private Driveway	
South	South	Brock Road South	
East	East	Gilmour Road	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
North	0.00	99999.00		0.00
West	0.00	99999.00		0.00
South	0.00	99999.00		0.00
East	0.00	99999.00		0.00

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
North	7.00	8.00	30.00	20.00	55.00	25.00	
West	3.50	4.50	30.00	20.00	55.00	25.00	
South	7.00	8.00	30.00	20.00	55.00	25.00	
East	3.50	4.50	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.723	2436.345
West		(calculated)	(calculated)	0.527	1357.445
South		(calculated)	(calculated)	0.723	2436.345

East		(calculated)	(calculated)	0.527	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	976.00	100.000
West	ONE HOUR	✓	6.00	100.000
South	ONE HOUR	✓	532.00	100.000
East	ONE HOUR	✓	60.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	8.000	954.000	14.000
	West	0.000	0.000	5.000	1.000
	South	516.000	7.000	0.000	9.000
	East	29.000	1.000	30.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.01	0.98	0.01
	West	0.00	0.00	0.83	0.17
	South	0.97	0.01	0.00	0.02
	East	0.48	0.02	0.50	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.140	1.080	1.250
	West	1.000	1.000	1.750	2.000
	South	1.130	1.170	1.000	1.250
	East	1.160	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	14.0	8.0	25.0
	West	0.0	0.0	75.0	100.0
	South	13.0	17.0	0.0	25.0

	East	16.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
North	0.45	2.93	0.87	~1	A	895.59	1343.39	58.62	2.62	0.65	58.62	2.62
West	0.01	8.33	0.02	~1	A	5.51	8.26	1.03	7.50	0.01	1.03	7.50
South	0.24	2.22	0.36	~1	A	488.17	732.26	25.78	2.11	0.29	25.78	2.11
East	0.06	3.90	0.07	~1	A	55.06	82.59	5.08	3.69	0.06	5.08	3.69

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	734.78	183.70	732.90	409.35	28.51	0.00	2415.74	2370.99	0.304	0.00	0.47	2.314	A
West	4.52	1.13	4.48	12.02	749.39	0.00	962.62	88.52	0.005	0.00	0.01	6.714	A
South	400.52	100.13	399.63	742.61	11.26	0.00	2428.20	2401.09	0.165	0.00	0.22	2.008	A
East	45.17	11.29	45.00	18.02	392.86	0.00	1150.46	113.81	0.039	0.00	0.04	3.488	A

Main results: (08:15-08:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	877.40	219.35	876.82	489.71	34.14	0.00	2411.67	2370.99	0.364	0.47	0.62	2.539	A
West	5.39	1.35	5.38	14.38	896.58	0.00	885.07	88.52	0.006	0.01	0.01	7.313	A
South	478.26	119.56	478.04	888.49	13.47	0.00	2426.60	2401.09	0.197	0.22	0.28	2.091	A
East	53.94	13.48	53.90	21.56	469.95	0.00	1109.85	113.81	0.049	0.04	0.05	3.651	A

Main results: (08:30-08:45)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	1074.60	268.65	1073.59	599.70	41.80	0.00	2406.13	2370.99	0.447	0.62	0.87	2.923	A
West	6.61	1.65	6.59	17.60	1097.78	0.00	779.07	88.52	0.008	0.01	0.02	8.328	A
South	585.74	146.44	585.41	1087.88	16.50	0.00	2424.42	2401.09	0.242	0.28	0.36	2.216	A
East	66.06	16.52	65.99	26.40	575.51	0.00	1054.23	113.81	0.063	0.05	0.07	3.903	A

Main results: (08:45-09:00)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	1074.60	268.65	1074.59	600.05	41.84	0.00	2406.10	2370.99	0.447	0.87	0.87	2.926	A
West	6.61	1.65	6.61	17.62	1098.81	0.00	778.53	88.52	0.008	0.02	0.02	8.334	A
South	585.74	146.44	585.74	1088.90	16.52	0.00	2424.41	2401.09	0.242	0.36	0.36	2.216	A
East	66.06	16.52	66.06	26.42	575.83	0.00	1054.06	113.81	0.063	0.07	0.07	3.903	A

Main results: (09:00-09:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	877.40	219.35	878.40	490.29	34.20	0.00	2411.62	2370.99	0.364	0.87	0.62	2.543	A
West	5.39	1.35	5.41	14.40	898.20	0.00	884.22	88.52	0.006	0.02	0.01	7.320	A
South	478.26	119.56	478.58	890.11	13.50	0.00	2426.58	2401.09	0.197	0.36	0.28	2.094	A
East	53.94	13.48	54.00	21.60	470.49	0.00	1109.56	113.81	0.049	0.07	0.05	3.653	A

Main results: (09:15-09:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	734.78	183.70	735.37	410.54	28.63	0.00	2415.64	2370.99	0.304	0.62	0.47	2.321	A
West	4.52	1.13	4.53	12.05	751.95	0.00	961.27	88.52	0.005	0.01	0.01	6.726	A
South	400.52	100.13	400.74	745.18	11.30	0.00	2428.17	2401.09	0.165	0.28	0.22	2.012	A
East	45.17	11.29	45.22	18.08	393.96	0.00	1149.89	113.81	0.039	0.05	0.04	3.490	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	6.96	0.46	2.314	A	A
West	0.12	0.01	6.714	A	A
South	3.30	0.22	2.008	A	A
East	0.64	0.04	3.488	A	A

Queueing Delay results: (08:15-08:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	9.12	0.61	2.539	A	A
West	0.16	0.01	7.313	A	A
South	4.12	0.27	2.091	A	A
East	0.81	0.05	3.651	A	A

Queueing Delay results: (08:30-08:45)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	12.80	0.85	2.923	A	A
West	0.22	0.01	8.328	A	A
South	5.34	0.36	2.216	A	A
East	1.05	0.07	3.903	A	A

Queueing Delay results: (08:45-09:00)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	13.05	0.87	2.926	A	A
West	0.23	0.02	8.334	A	A
South	5.40	0.36	2.216	A	A
East	1.07	0.07	3.903	A	A

Queueing Delay results: (09:00-09:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	9.47	0.63	2.543	A	A
West	0.17	0.01	7.320	A	A
South	4.23	0.28	2.094	A	A
East	0.84	0.06	3.653	A	A

Queueing Delay results: (09:15-09:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	7.22	0.48	2.321	A	A
West	0.13	0.01	6.726	A	A
South	3.40	0.23	2.012	A	A
East	0.67	0.04	3.490	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be		N/A	N/A

						because the mean queue is very small or very big.			
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.62	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.87	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.87	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.62	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	18	317	79	21	56	211	829	34	11	488	97
Future Volume (vph)	293	18	317	79	21	56	211	829	34	11	488	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	65.0		65.0	65.0		65.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	50.0			50.0			75.0			100.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.858			0.891				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1300	0	1367	1622	0	1583	3505	1077	1805	3312	1346
Flt Permitted	0.499			0.544			0.344			0.316		
Satd. Flow (perm)	920	1300	0	783	1622	0	573	3505	1077	600	3312	1346
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		345			61				94			125
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		545.8			677.0			575.9			822.8	
Travel Time (s)		39.3			48.7			41.5			59.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	50%	24%	32%	0%	6%	14%	3%	50%	0%	9%	20%
Adj. Flow (vph)	318	20	345	86	23	61	229	901	37	12	530	105
Shared Lane Traffic (%)												
Lane Group Flow (vph)	318	365	0	86	84	0	229	901	37	12	530	105
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		8.0	40.0	40.0	8.0	40.0	40.0
Minimum Split (s)	9.5	25.0		9.5	25.0		12.5	47.0	47.0	12.5	47.0	47.0
Total Split (s)	40.0	20.0		40.0	20.0		40.0	66.0	66.0	14.0	40.0	40.0
Total Split (%)	28.6%	14.3%		28.6%	14.3%		28.6%	47.1%	47.1%	10.0%	28.6%	28.6%
Maximum Green (s)	36.0	13.0		36.0	13.0		36.0	59.0	59.0	10.0	33.0	33.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	None		None	None		None	None	None	None	None	None
Act Effct Green (s)	40.1	24.4		24.1	13.4		58.0	52.9	52.9	46.1	34.8	34.8
Actuated g/C Ratio	0.38	0.23		0.23	0.13		0.55	0.50	0.50	0.43	0.33	0.33
v/c Ratio	0.59	0.65		0.35	0.33		0.49	0.52	0.06	0.03	0.49	0.20
Control Delay	29.5	11.2		27.7	23.6		19.3	22.4	0.2	16.1	33.8	4.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.5	11.2		27.7	23.6		19.3	22.4	0.2	16.1	33.8	4.8
LOS	C	B		C	C		B	C	A	B	C	A
Approach Delay		19.7			25.7			21.1			28.8	
Approach LOS		B			C			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 106.4
Natural Cycle: 95
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 92.1% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: Brock Rd S & McLean Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	318	365	86	84	229	901	37	12	530	105
v/c Ratio	0.59	0.65	0.35	0.33	0.49	0.52	0.06	0.03	0.49	0.20
Control Delay	29.5	11.2	27.7	23.6	19.3	22.4	0.2	16.1	33.8	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.5	11.2	27.7	23.6	19.3	22.4	0.2	16.1	33.8	4.8
Queue Length 50th (m)	50.2	3.5	11.9	4.6	27.3	69.3	0.0	1.2	50.9	0.0
Queue Length 95th (m)	84.9	35.1	25.3	22.4	52.5	127.1	0.0	5.0	83.1	10.0
Internal Link Dist (m)		521.8		653.0		551.9			798.8	
Turn Bay Length (m)	50.0		50.0		65.0		65.0	65.0		65.0
Base Capacity (vph)	682	564	532	257	665	2007	657	388	1082	524
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.65	0.16	0.33	0.34	0.45	0.06	0.03	0.49	0.20

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	18	317	79	21	56	211	829	34	11	488	97
Future Volume (vph)	293	18	317	79	21	56	211	829	34	11	488	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.86		1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1300		1367	1622		1583	3505	1077	1805	3312	1346
Flt Permitted	0.50	1.00		0.54	1.00		0.34	1.00	1.00	0.32	1.00	1.00
Satd. Flow (perm)	920	1300		783	1622		573	3505	1077	601	3312	1346
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	318	20	345	86	23	61	229	901	37	12	530	105
RTOR Reduction (vph)	0	267	0	0	56	0	0	0	19	0	0	69
Lane Group Flow (vph)	318	98	0	86	28	0	229	901	18	12	530	36
Heavy Vehicles (%)	3%	50%	24%	32%	0%	6%	14%	3%	50%	0%	9%	20%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	38.9	25.3		19.4	9.8		58.3	53.0	53.0	39.6	38.3	38.3
Effective Green, g (s)	38.9	25.3		19.4	9.8		58.3	53.0	53.0	39.6	38.3	38.3
Actuated g/C Ratio	0.35	0.23		0.17	0.09		0.52	0.48	0.48	0.36	0.34	0.34
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	509	295		187	142		445	1670	513	228	1140	463
v/s Ratio Prot	c0.14	0.08		0.04	0.02		c0.07	c0.26		0.00	0.16	
v/s Ratio Perm	c0.08			0.04			0.20		0.02	0.02		0.03
v/c Ratio	0.62	0.33		0.46	0.20		0.51	0.54	0.03	0.05	0.46	0.08
Uniform Delay, d1	28.8	35.9		40.4	47.1		15.4	20.5	15.5	23.2	28.5	24.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4	0.7		3.7	0.7		1.0	0.6	0.1	0.1	0.6	0.2
Delay (s)	32.2	36.6		44.1	47.8		16.4	21.1	15.5	23.3	29.1	24.7
Level of Service	C	D		D	D		B	C	B	C	C	C
Approach Delay (s)		34.5			45.9			20.0			28.3	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	111.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	13	5	1	23	7	1151	18	19	578	18
Future Volume (vph)	4	0	13	5	1	23	7	1151	18	19	578	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.895			0.891			0.998			0.996	
Flt Protected		0.989			0.992						0.998	
Satd. Flow (prot)	0	1314	0	0	1614	0	0	3431	0	0	3280	0
Flt Permitted		0.989			0.992						0.998	
Satd. Flow (perm)	0	1314	0	0	1614	0	0	3431	0	0	3280	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		245.4			507.3			822.8			276.5	
Travel Time (s)		17.7			36.5			59.2			19.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	36%	0%	0%	5%	17%	5%	0%	0%	10%	0%
Adj. Flow (vph)	4	0	14	5	1	25	8	1251	20	21	628	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	18	0	0	31	0	0	1279	0	0	669	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type: Other
Control Type: Roundabout
Intersection Capacity Utilization 47.3% ICU Level of Service A
Analysis Period (min) 15

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]

For sales and distribution information, program advice and maintenance, contact TRL:
[redacted] Web: http://www.trlsoftware.co.uk

Filename: Brock Road and Gilmour Road.arc8
Path: [redacted]
Report generation date: 2022-11-08 9:14:14 AM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Background						
Leg North	0.42	~1	2.25	0.28	A	3.05	A
Leg West	0.02	~1	4.56	0.02	A		
Leg South	1.21	1.05	3.37	0.54	A		
Leg East	0.05	~1	5.76	0.05	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Base, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Base, PM" model duration: 4:00 PM - 5:30 PM
"D3 - Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - Background, PM " model duration: 4:00 PM - 5:30 PM
"D5 - Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2022-11-08 9:14:14 AM

File summary

Title	(untitled)
Location	
Site Number	
Date	2022-11-08
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Background, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Background, PM	Background	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East				3.05	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Brock Road South	
West	West	Private Driveway	
South	South	Brock Road South	
East	East	Gilmour Road	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
North	0.00	99999.00		0.00
West	0.00	99999.00		0.00
South	0.00	99999.00		0.00
East	0.00	99999.00		0.00

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
North	7.00	8.00	30.00	20.00	55.00	25.00	
West	3.50	4.50	30.00	20.00	55.00	25.00	
South	7.00	8.00	30.00	20.00	55.00	25.00	
East	3.50	4.50	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.723	2436.345
West		(calculated)	(calculated)	0.527	1357.445
South		(calculated)	(calculated)	0.723	2436.345

East		(calculated)	(calculated)	0.527	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	615.00	100.000
West	ONE HOUR	✓	17.00	100.000
South	ONE HOUR	✓	1179.00	100.000
East	ONE HOUR	✓	29.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	18.000	578.000	19.000
	West	4.000	0.000	13.000	0.000
	South	1154.000	7.000	0.000	18.000
	East	23.000	1.000	5.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.03	0.94	0.03
	West	0.24	0.00	0.76	0.00
	South	0.98	0.01	0.00	0.02
	East	0.79	0.03	0.17	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.100	1.000
	West	1.000	1.000	1.360	1.000
	South	1.050	1.170	1.000	1.000
	East	1.050	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	10.0	0.0
	West	0.0	0.0	36.0	0.0
	South	5.0	17.0	0.0	0.0

	East	5.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
North	0.28	2.25	0.42	~1	A	564.33	846.50	29.98	2.13	0.33	29.98	2.13
West	0.02	4.56	0.02	~1	A	15.60	23.40	1.68	4.31	0.02	1.68	4.31
South	0.54	3.37	1.21	1.05	A	1081.87	1622.81	78.58	2.91	0.87	78.58	2.91
East	0.05	5.76	0.05	~1	A	26.61	39.92	3.33	5.00	0.04	3.33	5.00

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	463.00	115.75	461.98	886.66	9.75	0.00	2429.30	2408.67	0.191	0.00	0.26	2.000	A
West	12.80	3.20	12.74	19.53	452.20	0.00	1119.20	114.91	0.011	0.00	0.01	4.079	A
South	887.61	221.90	885.20	447.67	17.27	0.00	2423.86	2363.00	0.366	0.00	0.60	2.456	A
East	21.83	5.46	21.73	27.79	874.68	0.00	896.61	117.24	0.024	0.00	0.03	4.276	A

Main results: (16:15-16:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	552.87	138.22	552.61	1060.85	11.67	0.00	2427.90	2408.67	0.228	0.26	0.32	2.099	A
West	15.28	3.82	15.27	23.36	540.93	0.00	1072.45	114.91	0.014	0.01	0.02	4.269	A
South	1059.90	264.97	1059.06	535.53	20.67	0.00	2421.41	2363.00	0.438	0.60	0.81	2.773	A
East	26.07	6.52	26.04	33.24	1046.48	0.00	806.09	117.24	0.032	0.03	0.03	4.795	A

Main results: (16:30-16:45)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	677.13	169.28	676.73	1298.70	14.29	0.00	2426.01	2408.67	0.279	0.32	0.42	2.250	A
West	18.72	4.68	18.70	28.60	662.41	0.00	1008.45	114.91	0.019	0.02	0.02	4.560	A
South	1298.10	324.53	1296.53	655.80	25.31	0.00	2418.05	2363.00	0.537	0.81	1.21	3.365	A
East	31.93	7.98	31.87	40.70	1281.13	0.00	682.47	117.24	0.047	0.03	0.05	5.750	A

Main results: (16:45-17:00)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	677.13	169.28	677.12	1300.29	14.31	0.00	2426.00	2408.67	0.279	0.42	0.42	2.250	A
West	18.72	4.68	18.72	28.63	662.81	0.00	1008.24	114.91	0.019	0.02	0.02	4.561	A
South	1298.10	324.53	1298.08	656.20	25.32	0.00	2418.04	2363.00	0.537	1.21	1.21	3.373	A
East	31.93	7.98	31.93	40.74	1282.67	0.00	681.66	117.24	0.047	0.05	0.05	5.757	A

Main results: (17:00-17:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	552.87	138.22	553.27	1063.28	11.71	0.00	2427.88	2408.67	0.228	0.42	0.32	2.101	A
West	15.28	3.82	15.30	23.40	541.58	0.00	1072.11	114.91	0.014	0.02	0.02	4.270	A
South	1059.90	264.97	1061.46	536.19	20.69	0.00	2421.38	2363.00	0.438	1.21	0.82	2.781	A
East	26.07	6.52	26.13	33.30	1048.85	0.00	804.85	117.24	0.032	0.05	0.03	4.804	A

Main results: (17:15-17:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	463.00	115.75	463.27	889.98	9.80	0.00	2429.26	2408.67	0.191	0.32	0.26	2.003	A
West	12.80	3.20	12.81	19.59	453.48	0.00	1118.53	114.91	0.011	0.02	0.01	4.081	A
South	887.61	221.90	888.46	448.96	17.33	0.00	2423.82	2363.00	0.366	0.82	0.61	2.462	A
East	21.83	5.46	21.87	27.88	877.91	0.00	894.91	117.24	0.024	0.03	0.03	4.286	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	3.80	0.25	2.000	A	A
West	0.21	0.01	4.079	A	A
South	8.89	0.59	2.456	A	A
East	0.38	0.03	4.276	A	A

Queueing Delay results: (16:15-16:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	4.77	0.32	2.099	A	A
West	0.27	0.02	4.269	A	A
South	12.00	0.80	2.773	A	A
East	0.51	0.03	4.795	A	A

Queueing Delay results: (16:30-16:45)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	6.26	0.42	2.250	A	A
West	0.35	0.02	4.560	A	A
South	17.70	1.18	3.365	A	A
East	0.75	0.05	5.750	A	A

Queueing Delay results: (16:45-17:00)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	6.34	0.42	2.250	A	A
West	0.36	0.02	4.561	A	A
South	18.15	1.21	3.373	A	A
East	0.76	0.05	5.757	A	A

Queueing Delay results: (17:00-17:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	4.90	0.33	2.101	A	A
West	0.28	0.02	4.270	A	A
South	12.56	0.84	2.781	A	A
East	0.53	0.04	4.804	A	A

Queueing Delay results: (17:15-17:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	3.91	0.26	2.003	A	A
West	0.22	0.01	4.081	A	A
South	9.27	0.62	2.462	A	A
East	0.40	0.03	4.286	A	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.60	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.81	0.00	0.00	0.00	1.05			N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.42	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	1.21	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.42	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	1.21	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.82	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.61	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Appendix G

Total Traffic Operations Reports

Junctions 8

ARCADY 8 - Roundabout Module

Filename: Brock Road and Gilmour Road.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\220578 - Arcady
Report generation date: 2022-12-14 7:55:48 AM

Summary of intersection performance

	AM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total						
Leg North	0.95	~1	3.06	0.47	A	2.87	A
Leg West	0.02	~1	8.65	0.01	A		
Leg South	0.42	~1	2.34	0.27	A		
Leg East	0.09	~1	3.97	0.08	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Base, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Base, PM" model duration: 4:00 PM - 5:30 PM
"D3 - Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - Total, AM " model duration: 8:00 AM - 9:30 AM
"D6 - Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2022-12-14 7:55:48 AM

File summary

Title	(untitled)
Location	
Site Number	
Date	2022-11-08
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Total, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Total, AM	Total	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East				2.87	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Brock Road South	
West	West	Private Driveway	
South	South	Brock Road South	
East	East	Gilmour Road	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
North	0.00	99999.00		0.00
West	0.00	99999.00		0.00
South	0.00	99999.00		0.00
East	0.00	99999.00		0.00

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
North	7.00	8.00	30.00	20.00	55.00	25.00	
West	3.50	4.50	30.00	20.00	55.00	25.00	
South	7.00	8.00	30.00	20.00	55.00	25.00	

East	3.50	4.50	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.723	2436.345
West		(calculated)	(calculated)	0.527	1357.445
South		(calculated)	(calculated)	0.723	2436.345
East		(calculated)	(calculated)	0.527	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	1015.00	100.000
West	ONE HOUR	✓	6.00	100.000
South	ONE HOUR	✓	581.00	100.000
East	ONE HOUR	✓	76.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	8.000	954.000	53.000
	West	0.000	0.000	5.000	1.000
	South	516.000	7.000	0.000	58.000
	East	36.000	1.000	39.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.01	0.94	0.05
	West	0.00	0.00	0.83	0.17
	South	0.89	0.01	0.00	0.10
	East	0.47	0.01	0.51	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.140	1.080	1.250
	West	1.000	1.000	1.750	2.000
	South	1.130	1.170	1.000	1.250
	East	1.160	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	14.0	8.0	25.0
	West	0.0	0.0	75.0	100.0
	South	13.0	17.0	0.0	25.0
	East	16.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
North	0.47	3.06	0.95	~1	A	931.38	1397.07	63.15	2.71	0.70	63.15	2.71
West	0.01	8.65	0.02	~1	A	5.51	8.26	1.06	7.72	0.01	1.06	7.72
South	0.27	2.34	0.42	~1	A	533.14	799.70	29.50	2.21	0.33	29.50	2.21
East	0.08	3.97	0.09	~1	A	69.74	104.61	6.52	3.74	0.07	6.52	3.74

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	764.15	191.04	762.13	414.57	35.25	0.00	2410.86	2321.63	0.317	0.00	0.50	2.372	A
West	4.52	1.13	4.48	12.01	785.37	0.00	943.66	76.88	0.005	0.00	0.01	6.850	A
South	437.41	109.35	436.40	749.31	40.54	0.00	2407.03	2339.44	0.182	0.00	0.25	2.084	A
East	57.22	14.30	56.99	84.11	392.83	0.00	1150.48	247.93	0.050	0.00	0.06	3.522	A

Main results: (08:15-08:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	912.46	228.12	911.83	495.98	42.22	0.00	2405.82	2321.63	0.379	0.50	0.66	2.620	A
West	5.39	1.35	5.38	14.37	939.67	0.00	862.37	76.88	0.006	0.01	0.01	7.506	A
South	522.31	130.58	522.05	896.55	48.51	0.00	2401.27	2339.44	0.218	0.25	0.32	2.186	A
East	68.32	17.08	68.27	100.63	469.94	0.00	1109.85	247.93	0.062	0.06	0.07	3.697	A

Main results: (08:30-08:45)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	1117.54	279.38	1116.41	607.37	51.70	0.00	2398.97	2321.63	0.466	0.66	0.94	3.051	A
West	6.61	1.65	6.59	17.60	1150.51	0.00	751.29	76.88	0.009	0.01	0.02	8.639	A
South	639.69	159.92	639.30	1097.70	59.39	0.00	2393.41	2339.44	0.267	0.32	0.41	2.342	A
East	83.68	20.92	83.59	123.21	575.48	0.00	1054.25	247.93	0.079	0.07	0.09	3.968	A

Main results: (08:45-09:00)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	1117.54	279.38	1117.52	607.76	51.75	0.00	2398.93	2321.63	0.466	0.94	0.95	3.056	A
West	6.61	1.65	6.61	17.62	1151.66	0.00	750.68	76.88	0.009	0.02	0.02	8.646	A
South	639.69	159.92	639.69	1098.81	59.45	0.00	2393.36	2339.44	0.267	0.41	0.42	2.342	A
East	83.68	20.92	83.68	123.31	575.83	0.00	1054.06	247.93	0.079	0.09	0.09	3.968	A

Main results: (09:00-09:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	912.46	228.12	913.58	496.62	42.30	0.00	2405.76	2321.63	0.379	0.95	0.67	2.628	A
West	5.39	1.35	5.41	14.40	941.48	0.00	861.42	76.88	0.006	0.02	0.01	7.518	A
South	522.31	130.58	522.70	898.29	48.61	0.00	2401.21	2339.44	0.218	0.42	0.32	2.187	A
East	68.32	17.08	68.41	100.79	470.52	0.00	1109.55	247.93	0.062	0.09	0.07	3.701	A

Main results: (09:15-09:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	764.15	191.04	764.79	415.83	35.42	0.00	2410.74	2321.63	0.317	0.67	0.51	2.380	A
West	4.52	1.13	4.53	12.05	788.15	0.00	942.20	76.88	0.005	0.01	0.01	6.863	A
South	437.41	109.35	437.66	751.99	40.69	0.00	2406.93	2339.44	0.182	0.32	0.25	2.088	A
East	57.22	14.30	57.27	84.38	393.97	0.00	1149.88	247.93	0.050	0.07	0.06	3.524	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	7.42	0.49	2.372	A	A
West	0.12	0.01	6.850	A	A
South	3.74	0.25	2.084	A	A
East	0.82	0.05	3.522	A	A

Queueing Delay results: (08:15-08:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	9.79	0.65	2.620	A	A
West	0.16	0.01	7.506	A	A
South	4.70	0.31	2.186	A	A
East	1.03	0.07	3.697	A	A

Queueing Delay results: (08:30-08:45)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	13.89	0.93	3.051	A	A
West	0.23	0.02	8.639	A	A
South	6.15	0.41	2.342	A	A
East	1.36	0.09	3.968	A	A

Queueing Delay results: (08:45-09:00)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	14.17	0.94	3.056	A	A
West	0.24	0.02	8.646	A	A
South	6.23	0.42	2.342	A	A
East	1.38	0.09	3.968	A	A

Queueing Delay results: (09:00-09:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

North	10.18	0.68	2.628	A	A
West	0.17	0.01	7.518	A	A
South	4.83	0.32	2.187	A	A
East	1.07	0.07	3.701	A	A

Queueing Delay results: (09:15-09:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	7.70	0.51	2.380	A	A
West	0.13	0.01	6.863	A	A
South	3.85	0.26	2.088	A	A
East	0.85	0.06	3.524	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.50	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.66	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.94	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.41	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.95	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

South	0.42	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.67	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.51	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	31	242	40	16	18	260	488	65	55	645	300
Future Volume (vph)	77	31	242	40	16	18	260	488	65	55	645	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	65.0		65.0	65.0		65.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	50.0			50.0			75.0			100.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.867			0.919				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1517	1127	0	986	1329	0	1203	3167	1429	1641	3343	1346
Flt Permitted	0.528			0.388			0.238			0.455		
Satd. Flow (perm)	843	1127	0	403	1329	0	301	3167	1429	786	3343	1346
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		219			20				94			271
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		545.8			677.0			575.9			621.6	
Travel Time (s)		39.3			48.7			41.5			44.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	19%	17%	50%	83%	0%	58%	50%	14%	13%	10%	8%	20%
Adj. Flow (vph)	84	34	263	43	17	20	283	530	71	60	701	326
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	297	0	43	37	0	283	530	71	60	701	326
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		8.0	40.0	40.0	8.0	40.0	40.0
Minimum Split (s)	9.5	25.0		9.5	25.0		12.5	47.0	47.0	12.5	47.0	47.0
Total Split (s)	40.0	20.0		40.0	20.0		40.0	66.0	66.0	14.0	40.0	40.0
Total Split (%)	28.6%	14.3%		28.6%	14.3%		28.6%	47.1%	47.1%	10.0%	28.6%	28.6%
Maximum Green (s)	36.0	13.0		36.0	13.0		36.0	59.0	59.0	10.0	33.0	33.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	None		None	None		None	None	None	None	None	None
Act Effct Green (s)	24.6	14.0		21.8	13.4		67.2	54.8	54.8	45.5	34.0	34.0
Actuated g/C Ratio	0.24	0.14		0.21	0.13		0.66	0.54	0.54	0.45	0.33	0.33
v/c Ratio	0.29	0.86		0.29	0.19		0.66	0.31	0.09	0.14	0.63	0.52
Control Delay	33.3	39.1		36.2	30.9		19.6	15.4	1.9	12.4	34.8	10.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.3	39.1		36.2	30.9		19.6	15.4	1.9	12.4	34.8	10.6
LOS	C	D		D	C		B	B	A	B	C	B
Approach Delay		37.8			33.7			15.7			26.3	
Approach LOS		D			C			B			C	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 101.6
Natural Cycle: 95
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 24.5 Intersection LOS: C
Intersection Capacity Utilization 86.8% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 3: Brock Rd S & McLean Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	84	297	43	37	283	530	71	60	701	326
v/c Ratio	0.29	0.86	0.29	0.19	0.66	0.31	0.09	0.14	0.63	0.52
Control Delay	33.3	39.1	36.2	30.9	19.6	15.4	1.9	12.4	34.8	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.3	39.1	36.2	30.9	19.6	15.4	1.9	12.4	34.8	10.6
Queue Length 50th (m)	13.8	16.7	7.0	3.4	28.1	36.6	0.0	4.8	71.5	8.8
Queue Length 95th (m)	28.7	#75.8	17.6	14.9	61.1	52.8	4.7	10.7	107.5	39.7
Internal Link Dist (m)		521.8		653.0		551.9			597.6	
Turn Bay Length (m)	50.0		50.0		65.0		65.0	65.0		65.0
Base Capacity (vph)	554	344	360	192	528	1906	898	453	1119	631
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.86	0.12	0.19	0.54	0.28	0.08	0.13	0.63	0.52

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	31	242	40	16	18	260	488	65	55	645	300
Future Volume (vph)	77	31	242	40	16	18	260	488	65	55	645	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1517	1127		986	1329		1203	3167	1429	1641	3343	1346
Flt Permitted	0.53	1.00		0.39	1.00		0.24	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	843	1127		403	1329		301	3167	1429	786	3343	1346
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	84	34	263	43	17	20	283	530	71	60	701	326
RTOR Reduction (vph)	0	188	0	0	18	0	0	0	34	0	0	180
Lane Group Flow (vph)	84	109	0	43	19	0	283	530	37	60	701	146
Heavy Vehicles (%)	19%	17%	50%	83%	0%	58%	50%	14%	13%	10%	8%	20%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	25.6	14.7		17.2	10.3		65.1	54.8	54.8	41.4	35.1	35.1
Effective Green, g (s)	25.6	14.7		17.2	10.3		65.1	54.8	54.8	41.4	35.1	35.1
Actuated g/C Ratio	0.24	0.14		0.16	0.10		0.62	0.52	0.52	0.40	0.34	0.34
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	278	158		104	130		411	1657	747	362	1120	451
v/s Ratio Prot	0.03	c0.10		c0.03	0.01		c0.17	0.17		0.01	0.21	
v/s Ratio Perm	0.04			0.04			c0.26		0.03	0.06		0.11
v/c Ratio	0.30	0.69		0.41	0.15		0.69	0.32	0.05	0.17	0.63	0.32
Uniform Delay, d1	31.7	42.8		38.4	43.2		12.3	14.3	12.2	19.9	29.3	25.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	11.8		5.5	0.5		4.8	0.2	0.1	0.2	1.6	0.9
Delay (s)	33.0	54.6		43.9	43.7		17.1	14.5	12.3	20.1	30.8	26.8
Level of Service	C	D		D	D		B	B	B	C	C	C
Approach Delay (s)		49.8			43.8			15.2			29.0	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	104.7	Sum of lost time (s)	22.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1	5	39	1	36	7	516	58	53	954	8
Future Volume (vph)	0	1	5	39	1	36	7	516	58	53	954	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.887			0.936			0.985			0.999	
Flt Protected					0.975			0.999			0.997	
Satd. Flow (prot)	0	941	0	0	1611	0	0	3109	0	0	3300	0
Flt Permitted					0.975			0.999			0.997	
Satd. Flow (perm)	0	941	0	0	1611	0	0	3109	0	0	3300	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		245.4			72.6			201.2			276.5	
Travel Time (s)		17.7			5.2			14.5			19.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	100%	75%	0%	0%	16%	17%	13%	25%	25%	8%	14%
Adj. Flow (vph)	0	1	5	42	1	39	8	561	63	58	1037	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	6	0	0	82	0	0	632	0	0	1104	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary	
Area Type: Other	
Control Type: Roundabout	
Intersection Capacity Utilization 65.6%	ICU Level of Service C
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	1	5	39	1	36	7	516	58	53	954	8
Future Volume (veh/h)	0	1	5	39	1	36	7	516	58	53	954	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	5	42	1	39	8	561	63	58	1037	9
Approach Volume (veh/h)		6			82			632			1104	
Crossing Volume (veh/h)		1137			569			59			51	
High Capacity (veh/h)		556			883			1322			1331	
High v/c (veh/h)		0.01			0.09			0.48			0.83	
Low Capacity (veh/h)		426			710			1105			1112	
Low v/c (veh/h)		0.01			0.12			0.57			0.99	

Intersection Summary			
Maximum v/c High	0.83		
Maximum v/c Low	0.99		
Intersection Capacity Utilization	65.6%	ICU Level of Service	C

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	2	0	581	2	0	998
Future Volume (vph)	2	0	581	2	0	998
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	902	0	3529	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	902	0	3529	0	0	3539
Link Speed (k/h)	50		50			50
Link Distance (m)	73.0		621.6			201.2
Travel Time (s)	5.3		44.8			14.5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	100%	100%	2%	100%	100%	2%
Adj. Flow (vph)	2	0	632	2	0	1085
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2	0	634	0	0	1085
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		3.6			3.6
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 37.6%	ICU Level of Service A
Analysis Period (min) 15	

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	0	581	2	0	998
Future Volume (Veh/h)	2	0	581	2	0	998
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	0	632	2	0	1085
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1176	317			634	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1176	317			634	
tC, single (s)	8.8	8.9			6.1	
tC, 2 stage (s)						
tF (s)	4.5	4.3			3.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	86	459			503	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	2	421	213	362	723
Volume Left	2	0	0	0	0
Volume Right	0	0	2	0	0
cSH	86	1700	1700	503	1700
Volume to Capacity	0.02	0.25	0.13	0.00	0.43
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0
Control Delay (s)	47.7	0.0	0.0	0.0	0.0
Lane LOS	E				
Approach Delay (s)	47.7	0.0		0.0	
Approach LOS	E				

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	25	88	0	61	16	0
Future Volume (vph)	25	88	0	61	16	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.895					
Flt Protected					0.950	
Satd. Flow (prot)	1700	0	0	1900	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	1700	0	0	1900	1805	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	72.6			434.7	150.6	
Travel Time (s)	5.2			31.3	10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	27	96	0	66	17	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	123	0	0	66	17	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 16.7% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis — Total - 2030
202: Site Access & Gilmour Rd — AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	25	88	0	61	16	0
Future Volume (Veh/h)	25	88	0	61	16	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	96	0	66	17	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)						
pX, platoon unblocked						
vC, conflicting volume			123		141	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			123		141	75
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		98	100
cM capacity (veh/h)			1477		857	992

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	123	66	17
Volume Left	0	0	17
Volume Right	96	0	0
cSH	1700	1477	857
Volume to Capacity	0.07	0.00	0.02
Queue Length 95th (m)	0.0	0.0	0.5
Control Delay (s)	0.0	0.0	9.3
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	16.7%	ICU Level of Service	A
Analysis Period (min)	15		

Junctions 8
ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]

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The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

Filename: Brock Road and Gilmour Road.arc8
Path: [redacted]
Report generation date: 2022-12-14 7:56:20 AM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total						
Leg North	0.44	~1	2.31	0.29	A	3.27	A
Leg West	0.02	~1	4.72	0.02	A		
Leg South	1.24	1.05	3.43	0.54	A		
Leg East	0.23	~1	6.64	0.18	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Base, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Base, PM" model duration: 4:00 PM - 5:30 PM
"D3 - Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - Total, PM " model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2022-12-14 7:56:20 AM

File summary

Title	(untitled)
Location	
Site Number	
Date	2022-11-08
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Total, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Total, PM	Total	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East				3.27	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Brock Road South	
West	West	Private Driveway	
South	South	Brock Road South	
East	East	Gilmour Road	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
North	0.00	99999.00		0.00
West	0.00	99999.00		0.00
South	0.00	99999.00		0.00
East	0.00	99999.00		0.00

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
North	7.00	8.00	30.00	20.00	55.00	25.00	
West	3.50	4.50	30.00	20.00	55.00	25.00	
South	7.00	8.00	30.00	20.00	55.00	25.00	

East	3.50	4.50	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.723	2436.345
West		(calculated)	(calculated)	0.527	1357.445
South		(calculated)	(calculated)	0.723	2436.345
East		(calculated)	(calculated)	0.527	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	625.00	100.000
West	ONE HOUR	✓	17.00	100.000
South	ONE HOUR	✓	1190.00	100.000
East	ONE HOUR	✓	114.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	18.000	578.000	29.000
	West	4.000	0.000	13.000	0.000
	South	1154.000	7.000	0.000	29.000
	East	61.000	1.000	52.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.03	0.92	0.05
	West	0.24	0.00	0.76	0.00
	South	0.97	0.01	0.00	0.02
	East	0.54	0.01	0.46	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

	To				
		North	West	South	East
From	North	1.000	1.000	1.100	1.000
	West	1.000	1.000	1.360	1.000
	South	1.050	1.170	1.000	1.000
	East	1.050	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

	To				
		North	West	South	East
From	North	0.0	0.0	10.0	0.0
	West	0.0	0.0	36.0	0.0
	South	5.0	17.0	0.0	0.0
	East	5.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
North	0.29	2.31	0.44	~1	A	573.51	860.27	31.13	2.17	0.35	31.13	2.17
West	0.02	4.72	0.02	~1	A	15.60	23.40	1.73	4.43	0.02	1.73	4.43
South	0.54	3.43	1.24	1.05	A	1091.96	1637.95	80.38	2.94	0.89	80.39	2.94
East	0.18	6.64	0.23	~1	A	104.61	156.91	14.55	5.57	0.16	14.56	5.57

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	470.53	117.63	469.47	915.10	44.96	0.00	2403.84	2378.59	0.196	0.00	0.26	2.031	A
West	12.80	3.20	12.74	19.53	494.90	0.00	1096.70	106.17	0.012	0.00	0.01	4.163	A
South	895.89	223.97	893.44	482.86	24.78	0.00	2418.43	2338.50	0.370	0.00	0.61	2.472	A
East	85.83	21.46	85.39	43.56	874.66	0.00	896.62	142.25	0.096	0.00	0.11	4.552	A

Main results: (16:15-16:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	561.86	140.47	561.59	1094.93	53.86	0.00	2397.41	2378.59	0.234	0.26	0.33	2.140	A
West	15.28	3.82	15.27	23.36	592.09	0.00	1045.50	106.17	0.015	0.01	0.02	4.380	A
South	1069.79	267.45	1068.92	577.71	29.65	0.00	2414.91	2338.50	0.443	0.61	0.83	2.805	A
East	102.48	25.62	102.32	52.11	1046.47	0.00	806.10	142.25	0.127	0.11	0.15	5.247	A

Main results: (16:30-16:45)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	688.14	172.03	687.71	1340.38	65.90	0.00	2388.70	2378.59	0.288	0.33	0.44	2.310	A
West	18.72	4.68	18.69	28.60	725.01	0.00	975.47	106.17	0.019	0.02	0.02	4.717	A
South	1310.21	327.55	1308.57	707.39	36.31	0.00	2410.10	2338.50	0.544	0.83	1.24	3.425	A
East	125.52	31.38	125.19	63.80	1281.08	0.00	682.49	142.25	0.184	0.15	0.23	6.626	A

Main results: (16:45-17:00)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	688.14	172.03	688.13	1342.12	66.06	0.00	2388.59	2378.59	0.288	0.44	0.44	2.311	A
West	18.72	4.68	18.72	28.63	725.57	0.00	975.17	106.17	0.019	0.02	0.02	4.718	A
South	1310.21	327.55	1310.19	707.95	36.33	0.00	2410.08	2338.50	0.544	1.24	1.24	3.433	A
East	125.52	31.38	125.51	63.86	1282.67	0.00	681.66	142.25	0.184	0.23	0.23	6.641	A

Main results: (17:00-17:15)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	561.86	140.47	562.29	1097.61	54.10	0.00	2397.24	2378.59	0.234	0.44	0.34	2.142	A
West	15.28	3.82	15.31	23.40	592.98	0.00	1045.03	106.17	0.015	0.02	0.02	4.383	A
South	1069.79	267.45	1071.41	578.60	29.69	0.00	2414.88	2338.50	0.443	1.24	0.84	2.814	A
East	102.48	25.62	102.80	52.20	1048.90	0.00	804.82	142.25	0.127	0.23	0.15	5.264	A

Main results: (17:15-17:30)

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
North	470.53	117.63	470.81	918.67	45.25	0.00	2403.63	2378.59	0.196	0.34	0.27	2.033	A
West	12.80	3.20	12.81	19.59	496.47	0.00	1095.87	106.17	0.012	0.02	0.01	4.168	A
South	895.89	223.97	896.77	484.43	24.86	0.00	2418.37	2338.50	0.370	0.84	0.62	2.483	A
East	85.83	21.46	85.99	43.70	877.93	0.00	894.90	142.25	0.096	0.15	0.11	4.569	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	3.92	0.26	2.031	A	A
West	0.22	0.01	4.163	A	A
South	9.05	0.60	2.472	A	A
East	1.58	0.11	4.552	A	A

Queueing Delay results: (16:15-16:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	4.95	0.33	2.140	A	A
West	0.27	0.02	4.380	A	A
South	12.25	0.82	2.805	A	A
East	2.19	0.15	5.247	A	A

Queueing Delay results: (16:30-16:45)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	6.53	0.44	2.310	A	A
West	0.36	0.02	4.717	A	A
South	18.17	1.21	3.425	A	A
East	3.35	0.22	6.626	A	A

Queueing Delay results: (16:45-17:00)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	6.61	0.44	2.311	A	A
West	0.37	0.02	4.718	A	A
South	18.64	1.24	3.433	A	A
East	3.45	0.23	6.641	A	A

Queueing Delay results: (17:00-17:15)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

North	5.09	0.34	2.142	A	A
West	0.28	0.02	4.383	A	A
South	12.83	0.86	2.814	A	A
East	2.31	0.15	5.264	A	A

Queueing Delay results: (17:15-17:30)

Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
North	4.04	0.27	2.033	A	A
West	0.23	0.02	4.168	A	A
South	9.44	0.63	2.483	A	A
East	1.67	0.11	4.569	A	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.61	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.33	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.83	0.00	0.00	0.00	1.05			N/A	N/A
East	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	1.24	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
						Percentiles could not be calculated. This may			

South	1.24	?	?	?	?	be because the mean queue is very small or very big.		N/A	N/A
East	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.84	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.27	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.62	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	18	317	79	21	56	211	844	34	11	538	97
Future Volume (vph)	293	18	317	79	21	56	211	844	34	11	538	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	65.0		65.0	65.0		65.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	50.0			50.0			75.0			100.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.858			0.891				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1300	0	1367	1622	0	1583	3505	1077	1805	3312	1346
Flt Permitted	0.499			0.544			0.309			0.311		
Satd. Flow (perm)	920	1300	0	783	1622	0	515	3505	1077	591	3312	1346
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		345			61				94			125
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		545.8			677.0			575.9			616.6	
Travel Time (s)		39.3			48.7			41.5			44.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	50%	24%	32%	0%	6%	14%	3%	50%	0%	9%	20%
Adj. Flow (vph)	318	20	345	86	23	61	229	917	37	12	585	105
Shared Lane Traffic (%)												
Lane Group Flow (vph)	318	365	0	86	84	0	229	917	37	12	585	105
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		8.0	40.0	40.0	8.0	40.0	40.0
Minimum Split (s)	9.5	25.0		9.5	25.0		12.5	47.0	47.0	12.5	47.0	47.0
Total Split (s)	40.0	20.0		40.0	20.0		40.0	66.0	66.0	14.0	40.0	40.0
Total Split (%)	28.6%	14.3%		28.6%	14.3%		28.6%	47.1%	47.1%	10.0%	28.6%	28.6%
Maximum Green (s)	36.0	13.0		36.0	13.0		36.0	59.0	59.0	10.0	33.0	33.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	None		None	None		None	None	None	None	None	None
Act Effct Green (s)	40.2	24.5		24.1	13.4		58.2	53.2	53.2	46.3	35.0	35.0
Actuated g/C Ratio	0.38	0.23		0.23	0.13		0.55	0.50	0.50	0.43	0.33	0.33
v/c Ratio	0.59	0.65		0.36	0.33		0.52	0.53	0.06	0.03	0.54	0.20
Control Delay	29.6	11.2		27.9	23.8		19.9	22.5	0.2	16.0	34.6	4.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	11.2		27.9	23.8		19.9	22.5	0.2	16.0	34.6	4.8
LOS	C	B		C	C		B	C	A	B	C	A
Approach Delay		19.8			25.8			21.3			29.9	
Approach LOS		B			C			C			C	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 106.7	
Natural Cycle: 95	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 23.4	Intersection LOS: C
Intersection Capacity Utilization 92.1%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 3: Brock Rd S & McLean Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	318	365	86	84	229	917	37	12	585	105
v/c Ratio	0.59	0.65	0.36	0.33	0.52	0.53	0.06	0.03	0.54	0.20
Control Delay	29.6	11.2	27.9	23.8	19.9	22.5	0.2	16.0	34.6	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	11.2	27.9	23.8	19.9	22.5	0.2	16.0	34.6	4.8
Queue Length 50th (m)	50.2	3.5	11.9	4.6	27.3	71.0	0.0	1.2	57.3	0.0
Queue Length 95th (m)	86.1	35.5	25.6	22.6	52.4	129.7	0.0	5.0	92.6	9.8
Internal Link Dist (m)		521.8		653.0		551.9			592.6	
Turn Bay Length (m)	50.0		50.0		65.0		65.0	65.0		65.0
Base Capacity (vph)	681	563	531	257	653	2004	656	385	1085	525
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.65	0.16	0.33	0.35	0.46	0.06	0.03	0.54	0.20

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	18	317	79	21	56	211	844	34	11	538	97
Future Volume (vph)	293	18	317	79	21	56	211	844	34	11	538	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.86		1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1300		1367	1622		1583	3505	1077	1805	3312	1346
Flt Permitted	0.50	1.00		0.54	1.00		0.31	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	920	1300		783	1622		515	3505	1077	591	3312	1346
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	318	20	345	86	23	61	229	917	37	12	585	105
RTOR Reduction (vph)	0	267	0	0	56	0	0	0	19	0	0	69
Lane Group Flow (vph)	318	98	0	86	28	0	229	917	18	12	585	36
Heavy Vehicles (%)	3%	50%	24%	32%	0%	6%	14%	3%	50%	0%	9%	20%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	38.9	25.3		19.4	9.8		58.5	53.2	53.2	39.8	38.5	38.5
Effective Green, g (s)	38.9	25.3		19.4	9.8		58.5	53.2	53.2	39.8	38.5	38.5
Actuated g/C Ratio	0.35	0.23		0.17	0.09		0.53	0.48	0.48	0.36	0.35	0.35
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	5.0	3.0		5.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	508	295		186	142		423	1673	514	225	1144	465
v/s Ratio Prot	c0.14	0.08		0.04	0.02		c0.08	c0.26		0.00	0.18	
v/s Ratio Perm	c0.08			0.04			0.21		0.02	0.02		0.03
v/c Ratio	0.63	0.33		0.46	0.20		0.54	0.55	0.03	0.05	0.51	0.08
Uniform Delay, d1	28.9	36.0		40.5	47.2		15.6	20.6	15.5	23.2	29.0	24.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4	0.7		3.8	0.7		1.4	0.7	0.1	0.1	0.8	0.2
Delay (s)	32.3	36.7		44.3	47.9		17.1	21.2	15.5	23.3	29.7	24.7
Level of Service	C	D		D	D		B	C	B	C	C	C
Approach Delay (s)		34.6			46.1			20.3			28.9	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	22.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	13	52	1	61	7	1154	29	29	578	18
Future Volume (vph)	4	0	13	52	1	61	7	1154	29	29	578	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.895			0.928			0.996			0.996	
Flt Protected		0.989			0.978						0.998	
Satd. Flow (prot)	0	1314	0	0	1680	0	0	3426	0	0	3285	0
Flt Permitted		0.989			0.978						0.998	
Satd. Flow (perm)	0	1314	0	0	1680	0	0	3426	0	0	3285	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		245.4			93.6			206.2			276.5	
Travel Time (s)		17.7			6.7			14.8			19.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	36%	0%	0%	5%	17%	5%	0%	0%	10%	0%
Adj. Flow (vph)	4	0	14	57	1	66	8	1254	32	32	628	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	18	0	0	124	0	0	1294	0	0	680	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type: Other
Control Type: Roundabout
Intersection Capacity Utilization 57.0% ICU Level of Service B
Analysis Period (min) 15

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	4	0	13	52	1	61	7	1154	29	29	578	18
Future Volume (veh/h)	4	0	13	52	1	61	7	1154	29	29	578	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	14	57	1	66	8	1254	32	32	628	20
Approach Volume (veh/h)		18			124			1294			680	
Crossing Volume (veh/h)		717			1266#			36			66	
High Capacity (veh/h)		784			500			1346			1315	
High v/c (veh/h)		0.02			0.25			0.96			0.52	
Low Capacity (veh/h)		623			378			1126			1098	
Low v/c (veh/h)		0.03			0.33			1.15			0.62	

Intersection Summary

Maximum v/c High 0.96
Maximum v/c Low 1.15
Intersection Capacity Utilization 57.0% ICU Level of Service B
Crossing flow exceeds 1200, method is not applicable

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	3	0	1190	3	0	643
Future Volume (vph)	3	0	1190	3	0	643
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	902	0	3431	0	0	3438
Flt Permitted	0.950					
Satd. Flow (perm)	902	0	3431	0	0	3438
Link Speed (k/h)	50		50			50
Link Distance (m)	83.7		616.6			206.2
Travel Time (s)	6.0		44.4			14.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	100%	100%	5%	100%	100%	5%
Adj. Flow (vph)	3	0	1293	3	0	699
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3	0	1296	0	0	699
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		3.6			3.6
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 43.0% ICU Level of Service A

Analysis Period (min) 15

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	3	0	1190	3	0	643
Future Volume (Veh/h)	3	0	1190	3	0	643
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	1293	3	0	699
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1644	648			1296	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1644	648			1296	
tC, single (s)	8.8	8.9			6.1	
tC, 2 stage (s)						
tF (s)	4.5	4.3			3.2	
p0 queue free %	91	100			100	
cM capacity (veh/h)	34	242			211	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	3	862	434	233	466
Volume Left	3	0	0	0	0
Volume Right	0	0	3	0	0
cSH	34	1700	1700	211	1700
Volume to Capacity	0.09	0.51	0.26	0.00	0.27
Queue Length 95th (m)	2.2	0.0	0.0	0.0	0.0
Control Delay (s)	121.3	0.0	0.0	0.0	0.0
Lane LOS	F				
Approach Delay (s)	121.3	0.0		0.0	
Approach LOS	F				

Intersection Summary

Average Delay	0.2		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	36	21	0	29	85	0
Future Volume (vph)	36	21	0	29	85	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.950					
Flt Protected					0.950	
Satd. Flow (prot)	1805	0	0	1900	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	1805	0	0	1900	1805	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	93.6			413.7	159.4	
Travel Time (s)	6.7			29.8	11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	39	23	0	32	92	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	62	0	0	32	92	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 14.7%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	36	21	0	29	85	0
Future Volume (Veh/h)	36	21	0	29	85	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	23	0	32	92	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)						
pX, platoon unblocked						
vC, conflicting volume			62		82	50
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			62		82	50
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		90	100
cM capacity (veh/h)			1554		924	1023

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	62	32	92
Volume Left	0	0	92
Volume Right	23	0	0
cSH	1700	1554	924
Volume to Capacity	0.04	0.00	0.10
Queue Length 95th (m)	0.0	0.0	2.6
Control Delay (s)	0.0	0.0	9.3
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	14.7%	ICU Level of Service	A
Analysis Period (min)	15		

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Noise Feasibility Study

Proposed Industrial Development

128 Brock Street South

Puslinch, Ontario

Prepared for:

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March 9, 2023

HGC Project No. 02200716

VERSION CONTROL

Noise Feasibility Study,
128 Brock Street South,
Puslinch, Ontario.

Ver.	Date	Version Description / Changelog	Prepared By
0	March 9, 2023	Noise Feasibility Study in support of a Zoning by-law amendment and Site Plan Approval.	A. Rogers/ M. Chan

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Table of Contents

1 Introduction and Summary

Howe Gastmeier Chapnik Limited (HGC Engineering) was retained by Wellington Motor Freight to undertake a noise assessment for a proposed industrial development located at 128 Brock Street South in Puslinch, Ontario. The noise study is required by the municipality as part of the approvals process, specifically for a Zoning by-law amendment and Site Plan Approval. The study has been completed in accordance with the guidelines of the Municipality and the Ministry of Environment, Conservation and Parks (MECP).

An investigation of the potential noise impact from the proposed general industrial building onto the existing sensitive receptors was conducted. The analysis is based on information obtained from discussion with Wellington Motor Freight personnel, site visits, and HGC Engineering's past experience with similar facilities. The analysis includes assessment of the noise emissions of the anticipated trucking activities, rooftop mechanical equipment, and employee vehicle activities with respect to the closest existing residences The results of the analysis indicate the development is feasible at the site and can be within the limits of the MECP guidelines with the inclusion of noise control measures. The reader is referred to the main body of the report for assumptions and results of the analysis.

The acoustic recommendations may be subject to modifications if the site plan is changed significantly, operating scenarios are significantly different to those assumed in the assessment or these is a significant increase in background sound levels.

2 Site Description

The site is located on the northeast side of Brock Road South, southeast of Gilmour Road in Puslinch, Ontario. Figure 1 shows a key plan of the area. One industrial building and one office building with parking areas, trucking routes, and loading areas are indicated on the site plan prepared by Tacoma Engineers Inc. dated December 21, 2022, and is attached as Figure 2.

HGC Engineering visited the site in November 2022 to confirm the locations of the existing sensitive receptors and observe the acoustical environment. The area surrounding the subject site is best categorized as a Class 2 (Semi-Urban) acoustical environment, under MECP noise assessment guidelines where the daytime sound levels are dominated by human activities and road traffic. The most potentially impacted residences are located to the north of the site, along Gilmour Road, and northwest of the site, on Brock Road South. East, south and west of the site are existing industrial facilities. There is significant grading in the area of and surrounding the site, sloping up to the south and east from the intersection of Brock Road South and Gilmour Road.

2.1 Noise Source Description

The primary sources of sound associated with the proposed buildings will be arriving, departing, and idling trucks and employee vehicles, and rooftop air conditioning condenser equipment. The facility will operate during daytime hours only.

3 Noise Level Criteria

3.1 D1 – D6 Guidelines for Land Use Compatibility

The requirements for this study requested by the Municipality refers to determining if the proposed development is feasible and compatible with adjacent existing residential uses. The MECP D1 [1] and D6 [2] Guidelines address issues of compatibility between industrial and noise sensitive land uses in relation to land use changes.

For planning purposes for greenfield sites, the potential zone of influence of a Class I industrial use is 70 m and the minimum recommended distance setback is 20 m. The potential zone of influence of a Class II industry is 300 m and the minimum recommended distance setback is 70 m. For infill projects or projects located in transitional areas the recommended minimum distance setbacks can be reduced, based on the results of technical studies such as this study.

For the size and use of the industrial building, the proposed development can be considered a Class II industrial use. Typically, the recommended minimum distance setbacks apply between the property lines of the facilities, but exceptions can be made if the property lines are adjoined and portions of the residential or industrial lands are reserved for non- noise related uses, such as driveways, snow storage, parking lots or earth berms. In this case, there is approximately 70 m between the nearest existing residence and the tractor parking area, between which are lands reserved for snow storage which can be included in the setback distance. This meets the minimum separation distance for a Class II industry. Furthermore, the results from the assessment in Section 5 indicated that the MECP limits can be met with the inclusion of noise controls.

3.2 Criteria Governing Stationary Noise Sources

MECP Guideline NPC-300 [3] is the MECP guideline for use in investigating Land Use Compatibility issues with regard to noise. An industrial or commercial facility is classified in the MECP Guideline NPC-300 as a stationary source of sound (as compared to sources such as traffic or construction, for example) for noise assessment purposes. A stationary noise source encompasses the noise from all the activities and equipment within the property boundary of a facility including regular on-site truck traffic, material handling and mechanical equipment. Noise from these sources may potentially impact the existing sensitive receptors. In terms of background sound, the development is located in a semi-urban Class 2 acoustical environment which is characterized by an acoustical environment dominated by road traffic and human activity during the daytime hours.

Non-Impulsive Sources

NPC-300 is intended for use in the planning of both residential and commercial/industrial land uses and provides the acceptability limits for sound due to commercial operations in that regard. The facade of a residence (i.e., in the plane of a window), or any associated usable outdoor area is considered a sensitive point of reception (within 30 m of a dwelling façade). NPC-300 stipulates that the exclusionary non-impulsive sound level limit for a stationary noise source in a semi-urban Class 2 area is taken to be 50 dBA during daytime hours (07:00 to 23:00), and 45 dBA during nighttime hours (23:00 to 07:00) at the plane of the windows of noise sensitive spaces. If the background sound levels due to road traffic exceed the exclusionary limits, then that background sound level becomes the criterion. The background sound level is defined as the sound level that occurs when the source under consideration is not operating, and may include traffic noise and natural sounds.

Commercial activities such as the occasional movement of customer/employee vehicles and garbage collection are not of themselves considered to be significant noise sources in the MECP guidelines. However, the Town of Puslinch has indicated that employee vehicle activity should be considered in the assessment.

Thirteen existing residences near the site are considered to be the representative noise sensitive receptors (R1 to R13) in this study. R1, R2, R4 to R7 and R12 are 2-storey houses and R3, R8 to R11 and R13 are 1-storey houses. Receptor locations are shown on Figures 3, 4 and 6.

Impulsive Sources
Acceptability limits for frequently occurring sounds that are impulsive in character (such as those from coupling and decoupling of trailers) are also provided in NPC-300. The limit is determined in a similar fashion to non-impulsive sounds and the same limits apply in the case.

The table below summarizes the applicable sound level limits to which the operation of the proposed industrial facility is assessed.

Table 1: Applicable Sound Level Limits, L_{EQ}/L_{LM} (dBA/dBAI)

Receptor	Sound Level Limits		
	Day (07:00 to 19:00)	Evening (19:00 to 23:00)	Night (23:00 to 07:00)
R1 to R13	50	50	45

Compliance with MECP criteria generally results in acceptable levels of sound at the sensitive receptors although there may be residual audibility during periods of low background sound.

4 Assessment Methodology

Predictive noise modelling was used to assess the potential noise impact of mechanical equipment, trucking activities, and employee vehicle activities at the residential receptors. Assumed operational information outlined below and surrounding building locations obtained from aerial photography were used as input to a predictive computer model (Cadna/A 2023 build: 195.5312), in order to estimate the sound levels from the proposed buildings at the existing receptors. Cadna/A is a computer implementation of ISO Standard 9613-2 [4] which considers attenuation due to distance (geometrical spreading), shielding by intervening structures (such as barriers), air attenuation and ground absorption. Additional information, including a figure showing the stationary noise source locations, is provided in Appendix A.

Topographical data obtained from Government of Canada's High Resolution Digital Elevation Model was used for the site and surrounding areas, along with proposed grading information on the site plan. A Traffic Impact Study prepared by Paradign Transportation Solutions Ltd. dated December 2022 was reviewed to assess the volume of employee vehicles arriving and departing the site during a peak hour (see Appendix B).

For general warehousing facilities, the building would typically be ventilated passively and only the office building would be provided with air conditioning.

The facility will generally operate during daytime hours only (7:00 – 17:00); therefore, nighttime assessment is not considered further. In this impact assessment, we have considered the following worst-case (busiest hour) scenarios for the daytime hours. It has been assumed truck engines will idle for 10 minutes out of each hour as outlined in the Guelph by-law Number (1998)-15945. Figure 3 shows the location of the steady noise source locations and Figure 4 shows the location of the impulsive noise source locations. Vehicles are also conservatively assumed to idle for 5 minutes in the employee parking area. Truck idling, car idling, and rooftop HVAC units are shown as green crosses, truck pass-bys and car pass-bys are shown as a green line, and truck coupling/decoupling is shown as a green hatched area.

Assumed daytime/evening worst-case hour scenario:

- 23 trucks arrive and depart the facility or park at the tractor parking area;
- Trucks are assumed to idle in the loading bay or parking area for 10 minutes;
- 106 employee cars arrive and depart the facility or park in the employee parking area;
- Employee cars are assumed to idle in the parking area for 5 minutes;
- Employee cars idling while waiting to exit the facility for a combined total of 15 minutes;
- All rooftop equipment operates at full capacity for the full hour.

Additional information and assumptions used in the analysis:

- The height of the proposed building is 15 m;
- The facility is assumed to operate only during daytime hours;
- Rooftop HVAC units are assumed to be 1.5 m tall.

Sound emission data for the trucking activities, rooftop equipment, and employee vehicle activity was obtained from HGC Engineering project files which were measured from past similar projects. The employee vehicle movement noise source was included in the model as a line source producing equivalent sound pressure levels at a reference distance to those predicted by STAMSON 5.04, a computer algorithm developed by the MECP, based on the traffic volumes presented in the Traffic Impact Study. The calibration output from STAMSON is included in Appendix C. The sound power levels for non-impulsive and impulsive sources measured from similar facilities were used in our analysis and are summarized in Table 2.

Table 2: Sound Power Levels Used in the Analysis [dB re 10-12 W]

Source	Octave Band Centre Frequency [Hz]								A
	63	125	250	500	1k	2k	4k	8k	
HVAC Unit, 10-ton	91	89	86	84	84	78	76	67	88
Truck, traveling on truck route	101	100	94	96	97	95	91	86	101
Truck, idling	96	91	88	88	91	90	81	70	95
Car, idling	90	86	76	72	71	68	62	58	77
Car, traveling through parking area	64	64	62	63	59	59	52	44	65

Impulsive noises are assessed separately from the non-impulsive sound sources. Two types of impulsive sounds are expected to be emitted from the facility: loading/unloading of trailers by forklifts and coupling/decoupling of trucks to/from trailers. The multiple impulsive noises are combined to obtain a logarithmic mean impulse sound level (L_{LM}) of 110 dBAI. This was calculated based on measurements conducted by HGC Engineering for similar past projects. Impulsive sounds were modeled and distributing the assumed source sound power levels throughout the loading and parking area of the site. The impulsive sounds were assumed to be emitted during all daytime and evening time periods.

5 Assessment Results and Recommendations

Non-Impulsive Sources

The predicted sound levels due to the trucking activities (arriving, idling and departing) and rooftop mechanical equipment at the representative receptors (R1 to R13) during a worst-case busiest hour operating scenario, are summarized in the following table and shown graphically in Figure 3.

Table 3: Predicted Non-Impulsive Source Sound Levels at Receptors during a Worst-case Operating Scenario hour (Without Mitigation), Leq (dBA)

Receptor	Description	Criteria Day/Eve (dBA)	Daytime OLA	Daytime/ Evening (dBA)
R1	95 Brock Road South	50 / 50	<40	42
R2	2 Gilmour Road	50 / 50	47	48
R3	4 Gilmour Road	50 / 50	46	45
R4	6 Gilmour Road	50 / 50	46	45
R5	5 Gilmour Road	50 / 50	50	49
R6	10 Aberfoyle Mill Crescent	50 / 50	45	46
R7	9 Aberfoyle Mill Crescent	50 / 50	43	45
R8	20 Gilmour Road	50 / 50	<40	43
R9	24 Gilmour Road	50 / 50	40	41
R10	30 Gilmour Road	50 / 50	<40	<40
R11	34 Gilmour Road	50 / 50	<40	<40
R12	38 Gilmour Road	50 / 50	<40	<40
R13	37 Gilmour Road	50 / 50	<40	<40

Impulsive Sources

The predicted impulsive sound levels are provided in Figure 4 and also summarized in Table 4.

Table 4: Predicted Impulsive Sound Levels at Residential Receptors (Without Mitigation), L_{LM} (dBAI)

Receptor	Description	Criteria Day/Eve (dBAI)	Predicted Impulsive Sound Levels (dBAI)
R1	95 Brock Road South	50 / 50	48
R2	2 Gilmour Road	50 / 50	52
R3	4 Gilmour Road	50 / 50	49
R4	6 Gilmour Road	50 / 50	51
R5	5 Gilmour Road	50 / 50	53
R6	10 Aberfoyle Mill Crescent	50 / 50	51
R7	9 Aberfoyle Mill Crescent	50 / 50	51
R8	20 Gilmour Road	50 / 50	48
R9	24 Gilmour Road	50 / 50	48
R10	30 Gilmour Road	50 / 50	46
R11	34 Gilmour Road	50 / 50	42
R12	38 Gilmour Road	50 / 50	<40
R13	37 Gilmour Road	50 / 50	45

The results of this analysis indicate that the predicted non-impulsive sound levels due to trucking activities, mechanical equipment, and employee vehicle activities at the proposed facility are expected be within the applicable limits at the noise sensitive receptors during an assumed worst-case operational scenario. However, the impulsive sound levels due to trucking activities are expected to exceed the applicable limits at the noise sensitive receptors during an assumed worst-case operational scenario. Noise control measures are required and provided in Section 5.1.

5.1 Recommendations

Calculations indicate that a 2.2 m high noise barrier (approximately 90 m in length), relative to proposed grade, northwest of the loading bays, as shown in Figure 5, will provide sufficient noise mitigation. A noise barrier can consist of an earth berm or a noise wall on top of an earth berm. The noise wall can be constructed from a variety of materials such as wood, metal, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks and has a solid construction, with a surface density of no less than 20 kg/m^2.

The predicted impulsive sound levels with the inclusion of the noise barrier mentioned above are summarized in Tables 5, and shown on Figure 6.

Table 6: Predicted Impulsive Sound Levels at Residential Receptors (With Mitigation), L_{LM} (dBAI)

Receptor	Description	Criteria Day/Eve (dBAI)	Predicted Impulsive Sound Levels (dBAI)
R1	95 Brock Road South	50 / 50	46
R2	2 Gilmour Road	50 / 50	50
R3	4 Gilmour Road	50 / 50	47
R4	6 Gilmour Road	50 / 50	48
R5	5 Gilmour Road	50 / 50	50
R6	10 Aberfoyle Mill Crescent	50 / 50	49
R7	9 Aberfoyle Mill Crescent	50 / 50	49
R8	20 Gilmour Road	50 / 50	48
R9	24 Gilmour Road	50 / 50	47
R10	30 Gilmour Road	50 / 50	46
R11	34 Gilmour Road	50 / 50	42
R12	38 Gilmour Road	50 / 50	<40
R13	37 Gilmour Road	50 / 50	45

6 Conclusions

The acoustical analysis indicates that sound levels predicted under worst case operating scenarios and incorporating the noise control measures recommended herein, are expected to comply with the applicable MECP limits for non-impulsive and impulsive sounds at neighbouring receptors.

The acoustic recommendations may be subject to modifications if the site plan is changed significantly, operating scenarios are significantly different to those assumed in the assessment or there is a significant increase in background sound levels.

6.1 Implementation

1) Prior to the issuance of building permits for this development or at appropriate approvals stage by the municipality, a Professional Engineer qualified to provide acoustical engineering services in Ontario shall review the site, building plans, rooftop mechanical specification and grading plans to confirm that the assumptions are in accordance with the approved noise study and that the appropriate height and extent of the required noise barrier have been incorporated to meet MECP guideline limits at adjacent receptors.

7 References

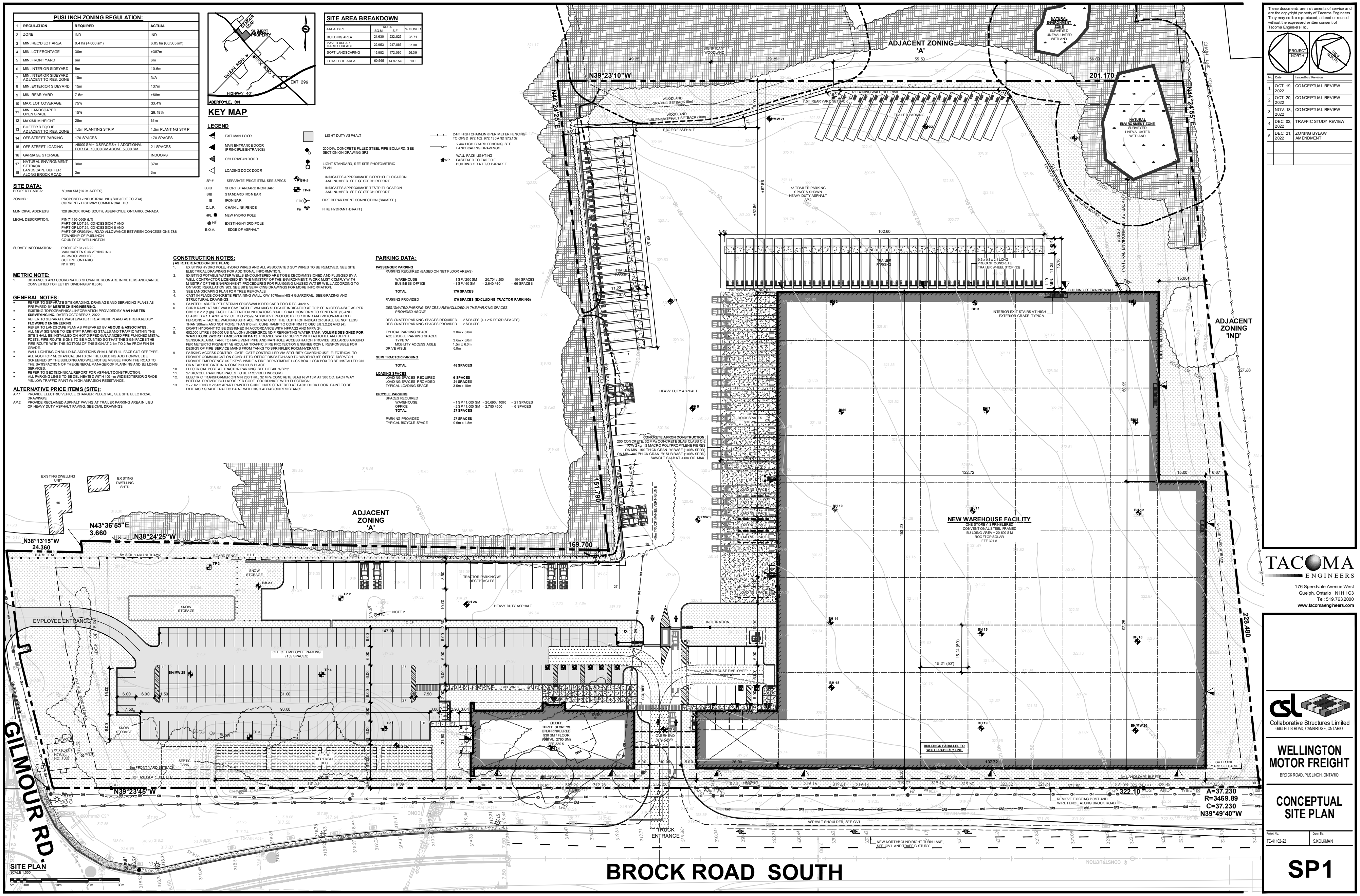
1. Ontario Ministry of the Environment Publication Guideline D1, *Land Use Compatibility, July 1995*

2. Ontario Ministry of the Environment Publication Guideline D6, *Compatibility Between Industrial Facilities and Sensitive Land Uses, July 1995*

3. Ontario Ministry of the Environment Publication NPC-300, *Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning*, August 2013.

4. International Organization for Standardization, *Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation*, ISO-9613-2, Switzerland, 1996.

Figure 1: Key Plan



PUSLINCH ZONING REGULATION:

1	REGULATION	REQUIRED	ACTUAL
2	ZONE	IND	IND
3	MIN. REQ'D LOT AREA	0.4 ha (4,000 sm)	6.05 ha (60,565 sm)
4	MIN. LOT FRONTAGE	30m	±387m
5	MIN. FRONT YARD	6m	6m
6	MIN. INTERIOR SIDEYARD	5m	10.6m
7	MIN. INTERIOR SIDEYARD ADJACENT TO RES. ZONE	15m	N/A
8	MIN. EXTERIOR SIDEYARD	15m	137m
9	MIN. REAR YARD	7.5m	±68m
10	MAX. LOT COVERAGE	75%	33.4%
11	MIN. LANDSCAPED OPEN SPACE	15%	29.18%
12	MAXIMUM HEIGHT	25m	15m
13	BUFFER REQ'D IF ADJACENT TO RES. ZONE	1.5m PLANTING STRIP	1.5m PLANTING STRIP
14	OFF-STREET PARKING	170 SPACES	170 SPACES
15	OFF-STREET LOADING	>5000 SM = 3 SPACES + 1 ADDITIONAL FOR EA. 10,000 SM ABOVE 5,000 SM	21 SPACES
16	GARBAGE STORAGE		INDOORS
17	NATURAL ENVIRONMENT SETBACK	30m	37m
18	LANDSCAPE BUFFER ALONG BROCK ROAD	3m	3m

SITE AREA BREAKDOWN

AREA TYPE	AREA SQ.M.	AREA S.F.	% COVER
BUILDING AREA	21,630	232,825	35.71
PAVED AREA / HARD SURFACE	22,953	247,066	37.90
SOFT LANDSCAPING	15,982	172,030	26.39
TOTAL SITE AREA	60,565	14.97 AC	100

Figure 2 - Proposed Site Plan

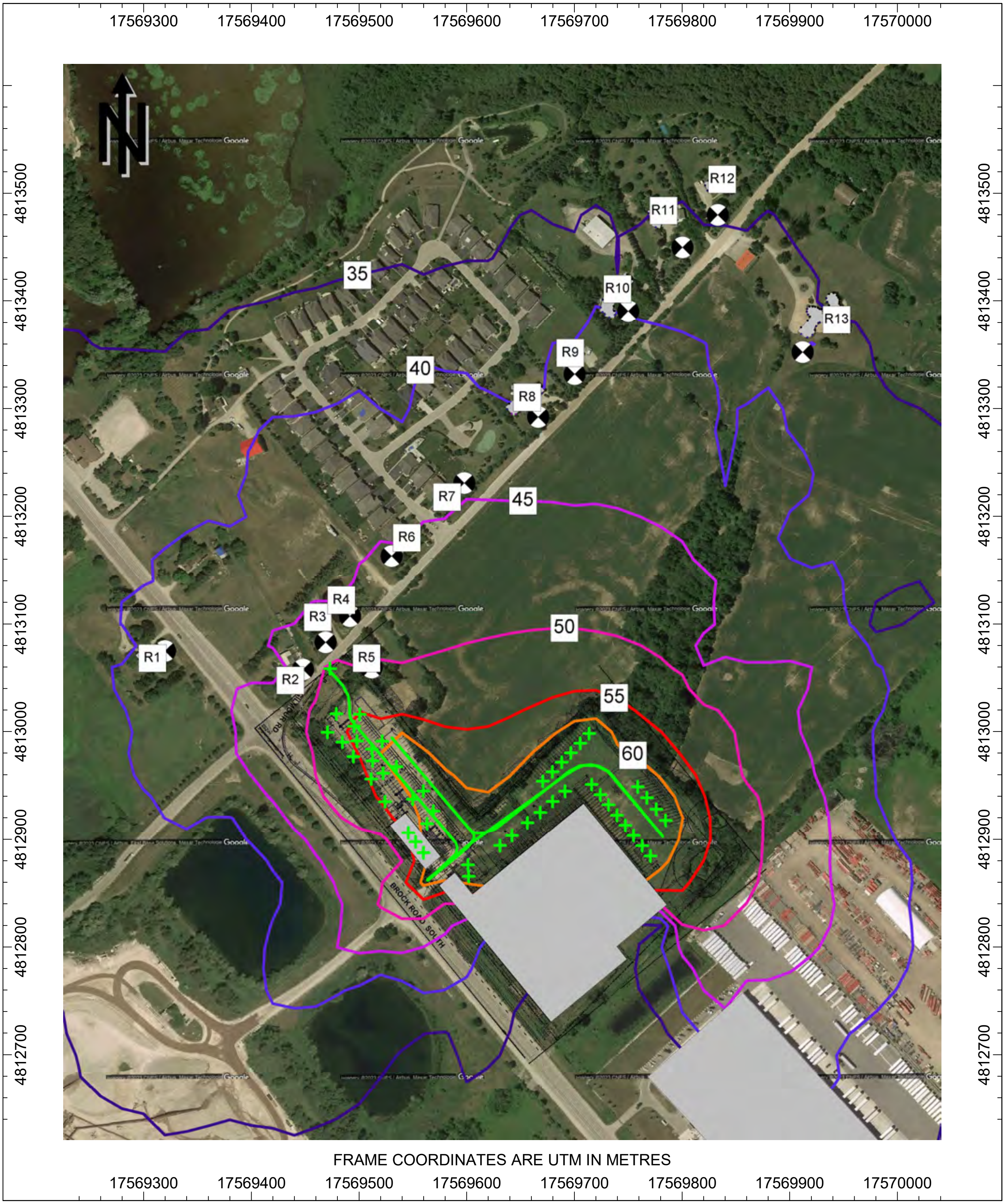


Figure 3: Predicted Daytime/Evening Hour Non-Impulsive Sources Sound Level Contours

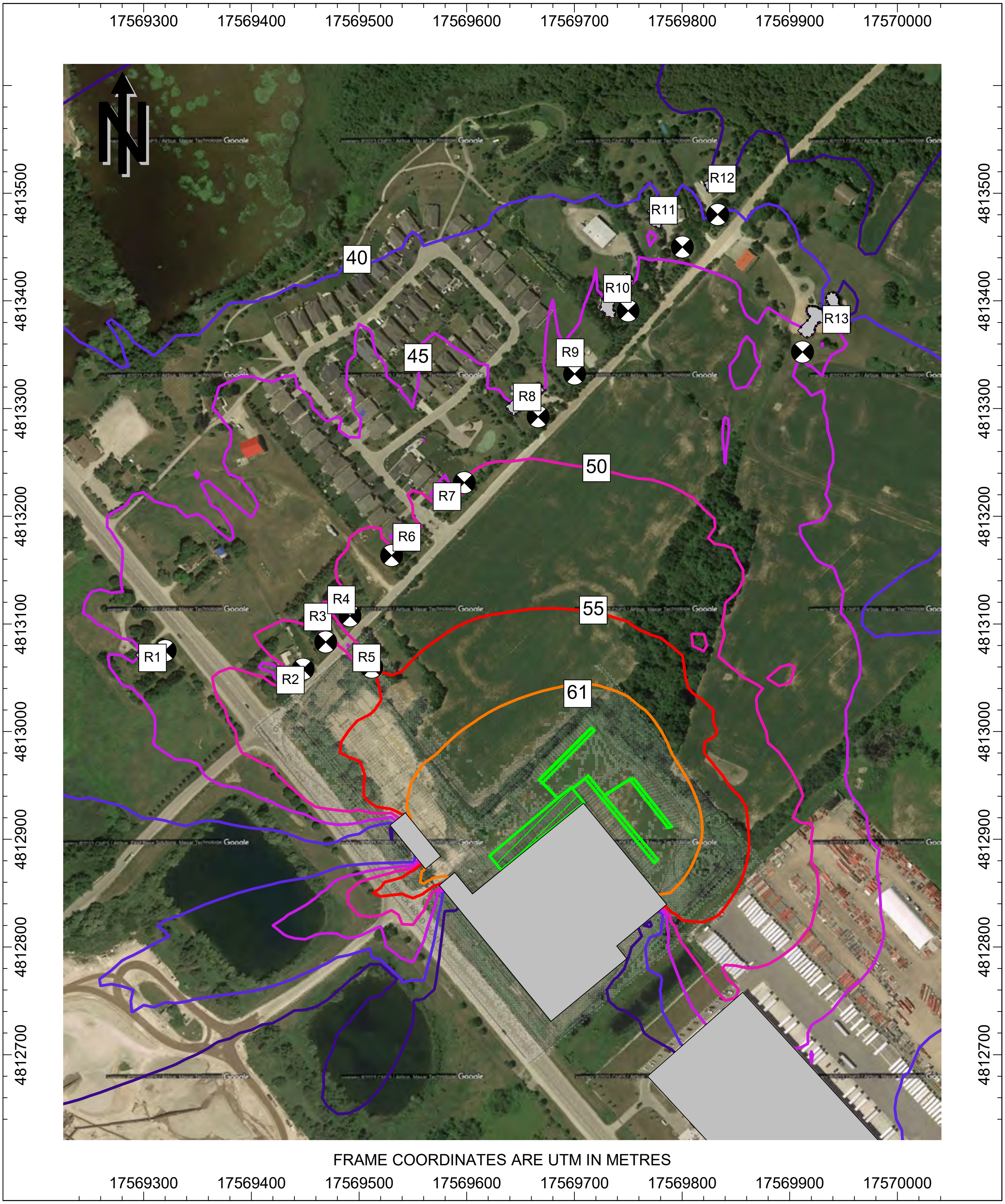


Figure 4: Predicted Impulsive Sources Sound Level Contours

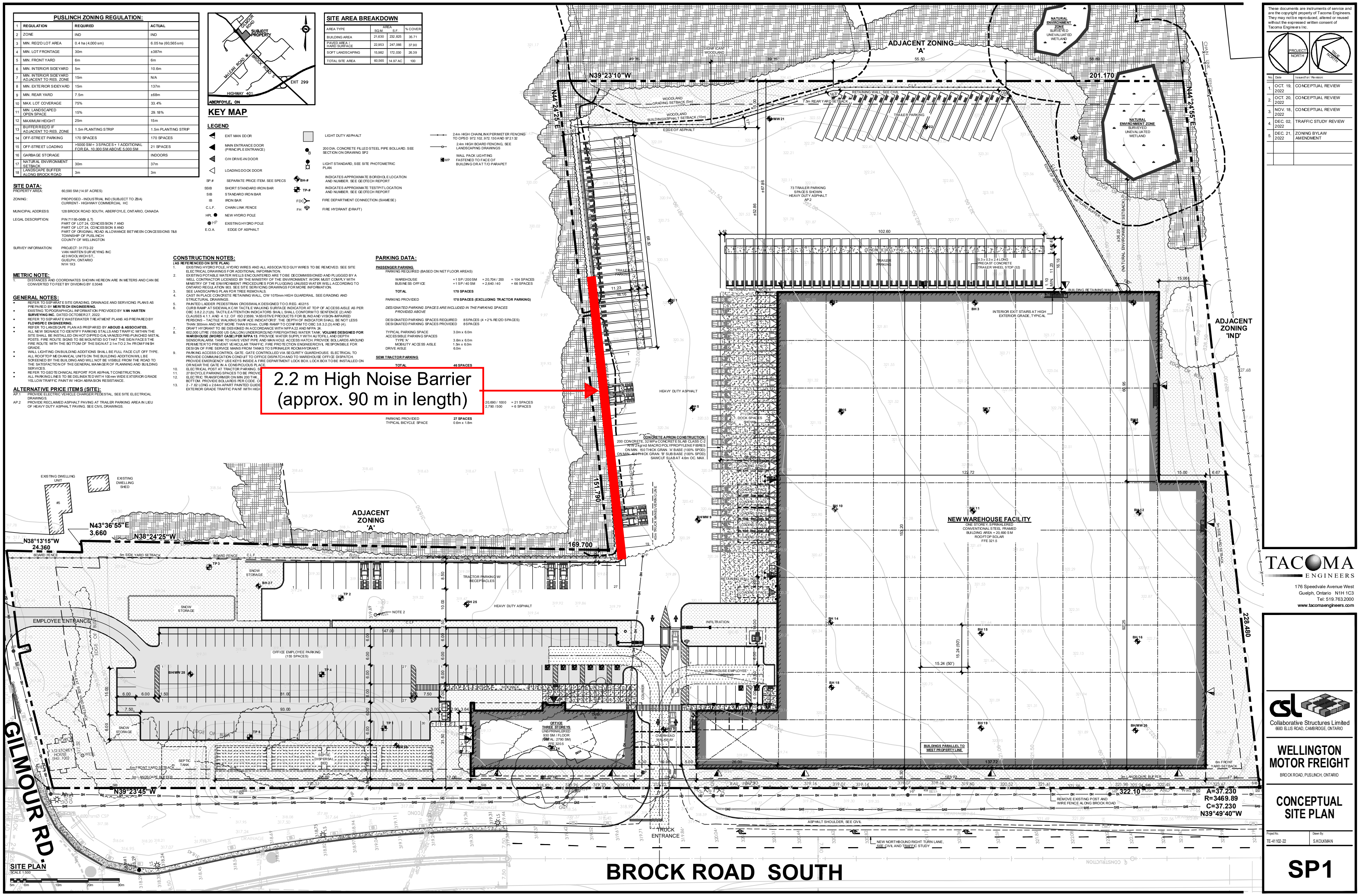


Figure 5 - Proposed Site Plan Showing Noise Barrier Location

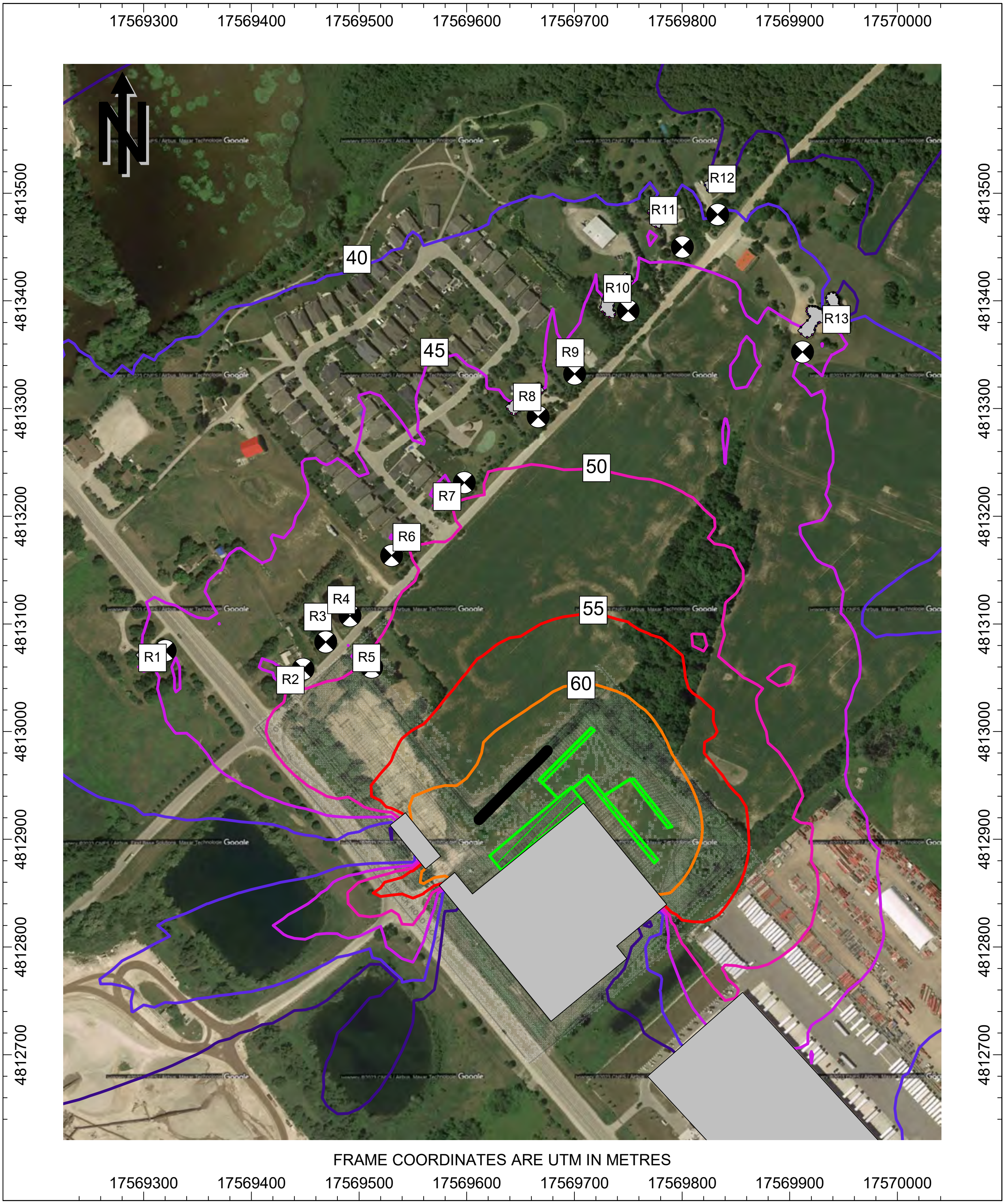


Figure 6: Predicted Impulsive Sources Sound Level Contours with Mitigation

APPENDIX A

Acoustical Modelling Assumptions

The predictive model used for this Assessment (*Cadna-A version 2023 Build 195.5312*) is based on methods from ISO Standard 9613-2.2 "Acoustics - Attenuation of Sound During Propagation Outdoors", which accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures such as buildings. This modeling technique is acceptable to the MECP.

The subject site and surrounding area were modelled based on observations during the site visit. Foliage was not included in the modelling. Ground attenuation was assumed to be spectral for all sources, with a ground factor (G) of 0.25 in paved areas (site area) and 0.9 for soft-ground areas (surrounding lands). The temperature and relative humidity were assumed to be 10° C and 70%, respectively.

The predictive modelling considered one order of reflection, the sufficiency of which was verified through an iterative convergence analysis, using successively increasing orders of reflection.

All mechanical sources, with the exception of on-site truck/employee vehicle movements, were modeled as point sources of sound, shown as crosses in Figures 3 and A1. On-site truck and employee vehicle movements were modeled as line sources that are shown as green lines in Figures 3 and A1. The impulsive noise sources, including loading/unloading of trailers by forklifts and coupling/decoupling of trucks to/from trailers, were modeled as an area source that is shown as a green hatched area in Figures 4 and 6.

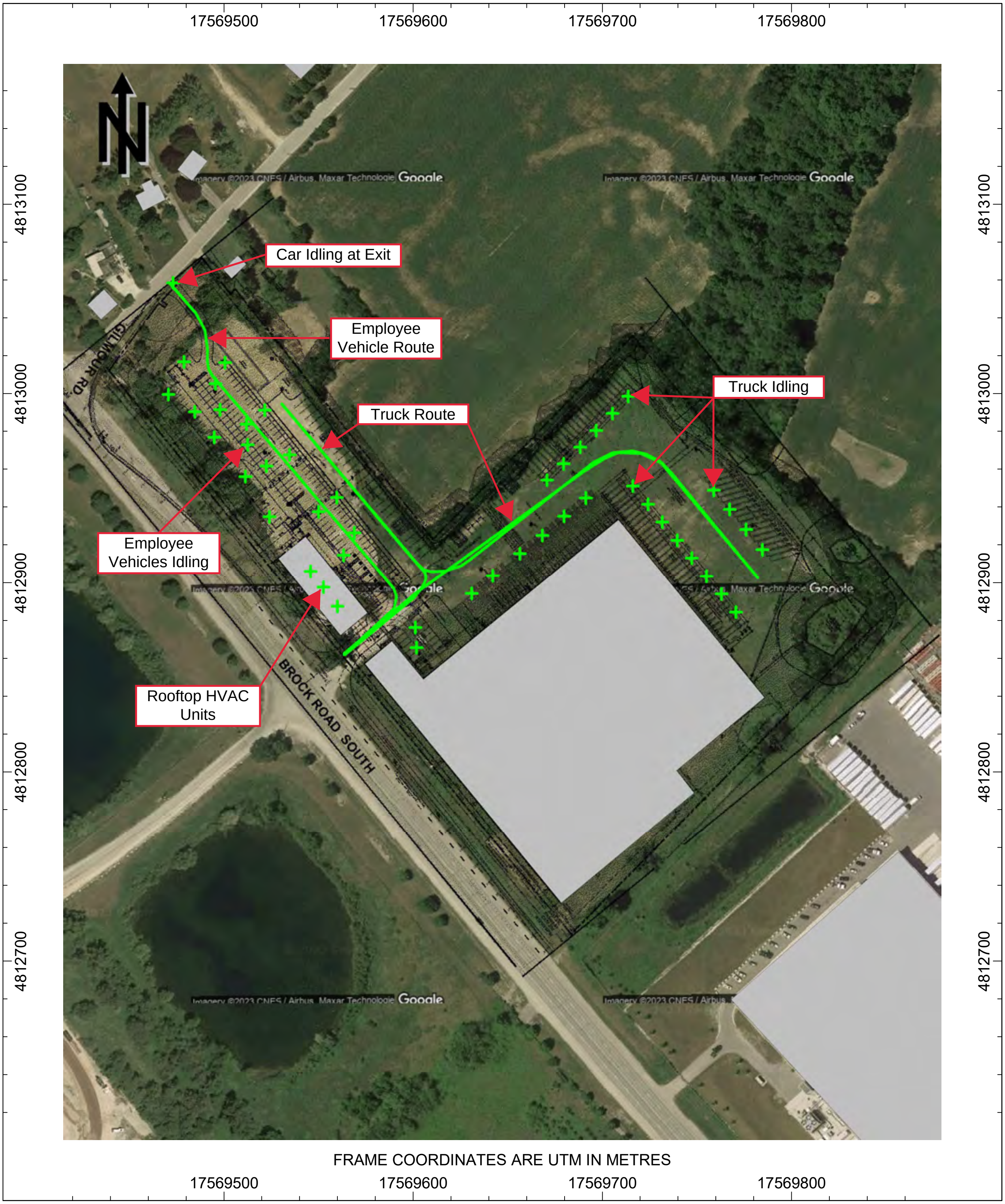


Figure A1: Non-Impulsive Noise Source Locations

APPENDIX B

Employee Vehicle Traffic Data

3.2 Development Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation[4] methods are used to estimate the site trip generation. The following Land Use Codes (LUC) were used to estimate the site generated trips:

- LUC 150 (Warehouse); and
- LUC 710 General Office Building.

Regression equation rates were used to calculate the trips generated by the warehouse use. **Table 3.1** summarizes the estimated trip generation and is estimated to be approximately 108 AM peak hour trips and 112 PM peak hour trips. No reductions for alternative modes of transportation were used in the calculation. **Appendix D** contains the ITE trip generation data sheets.

Table 3.1 summarizes the forecast number of net new trips generated by the proposed development.

TABLE 3.1: TRIP GENERATION

ITE Land Use	Units	Vehicle Type	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
LUC 150 - Warehouse (GFA/1,000ft^2)	207.6	Vehicles	36	9	**45**	11	34	**45**
		Trucks	2	2	**4**	3	3	**6**
LUC 710 - General Office Building (GFA/1,000ft^2)	30.0	Vehicles	52	7	**59**	10	51	**61**
Total Trip Generation			**90**	**18**	**108**	**24**	**88**	**112**

LUC 150: AM T = 0.12(X) + 23.62 | PM T= 0.12(X) + 26.48

LUC 710: AM Ln(T) = 0.87 Ln(X) + 3.05 | PM Ln(T) = 0.83 Ln(X) + 1.29

3.3 Development Trip Distribution and Assignment

The trip distribution used for this study was based on the existing trip distribution for Brock Road (Wellington Road 46) as the site traffic would likely use this route for trips to/from Guelph and/or Highway 401. The trip distribution is shown in **Table 3.2**.

[4] *Trip Generation Tenth Edition*, Institute of Transportation Engineers, Washington D.C., 2017

APPENDIX C

Calibration Stamson Output

```
STAMSON 5.0        NORMAL REPORT        Date: 09-03-2023 10:28:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: vehcal.te            Time Period: 1 hours
Description: Employee vehicle movement calibration.


Road data, segment # 1:
------------------------
Car traffic volume  :   106 veh/TimePeriod
Medium truck volume :     0 veh/TimePeriod
Heavy truck volume  :     0 veh/TimePeriod
Posted speed limit  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1:
----------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  30.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1:
---------------------

Source height = 0.50 m

ROAD (0.00 + 46.62 + 0.00) = 46.62 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  49.63   0.00  -3.01   0.00   0.00   0.00   0.00  46.62
----------------------------------------------------------------------------

Segment Leq : 46.62 dBA

Total Leq All Segments: 46.62 dBA



TOTAL Leq FROM ALL SOURCES:       46.62
```

VALCOUSTICS
Canada Ltd.
Sound solutions to acoustical challenges
Celebrating over 60 years
30 Wertheim Court, Unit 25
Richmond Hill, Ontario, Canada, L4B 1B9
email ● solutions@valcoustics.com
web ● www.valcoustics.com
telephone ● 905 764 5223
fax ● 905 764 6813

March 13, 2023

Township of Puslinch
7404 Wellington Road 34
Puslinch, Ontario
N0B 2J0

Attention: Lynne Banks **VIA E-MAIL**
lbanks@puslinch.ca

Re: Peer Review of Noise Feasibility Study
Proposed Wellington Motor Freight Facility
Puslinch, Ontario
VCL File: 123-0058

Dear Ms. Banks:

We have completed our review of the "*Noise Feasibility Study, Proposed Industrial Development, 128 Brock Street South, Puslinch, Ontario*", dated March 9, 2023, prepared by Howe Gastmeier Chapnik Limited (HGC).

Our comments are outlined herein.

1.0 COMMENTS

a) The noise assessment has applied the Ministry of Environment, Conservation and Parks (MECP) noise guideline requirements of NPC-300. This is considered appropriate.

b) Section 2.1 of the HGC report indicates the facility will only operate during the daytime hours (i.e., between 0700 and 1900 hours). There should be a restriction to prevent the existing and any future operations at the facility from occurring during the evening and at night since the analysis results indicate the evening and nighttime noise guideline limits would be exceeded. If there is the potential for the facility to operate during the evening and/or nighttime hours, the assessment should be updated to include these time periods.

c) Table 1 provides the MECP noise guideline limits that are applicable at the exterior plane of window of a noise sensitive receptor location. The guideline limits at an outdoor point of reception (anywhere within 30 m of a dwelling) are somewhat different than the limits presented in Table 1. In particular, the evening limit at an outdoor point of reception is 5 dBA lower than the plane of window criteria in a Class 2 area such as this.

It should be noted that page 6 and Table 3 in the report indicate evening operations. The results in Table 3 indicate the evening outdoor point of reception criteria are exceeded at R2, R5 and R6. Clarification is needed.

d) We have these questions/comments about the analysis scenarios and operating assumptions:

a. Will there be any shunting movements between the loading bay and trailer parking areas? If so, how where these included in the assessment?

b. A Stamson output is provided as Appendix C and is indicated as being a calibration output. It is not clear what this result is being used to calibrate since there are no sample calculations provided within the report.

(1) The report should include sample calculations. Alternatively, the CadnaA model could be provided for our review;

(2) The Stamson output indicates a 40 km/hr speed has been used for employee vehicles travelling on the site. Presumably this is for automobiles travelling on the site. It is unlikely that vehicles would be travelling at this high a speed on the site. Vehicles travelling at a lower speed will take longer to get to their destination resulting in higher noise generation;

(3) The report indicates an average impulse reference sound level of 110 dBAI has been used in the assessment. What sound level was used for the impulses generated in the trailer parking areas where there would be no loading/unloading impulses. Our experience is that coupling/uncoupling impacts generate sound levels higher than the loading/unloading impacts;

(4) The results presented in Table 3 appear to not include employee vehicle movements (see paragraph above the table). As per comments from the Town, the assessment is to include all vehicle movements on the site; and

(5) Appendix A indicates all sources, except vehicle movements, have been modelled as point sources of sound. Review of Figure 6 seems to indicate that the impulses were modelled as a line source(s). An explanation of how the impulses were modelled and why this represents a predictable worst-case scenario is needed.

2.0 CONCLUSIONS

Our review of the noise feasibility study prepared in support of the motor freight facility indicates there are a few items, as outlined above, that require further clarification and assessment before we can concur with its findings and conclusions

If there are any questions, please do not hesitate to call.

Yours truly,

VALCOUSTICS CANADA LTD.

Per: ______________________________

John Emeljanow, P.Eng.

JE\
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PUSLINCH ZONING REGULATION:			
1	REGULATION	REQUIRED	ACTUAL
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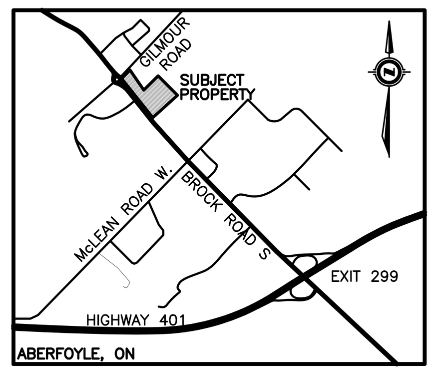

KEY MAP

SITE AREA BREAKDOWN			
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BUILDING AREA	21,630	232,825	35.71
PAVED AREA / HARD SURFACE	22,953	247,066	37.90
SOFT LANDSCAPING	15,982	172,030	26.39
TOTAL SITE AREA	60,565	14.97 AC	100

LEGEND

EXIT MAN DOOR
MAIN ENTRANCE DOOR (PRINCIPLE ENTRANCE)
O/H DRIVE-IN DOOR
LOADING DOCK DOOR
SSIB SHORT STANDARD IRON BAR
SIB STANDARD IRON BAR
IB IRON BAR
C.L.F. CHAIN LINK FENCE
HPL NEW HYDRO POLE
HP EXISTING HYDRO POLE
E.O.A. EDGE OF ASPHALT
LIGHT DUTY ASPHALT
B 200 DIA. CONCRETE FILLED STEEL PIPE BOLLARD. SEE SECTION ON DRAWING SP2
LIGHT STANDARD, SEE SITE PHOTOMETRIC PLAN
BH-# INDICATES APPROXIMATE BOREHOLE LOCATION AND NUMBER. SEE GEOTECH REPORT
TP-# INDICATES APPROXIMATE TESTPIT LOCATION AND NUMBER. SEE GEOTECH REPORT
FDC FIRE DEPARTMENT CONNECTION (SIAMESE)
FH FIRE HYDRANT (DRAFT)
2.4m HIGH CHAINLINK PERIMETER FENCING TO OPSD 972.102, 972.130 AND 972.132
2.4m HIGH BOARD FENCING, SEE LANDSCAPING DRAWINGS
WP WALL PACK LIGHTING FASTENED TO FACE OF BUILDING OR AT T/O PARAPET

SITE DATA:

PROPERTY AREA: 60,590 SM (14.97 ACRES)

ZONING: PROPOSED - INDUSTRIAL IND (SUBJECT TO ZBA)
CURRENT - HIGHWAY COMMERCIAL HC

MUNICIPAL ADDRESS: 128 BROCK ROAD SOUTH, ABERFOYLE, ONTARIO, CANADA

LEGAL DESCRIPTION: PIN 71195-0669 (LT)
PART OF LOT 24, CONCESSION 7 AND
PART OF LOT 24, CONCESSION 8 AND
PART OF ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 7&8
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

SURVEY INFORMATION: PROJECT: 31772-22
VAN HARTEN SURVEYING INC
423 WOOLWICH ST.,
GUELPH, ONTARIO
N1H 1X3

METRIC NOTE:

1. DISTANCES AND COORDINATES SHOWN HEREON ARE IN METERS AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GENERAL NOTES:

- REFER TO SEPARATE SITE GRADING, DRAINAGE AND SERVICING PLANS AS PREPARED BY **MERITECH ENGINEERING.**
- EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY **VAN HARTEN SURVEYING INC.** DATED OCTOBER 27, 2022.
- REFER TO SEPARATE WASTEWATER TREATMENT PLANS AS PREPARED BY **FLOWSPEC ENGINEERING.**
- REFER TO LANDSCAPE PLAN AS PREPARED BY **ABOUD & ASSOCIATES.**
- ALL NEW SIGNAGE TO IDENTIFY PARKING STALLS AND TRAFFIC WITHIN THE SITE SHALL BE INSTALLED ON HOT DIPPED GALVANIZED PRE-PUNCHED METAL POSTS. FIRE ROUTE SIGNS TO BE MOUNTED SO THAT THE SIGN FACES THE FIRE ROUTE WITH THE BOTTOM OF THE SIGN AT 2.1m TO 2.7m FROM FINISH GRADE.
- WALL LIGHTING ON BUILDING ADDITIONS SHALL BE FULL FACE CUT OFF TYPE.
- ALL ROOFTOP MECHANICAL UNITS ON THE BUILDING ADDITION WILL BE SCREENED BY THE BUILDING AND WILL NOT BE VISIBLE FROM THE ROAD TO THE SATISFACTION OF THE GENERAL MANAGER OF PLANNING AND BUILDING SERVICES.
- REFER TO GEOTECHNICAL REPORT FOR ASPHALT CONSTRUCTION.
- ALL PARKING LINES TO BE DELINEATED WITH 100mm WIDE EXTERIOR GRADE YELLOW TRAFFIC PAINT W/ HIGH ABRASION RESISTANCE.

CONSTRUCTION NOTES:

(AS REFERENCED ON SITE PLAN)

1. EXISTING HYDRO POLE, HYDRO WIRES AND ALL ASSOCIATED GUY WIRES TO BE REMOVED. SEE SITE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. EXISTING POTABLE WATER WELLS ENCOUNTERED ARE TO BE DECOMMISSIONED AND PLUGGED BY A WELL CONTRACTOR LICENSED BY THE MINISTRY OF THE ENVIRONMENT. WORK MUST COMPLY WITH MINISTRY OF THE ENVIRONMENT PROCEDURES FOR PLUGGING UNUSED WATER WELL ACCORDING TO ONTARIO REGULATION 903. SEE SITE SERVICING DRAWINGS FOR MORE INFORMATION.
3. SEE LANDSCAPING PLAN FOR TREE REMOVALS.
4. CAST IN PLACE CONCRETE RETAINING WALL, C/W 1070mm HIGH GUARDRAIL. SEE GRADING AND STRUCTURAL DRAWINGS.
5. PAINTED LADDER PEDESTRIAN CROSSWALK DESIGNED TO O.REG. 402/15
6. CURB RAMP AT SIDEWALK C/W TACTILE WALKING SURFACE INDICATOR AT TOP OF ACCESS AISLE AS PER OBC 3.8.2.2.(1)(h). TACTILE ATTENTION INDICATORS SHALL SHALL CONFORM TO SENTENCE (2) AND CLAUSES 4.1.1. AND 4.1.2. OF ISO 23599, "ASSISTIVE PRODUCTS FOR BLIND AND VISION-IMPAIRED PERSONS – TACTILE WALKING SURFACE INDICATORS". THE DEPTH OF INDICATOR SHALL BE NOT LESS THAN 300mm AND NOT MORE THAN 610mm. CURB RAMP TO CONFIRM TO OBC 3.8.3.2.(3) AND (4).
7. DRAFT HYDRANT TO BE DESIGNED IN ACCORDANCE WITH NFPA 22 AND NFPA 24.
8. 602,000 LITRE (159,000 US GALLON) UNDERGROUND FIREFIGHTING WATER TANK. **VOLUME DESIGNED FOR WAREHOUSE (WORST CASE) PER NFPA 13**. PROVIDE WATER SUPPLY WITH AUTOFILL AND DEPTH SENSOR/ALARM. TANK TO HAVE VENT PIPE AND MAN HOLE ACCESS HATCH. PROVIDE BOLLARDS AROUND PERIMETER TO PREVENT VEHICULAR TRAFFIC. FIRE PROTECTION ENGINEER/CIVIL RESPONSIBLE FOR DESIGN OF FIRE SERVICE MAINS FROM TANKS TO SPRINKLER ROOM/HYDRANT.
9. PARKING ACCESS CONTROL GATE. GATE CONTROLLED VIA SECURITY GUARDHOUSE. ELECTRICAL TO PROVIDE COMMUNICATION CONDUIT TO OFFICE. PROVIDE EMERGENCY USE KEYS INSIDE A FIRE DEPARTMENT LOCK BOX. LOCK BOX TO BE INSTALLED ON OR NEAR THE GATE IN A CONSPICUOUS PLACE.
10. ELECTRICAL POST AT TRACTOR PARKING. SEE DETAIL '4/SP3'.
11. SURFACE MOUNTED BIKE RACKS, 27 BICYCLE PARKING SPACES TOTAL. SEE DETAIL '5/SP3'.
12. ELECTRIC TRANSFORMER ON MIN 200 THK., 32 MPa CONCRETE SLAB R/W 15M AT 300 OC. EACH WAY BOTTOM. PROVIDE BOLLARDS PER CODE. COORDINATE WITH ELECTRICAL.
13. 2 - 7.62 LONG x 2.64m APART PAINTED GUIDE LINES CENTERED AT EACH DOCK DOOR. PAINT TO BE EXTERIOR GRADE TRAFFIC PAINT WITH HIGH ABRASION RESISTANCE

PARKING DATA:

PARKING

PARKING REQUIRED (BASED ON NET FLOOR AREAS)

WAREHOUSE	=1 SP / 200 SM	= 20,690 / 200	= 104 SPACES
BUSINESS OFFICE	=1 SP / 40 SM	= 2,630 / 40	= 66 SPACES
TOTAL	**170 SPACES**		

PARKING PROVIDED **170 SPACES (EXCLUDING TRACTOR PARKING)**

DESIGNATED PARKING SPACES ARE INCLUDED IN THE PARKING SPACES PROVIDED ABOVE

DESIGNATED PARKING SPACES REQUIRED 8 SPACES (4 + 2% REQ'D SPACES)
DESIGNATED PARKING SPACES PROVIDED 8 SPACES

TYPICAL PARKING SPACE 3.0m x 6.0m
ACCESSIBLE PARKING SPACES
TYPE 'A' 3.6m x 6.0m
MOBILITY ACCESS AISLE 1.5m x 6.0m
DRIVE AISLE 6.0m

LOADING SPACES

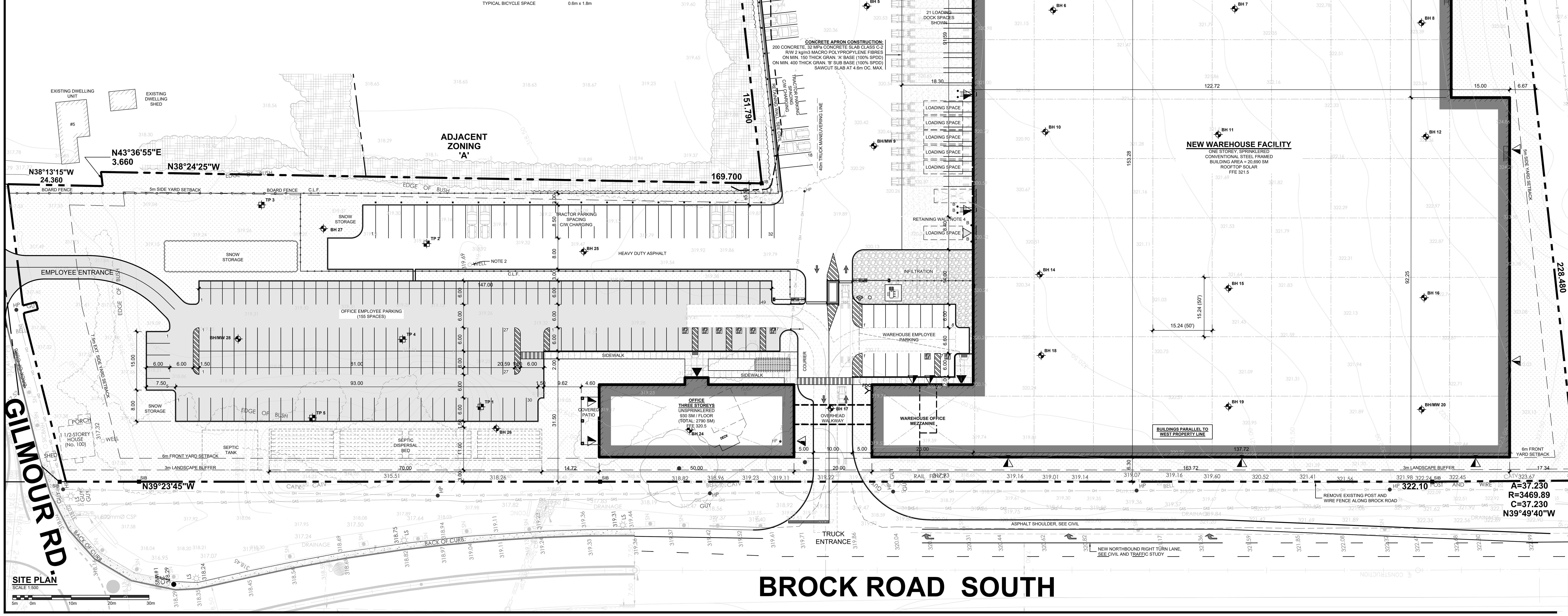
LOADING SPACES REQUIRED **6 SPACES**
LOADING SPACES PROVIDED **21 SPACES**
TYPICAL LOADING SPACE 3.5m x 10m

BICYCLE PARKING

SPACES REQUIRED

WAREHOUSE	=1 SP / 1,000 SM	= 20,690 / 1000	= 21 SPACES
OFFICE	=2 SP / 1,000 SM	= 2,790 / 500	= 6 SPACES
TOTAL	**27 SPACES**		

PARKING PROVIDED **27 SPACES**
TYPICAL BICYCLE SPACE 0.6m x 1.8m



SITE PLAN
SCALE 1:500

PROJECT NORTH
TRUE NORTH

No.	Date	Issued for / Revision:
1.	OCT. 19, 2022	CONCEPTUAL REVIEW
2.	OCT. 20, 2022	CONCEPTUAL REVIEW
3.	NOV. 18, 2022	CONCEPTUAL REVIEW
4.	DEC. 02, 2022	TRAFFIC STUDY REVIEW
5.	DEC. 21, 2022	ZONING BYLAW AMENDMENT

TACOMA ENGINEERS
176 Speedvale Avenue West
Guelph, Ontario N1H 1C3
Tel: 519.763.2000
www.tacomaengineers.com

Collaborative Structures Limited
6683 ELLIS ROAD, CAMBRIDGE, ONTARIO

WELLINGTON MOTOR FREIGHT

BROCK ROAD, PUSLINCH, ONTARIO

CONCEPTUAL SITE PLAN

Project No.	Drawn By:
TE-41102-22	S.KOLKMAN

SP1

CONSTRUCTION NOTES:
(AS REFERENCED ON SITE PLAN)

1. EXISTING HYDRO POLE, HYDRO WIRES AND ALL ASSOCIATED GUY WIRES TO BE REMOVED. SEE SITE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. EXISTING POTABLE WATER WELLS ENCOUNTERED ARE TO BE DECOMMISSIONED AND PLUGGED BY A WELL CONTRACTOR LICENSED BY THE MINISTRY OF THE ENVIRONMENT. WORK MUST COMPLY WITH MINISTRY OF THE ENVIRONMENT PROCEDURES FOR PLUGGING UNUSED WATER WELL ACCORDING TO ONTARIO REGULATION 903. SEE SITE SERVICING DRAWINGS FOR MORE INFORMATION.
3. SEE LANDSCAPING PLAN FOR TREE REMOVALS.
4. CAST IN PLACE CONCRETE RETAINING WALL, C/W 1070mm HIGH GUARDRAIL. SEE GRADING AND STRUCTURAL DRAWINGS.
5. PAINTED LADDER PEDESTRIAN CROSSWALK DESIGNED TO O.REG. 402/15
6. CURB RAMP AT SIDEWALK C/W TACTILE WALKING SURFACE INDICATOR AT TOP OF ACCESS AISLE AS PER OBC 3.8.2.2.(1)(h). TACTILE ATTENTION INDICATORS SHALL SHALL CONFORM TO SENTENCE (2) AND CLAUSES 4.1.1. AND 4.1.2. OF ISO 23599, "ASSISTIVE PRODUCTS FOR BLIND AND VISION-IMPAIRED PERSONS – TACTILE WALKING SURFACE INDICATORS". THE DEPTH OF INDICATOR SHALL BE NOT LESS THAN 300mm AND NOT MORE THAN 610mm. CURB RAMP TO CONFIRM TO OBC 3.8.3.2.(3) AND (4).
7. DRAFT HYDRANT TO BE DESIGNED IN ACCORDANCE WITH NFPA 22 AND NFPA 24.
8. 602,000 LITRE (159,000 US GALLON) UNDERGROUND FIREFIGHTING WATER TANK. **VOLUME DESIGNED FOR WAREHOUSE (WORST CASE) PER NFPA 13**. PROVIDE WATER SUPPLY WITH AUTOFILL AND DEPTH SENSOR/ALARM. TANK TO HAVE VENT PIPE AND MAN HOLE ACCESS HATCH. PROVIDE BOLLARDS AROUND PERIMETER TO PREVENT VEHICULAR TRAFFIC. FIRE PROTECTION ENGINEER/CIVIL RESPONSIBLE FOR DESIGN OF FIRE SERVICE MAINS FROM TANKS TO SPRINKLER ROOM/HYDRANT.
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10. ELECTRICAL POST AT TRACTOR PARKING. SEE DETAIL '4/SP3'.
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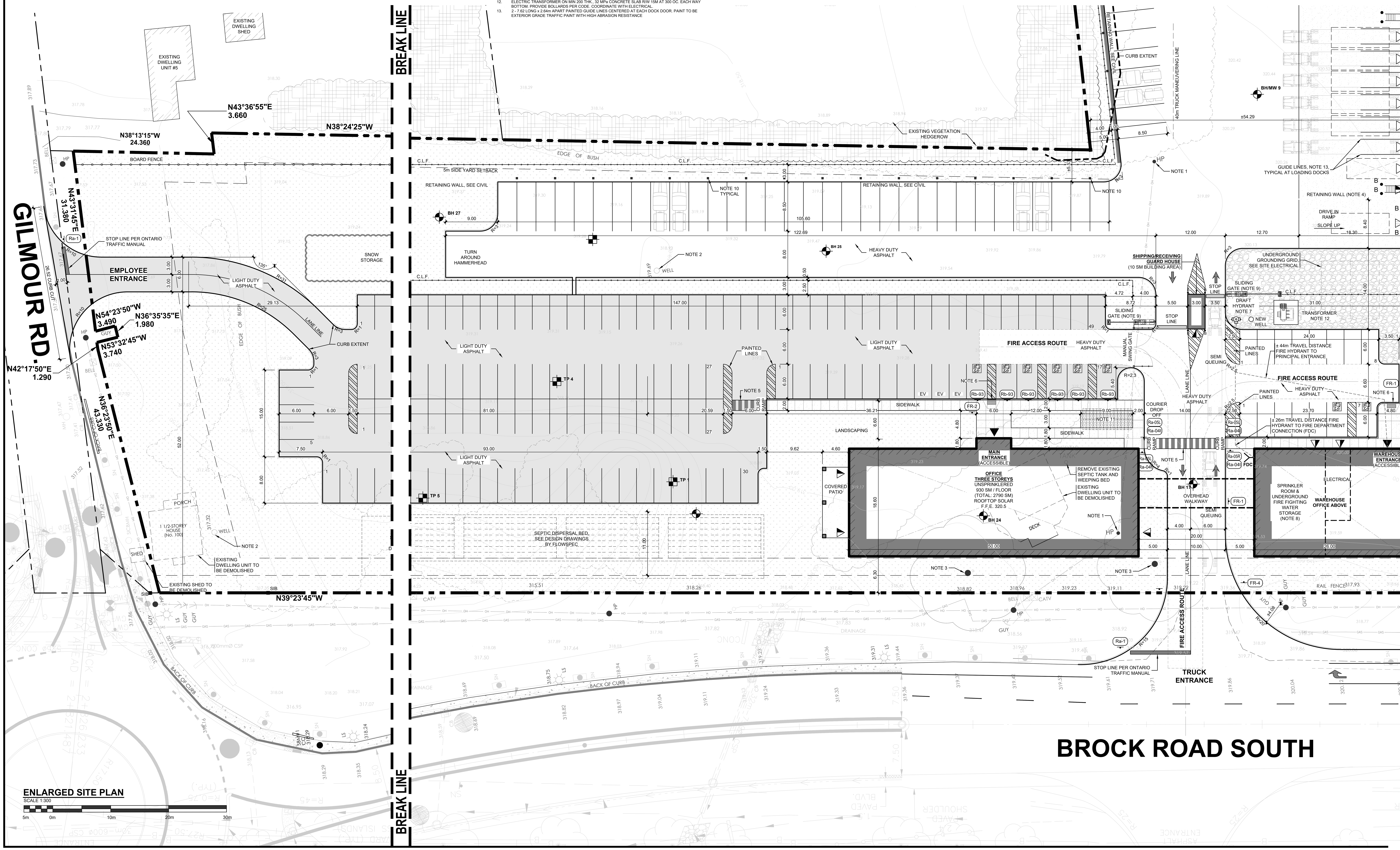
12. ELECTRIC TRANSFORMER ON MIN 200 THK., 32 MPa CONCRETE SLAB R/W 15M AT 300 OC. EACH WAY BOTTOM. PROVIDE BOLLARDS PER CODE. COORDINATE WITH ELECTRICAL.
13. 2 - 7.62 LONG x 2.64m APART PAINTED GUIDE LINES CENTERED AT EACH DOCK DOOR. PAINT TO BE EXTERIOR GRADE TRAFFIC PAINT WITH HIGH ABRASION RESISTANCE

LEGEND

Symbol	Description
	EXIT MAN DOOR
	MAIN ENTRANCE DOOR (PRINCIPLE ENTRANCE)
	O/H DRIVE-IN DOOR
	LOADING DOCK DOOR
SSIB	SHORT STANDARD IRON BAR
SIB	STANDARD IRON BAR
IB	IRON BAR
C.L.F.	CHAIN LINK FENCE
HPL	NEW HYDRO POLE
HP	EXISTING HYDRO POLE
E.O.A.	EDGE OF ASPHALT
	LIGHT DUTY ASPHALT
B	200 DIA. CONCRETE FILLED STEEL PIPE BOLLARD. SEE SECTION ON DRAWING SP2
	LIGHT STANDARD, SEE SITE PHOTOMETRIC PLAN
BH-#	INDICATES APPROXIMATE BOREHOLE LOCATION AND NUMBER. SEE GEOTECH REPORT
TP-#	INDICATES APPROXIMATE TESTPIT LOCATION AND NUMBER. SEE GEOTECH REPORT
FDC	FIRE DEPARTMENT CONNECTION (SIAMESE)
FH	FIRE HYDRANT (DRAFT)
	2.4m HIGH CHAINLINK PERIMETER FENCING TO OPSD 972.102, 972.130 AND 972.132
	2.4m HIGH BOARD FENCING, SEE LANDSCAPING DRAWINGS
WP	WALL PACK LIGHTING FASTENED TO FACE OF BUILDING OR AT T/O PARAPET



ENLARGED SITE PLAN
SCALE 1:300
5m 0m 10m 20m 30m

PROJECT NORTH — TRUE NORTH

No.	Date	Issued for / Revision:
1.	OCT. 19, 2022	CONCEPTUAL REVIEW
2.	OCT. 20, 2022	CONCEPTUAL REVIEW
3.	NOV. 18, 2022	CONCEPTUAL REVIEW
4.	DEC. 21, 2022	ZONING BYLAW AMENDMENT

TACOMA ENGINEERS
176 Speedvale Avenue West
Guelph, Ontario N1H 1C3
Tel: 519.763.2000
www.tacomaengineers.com

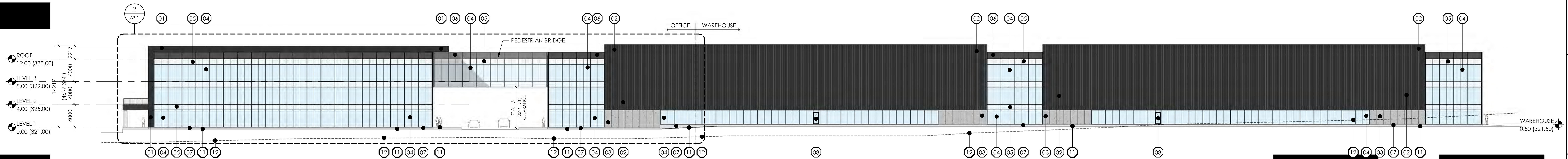
csl Collaborative Structures Limited
6683 ELLIS ROAD, CAMBRIDGE, ONTARIO

WELLINGTON MOTOR FREIGHT
BROCK ROAD, PUSLINCH, ONTARIO

CONCEPTUAL ENLARGED SITE PLAN

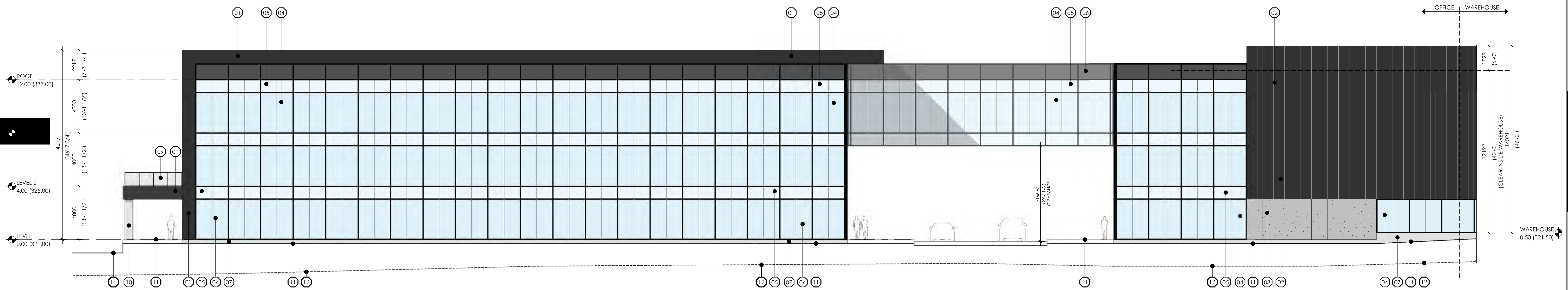
Project No.	Drawn By:
TE-41102-22	S.KOLKMAN

SP2



WEST ELEVATION - OFFICE AND WAREHOUSE

1 : 350



WEST ELEVATION (ENLARGED) - OFFICE ONLY

1 : 150

MATERIAL LEGEND

01 ALUMINIUM COMPOSITE METAL PANEL COLOUR: BLACK

02 INSULATED METAL PANEL COLOUR: DAR[redacted]

03 PRECAST CONCRETE PANEL COLOUR: NATURAL

04 ALUMINIUM FRAMED CURTAIN WALL GLAZING W/ CAPPED HORIZONTAL MULLIONS AND ALTERNATING CA[redacted] SILICONE VERTIC[redacted] COLOUR: BLACK[redacted]

05 GLASS SPANDREL PANEL COLOUR: LIGHT GREY

06 INSULATED ALUMINIUM SPANDREL PANEL COLOUR: BLACK O[redacted]

07 CONCRETE FOUNDATION WALL

08 ALUMINIUM EXTERIOR DOOR W/ FULL LITE COLOUR: BLACK

09 GLAZED/ ALUMINIUM BALCONY RAILING SYSTEM COLOUR: BLACK

10 [redacted]CONCRETE COLUMN

11 LINE OF PROPOSED GRADE (T.B.D.)

12 [redacted]E OF EXISTING GRADE

[redacted]

[redacted]

ISSUED FOR:

SCHEMATIC DESIGN

DEVELOPED DESIGN

SITE PLAN APPROVAL

BUILDING PERMIT

BIDDING/TENDER

NO.
1 ZBA [redacted].15

EDGE
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ARCHITECTS SEAL

PROJECT NAME

WELLINGTON MOTOR FREIGHT
BROCK ROAD, PUSLINCH, ON

CLIENT

[redacted]

TACOMA ENGINEERS

DRAWING TITLE

ELEVATIONS

PROJECT NUMBER 22052	DRAWING NUMBER A3.1
SCALE As indicated	
SHEET SIZE 24x36	

PLANNING REPORT
for the TOWNSHIP OF PUSLINCH

Prepared by the County of Wellington Planning and Development Department

MEETING DATE:	Mach 22nd, 2023
TO:	Glenn Schwendinger, CAO Township of Puslinch
FROM:	Zach Prince, Senior Planner County of Wellington
SUBJECT:	**PUBLIC MEETING – Wellington Motor Freight** **Zoning By-law Amendment Application D14/WEL** **Puslinch Concession 7 Concession 8 Part Lot; 24 Part Road** **128 Brock Road South**
ATTACHMENTS:	**1 – Aerial of Subject Lands** **2 – Sketch Provided by Applicant**

SUMMARY

The purpose of this application is to amend the Township of Puslinch Zoning By-Law 23-2018 to permit the development of a warehouse, office and transport terminal. The operation includes a warehouse building, office building with surface parking for employees, tractor trailers and loading spaces.

A public meeting is scheduled for March 22nd, 2023. This report provides a preliminary overview of the proposal, highlights key planning policies to be considered, details comments received to date and explains the next steps in the planning review process.

It is recommended that this Public Meeting Report regarding the proposed Zoning By-law Amendment D14/WEL be received for information.

INTRODUCTION

The subject property is legally known as Puslinch Concession 7 Concession 8 Part Lot; 24 Part Road and municipally known as 126 and 128 Brock Road South within the Township of Puslinch. The lands are located at the corner of Brock Road S and McLean Road and includes 2 properties (126 Brock Rd S and 128 Brock Rd S). The property is approximately 6.2 ha (15.3 ac) in area and contains two single detached dwellings. The immediate surrounding properties include rural residential, agricultural and industrial uses. A subject property map is identified in **Attachment 1**.

PROPOSAL

The purpose of the Zoning By-law amendment is to rezone the subject property, which is currently zoned as Site Specific Highway Commercial (sp89) Zone and Natural Environment (NE) Zone, to an Industrial Zone (IND). The subject property is accessible through the Brock Road South and Gilmore Road. The applicant is proposing to demolish the existing residential dwellings to establish the use. The proposal includes a 19,282 m^2 (207,550 ft^2) warehouse building, 2,790m^2 (30,031 ft^2) office building, 170 employee parking spaces, 123 tractor trailer parking spaces, 21 loading spaces and associated landscaping. A sketch prepared by the applicant has also been provided and can be seen in **Attachment 2**.

SUPPORTING STUDIES AND REPORTS

- Cover Letter prepared by MHBC Limited, dated January 9th, 2023
- Planning Justification Report, prepared by MHBC Limited, dated January 2023
- Servicing and storm water management report, prepared by Meritech Engineering, dated December 21st, 2022
- Environmental Impact Study, prepared by Natural Resource Solutions Inc., dated January 5th, 2023
- 'Scoped' Hydrogeological Assessment prepared by Chung & Vander Doelen Engineering Ltd., dated December 22nd, 2022
- Geotechnical Investigation Report, prepared by Chung & Vander Doelen Engineering Ltd., dated December 20th, 2022
- Transportation impact study, prepared by Paradigm Transportation Solutions Limited, dated December 20th, 2023
- Site plan, prepared Tacoma Engineers, dated Dec 21st, 2022
- Architectural elevations, prepared by Edge Architectural Ltd., dated Dec 15th, 2022

PLANNING POLICY REVIEW

PROVINCIAL POLICY - PROVINCIAL POLICY STATEMENT (PPS 2020)

The PPS provides a policy framework on matters of provincial interest and guides land use planning and development within the Province of Ontario. All land use decisions must be consistent with Provincial policy and included below are several key policies set out within the PPS that Council will need to consider. As the subject lands are located outside of a settlement area, the Rural Area and Land use policies apply.

Rural Area

Section 1.1.4 of the PPS speaks to Rural areas as a system that may include rural settlement areas, rural lands, prime agricultural areas, natural heritage features and areas and other resources. It is recognized that the rural areas are important to the economic success of the Province and quality of life. More specifically, Section 1.1.4.1 states: "Healthy, integrated and viable rural areas should be supported by:

> a) building upon rural character, and leveraging rural amenities and assets;
>
> f) promoting diversification of the economic base and employment opportunities through goods and services, including value-added products and the sustainable management or use of resources;
>
> h) conserving biodiversity and considering the ecological benefits provided by nature; and
>
> i) providing opportunities for economic activities in prime agricultural areas, in accordance with policy 2.3."

Although rural settlements generally are the focus for growth and development, Section 1.1.4.4. also identifies that growth and development may be directed to rural lands.

Rural Lands

As the subject property is designated as Secondary Agricultural and Puslinch Economic Development Area, the lands can generally be considered rural lands. Section 1.1.5.1 states: "When directing development on rural lands, a planning authority shall apply the relevant policies of Section 1: Building Strong Healthy Communities, as well as the policies of Section 2: Wise Use and Management of Resources and Section 3: Protecting Public Health and Safety."

Section 1.1.5.2 establishes permitted uses on rural lands with Section 1.1.5.3 also stating that Recreational, tourism and other economic opportunities should be promoted". Further, Section 1.1.5.4 states: "Development that is compatible with the rural landscape and can be sustained by rural service levels should be promoted."

Land Use Compatibility
Section 1.2.6.1 states: "Major facilities and sensitive land uses shall be planned and developed to avoid, or if avoidance is not possible, minimize and mitigate any potential adverse effects from odour, noise and other contaminants, minimize risk to public health and safety, and to ensure the long-term operational and economic viability of major facilities in accordance with provincial guidelines, standards and procedures.

Section 1.2.6.2 states: "Where avoidance is not possible in accordance with policy 1.2.6.1, planning authorities shall protect the long-term viability of existing or planned industrial, manufacturing or other uses that are vulnerable to encroachment by ensuring that the planning and development of proposed adjacent sensitive land uses are only permitted if the following are demonstrated in accordance with provincial guidelines, standards and procedures:

a) there is an identified need for the proposed use;
b) alternative locations for the proposed use have been evaluated and there are no reasonable alternative locations;
c) adverse effects to the proposed sensitive land use are minimized and mitigated; and
d) potential impacts to industrial, manufacturing or other uses are minimized and mitigated"

The PPS defines *sensitive land uses*: "means buildings, amenity areas or outdoor spaces where routine or normal activities occurring at reasonable expected times would experience one or more adverse effects from contaminant discharges generate by a nearby major facility, sensitive land uses may be part of the natural or built environment. Examples include, but are not limited to: residences, day care centres, and educational and health facilities.

Employment
Section 1.3.1 states: "Planning authorities shall promote economic development and competitiveness by:

a) providing for an appropriate mix and range of employment, institutional, and broader mixed uses to meet long-term needs;
b) providing opportunities for a diversified economic base, including maintaining a range and choice of suitable sites for employment uses which support a wide range of economic activities and ancillary uses, and take into account the needs of existing and future businesses;
c) facilitating the conditions for economic investment by identifying strategic sites for investment, monitoring the availability and suitability of employment sites, including market-ready sites, and seeking to address potential barriers to investment;
d) encouraging compact, mixed-use development that incorporates compatible employment uses to support liveable and resilient communities, with consideration of housing policy 1.4; and
e) ensuring the necessary infrastructure is provided to support current and projected needs.

Further, amongst other policies, Section 1.3.2.3 also states: "Within employment areas planned for industrial or manufacturing uses, planning authorities shall prohibit residential uses and prohibit or limit other sensitive land uses that are not ancillary to the primary employment uses in order to maintain land use compatibility.

Employment areas planned for industrial or manufacturing uses should include an appropriate transition to adjacent non-employment areas."

Natural Heritage

Section 2.1.1 states: "Natural features and areas shall be protected for the long term." Further, Section 2.1.8 states: "Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been determined that there will be no negative impacts on the natural features or on their ecological functions.

PROVINCIAL POLICY – A PLACE TO GROW, PROVINCIAL GROWTH PLAN (2020)
Similar to the PPS, the Growth Plan directs growth to settlement areas, unless where otherwise permitted. Section 2.2.9 establishes policies for Rural Areas. Within Rural Areas, there are Rural Lands, which are defined as "lands which are located outside of settlement areas and which are outside prime agricultural areas". Further, Section 2.2.9.3 permits similar uses to the PPS including development outside of settlement for c) other rural land uses that are not appropriate in settlement areas provided they: "i. are compatible with the rural landscape and surrounding land uses, ii. sustained by rural service levels and iii. not adversely affect agricultural uses or resource-based uses."

The subject property went through a related Official Plan amendment to include the lands within the Puslinch Economic Development Area (PA7-1) which is a historical special policy that generally would meet the definition of an employment area within the PPS. However, the policy is a Puslinch-specific special policy area that provides policy permissions for additional uses, primary focusing on aggregate operations once they've ceased to operate.

Further, the Growth Plan also includes policies with respects to employment, rural areas and rural lands, natural heritage etc. Section 2.2.9.5 states: "Existing employment areas outside of settlement area on rural lands that were designated for employment uses in an official plan that was approved and in effect as of June 16, 2006 may continue to be permitted. Expansions to these existing employment areas may be permitted only if necessary to support the immediate needs of existing businesses and if compatible with the surrounding area."

In regards to the natural features on-site, which includes key hydrological features (i.e. wetlands and streams), Section 4.2.4 identifies policies for development and site alteration adjacent to and within 120 metres (393.7 feet) of a key hydrological feature. At a minimum, a 30 metres (98.4 feet) vegetative protection zone is required. An Environmental Impact Study (EIS) was prepared by NRSI which is being peer reviewed by Dougan and Associates.

WELLINGTON COUNTY OFFICIAL PLAN
The subject property is designated as Secondary Agricultural and Core Greenlands, and subject to a Special Policy Area (PA7-1 – Puslinch Economic Development Area) within the County of Wellington Official Plan. Identified features include a Grand River Conservation Authority (GRCA) regulated Wetlands. A portion is located within Paris Galt Moraine Policy Area.

General County Policies:
Wellington County Growth Strategy (Section 3)– majority of growth will be directed to urban centre that offer municipal services and growth will also be directed to the secondary agricultural areas;

Economic Development Section 4.2, the Rural System will provide opportunities for employment with the main employment generator being resource based industries such as agriculture, aggregate and forestry. The Rural System can also contribute sites for employment based on the larger lots, larger buffer abilities, and proximity to rural resources and major roads;

Planning Impact Assessment Section 4.6.2, may be required to evaluate: the need of the use and taking into consideration available lands or buildings in the area; appropriateness and intensity of the use; adequacy of servicing; compatibility; impact on natural resources, biodiversity and natural features and areas; exterior design etc.

Rural System
Secondary Agricultural Area
Within the 'Secondary Agriculture' designation small-scale commercial, industrial and institutional uses are permitted. Overall, the existing PA7-1 policy area generally provides policy permissions for industrial uses.

Rural Employment Area
Section 6.8 provides permitted uses for rural employment areas including "dry" industrial uses wchi do not use significant amounts of water in their operation and which do not produce significant amounts of effluent. Further, Section 6.8.3 provides compatibility considerations including that sensitive land uses are adequately separated from industrial uses.

PA7-1 Puslinch Economic Development Area
As per Section 9.8.5, the intent of PA7-1 Area is to service the Township by providing locations for economic activity and employment opportunities. This area is the predominant location for business and industry in the Township.

Greenland System
The Official Plan recognizes that the features and areas identified in the Plan function as a System and that this System will be protected, maintained and enhanced. Section 5.4 provides policies for the Core Greenlands which is specific to all wetlands, habitation of endangered or threatened species or fish habitat and hazardous areas. Section 5.5.1 provides policies specific to Wetlands and states that "wetlands will be protected in large measure and development that would seriously impair their future ecological functions will not be permitted. The appropriate Conservation Authority should be contacted when development is proposed in or adjacent to a wetland."

Groundwater and Paris Galt Moraine
Section 4.9.3 states that it is the County's intent that the development of public and private uses will not negatively impact groundwater recharge or discharge, impair groundwater or surface water quality, negatively impact municipal groundwater supply. Further, Section 4.9.4 provides policy direction that Wellington County commits to pursuing the following directions relating to water resources:

a) ensure that land use planning contributes to the protection, maintenance and enhancement of water and related resources and aquatic systems on an integrated watershed management basis;
b) protect surface and groundwater quality and quantity through the use of regulatory and voluntary means of prohibiting, restricting or influencing land uses and activities;
a) protect wetlands and areas that make significant contributions to groundwater recharge;

Further, Section 4.9.7 provides policies relative to development on the Paris Galt Moraine Policy Area. The Paris and Galt Moraine policies are intended to:

- protect moraine processes and features in order to maintain and where possible restore and enhance groundwater and surface water resources; and
- promote stewardship activities on the moraines that maintain, restore or enhance groundwater and surface water resources

Source Water Protection
The subject property is located within a Q1 and Q2 Wellhead Protection Area and the County's Risk Management Official has provided comments on the initial submission. These comments have been included within the Agency and Public Comments section.

Environmental Services
The objectives in Section 11.2.2 for water and sewage services are to protect the quality and quantity of ground and surface water. Further, development in the rural system is anticipated to be on individual well and septic where soil conditions are suitable over the long term.

ZONING BY-LAW
According to Schedule 'A' of Zoning By-law No. 023-18 the subject property is zoned Site Specific Highway Commercial (sp89) Zone and Natural Environment (NE) Zone and a portion of the lands are subject to the Township's Environmental Protection Overlay. The zoning limits can be seen in **Attachment 1**. The applicant is proposing to amend the existing HC(sp89) zone to an IND zone to permit a transport terminal, warehouse and office.

The existing Site Specific Highway commercial only permits the following uses
a) Art gallery Conference or meeting facility;
b) Personal service shop;
c) Professional office;
d) Public office;
e) Garden centres or nurseries;
f) Log cabin/model home display;
g) Restaurant;
h) Miniature golf;
i) Refreshment room;
j) Retail store engaged in the sale of gifts, antiques, tourist shop, furniture, home and garden or landscaping improvement supplies, farm produce, or domestic arts and crafts;
k) Model railway;
l) Specialty food store;
m) Variety store;
n) Outdoor activity area; and
o) Recreational or entertainment facility.

The existing NE zone is proposed to remain and requires a 30m setback which may be reduced in certain circumstances.

AGENCY AND PUBLIC COMMENTS
This application was circulated to statutory agencies by the Township of Puslinch. The following comments have been provided at the time of preparation of this report are summarized below:

- **Building Department:** No concerns at zoning stage will provide more comments at site plan stage.

- **By-law Department:** No concerns with the proposed Zoning By-law Amendment application.

- **Fire Department:** Below are the following comments.
    - Show the fire route on the site plan.

  - If the overhead walkway between the office building and the warehouse building are constructed above the fire route, the overhead clearance above the fire route shall be a minimum of 5m in clear height above the road surface.
  - Show the water supply for firefighting purposes on the site plan. Attached are the Puslinch requirements.
  - Show the fire department pumper connection for the sprinklered warehouse.
  - A fire safety plan could be required before occupancy. Please refer to 2.8.2 of the Ontario Fire Code for requirements.

- **GRCA Comments:** This application is considered to be a minor Zoning By-law Amendment. GRCA staff recommend that the application and Draft By-law be amended to include the Natural Environment Zone on the subject property.

- **Township Engineer (GM Blue Plan):** No concerns with the zoning bylaw amendment from an engineering perspective. Further detailed review will be provided at the time of detailed design and site plan application. Note that an MECP ECA will be required for the wastewater treatment system.

- **Public Works Department:** No comment

- **Hydrogeological Review Comments (Harden Environmental):**
  - *Existing well:* Should either be decommissioned or retrofitted to obtain water only from the Guelph Formation or Goat Island/Gasport formations. Groundwater from the Guelph Formation should not be permitted to flow to the lower formations.
  - *On-Site Recharge:* Provide water balance that confirms that recharge conditions prior to the filling in of the depressions can be met post development.
  - *Septic System:* Although the Township is not responsible for approving this septic system, we recommend that the Township review and comment on the required Environmental Compliance Approval.

- **Source Water Protection:** Please note that we are in support of the Township Hydrogeologist's comments that a water balance be submitted for review that confirms that recharge conditions can be met post development, and that the Township review and comment on the required septic system Environmental Compliance Approval.

- **Environmental Impact Assessment (Dougan & Associates):**
  - No ToR was provided prior to completing the EIS
  - Some of the surveys completed by Aboud & Associates were not repeated by NRSI during appropriate survey/breeding windows. As a result, the 2014 data and surveys conducted outside of appropriate survey windows should not be used to draw conclusions about the existing conditions and significance of features on site.
  - No negative impacts on natural features onsite or adjacent lands, however this conclusion is likely premature; adequate field studies have not been carried out to support the EIS.

- **County of Wellington Roads Department:** In general, the concept of accessing the existing entrance onto Brock Road and a new access on Gilmore Rd is acceptable to the Wellington Roads. Additional access points along Brock Rd will Not be provided for this development as outlined in our policy and official plan requirements. The TIS will be peer review and official comments will be provided as the zoning bylaw amendment moves along through the process.

Additional Comments:

- **Planning Development and Advisory Committee (PDAC):** Formal minutes for the PDAC meeting have not been provided at this time.

- **Public Comments:** Staff have received a number of comments in advance of the public meeting, concerns received to date relate to the proximity of residential dwellings to a logistics facility; fire safety regarding warehousing uses; further industrial expansions; noise, visual effects, traffic and safety concerns on Gilmour Road and the roundabout; decreased property values; light pollution; septic and water impacts and other environmental concerns.

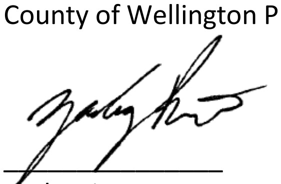
Staff and agencies submitted a number of initial comments in January 2023, Township council received a report and deemed the application complete on February 23rd, 2023.

Additional Items for consideration
When drafting an amending Zoning By-law and in considering this application the appropriateness of the use including conformity with Provincial policy and the County of Wellington Official Plan, the scale and compatibility of the proposal will need to be considered.

The initial comments provided to the applicant indicate a noise assessment should be required to determine if mitigate measures are required for the proposed development. A water balance as indicated by the Township's engineer, Hydrogeologist and Source Water staff will be required to determine the required recharge areas prior to the filling in of infiltration depressions on the site. Dougan has provided comments on the applicant's EIS which will require resubmission and review of the report. The applicant has indicated their intent to provide the noise assessment, the report has not been received by staff at this time.

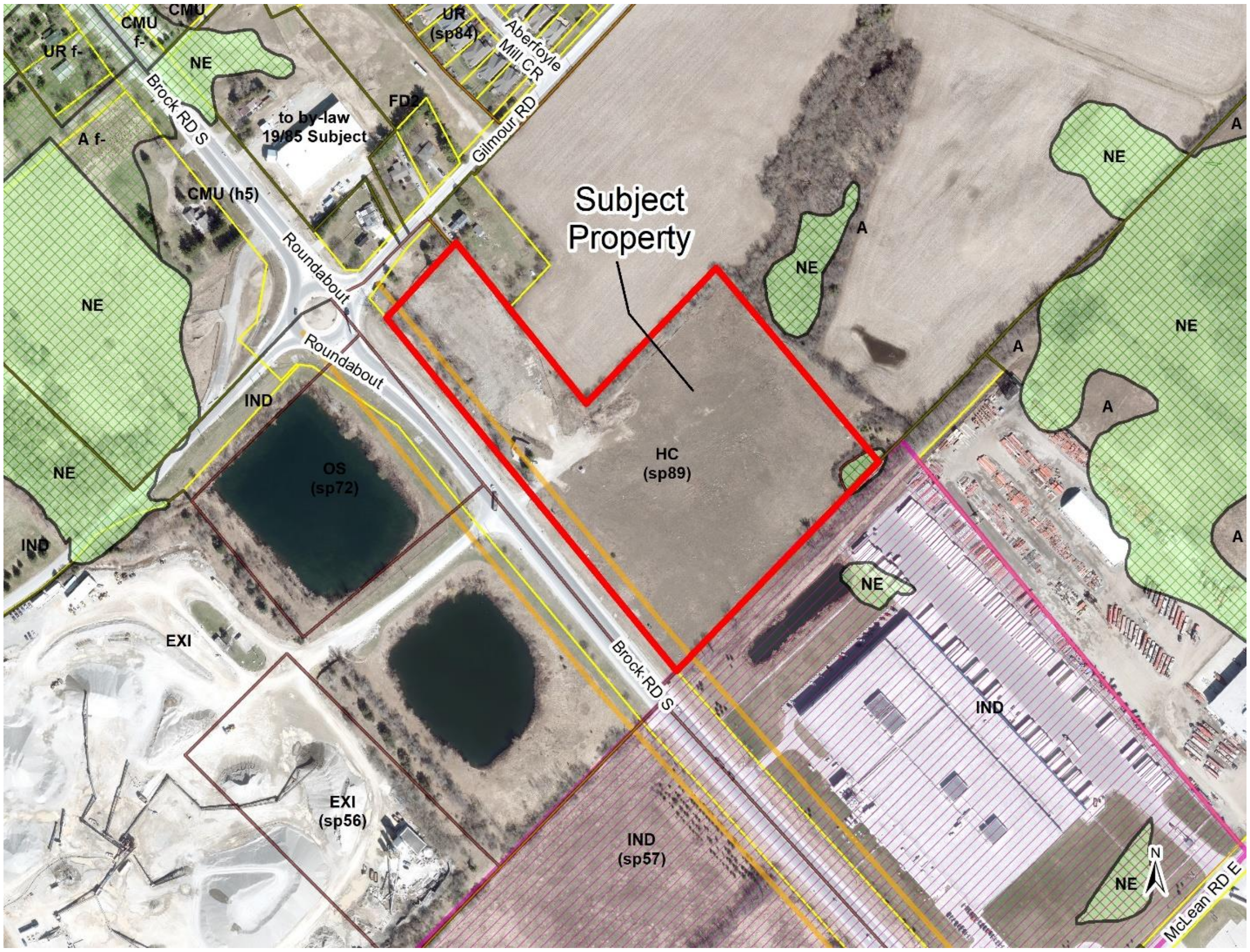
NEXT STEPS
It is expected that comments from the County's peer review of the TIS will be provided to the applicant which may require additional review. The applicant is required to submit a water balance and noise assessment which will also need to be reviewed. It is expected that there will be additional discussion with the applicant regarding the proposal prior to providing a recommendation report to council. The public meeting for this application is scheduled for March 22nd, 2023. We will be in attendance at the public meeting to hear the applicant's presentation and any public comments. Our planning recommendations will be provided following the public meeting and resolution of the identified outstanding issues.

Respectfully submitted,
County of Wellington Planning and Development Department

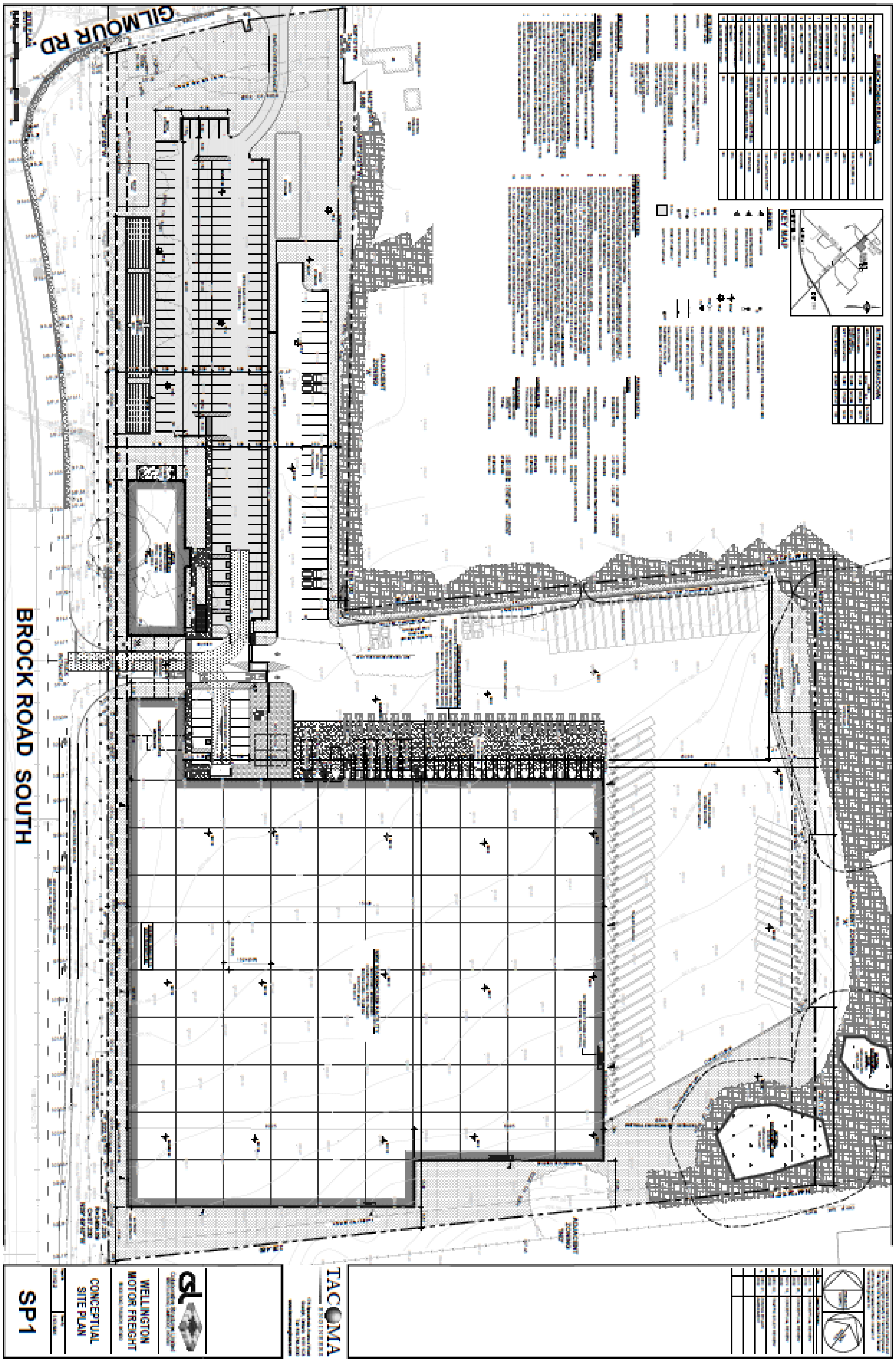


Zach Prince MCIP RPP
Senior Planner

ATTACHMENT 1 – Aerial of Subject Lands



ATTACHMENT 2 - Sketch provided by Applicant



BLUETRITON™ 101 BROCK ROAD SOUTH, PUSLINCH , ONTARIO N0B 2J0

March 10, 2023

Township of Puslinch
7404 Wellington County Rd 34,
Puslinch, ON
N0B 2J0

Dear Mayor Seeley, Councillor Hurst, Councillor Goyda, Councillor Sepulis & Councillor Bailey

BlueTriton Brands (BTB) has reviewed the application and supporting documentation related to the proposed Wellington Motor Freight (WMF) development at the corner of Gilmour and Brock Road in Puslinch Township.

As one of the most heavily monitored water-taking sites in the province, whose business depends on the quality of the water we bottle, we are extremely concerned with this type of operation potentially being constructed across the street from our operations. Without proper controls at the facility, the proposed development would be a direct threat to the local groundwater quality and particularly to the BTB production well which supplies all of the water to its 200-employee facility. If this project moves forward, it has the potential to affect our business if strong environmental compliance is not followed or an accidental spill were to occur.

One of the aspects of our business we are most proud of is to be an emergency source of drinking water to our surrounding communities and organizations. The water that BTB bottles at its facility is not only important from an economic and health perspective, it is essential in times of emergencies. Annually BlueTriton donates over 1.5 million bottles of water to Canadians in crises during floods and fires. BTB also has a partnership with the Canadian Red Cross to support the organization in times of need. We are committed to helping Canadian families and unhoused populations in Ontario through ongoing donations to Project Water (over 300,000 bottles annually) and Project Food Chain (over 100,000 bottles annually). In February 2023, we donated over 81,000 bottles of water to Second Harvest to help Ontario families in need. We have an ongoing monthly donation to the Waterloo Foodbank and Feed Ontario of over 32,000 bottles of spring water a month to help local families in need as inflation continues to make life difficult. All these donations are reliant on our location in Puslinch.

Below we outline concerns we have regarding the approval of the rezoning application to allow for the proposed truck facility.

1. Existing supply well at the location of the proposed facility

In the Township's hydrogeology review, Harden Environmental has noted that there is an existing 12-inch diameter water well at the location of the proposed development. Harden Environmental has noted that the well is open across multiple bedrock aquifers. The existing well has a casing that terminates at the top of rock and penetrates the Guelph, Eramosa and Goat Island/Gasport aquifers. In previous comments to the Township of Puslinch, Harden Environmental has noted that wells open across multiple aquifers pose a direct threat to groundwater quality. The existing supply well and other private wells on the property should be properly decommissioned. The proposed facility is located in an area without municipal water supply. Therefore, a new well will be required to service the 100+ staff for the proposed facility. The new well should be constructed so that it obtains its supply from only the Guelph Formation or Goat Island/Gasport Formation, but not both. A permit to take water (PTTW) must be required for the new well to ensure that it is properly operated with strict monitoring and reporting requirements.

2. Infiltration from the proposed infiltration gallery septic field

The proposed development includes an infiltration gallery and a 777 m2 septic field with a planned infiltration capacity of greater than 10,000 litres per day. A capacity of 10,000 litres per day distributed over an area of 777 m2 corresponds to an infiltration rate of 0.013 m/day. This is about 15 times larger than the estimated recharge to the bedrock over this area (300 mm/year). The elevated infiltration rate may overwhelm natural dilution of contaminants in the leachate. In addition, although the proposed treatment system has been sized and designed to prevent surface ponding of septic waste, locating the system at the topographically-low point of on the property may result in runoff from the parking areas entering this leach field, particularly during large storm events.
If the project moves forward, we request that the septic field is moved from its current proposed location to the furthest northeast corner. The developer should additionally be required through the MECP permit to monitor treatment effectiveness and to demonstrate that degradation of water quality does not occur as leached water moves south and west across the property.

3. Road Salt

The proposed development includes a 5.7-acre parking lot. The parking area is large, suggesting that substantial amounts of road salt and/or deicing compounds will be required. The impact of road salt and deicing compounds on groundwater quality in the area of the proposed WMF facility is an important concern for BTB and the surrounding community. Recognizing the potential impacts of road salt on water quality, BTB now applies primarily

BLUETRITON™ 101 BROCK ROAD SOUTH, PUSLINCH , ONTARIO N0B 2J0

sand at its operations. If the project moves forward, we request that rock salt alternatives be used for deicing.

4. Stormwater management

The proposed design indicates that parking surface water runoff will be directed through an oil-water separator to remove oils from trucks, before being sent via ditch to Mill Creek. It is not known whether additional truck washing/maintenance is planned, which would result in the need for additional hydrocarbon management.

At a minimum, we believe WMF facility should have an extensive monitoring program to ensure that its operations do not compromise surface water and groundwater quality in the Puslinch area. The monitoring program should include specific aspects of how the oil-water separator will be managed and maintained and should also require prompt notification of any releases from the facility.

Conclusion

BTB appreciates the opportunity to comment on the proposed Wellington Motor Freight facility. As an operation whose business depends on the groundwater quality, we are concerned with this type of operation potentially being constructed in such close proximity to our operations. Without plans to properly abandon the existing supply well at the location of the proposed facility and an extensive monitoring and reporting program, the proposed development is an unnecessary threat to the groundwater resources for all residents and businesses in this area.

Thank you,

Dr. Andreanne Simard, Ph.D.
Natural Resource Manager
BlueTriton Brands Canada

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 7:56 AM
To: Admin
Subject: Warehouse and Truck Transportation Hub at Gilmour and Brock Road

As a taxpayer / voter in this county, I am writing to you to let you know that I strongly oppose file application D14/WEL.

Gilmour Rd and Aberfoyle Mill Cres are residential roads. The proposed plan to change a portion of Gilmour Rd. To industrial zoning would have a considerably negative impact on the residents of the area. I have no doubt that if your family lived in the area you would agree.

The negative impacts include greatly increased traffic along Gilmour, additional noise and pollution to go along with that. There are safety concerns with the additional traffic as residents in the area use Gilmour as a walking route. Also, school buses routes are along Gilmour.

I am also concerned about property values being impacted because of the additional noise and visual impact of the proposal.

I urge you to oppose this application. Awaiting your reply.

Sincerely,
[redacted]

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 2:53 PM
To: Admin; James Seeley; John Sepulis; Russel Hurst; Sara Bailey; Jessica Goyda
Cc: [redacted]
Subject: We are opposed to the Zoning By-Law Amendment to Industrial

Dear Sir / Madam

I would like to inform the township of our serious opposition to the proposed Zoning By-Law Amendment rezoning application for a proposed Warehouse and Truck Transportation Hub at Gilmour and Brock Road. 100% or our resident responses to our intra-community survey are opposed to this re-zoning. This will be detailed at the March 22 Town Meeting.

Some of the reasons for our opposition to this rezoning application are as follows:

1. Rezoning from Highway Commercial / Secondary Agricultural to Industrial does a number of things:
    1. The subject lands are designated Highway Commercial, which comprises the Rural System. Permitted uses are agricultural, small scale commercial, industrial and institutional uses, as well as public service facilities. Changing it to Industrial:
        1. Removes restricted use of the land
        2. Removes the buffer that currently exists between the Industrial Area as laid out in the Official Plan and Aberfoyle Downtown Commercial, Urban Rural, Rural and Agricultural lands
        3. Obviously, we are not opposed to commercial development on the same lot. We welcome commercial development that doesn't degrade and devalue our beautiful residential community.

2. Proposed use of the land and a lack of commitment not to operate outside of business hours will have a direst impact on:
    1. Residential Property values – with additional noise / light / visual impacts and possible impact on our watershed / water supply and quality.
    2. Traffic increase with 21 loading docks, Tractor and trailer parking spaces and up to 150 employees
        1. Exiting/entering the 401 and thru Morriston (until Morriston bypass is completed)
        2. Down Brock Street, thru the town of Aberfoyle and the corresponding roundabouts
        3. The road capacity along Gilmour especially during shift changes
        4. Proposed entrance to the development on Brock is adjacent to the truck turning of the existing aggregate facility - causing additional delays
        5. We have a near accident on the south east corner of the Gilmore Brock round-a-bout about once every two or three weeks already so it is an unsafe situation now that would be made much worse.
    3. Environmental
        1. Noise from the additional traffic and the nature of the operations themselves such as truck back up alarms.
        2. Light from loading docks, parking lots and traffic
        3. Air quality from trucking facility
        4. Soil / water and aquifer concerns with reduced permeability surfaces after paving over a sizable amount of land and the addition of a massive septic system. Surface water pollution (salt & petrochemical) and drainage above sensitive ground water.
        5. Provincial water permitting and risk is a major unknown and water quality is our biggest concern. Large centralized septic systems are inherently more difficult to mitigate risk, especially in such an important area for Blue Triton and our community. We have a natural wetland and retention pond for stormwater management and mitigation. This site is essentially filling what was a natural wetland.

        6. Addition of a well and the water reservoirs needed for fire and sprinkler systems (including regular testing, emptying and refreshing)
    4. Safety
        1. With residents using Gilmour as a walking route.
        2. The traffic circle is already dangerous, but will get much worse. Not worried about delays so much as more accidents.
        3. Gilmore is also a School bus route.
        4. Security of the site and our surrounding community

5. Potential for storage and transportation of flammable and or hazardous goods (risk of fire, smoke & toxicity)

Our community appreciates the opportunity to comment and present at the Town Meeting on March 22. Our community depends on ground water quality. The lifestyle of our community depends on peace, quiet and safety. We see industrial re-zoning as an unnecessary threat to our property values, our water and quality of life. Our grown children refer to our community, The Meadows of Aberfoyle as Pleasantville, something that makes us smile and something we are proud of. We want to preserve and protect this special oasis we call home.

Sincerely,

[redacted]

Sent from Mail for Windows

Justine Brotherston

From: Meadows of Aberfoyle <aberfoylemeadows@gmail.com>
Sent: Tuesday, March 14, 2023 2:54 PM
To: Admin; Planning
Subject: File number D14/WEL - Rezoning Application for 128 Brock Road S,
Attachments: The Board Response - Non Compliance PPS - Planning Act.docx; The Board Response - Objection to Rezoning of 128 Brock Street - Concerns -2.docx

To: Courtenay Hoytfox, Municipal Clerk, Township of Puslinch

This email is to notify you that the Meadows of Aberfoyle's Board of Directors and/or their delegates wish to make an oral submission at the Public Information Meeting on March 22, 2023 to express the concerns of our residents to the application to rezone the property at 128 Brock Road South.

Please find attached two documents as submissions to the Township in this matter.

1. The Board Response - Non Compliance PPS Planning Act
2. The Board Response - Objection to Rezoning and Concerns 2

Please contact me at aberfoylemeadows@gmail.com to confirm receipt of this submission email and advise of next steps regarding the oral submission at the Public Information Meeting on March 22, 2023.

Thank you,

Cameron McConnell

President, Board of Directors,
The Wellington Vacant Land Condominium Corporation No. 147,
The Meadows of Aberfoyle

Sent On Behalf of the Board of Directors

The Wellington Vacant Land Condominium Corporation No. 147
the Meadows of Aberfoyle

THE MEADOWS of ABERFOYLE

Response to the Township of Puslinch

to the Application for Rezoning of 128 Brock Rd S

Non-Compliance with The Provincial Policy Statement Under the *Planning Act*

In recognition that our neighbourhood as one of the newest, largest, densest and significant residential areas in this area and close to the main street of the town of Aberfoyle, the board of the Wellington Vacant Land Condominium Corporation No. 147 - the Meadows of Aberfoyle (board) presents this document in your consideration of the application for the rezoning of 128 Brock Rd S.

The community of the Meadows of Aberfoyle was developed as a 15 acre environmentally protected park with walking trails. It is a community of fifty-five well-appointed houses, set in a rural pocket with owners who purchased these homes seeking a peaceful, natural setting. Owners understood upon purchase that across the road (Gilmore Road), the zoning was highway commercial and that was accepted by the purchasers.

It is our position that to maintain the small-town feel of Aberfoyle, the well-known and tourist features of the Aberfoyle Antique Market and the Aberfoyle Mill; to preserve its charm and its attraction, we ask the Township to consider maintaining this land use in a way that will provide a boarder or buffer between an industrial area and these sensitive areas of Aberfoyle. We ask that it not allow a trucking distribution centre to be placed beside its largest residential area and abutting its main street and attractions.

The board represents the residents of the Meadows of Aberfoyle, living on Aberfoyle Mill Crecent, Puslinch, Ontario. The board wants to express the strongest opposition for the application for rezoning of 128 Brock Rd S, adjacent to our urban residential zone, and puts forward the following submission through the provisions of the Provincial Policy Statement (PPS) as follows:

> ***The Provincial Policy Statement***
>
> ***Part I: Preamble***
>
> *The Provincial Policy Statement provides policy direction on matters of provincial interest related to land use planning and development. As a key part of Ontario's policy-led planning system, the*

*Provincial Policy Statement sets the policy foundation for regulating the development and use of land. It also supports the provincial **goal to enhance the quality of life for all Ontarians**.*

The board highlights this section of the PPS, to point out that the approval of this amendment will not enhance the quality of life for the residents of the Meadows of Aberfoyle, in Puslinch, impacting their health, enjoyment of their properties as well as the value and investments of their homes.

The Provincial Policy Statement provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment. The Provincial Policy Statement supports improved land use planning and management, which contributes to a more effective and efficient land use planning system.

The board submits that they are concerned about their water, their health and safety, the impact to their natural and built environment. The board is confident that the township can make the decision to continue the current zoning in and effort to comply with the PPS.

*The policies of the Provincial Policy Statement may be complemented by provincial plans or by locally-generated policies regarding matters of municipal interest. Provincial plans and municipal official plans provide a framework for comprehensive, integrated, place-based and long-term planning that supports and integrates the **principles of strong communities, a clean and healthy environment** and economic growth, for the long term.*

Again, the board is confident that the Township understands that allowing a land use that will significantly impact residents' health and safety concerns and provide obvious pollutants, would not comply with a clean and healthy environment, if it is placed in such a close proximity to a residential neighborhood.

The Provincial Policy Statement

Part III Geographic Scale of Policies

The Provincial Policy Statement recognizes the diversity of Ontario and that local context is important. Policies are outcome-oriented, and some policies provide flexibility in their implementation provided that provincial interests are upheld.

The Provincial Policy Statement (PPS) recognizes your unique expertise of the town of Aberfoyle.

The Provincial Policy Statement

Part III Policies Represent Minimum Standards

The policies of the Provincial Policy Statement represent minimum standards. Within the framework of the provincial policy-led planning system, planning authorities and decision-makers may go beyond these minimum standards to address matters of importance to a specific community, unless doing so would conflict with any policy of the Provincial Policy Statement.

In consideration of the Township's ability to use the PPS as minimum standards, the board requests that it decide against this application in favour of the unfortunate outcome that we expect it will have on the town of Aberfoyle as well as our residents.

> ***The Provincial Policy Statement***
>
> ***Part III Relationship with Provincial Plans***
>
> *Land use planning decisions made by municipalities, planning boards, the Province, or a commission or agency of the government must be consistent with the Provincial Policy Statement. Where provincial plans are in effect, planning decisions must conform or not conflict with them, as the case may be.*

The Board submits that approving this zoning amendment will be in conflict with the PPS meaningfully and in the intension of the instrument.

> ***The Provincial Policy Statement***
>
> ***Part IV: Vision for Ontario's Land Use Planning System***
>
> *The long-term prosperity and social well-being of Ontario depends upon planning for strong, sustainable and resilient communities for people of all ages, a clean and healthy environment, and a strong and competitive economy.*

The board submits that the situation of a trucking distribution centre next to a residential zone does not represent a clean and healthy environment for the residents of the Meadows of Aberfoyle. It is not creating a sustainable community given the threat to our water and other pollutants.

> *The Provincial Policy Statement focuses growth and development within urban and rural settlement areas while supporting the viability of rural areas. It recognizes that the wise management of land use change may involve directing, promoting or sustaining development. Land use must be carefully managed to accommodate appropriate development to meet the full range of current and future needs, while achieving efficient development patterns and avoiding significant or sensitive resources and areas which may pose a risk to public health and safety. Planning authorities are encouraged to permit and facilitate a range of housing options, including new development as well as residential intensification, to respond to current and future needs.*

The board submits that the PPS directs that efficient planning avoid such a proposed development so close to the sensitive water table which includes the water supply of the well of the community, threatening its safety. There is an expectation of many pollutants that will be faced by the residents, threatening their health and safety, if so closely tied to the trucking distribution centre. We instead request that the township retain it's current zoning or replace it with zoning that aligns with the residential intensification requirement of the PPS.

> *[The PPS] support the financial well-being of the Province and municipalities over the long term, and minimize the undesirable effects of development, including impacts on air, water and other*

resources. They also permit better adaptation and response to the impacts of a changing climate, which will vary from region to region.

The board suggests that the Township minimize the undesirable effects of the development by not allowing it to be build upon the lands being considered in this application.

Strong, liveable and healthy communities promote and enhance human health and social wellbeing, are economically and environmentally sound, and are resilient to climate change.

The board advises that the community will not feel aligned with the above statement, if the application is approved.

The Provincial Policy Statement directs development away from areas of natural and human-made hazards. This preventative approach supports provincial and municipal financial well-being over the long term, protects public health and safety, and minimizes cost, risk and social disruption.

In alignment with this direction, how can we place a truck distribution centre next to a dense residential area of the community, inserting it as a potential or probable human made hazard next to fifty five residences of families including all ages, disrupting the natural enjoyment of their homes, the enjoyment that they expected when purchasing these properties.

Taking action to conserve land and resources avoids the need for costly remedial measures to correct problems and supports economic and environmental principles.

Strong communities, a clean and healthy environment and a strong economy are inextricably linked. Long-term prosperity, human and environmental health and social well-being should take precedence over short-term considerations.

Conservation of our water, the impact of future remedial requirements, disruption of our clean and healthy environment are all concerns of the residents of the Meadows of Aberfoyle.

The fundamental principles set out in the Provincial Policy Statement apply throughout Ontario. To support our collective well-being, now and in the future, all land use must be well managed.

In support of our position against this application for rezoning to an industrial zone, the board would highlight its appreciation that the township to adhere to the direction of the final statement of the Part IV of the PPS above.

Part V: Policies

1.0 Building Strong Healthy Communities

Efficient land use and development patterns support sustainability by promoting strong, liveable, healthy and resilient communities, protecting the environment and public health and safety, and facilitating economic growth.

The board submits that this does not align with the application for a truck distribution center next to a residential neighborhood.

1.1 ***Managing and Directing Land Use to Achieve Efficient and Resilient Development and Land Use Patterns***

1.1.1 Healthy, liveable and safe communities are sustained by:

c) avoiding development and land use patterns which may cause environmental or public health and safety concerns;

The board submits that this does not align with the application for a truck distribution center next to a residential neighborhood, given the potential and probable issues set out in our accompanying document.

1.1.3.5 Planning authorities shall establish and implement minimum targets for intensification and redevelopment within built-up areas, based on local conditions. However, where provincial targets are established through provincial plans, the provincial target shall represent the minimum target for affected areas.

The board is not aware of the implementation of any minimum targets and suggests that the area being considered for rezoning might offer that ability, for the township's consideration.

1.1.3.7 Planning authorities should establish and implement phasing policies to ensure:

a) that specified targets for intensification and redevelopment are achieved prior to, or concurrent with, new development within designated growth areas; and

b) the orderly progression of development within designated growth areas and the timely provision of the infrastructure and public service facilities required to meet current and projected needs.

1.6.6 Sewage, Water and Stormwater

The Board is so concerned about the protection of the community's water and without the expertise to make predictions that we intend to highlight the entire section of 1.6.6 as a concern.

The resource may be deemed protected but that can be different quickly and without warning or mitigation. The concern is for the impact of this business and of subsequent business owners.

Despite mitigation requirements that may be assigned upon construction, there are no requirements to test, to share results or to mitigate negative test results in the future. There is no agreement for continuous improvement and newer and more accurate testing of this or other pollutants in the future.

3.0 Protecting Public Health and Safety

Ontario's long-term prosperity, environmental health and social well-being depend on reducing the potential for public cost or risk to Ontario's residents from natural or human-made hazards.

Development shall be directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damage, and not create new or aggravate existing hazards.

Accordingly:

3.2 Human-Made Hazards

3.2.1 Development on, abutting or adjacent to lands affected by mine hazards; ***oil, gas and salt hazards****; or former mineral mining operations, mineral aggregate operations or* ***petroleum resource operations*** *may be permitted only if rehabilitation or other measures to address and mitigate known or suspected hazards are under way or have been completed.*

In accordance with the intent of this item, the board suggests that the hazards associated with a trucking distribution center not be set beside a residential neighborhood.

4.0 Implementation and Interpretation

4.4 This Provincial Policy Statement shall be implemented in a manner that is consistent with Ontario Human Rights Code and the Canadian Charter of Rights and Freedoms.

4.5 In implementing the Provincial Policy Statement, the Minister of Municipal Affairs and Housing may take into account other considerations when making decisions to support strong communities, a clean and healthy environment and the economic vitality of the Province.

6.0 Definitions

Adverse effects: as defined in the Environmental Protection Act, means one or more of:

a) impairment of the quality of the natural environment for any use that can be made of it;
b) injury or damage to property or plant or animal life;
c) harm or material discomfort to any person;
d) an adverse effect on the health of any person;
e) impairment of the safety of any person;
f) rendering any property or plant or animal life unfit for human use;
g) loss of enjoyment of normal use of property;

The Board submits that the rezoning would have significant adverse effects on the residents of the Meadows of Aberfoyle.

Designated vulnerable area: means areas defined as vulnerable, in accordance with provincial standards, by virtue of their importance as a drinking water source.

Negative impacts: means

a) in regard to policy 1.6.6.4 and 1.6.6.5, potential risks to human health and safety and degradation to the quality and quantity of water, sensitive surface water features and sensitive ground water features, and their related hydrologic functions, due to single, multiple or successive development.

Negative impacts should be assessed through environmental studies including hydrogeological or water quality impact assessments, in accordance with provincial standards;

b) in regard to policy 2.2, degradation to the quality and quantity of water, sensitive surface water features and sensitive ground water features, and their related hydrologic functions, due to single, multiple or successive development or site alteration activities;

Private communal water services: means a non-municipal drinking-water system within the meaning of section 2 of the Safe Drinking Water Act, 2002 that serves six or more lots or private residences.

The Township is asked to put their mind to the designation of the water supply as vulnerable, given that water supply is being used by a company to send water all over the world and given that the residents have been required to have the most significant and severe septic systems available. It also notes that the residents share a private communal water system, that might easily be impacted by the pollutants of a trucking distribution centre,

Sensitive: *in regard to surface water features and ground water features, means areas that are particularly susceptible to impacts from activities or events including, but not limited to, water withdrawals, and additions of pollutants.*

Sensitive land uses: *means buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from contaminant discharges generated by a nearby major facility.*

Sensitive land uses *may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities.*

The board suggests that these definitions apply to the community of the Meadows of Aberfoyle.

The board finally notes that the workforce will be going home to their homes, not impacting their families by these pollutant or issues that would impact the enjoyment of their properties

The Wellington Vacant Land Condominium Corporation No. 147
the Meadows of Aberfoyle

Response to the Township of Puslinch

to the Application for Rezoning of 128 Brock Rd S

Objection and Community Concerns

The board of the Wellington Vacant Land Condominium Corporation No. 147 - the Meadows of Aberfoyle (board) presents this document in your consideration of the application for the rezoning of 128 Brock Rd S. as part of its submission in the objection to the application for rezoning of 128 Brock Rd S.

The residents of the Aberfoyle Meadows community, located off Gilmour Road directly northwest of the proposed trucking facility, are extremely concerned about the development of a trucking facility adjacent to our neighborhood. Specific comments include the following:

The board puts forward the following as concerns for the rezoning application:

1. The proposed septic bed is 300 meters from our private wells. We are extremely concerned that septic water will be drawn into our well as the proposed location is in close proximity to the nearest corner to our neighborhood. Contamination will only be confirmed after the fact- at which point it is too late.

2. The new facility will create even more traffic in an area that has recently become overloaded with trucks and commuters. We are concerned about 100 or more employees coming and leaving on Gilmour Road and backing up traffic into the new traffic circle. We are also concerned about the increasing use of Gilmour Road going northwest, as the road becomes unpaved just beyond our neighborhood and is not improved to handle higher traffic loads. We expect all trucks will also have to exit the facility by way of the traffic circle, as they will find it difficult to exit the facility by taking left turns across Brock Road. There may also be a requirement to have a separate turning lane off Brock S to avoid northbound delays.

3. The proposed employees' entrance will not provide adequate room to safely exit the round-about before being required to stop behind or in a lineup while employees turn into the driveway. This space may not be long enough for both line of sight and sudden stopping. Those coming from the round-about are only yielding when they come upon a car or line of turning / stopped cars.

    - It's not clear in the proposal if the measurement between the roundabout and the employee driveway is in compliance with any requirements.

4. We don’t see how the new facility won’t greatly increase noise disturbance and diesel odors in the neighborhood. The truck parking area is less than 250 meters from our neighborhood, and the employee entrance is about 100 meters from the nearest house in the neighborhood.

5. We are concerned about what could potentially be warehoused in the facility or in the trailers parked on the property. Flammable or toxic goods / trailers / building materials have the potential of emitting toxic smoke in the event of accidents or fires.

6. Consideration should also be given to the future potential use and density of this property once the zoning is approved.
   - Sales to a less integrous owner
   - Immediate growth impact -additional shifts, employees and trucks
   - Additional departments such as truck mechanics, storage, diesel and gas pumps

7. The facility should be required to obtain a Permit to Take Water. Even though the septic system is proposed to treat only 10,000 liters per day, water for sanitation and cleaning in the warehouse, as well as water for filling the storage reservoir for fire suppression, suggests that enough water will be used to warrant a Permit. Without a Permit, how will the Township track how much water is actually being used, particularly as propose items change or grow.
   - Consideration should be given to (impermeable) roof run off that falls on the pavement and may drag through the pollutants fallen from trucks such as oil, gas and particulates before settling on top of the aquafer.
   - Consideration should be given to the pollutants from underground reservoirs, particularly as the age, that may be used for the regular testing of fire systems. Similarly questions about where the flush will be sent.
   - Consideration should be given to the depth of any well to ensure that water would be taken from the appropriate aquifer.

8. Residents polled neighbours along Gilmour Rd. and Brock S as none of them received notice of the application or the upcoming meetings. All of those that were contacted opposed this rezoning application.

9. Only a handful of residents in the Meadows of Aberfoyle Many received notice of this rezoning application. The impact to the aquifer/water supply would suggest that the notice should have been sent more broadly.

The Residents Brought Forward the Following Concerns through the Wellington Vacant Land Condominium Corporation No. 147 Board of Directors:

Collective Concerns Brought forward to the Board

1. **Health and Safety Concerns and Pollutants**

   Light
   - light pollution due to industrial lighting 24/7
   - security lighting
   - lighting required to be redirected away from areas in mitigation requirements, may require lighting direction towards homes.
   - head lights

   Noise
   - The residents contend with the noise of the current industrial activities to the south.
     - The noise of this is enough to keep us awake or wake us through the night.
     - This reduces our ability to open windows during summer nights.
   - Significant Noise Pollution
   - Refrigerator truck noise – which produces a constant aggressive, aggravating hum to most people
   - Trucks backing up
   - Trucks gearing up and down
   - Large truck noise
   - Increased traffic noise
   - 24/7 nature of trucking firms (anytime after approval)and impacting sound levels - truck shunting, refrigerator trucks running 24/7 etc.

   Air Pollution
   - Truck and traffic exhaust
   - Unknown pollutants from unknown storage trailers and trucks
   - smell

   Health and Safety – potential, unknown and uncontrollable
   - trailers,
   - containers,
   - trucks and other materials stored on property
   - risk associated with type of goods housed in distribution centre - toxic chemicals, flammable materials etc.
   - Potential safety issues regarding handling of dangerous goods
   - toxicity

2. **Water Safety**
   - septic specifically in addition to run-off and drainage into aquifer,
   - water pollution
   - Large centralized septic risk and potential impact on well water
   - Impacts to the water table
   - Diesel generators, pumps and backups – noise and leakage

- The Meadows well is overseen by the province. Will this facility require the same?

3. **Property Values**
   - Reduction of property values
   - Increased selling times
   - Visually detracting warehouse and yard parking in close proximity to residential neighbourhood,
   - increased traffic on Gilmour Rd.
   - Visual negative impact to community setting with industrial use
   - (High structures, lighted buildings extending to surrounding property),
   - Destruction of green space, threat to wild life
   - massive lighting on the property spoiling the natural beauty
   - Property is zoned commercial, that was accepted upon purchase of these properties. Trucking is not commercial.

4. **Security**
   - Potential for additional car theft
   - pedestrian safety,
   - increased crime,
   - Residential Safety with in creased traffic as there are no sidewalks and Gilmour is used for frequent foot traffic

5. **Traffic and Road Conditions**
   - Increase traffic on Roundabout.
   - Access to and from Gilmore and Brock Rd.
   - Heavy Industrial trucks entering Brock, Congestion.
   - Large truck noise and traffic
   - Road conditions/wear and tear.
   - traffic safety,
   - degradation of Gilmour Rd quality,
   - Deterioration of road surfaces on Gilmour and Brock roads
   - 401 exit and Morriston bottleneck which will continue until the Morriston bypass comes to pass
   - Gilmour Road roundabout bottleneck with additional traffic
   - Use of Gilmour Rd as access to the site which will happen at the same time as school buses use Gilmour rd. (7:30-8:30)
   - Further infringement on the residential area on Gilmour
   - Trucks/traffic accessing Gilmour St - This is terrible and would make getting to Gordon not fun.
     The idea of Aberfoyle as a retirement 50 home beautiful development will be destroyed by a bunch of trucks and cars of employees who could care less about the communities.
   - Gilmour Rd would be residential not industrial or commercial.
   - Objection to the “less than transparent” proposal that traffic will be impacted by “a second”.

6. **Acquiesce to continued re-zoning and expanding concerns.**
   - **Eventual night shift/growth of the company or future companies**
   - This will set precedence for other like-minded companies to do the same and continued rezoning of adjacent lands.
   - Why is that this companies/corporation seems to have no problem getting the zoning of land changed?
   - Potential for future changes to operations of the logistics/trucking operation negatively impacting the community
   - There is no doubt that a business will try to grow. This is not a static request.
   - There is no doubt that the negative impact to the community will increase with time
   - Lack of oversight on their operations. Environmental impacts, including encroachment on our homes and health.

Justine Brotherston

From: [redacted]
Sent: Thursday, March 09, 2023 5:02 PM
To: Admin
Cc: James Seeley; Russel Hurst; Jessica Goyda; John Sepulis; Sara Bailey
Subject: Warehouse and Transportation Hub

We are writing this letter in response to the application for rezoning at 128 Brock Road South. We have been residents on Gilmour Road for over 20 years. We moved to this area because of the quietness and peace that it offers residents. This proposal would rob us of that.
We are frequent walkers along Gilmour Road. There are already concerns around traffic speed and pedestrian safety. This would make it impossible to enjoy our surroundings.
Traffic accidents along Brock Road are frequent due to vehicle volume. Just this morning (March 9th) there was an accident at the roundabout at Gilmour and Brock between a tanker and car. These accidents would multiply.
The noise that would come from such a warehouse would spread all the way down the road. Again, the peace we came for would disappear.
Truck traffic is not permitted on Gilmour Road (we have contacted the township about this numerous times). We question the compliance with this when such a warehouse is situated on the corner of our road. Truck traffic is already an issue in Morriston and this would exaggerate these issues. One year ago, I was witness to a truck rollover on Brock Road that missed my car by seconds. I do not want to drive in my neighborhood with the constant fear that this can happen again.
This area was originally wetland protected. What happened to this protection?
We are asking that this rezoning not be permitted by council so that residents of our township can be safe and comfortable in their neighbourhood.

[redacted]

Sent from my iPhone

Justine Brotherston

To: John Sepulis
Subject: RE: New Entry - Email Councillor John Sepulis

On Mar 10, 2023, at 9:20 PM, [redacted] wrote:

Your Name
[redacted]

Your Email
[redacted]

Your Address
[redacted]

Subject
Development

Your Message
Hi John
I am not sure to whom I should send my comments but I hope, through you, they will reach the correct destination.

On the matter of 128 Brock Road development, there is no question the plans raise the prospect of damage to Mill Creek and the watershed. This is one projects that requires thinking along the lines of the Precautionary Principle. Even it the likelihood of a spill or ground water damage is small, the impact on the Creek would be monumental.
Profits and tax assessment should not always take precedent over the preservation of fragile ecosystems.
Mill Creek should flow, cold and strong, long after this business is gone: it should be relocated to another location. Future generations will care little about what business was at 128 Brock Road. They WILL care about Mill Creek.
[redacted]

Sent from Township of Puslinch

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 11:12 PM
To: Admin
Subject: Proposed Warehouse and Truck Transportation Hub Gilmour and Brock Road

Importance: High

We are writing to you to express our concerns with the proposed Warehouse and Truck Transportation Hub at Gilmour and Brock Road. Our quaint and beautiful community does not need this type of business so close to a residential area.

1. Rezoning from Highway Commercial / Secondary Agricultural to Industrial does a number of things:
   - The subject lands are designated Highway Commercial, which comprises the Rural System. Permitted uses are agricultural, small scale commercial, industrial and institutional uses, as well as public service facilities. Changing it to Industrial:
     1. Removes restricted use of the land
     2. Removes the buffer that currently exists between the Industrial Area as laid out in the Official Plan and Aberfoyle Downtown Commercial, Urban Rural, Rural and Agricultural lands

2. Proposed use of the land and a lack of commitment not to operate outside of business hours will have a direct impact on:
   - Residential Property values – with additional noise / light / visual impacts
   - Traffic increase with 21 loading docks, 123 Tractor and trailer parking spaces and over 150 employees
     1. Exiting/entering the 401 and thru Morriston (until Morriston bypass is completed)
     2. Down Brock Street, thru the town of Aberfoyle and the corresponding roundabouts
     3. The road capacity along Gilmour especially during shift changes
     4. Proposed entrance to the development on Brock is adjacent to the truck turning of the existing aggregate facility - causing additional delays
   - Environmental
     1. Noise from the additional traffic and the nature of the operations themselves
     2. Light from loading docks and traffic
     3. Air quality from trucking facility
     4. Soil / water and aquifer concerns with reduced permeability after paving over a sizable amount of land and the addition of a massive septic system.
     5. Addition of a well and the water reservoirs needed for fire and sprinkler systems (including regular testing, emptying and refreshing)
   - Safety
     1. With residents using Gilmour as a walking route
     2. School bus routes along rural, residential, and school zones.
     3. Security of the site and our surrounding community

3. Potential for storage and transportation of hazardous goods

We ask you to strongly consider the above areas of concern when voting on this proposed rezoning application and remember the residential community that would be greatly impacted by this change.

Sincerely,

[redacted]

March 14, 2023

To Township of Puslinch

RE: Rezoning Application of 128 Brock Road South

Hello,

My [redacted] and I moved to the Meadows of Aberfoyle four years ago as we were attracted to the rural/residential atmosphere and quaintness of the Village of Aberfoyle. We enjoy the rich history of the area as well as the local amenities that Aberfoyle has to offer, including the recreation centre, library, antique market, Old Mill restaurant (and the former Village Family Restaurant) all within walking distance. The people who make up this community have been friendly and welcoming. We feel fortunate to be a part of this wonderful community.

However, we are now very concerned that the proposed industrial development being considered by Puslinch Township and Council will negatively impact our neighbourhood and community. We are writing to express our opposition to the rezoning proposal.

Prior to purchasing our home in Aberfoyle, we had confirmed that the subject lands along this stretch of Brock Road were designated Highway Commercial/Secondary Agricultural, limiting use to agricultural, small commercial, institutional and public service facilities. The rezoning of this property to industrial would have significant impacts to not only our immediate community but to the many nearby homes. We ask that the current zoning remain unchanged to ensure future development plans for this parcel of land align with the needs of the community while preserving the character of the Village of Aberfoyle.

Rezoning to industrial would allow this site (now or in the future) to be used for a multitude of industrial activities, including the current proposed warehouse and transportation hub. Furthermore, it would take away the buffer that currently exists between the McLean Road industrial area and our community.

Throughout my career, I have inspected and assessed many warehouse logistics facilities similar to the one being proposed. These types of operations are typically located in planned industrial parks, well away from residential areas and often along major highways. Although warehousing may be perceived as being a ‘clean’ operation, there are inherent hazards associated with such operations, with high piled storage of products on racks to great heights. Depending on marketplace/customer demands, this could include highly combustible or hazardous goods/ materials/ packaging. There can also be storage of combustible and/or hazardous product in trailers or in the open yard. In addition, water demands for fire protection systems and firefighting would be extensive.

Having an industrial operation such as this, located in close proximity to our neighbourhood, and with access to Gilmour Road, would not only have a negative visual impact to existing residences, but would raise numerous other concerns. We respectfully offer the Township of Puslinch and Council the following points of concern to consider.

The application to rezone the subject land to industrial will:

- result in industrial encroachment onto rural agricultural land
- open the door to further industrial expansion in an area that is primarily rural residential
- adversely affect the residential appeal of this area, impacting property values of established and future homes
- significantly increase traffic from trucks and employee vehicles (over 100 trips cited by applicant during peak hours that will flow onto Gilmour Road and onto Brock Road)
- create noise from nearby idling trucks, shunting of trailers in the yard, reverse beeping of trucks/forklifts
- be a visual detraction to adjacent residents - proposed warehouse and adjoining three story office building (appears to be over 30 feet high) with hundreds of transport trucks, trailers and cars parked on the east and north sides of property
- create light pollution from yard, building, and vehicle lights
- affect air quality from truck diesel fuel exhaust
- affect an environmentally sensitive area with potential impacts to the aquifer and in turn, the Meadows of Aberfoyle community well, due to the large septic system and site water run-off (salt, spilled diesel fuel and other contaminants)
- require extensive water supply for fire protection and sprinkler systems and will necessitate frequent discharge testing and maintenance (diesel pumps and/or generators) resulting in additional water run-off of untreated stagnant water
- potentially expand the hours of operations to additional shifts including nights and weekends.
- potentially store highly combustible commodities as part of a general storage warehouse. There are no guarantees that hazardous materials will not be stored at this location at a later date given the company is a customer/market driven business
- potentially have combustible storage in yard and in trailers creating a further health and safety risk to residents in the surrounding community
- create traffic safety issues:
    - Incoming/outgoing trucks making left turns onto or from Brock Road directly across from truck traffic entering/exiting existing aggregate operation.
    - Additional truck and vehicle traffic anticipated through the roundabout at Gilmour Road and on Brock Road through the Hamlet of Aberfoyle
    - Extensive employee vehicle traffic entering or exiting via the proposed Gilmour drive entrance, where school buses pick up and drop off children

- Potential line up of traffic to access roundabout on Gilmour Road especially during peak hours blocking resident driveways, school buses, local vehicle traffic etc.
- Increase in traffic on Gilmour Road from Brock Road to Victoria Road causing a safety concern for local walkers, joggers, and cyclists that frequent this road

We hope that the Township Council will <u>NOT</u> approve the zoning change given the significant impacts and the above noted concerns.

Aberfoyle has been described as a community with rich history that offers all the charms of small-town life, while being very close to the amenities and comforts of urban life. Please help keep industrial sprawl away from our homes and community.

Thank you for your consideration,

[redacted]

[redacted]

cc. Mayor James Seeley
Councillor Sara Bailey
Councillor Jessica Goyda
Councillor Russel Hurst
Councillor John Sepulis

Justine Brotherston

To: John Sepulis
Subject: RE: New Entry - Email Councillor John Sepulis

From: [redacted]
Sent: Monday, March 13, 2023 5:05 PM
To: John Sepulis <jsepulis@puslinch.ca>
Subject: New Entry - Email Councillor John Sepulis

Your Name

[redacted]

Your Email

[redacted]

Your Address

[redacted]

Subject

Zoning Application Wellington Truck Company

Your Message

I am currently abroad on vacation, but feel strongly enough about the zoning application submitted by Wellington Trucking that I have to interrupt my vacation to add my concerns and support to my fellow neighbours in Aberfoyle Mill Crescent and surrounding areas.

The concept for a trucking operation with a three storey office building together with warehouse facilities and the need to accommodate staff and also tractor trailer parking is of grave concern. Especially as staff accessibility is planned to be via Gilmour Road, which is extremely close to a major junction and roundabout.

At this point I would also add that the driving standards on this roundabout leave a lot to be desired and the increased traffic from a safety prospective has, hopefully, got to be extremely high on the Townships list when considering this application.

This access would also give vehicles the opportunity to turn and exit east on Gilmour Road, which as we all know is unmade up and poorly maintained.

Other concerns would also include:-

- Additional traffic
- Noise
- Pollution
- Water / Septic issues
- Expected operational growth which will exacerbate all our concerns
- Reduction of property values in Aberfoyle Mill Crescent & Gilmour Road
- Increased selling times

Unfortunately, being away I do not have access or time to all the information that is available on the application, but like many in this area I am strongly against this proposal.

[redacted]

Sent from Township of Puslinch

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 7:53 AM
To: Admin
Cc: James Seeley; John Sepulis; Russel Hurst; Sara Bailey; Jessica Goyda
Subject: I am opposed to the proposed Zoning By-Law Amendment -

Dear Sir or Madam

I would like to inform the township of my serious opposition to the proposed Zoning By-Law Amendment rezoning application for a proposed Warehouse and Truck Transportation Hub at Gilmour and Brock Road.

Some of my reasons for my opposition to this rezoning application are as follows:

1. Rezoning from Highway Commercial / Secondary Agricultural to Industrial does a number of things:
   - The subject lands are designated Highway Commercial, which comprises the Rural System. Permitted uses are agricultural, small scale commercial, industrial and institutional uses, as well as public service facilities. Changing it to Industrial:
     - Removes restricted use of the land
     - Removes the buffer that currently exists between the Industrial Area as laid out in the Official Plan and Aberfoyle Downtown Commercial, Urban Rural, Rural and Agricultural lands

2. Proposed use of the land and a lack of commitment not to operate outside of business hours will have a direst impact on:
   - Residential Property values – with additional noise / light / visual impacts
   - Traffic increase with 21 loading docks, 123 Tractor and trailer parking spaces and over 150 employees
     - Exiting/entering the 401 and thru Morriston (until Morriston bypass is completed)
     - Down Brock Street, thru the town of Aberfoyle and the corresponding roundabouts
     - The road capacity along Gilmour especially during shift changes
     - Proposed entrance to the development on Brock is adjacent to the truck turning of the existing aggregate facility - causing additional delays
   - Environmental
     - Noise from the additional traffic and the nature of the operations themselves
     - Light from loading docks and traffic
     - Air quality from trucking facility
     - Soil / water and aquifer concerns with reduced permeability after paving over a sizable amount of land and the addition of a massive septic system.
     - Addition of a well and the water reservoirs needed for fire and sprinkler systems (including regular testing, emptying and refreshing)
   - Safety
     - With residents using Gilmour as a walking route
     - School bus routes along rural, residential, and school zones.
     - Security of the site and our surrounding community

- Potential for storage and transportation of hazardous goods

Yours truly

[redacted]

[redacted]

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 2:06 PM
To: Admin
Subject: Proposed Warehouse Truck Transportation Hub - Gilmore and Brock

Follow Up Flag: Follow up
Flag Status: Flagged

Dear mayor and council members

We live in the Meadows of Aberfoyle and have concerns regarding the proposed warehouse and truck transportation hub. We have many concerns, especially in the area of traffic. Brock road is already a very busy route and will only get worse until the Morrison by pass is completed. Trucks entering or leaving the facility will either make a left turn off Brock or use the roundabput. This is a perfect storm for congestion and accidents. Any traffic off Gilmore is completely unacceptable. Noise and air quality are other factors. Trucks are noisy polluters. Currently this property is not designated industrial and as tax paying residents of Puslinch we believe we are entitled to have the designation not changed. We live in a quiet neighbourhood but would consider moving if the noise and traffic becomes unbearable.

We request that we be given the opportunity to attend the public meeting on March 22th.

yours truly

[redacted]

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 3:32 PM
To: Admin
Cc: James Seeley
Subject: Rezonjng from highway commercil industrial

Hello,
Good afternoon ,
This email is regarding Rezoning application.
Hereby I would like to drop my opinion.

Rezoning will leads to few things which I am not in favour of.

- The subject lands are designated Highway Commercial, which comprises the Rural System. Permitted uses are agricultural, small scale commercial, industrial and institutional uses, as well as public service facilities. Changing it to Industrial:

It Removes restricted use of the land

Proposed use of the land and a lack of commitment not to operate outside of business hours will have a direst impact on:

- Residential Property values – with additional noise / light / visual impacts
- Traffic increase with 21 loading docks, 123 Tractor and trailer parking spaces and over 150 employees
  - ✦ Exiting/entering the 401 and thru Morriston (until Morriston bypass is completed)
  - ✦ Down Brock Street, thru the town of Aberfoyle and the corresponding roundabouts
  - ✦ The road capacity along Gilmour especially during shift changes
  - ✦ Proposed entrance to the development on Brock is adjacent to the truck turning of the existing aggregate facility - causing additional delays
- Environmental
  - ✦ Noise from the additional traffic and the nature of the operations themselves
  - ✦ Light from loading docks and traffic
  - ✦ Air quality from trucking facility
  - ✦ Soil / water and aquifer concerns with reduced permeability after paving over a sizable amount of land and the addition of a massive septic system.
  - ✦ Addition of a well and the water reservoirs needed for fire and sprinkler systems (including regular testing, emptying and refreshing)
- Safety
  - ✦ With residents using Gilmour as a walking route
  - ✦ School bus routes along rural, residential, and school zones.
  - ✦ Security of the site and our surrounding community

✦ Potential for storage and transportation of hazardous goods.

Please let me know if any concerns.

Thank you

Regards
[redacted]

Justine Brotherston

From: [redacted]
Sent: Monday, March 13, 2023 12:53 PM
To: Admin
Subject: 128 Brock Road S Proposal Opposition

Good afternoon,

I am a resident on Gilmour Rd. located at 96. I wanted to share my concern and complete opposition to the proposed rezoning and subsequent business development which has been applied for at 128 Brock Rd. S. As the general community of Aberfoyle continues to welcome new families to the area and promote the residential nature of the area, the positioning of a site like this would work in direct conflict with this objective.

On the personal side, I have a [redacted]. When my family moved to Aberfoyle, we did so because of the visit which the community had and the calmness of Gilmour Rd in particular. Many other families reside on Gilmour Rd who feel the same. With the dirt road already becoming a thoroughfare for many vehicles and trucks despite the signs, we already deal with a volume of traffic and type of traffic which make a dirt road quite unsafe for a community and family. In addition to this, we already have cars which drive much too fast down the road.

This proposal would be a huge safety concern for the community in general and would take the Aberfoyle community into a more industrial area vs a place for families to grow.

Please do not accept this rezoning application on behalf of every family on Gilmour Rd. and Aberfoyle in general.

Thank you for your time,

--
[redacted]

Justine Brotherston

From: [redacted]
Sent: Monday, March 13, 2023 1:23 PM
To: Admin
Subject: Re Zoning application - 128 Brock Road S

We are residents of Puslinch and we want to voice our concern regarding the rezoning of the land at the corner of Brock Road and Gilmour. We live in the Meadows of Aberfoyle and we are already subject to significant noise from warehousing and aggregate industries that are impacting on our enjoyment of our property. This latest intrusion is of particular concern due to its proximity and nature of the industry.

Having worked for many years in the trucking and logistics industry we have seen many warehouse logistics and trucking facilities. These types of operations are typically located in large industrial parks, well away from residential areas often along major highways, such as the 401 and Hanlon. There are inherent hazards associated with warehousing operations due to the rack storage of potential combustible/flammable products on racks to great heights. The product mix can also change depending on current and future customer requirements.

Having an industrial operation such as this located in close proximity to our neighbourhood, and with access to Gilmour Road, would not only have a negative visual impact to existing residences in proximity but would raise numerous other concerns. Some key points of concern to consider include:

· Industrial encroachment on to rural agricultural land, adjacent to existing residential area

· Opens the door to further industrial expansion in this area

· The residential appeal of this area of Aberfoyle would be lost as a result

· Traffic and safety concerns from trucks and employee vehicles (over 100 trips cited by applicant during peak hours that will flow onto Gilmour Road and onto Brock Road to a lesser degree)

· Noise - truck idling, shunting trailers, reverse beeping (often at night)

· Visual detraction - proposed warehouse and adjoining 3 story office building (appears to be over 30 feet high) with hundreds of transport trucks, trailers and cars parked on the east and north sides of property

· Light pollution

· Septic and water impacts (sensitive environmental area)

· Potential pollution exposure from diesel fuel leaks

While council may want to increase the commercial and industrial mix in our township this is not the location that should be chosen for a major industrial operation.

The official plan for Puslinch does not reflect this type of business in close proximity to the residential neighbourhood.. There are many other potential sites that would be far better suited for this type of operation - why not one of the reclaimed aggregate sites?

[redacted]

Justine Brotherston

From: [redacted]
Sent: Thursday, March 09, 2023 8:56 AM
To: Admin
Subject: Rezoning proposal for trucking and distribution centre

Dear Clerk,

We are writing to express our concerns about the proposal currently being considered by the Township to re-zone and approve construction of a trucking and distribution centre on the land at the corner of Gilmour and Brock Roads.

[redacted], [redacted] and I are residents of 70 Aberfoyle Mill Crescent in the Meadows of Aberfoyle subdivision across from the planned site. As such we are very concerned about a range of issues that would, unless mitigated, affect us and our neighbours.

The first is traffic congestion at an already busy stretch of Brock Road and roundabout at Gilmour. It is difficult to believe that the volume of traffic planned by the applicant for the short term will remain the same after the development is in operation. The development will undoubtedly aggravate air, noise, and light pollution in the area.

We are especially concerned about water quality. We are all aware about the special nature of the fresh water aquifer in the area. The applicant is proposing construction of a large centralized septic system for the development. This solution has not worked well in other developments nearby of which I am sure the Township is well aware. It also does not solve the issue of the water, chemical, oil, and gas run-off which would be inevitable at the trucking centre. Given the potential harm to an environmentally sensitive area, I expect that the Township would insist on the development undergoing a thorough individual environmental assessment before proceeding.

Until our concerns are satisfactorily addressed, we are opposed to the re-zoning plan.

[redacted]

Justine Brotherston

From: [redacted]
Sent: Friday, March 10, 2023 11:16 AM
To: Admin
Subject: Concerns Regarding Proposed Warehouse & Truck Hub at Brock & Gilmour

Good morning,

Hope you had a wonderful week!

It was recently brought to our attention that there has been an application to rezone property at the end of our road for a proposed warehouse and truck transportation hub at Brock and Gilmour Road and needless to say as a Puslinch resident this is extremely concerning to us.

Currently Gilmour Road is lovely, quiet residential street, where people enjoy the beautiful country life, safe walks on the road with pets and children and time with friends and neighbours. This has created lots of opportunity for the township by making it one of the more desirable places to live. And sadly the proposal for a large, dirty and busy truck hub will greatly ruin the appeal of moving and living in Puslinch/Aberfoyle. Currently on your website you state "Our residents know that the Township of Puslinch is the ideal place to call home. With its laidback country feel and convenient proximity to major cities, it truly is a perfect fusion of rural and urban living." but if you allow companies like this to come in and threaten our beautiful community you are essentially turning your backs on this statement as well as your current residents.

As a resident my list of concerns if you allow this to proceed is extensive:
1. I am extremely disappointed to see the township is yet again turning its back on beautiful agricultural land to be rezoned for industrial use. We are an agricultural community that used to support farmers and local produce, but we seem to have lost our way the last couple years, focusing more on stealing precious farmland from those that work hard to feed our towns and cities for industrial and truck stops.

2. By allowing a truck company to build here you are placing enormous risk to our local environment. A large company like this, specifically in the trucking business places a huge risk to our groundwater, increased garbage on our local roadsides, extreme risk of pollutant leaks such as oil, antifreeze and other fluids being leaked into our grounds. All of this is only mere meters from residential homes and our beloved local elementary school.

3. Take a real look at the current truck hubs we have in the county. They all create excess dust, look dirty and unkept, create issues with traffic and park along the roads, cause light pollution all night long, and show little respect for their neighbours. My family currently farms in Puslinch and we have a couple fields that back onto the current truck hubs and I can tell you from experience they companies and their drivers have little to no respect for others properties, the environment or the community they are in. We constantly have to walk our fields before trying to harvest our crops to clean up all the garbage they throw over the fence into our fields. They seldom stop let alone slow down coming out of the facility's lane creating an extremely dangerous road. And we have no doubt in our minds they do not dispose of mechanical fluids properly, rather quickly and cheaply, with no respect for the land they are on or the negative effects they have on our environment and water supply.

4. You would be allowing a loud, dirty and busy truck location to be within feet of beautiful well sought after residential areas. With no buffer land in between. I have no doubt this will greatly decrease the value of all the

beautiful family homes on Gilmour Road and surrounding area, and will most likely mean the majority of residents will potentially look to leave the area, in search of another community to live in.

5. The roads are not set up for the number of trucks this new hub would have. The small streest through Morriston and Aberfoyle, as well as the small side roads (which truckers already drive on regardless of regulations) are not appropriate or safe to have these large transports travelling on them, nor are the roundabouts throughout the route.

6. As a trucking hub the location would undoubtedly be open 24 hours, this means shifts of employees coming in and out at all hours, all night lighting disturbing the country sky, excessive noise all hours of the day.

7. Air quality due to excessive exhaust and trucks being left on. We always say that the air in Puslinch, in the country, is so beautiful compared to the smog and dirty exhaust you see in the big cities, but by opening our doors to this company you are basically inviting the horrible air pollution to our front doors, only meters away from family residents and an elementary school.

8. How much water will this new company use? We currently are known for our great water in Puslinch, but if this company is allowed to move in, how much will they be draining from our groundwater supply? By time you figure in office, septic, sprinkler systems, reservoirs, washing trucks and automobiles on site? Add in the fact that they will take from the township but will most likely also be the main cause of water pollution in our area as well, with run off, lack of environmental stewardship practices and harmful liquids on site. It would only be a matter of a couple years before our well sought after clean water would be a health hazard.

9. Safety concerns for the community, with additional traffic, school bus routes, school safety zones are all at risk for additional accidents and deaths.

10. We have already seen on Gilmour Road the disrespect of people using our lovely country roads to dump garbage and pollute the roadside. This has been excessive in the past, but we can guarantee there will be lots more if you allow a trucking company to be on the road as well.

I am sure in theory the company that has purchased the land will make promises up front on paper, but will they truly stick to their promises to protect the local environment and respect their neighbours? Probably not. They do not live here, they are not raising their families here, they do not have kids going to the school down the road. They are here to make money and do what makes them most profitable, with no regard whatsoever to those around them. That is not what Puslinch is about and I don't think we should be allowing people who do not have the same values and goals as our township to come in and destroy them.

I really hope that the township truly takes all the current residents' concerns into consideration. Families used to be excited at the prospect of moving to this area but if we continue to disregard the reasons that make Puslinch so great for less savory development, I think we will soon find Puslinch is no longer the wonderful place it once was, which is extremely sad.

Sincerely,

[redacted]

Your Name

[redacted]

Your Email

[redacted]

Your Address

[redacted]

Subject

Zoning Amendment application

Your Message

totally against this company moving in
Gilmour is a quiet street and should remain so No access to any traficv/trucks etc onto Gilmour.
I am against this zoning

Sent from Township of Puslinch

Your Name

[redacted]

Your Email

[redacted]

Your Address

[redacted]

Subject

Rezoning Application - Wellington Trucking

Your Message

As a resident of Meadows of Aberfoyle, I would like to voice my concerns pertaining to the Wellington Trucking Company occupying the land at Gordon and Gilmour.

The thought of having a large trucking company adjacent to our quiet community is very disturbing. The effect this will have on our property values, as well as the noise pollution, additional traffic and safety along Gordon with respect to vehicles pulling in and out of the premises negatively impacts our community.

The highway 6 corridor is already a source of frustration for Puslinch/Guelph residents with the amount of trucks using this route.

Also the Trans-X trucking company (among many others) currently put a lot of strain on the highway 6 corridor with all the trucks that come in and out of that area on a daily basis. Having another trucking company would only put more stress on the area and with the decision to postpone the Highway 6 overpass, the current infrastructure would not meet the needs of additional traffic.

Also, the roundabout at Highway 6 and Gilmour would allow for more traffic confusion and opens the door for more congestion and potential accidents.

In conclusion, for the above reasons I am strongly against the Wellington Trucking Company making their home at Highway 6 and Gilmour and I ask for your support in ensuring this rezoning is rejected.

Regards,

[redacted]

Sent from Township of Puslinch

Your Name

[redacted]

Your Email

[redacted]

Your Address

[redacted]

Subject

Objection to texting of 128 Brock rd south

Your Message

I'm writing you to object to the rezoning of the above address. I'm a resident of Aberfoyle mills & have been for 4+ years. We moved to the country to a quiet community for a reason. Rezoning of this nature will definitely affect our environment. It'll increase the noise level of trucks running up & down Gilmour street that is already being used by large heavy trucks illegally. I frequently walk up & down Gilmour with my dog, kids & grandchildren it'll be a safety issue for us to continue to do so. Potentially it could affect our environment ; drinking water & our septic systems. Please help us oppose this. [redacted]

Sent from Township of Puslinch

[redacted]

March 13, 2023

Town of Puslinch
7404 Wellington Rd 34
Puslinch ON N0B 2J0
Sent via e-mail : admin@puslinch.ca

Attention: Clerk's Office

RE: File D14/WEL

SUBJECT LAND: Part Lot 24, Concession 7; Part Lot 24, Concession 8; Part Road Allowance between Concessions 7 & 8 as in RO677671 and RO677672 Save and Except Part 1, 61R-21577; Town of Puslinch.

LETTER OF OPPOSITION to Proposed Rezoning and Development at 128 Brock Road South and Gilmour Road, (Aberfoyle) Puslinch, ON.

To Whom It May Concern:

We are Mark & Katherine Godding, Aberfoyle residents living at 4 Gilmour Road, Puslinch, ON. As new residents to the Aberfoyle community, we are writing to express our strong opposition to the proposed rezoning and development of property at 128 Brock Road S and Gilmour Road. The Brock Road S and Gilmour Road Use Plan for this site is not consistent with the broader intent of the existing Commercial/Agriculture Land Zoning.

Our opposition is also based on these potential and/or probable negative effects: • The loss of neighborhood and community character • A decrease in the market value of our property • Increased traffic congestion adding to an already dangerous situation at the Brock Road S and Gilmour Road roundabout • The traffic surge during employee shift changes will also have a harmful effect on community safety • Wildlife has been observed in the area, and any development will destroy their habitat. • The destruction of green space and mature trees • Environmental concerns impacting air, water, soil and noise pollution. • This type of Industrial Transportation Hub and Distribution Warehouse does not fit into the small town neighborhood enjoyed on Gilmour Road.

[redacted]

If the property is rezoned, a developer can change the original concept within the approved Site Specific Industrial (IND). Without the existence of a city water supply, our shared well relies on the aqueduct system for a sufficient fresh water supply for our family. There are significant concerns that an operation such as Wellington Motor Freight with a 208,000 sq ft facility, accommodating 150 employees along with hundreds of truck operators accessing the water supply daily.

Please DO NOT rezone this land to Site Specific Industrial (IND). Our quaint country property will be lost with a significant increase in traffic, noise pollution, along with industrial lighting intruding on our property and privacy. If there was no error made when the land was originally zoned, that would suggest and there is sufficient land elsewhere for a high-density transportation and industrial use facility.

Respectfully,

[redacted]

cc via e-mail: James Seeley, Russel Hurst, Jessica Goyda, John Sepulis, and Sara Bailey

March 12, 2023

Mayor James Seely

Councillors: Jessica Goyda, Russel Hurst, John Sepulis, Sara Bailey:

Dear Mayor and Town Counsellors:

We are writing you in advance of the March 22, 2023 meeting to address the zoning change requested by Wellington Motor Freight. As residents of Puslinch and more specifically Gilmour Road for the past 25 years, we are deeply concerned about this proposal and the numerous deleterious effects such an overwhelming commercial enterprise will have on this community.

Over the years we have seen traffic rise sharply on Brock Road to the point of near gridlock at times at the new roundabouts as Brock Road has become a key artery into Guelph as the city and surrounding area has grown. Additional commercial burdens including the immediate adjacent water plant, meat processing plant among others, have further increased the traffic burden on main roads and adjacent roadways such as Gilmour Road, a road not meant to be a significant roadway and for which posted restrictions regarding speed limits and no heavy trucks, as we see often, are categorically and frequently ignored. Accidents, in particular at the two crests in the road and at the newly refurbished work over the creek, have increased with further vehicles which lose control. What would be a monstrous increase in traffic on Gilmour would be an increased threat to anyone on the road from walkers to cyclists to children waiting for school. Any consideration to paving the road would be nothing short of inviting disaster and no doubt Council will be made aware of other environmental concerns.

Like many residents of Puslinch, we were originally attracted to and remained in the area because of the lifestyle, ambience, and tenor of the area and the exemplary philosophy previous councils have embraced with regards to growth and representing the wishes and choices of the electorate who voted for them. While we are certainly not opposed to further commercial growth including this one, and fully understand that Council must also balance budgets as well and faces pressure there, it is the proposed current location and scale of this project that will advance an atmosphere and surroundings often defined in the landlord tenants acts as 'nuisance' whereby residents in their homes simply will not be able to enjoy their residences in peace and be fearful of the effect on their home values and financial planning goals.

We hope that Council will hear the residents concerns and we would certainly support reasonable alternatives but are vehemently opposed to this project as currently proposed. Thank you for taking the time to read this opinion.

[redacted]

[redacted]

[redacted]

101 Aberfoyle Mill Cres.

Puslinch, N0B 2J0

March 13, 2023

Re: Response to the Township of Puslinch to the Application for Rezoning of 128 Brock St. S

A rural and small-town revival is happening across Ontario, primarily driven by a move from large urban centres to rural and suburban communities. A 2020 survey by RE/MAX found that 32 per cent of Canadians no longer want to live in large urban centres.

Across Canada, rural towns are being challenged and transformed by the big city next door. Rural and small-town communities are struggling to maintain their character and identity; small and independent stores find it difficult to compete and downtown centres must find their relevance in a world of big box stores and malls with plenty of parking. Aberfoyle / Puslinch is no different.

That's the end of the lecture – our apologies…

The point is that we believe we need to take every opportunity to protect and enhance the attributes that make our community attractive in the first place.

The County of Wellington Official Plan does a good job of delineating boundaries designated for residential / industrial growth, in an effort to maintain the character and **"principles of strong communities, a clean and healthy environment and economic growth, for the long term"** (Provincial Policy Statement).

The subject lands are designated Highway Commercial / Secondary Agricultural Area, which comprises the Rural System. Permitted uses are agricultural, small-scale commercial, industrial, and institutional uses, as well as public service facilities.

As per the Official plan: 4.7.1 Distinct Urban-Rural Boundary

> In order to allow the efficient expansion of urban areas, and to maintain a clear distinction between urban and rural areas, the County of Wellington: Wellington County Official Plan May 6, 1999 (Last Revision June 1, 2022) Page 48 a) prohibits new development adjacent to existing urban centres, or hamlets unless part of an urban expansion (adjacent will normally mean within 1 kilometre of an urban area boundary); b) requires that livestock operations adjacent to existing urban boundaries shall only be permitted in accordance with the Minimum Distance Separation Formula. This policy does not apply to prevent the completion of previously approved development, logical infilling or development of a minor nature which does not impede the efficient expansion of the urban area. Additionally, the expansion of existing developments may

be considered if the overall intent of this section is met. A clear distinction between urban and rural areas should be maintained.

The subject land is the last piece of property suitable for mixed use commercial use in Puslinch. Rezoning from Highway Commercial / Secondary Agricultural to Industrial does a number of things:

- **Removes and deprives the community of the potential small-scale commercial, institutional, and public service facilities.**
- **Removes the buffer that currently exists between the Industrial Area as laid out in the Official Plan and Aberfoyle Downtown Commercial, Urban, Rural and Agricultural lands.**
- **Puts in jeopardy the health and safety of the surrounding community.**
- **Brings with it several issues that will dramatically impact residents on an ongoing basis, and made worse by the lack of commitment not to operate outside of business hours.**

Specifically:

The proposed use of the land will have a direct impact on:

- Residential Property values – with additional noise / light / visual impacts
- The proposed parking entrance off Gilmour imposes a level of traffic, noise and safety issues that will have a direct bearing on all residents on Gilmour
- Traffic increase with 21 loading docks, 123 Tractor and trailer parking spaces and over 150 employees.
    - Exiting/entering the 401 and thru Morriston (until Morriston bypass is completed)
    - Down Brock Street, thru the town of Aberfoyle and the corresponding two roundabouts
    - Along Gilmour especially during shift changes, will make leaving and entering the Meadows of Aberfoyle that much more difficult.
- Environmental:
    - Noise from the additional traffic and the nature of the operations themselves, especially truck reversals.
    - Light from loading docks and traffic.
    - Air quality from trucking facility, diesel generators, and refrigerated units / trucks.
    - Soil / water and aquifer concerns with reduced permeability after paving over a sizable amount of Secondary Agricultural land and the addition of a massive septic system.
    - Addition of a well and water reservoirs needed for fire and sprinkler systems (including regular testing, emptying, and refreshing)
- Safety
    - With residents using Gilmour as a walking route
    - School bus routes along rural, residential, and school zones.
    - Substantial addition and time of day surges in traffic at the Gilmour Rd round-about and on Gilmour Rd overall.
    - Potential for storage and transportation of hazardous goods – either within the storage facility, or in the trucks that remain in the yard.

Overall, the proposed rezoning does nothing for the community other than meet the requirements of a commercial operation, and in fact substantially deviates from the intention of the Provincial Plan.

Land use planning decisions made by municipalities, planning boards, the province, or a commission or agency of the government must be consistent with the Provincial Policy Statement. Where provincial plans are in effect, planning decisions must conform or not conflict with them, as the case may be.

Traffic, environmental and community impact assessments that have been submitted by the applicant have not sufficiently taken into consideration all aspects of the proposal, nor, in our opinion, have satisfactorily addressed concerns articulated in any documentation we have reviewed.

From a more personal perspective, the proposed rezoning will have a direct and irreversible impact on our community and would significantly impact the sustainability of Aberfoyle's / Puslinch's uniqueness and appeal as a community.

Thank you for considering the **merits of *voting <u>against</u>* the rezoning application for 128 Brock St. S.**

Regards

[redacted] [redacted]

[redacted] [redacted]

[redacted] [redacted]

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 8:40 AM
To: Admin
Cc: Jessica Goyda; Sara Bailey; Russel Hurst; John Sepulis; James Seeley
Subject: Proposed Warehouse and Truck Transportation Hub at Gilmour & Brock Rd

Good morning.

We have been made aware of the rezoning application which would see a proposed Warehouse and Truck Transportation Hub at Gilmour and Brock Road. As residents/homeowners/parents in the closest community to the site, we have grave concerns regarding this proposed rezoning from Highway Commercial/Secondary Agricultural to Industrial.

By changing from current designation to Industrial will:
- remove restricted use of the land
- remove the buffer between the industrial area and the commercial, urban rural, rural and agricultural areas
- potential future industrial expansion/development

The proposed use of the land will:
- decrease residential property values
- increase noise pollution
- increase light pollution
- increase air pollution from trucking facility
- pose concerns on soil quality due to sizeable paving
- pose concerns on water & aquifer quality particularly with addition of well/septic system and reserves
- increase traffic due to 21 loading docks, 123 Tractor and trailer parking spaces and over 150 employees
- increase safety concerns while exiting/entering the 401 and thru Morriston until bypass is constructed
- increase safety concerns down Brock, through the town of Aberfoyle and the corresponding roundabouts
- decrease pedestrian safety along Gilmour and Brock
- decrease road capacity along Gilmour especially during shift changes
- decrease safety of school bus routes
- increase additional delays due to proposed entrance on Brock is adjacent to the truck turning of the existing aggregate facility
- increase security concerns both at the site and in the community
- increase potential for storage & transport of hazardous goods

The lack of commitment not to operate outside of business hours is a serious concern - the potential 24/7 traffic, noise and light is a detriment to a community that is composed primarily of seniors and young families. An industrial complex this close to a residential & agricultural area poses a risk we are not willing to take. Please do not consider this application.

Regards,

[redacted]

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 2:10 PM
To: Admin
Cc: James Seeley; Russel Hurst; Jessica Goyda; John Sepulis; Sara Bailey
Subject: Proposed Warehouse and Truck Transportation Hub
Attachments: Health Effects of Diesel Exhaust.pdf; CCOHS diesel_exhaust.pdf; Diesel Exhaust Canada.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

To the Councillors of The Township of Puslinch and Administrative Staff,

My [redacted], and I chose to make our home on Gilmour Road and have lived here since 1995. In this peaceful environment we have raised a family of six children and now our grandchildren are visiting to also spend peaceful and carefree time with us. We chose this location because of its distinctly rural character and environmental factors that include air and water quality.

When Schneider and the GO station were installed, I made mental note but not to the degree of elevated concern. Only afterwards did we recognize the negative effects on us in being able to enjoy the outdoors of our home: sitting on our front porch in the warmer months was soon punctuated by announcements over the PA system, of what we presume came from the Schneider Trucking facility. Stargazing and teaching our grandchildren about the constellations at night has become more difficult because of the light pollution from that area which is only approximately one kilometre away.

Bringing the proposed Wellington Motor Freight Facility to our neighbourhood, within about 250 meters proximity, is highly undesirable. The increase in traffic on Brock Road would be significant. Big rigs lumbering around the traffic circles would increase significantly, on top of the present volume of trucks manoeuvring into Triton Blue. Consequently, traffic passing through Aberfoyle would be greatly affected by this. Passenger vehicular traffic would also greatly increase on Gilmour Road itself, a heavier load than what it was built for. Gone would be opportunity to peacefully walk down a pleasant country road. We are additionally concerned about the increased noise that would naturally be a part of such a large operation as well as the increased light pollution on a 24/7 basis.

Approving a zone change that would put "Industrial" directly beside "Residential" is something that should not even be considered. In the strongest terms we urge the Township of Puslinch to reject this application which would permanently disfigure the character of our hamlet.

I humbly request to be given the opportunity to speak at the upcoming public meeting. I will endeavour to present concise and relevant information, which is the area of my professional expertise (environmental quality) and would be helpful to the council in the decision-making process.

I am appending three papers applicable to this issue.

Regards,

[redacted]

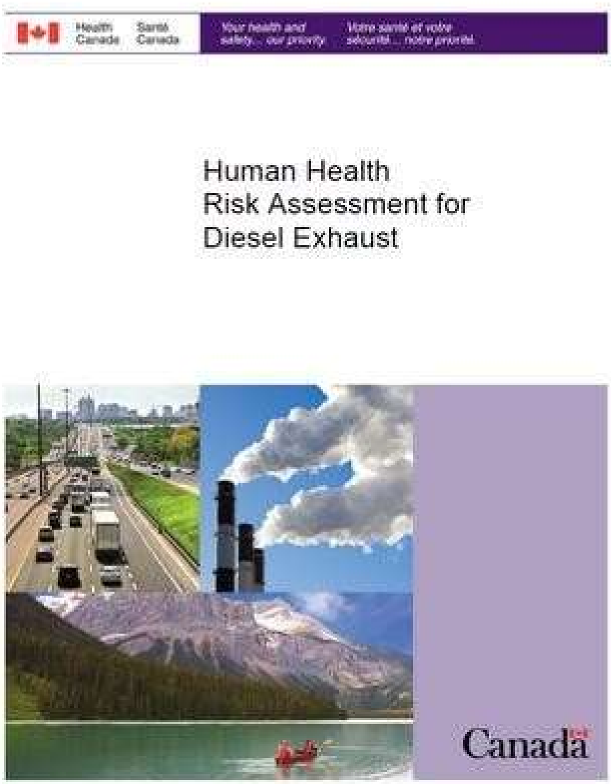
Human Health Risk Assessment for Diesel Exhaust – summary

Health Canada completed the *Human Health Risk Assessment for Diesel Exhaust*, a comprehensive review and analysis of the potential adverse health effects associated with diesel fuel use in Canada. The report focuses on diesel exhaust (DE) emissions from on-road and off-road vehicles (excluding rail and marine applications) and targets impacts resulting from general population exposures. The assessment includes a review of diesel fuels, engines and emissions, a review of exposure to DE, an evaluation of the health effects associated with DE exposure, as well as a quantitative analysis of the population health impacts associated with the contribution of DE to criteria air contaminant concentrations in Canada. This report does not address the health risks of diesel fuel itself, which is under review as part of the Chemicals Management Plan of the Government of Canada and will be reported elsewhere.

Internationally, the potential health effects of DE exposure have long been recognized, and great effort has resulted in substantial reductions in diesel emissions, including in Canada. A key accomplishment has been the introduction of stringent emission regulations for new diesel vehicles and engines, resulting in improved engine and emission control technologies in both the off-road and on-road diesel fleets. In addition, the quality of diesel fuel used in on-road, off-road, rail, marine and stationary engines has improved, particularly in terms of the sulphur content. Some jurisdictions have undertaken additional initiatives to mitigate in-use diesel engine emissions and human exposure to them, such as inspection and maintenance programs, retrofit and scrappage programs and idling restrictions. However, the Canadian in-use diesel fleet is still dominated by engines pre-dating the most recent emission standards.

Diesel-powered vehicles are pervasive on major roadways and in urban centres in Canada. It is reasonable to assume that most Canadians are regularly exposed to DE. Because of the variable and complex nature of DE and the fact that DE constituents are emitted by other pollution sources, it has been difficult to quantify general population exposure to DE. Several surrogates have been used to represent DE, all of which have had their limitations. The respirable fraction of elemental carbon is considered to be one of the better options used to date.
This risk assessment considered the reviews and conclusions of the California Environmental Protection Agency (1998) [1] and the United States Environmental Protection Agency (2002) [2] human health risk assessments for DE and provided detailed review of the health effects literature published since 2000. The available information supports the conclusion that DE emissions have direct effects on human health.

The newly published health studies along with supporting evidence from work published prior to 2000 provide sufficient evidence to conclude that DE is carcinogenic in humans and is specifically associated with the development of lung cancer. Although the risk estimates are generally small, the population health risks are considered to be significant given the ubiquitous presence of DE emissions in Canada. The evidence is also suggestive that DE may be implicated in the development of cancer of the bladder in humans, but further research is required to allow definitive conclusions to be drawn. A limited number of studies have investigated other cancers in association with DE exposure, but the evidence is inadequate to draw conclusions regarding causality. Overall, these conclusions are consistent with the categorization of DE as a human carcinogen (Group 1) by the International Agency for Research on Cancer. [3], [4]



Organization: Health Canada

Date published: 2016-03-04

Related Topics

- Human Health Risk Assessment for Gasoline Exhaust
- Road traffic and air pollution
- Health Risks and Benefits Associated With the Use of 10% Ethanol
- Human Health Risk Assessment for Biodiesel Production, Distribution and Use in Canada

Regarding non-cancer health effects and the potential causal role of DE in their development, a number of conclusions are drawn from the existing literature. The evidence supports a causal relationship between acute exposure to DE at relatively high concentrations and effects on the respiratory system, including increases in airway resistance and respiratory inflammation. Under conditions of chronic exposure, DE exposure is likely to be causal in the development of respiratory effects. It was concluded that DE exposure is likely to be causal in the development of adverse cardiovascular outcomes following acute exposure and in the development of adverse immunological responses. The evidence reviewed is suggestive of a causal relationship between DE and 1) adverse cardiovascular outcomes following chronic exposure, 2) adverse reproductive and developmental effects and 3) central nervous system effects following acute exposure to DE. Currently, there is inadequate evidence to draw conclusions regarding the potential neurological impacts of chronic DE exposure.

Based on traditional risk assessment methodologies and with regard to general population exposures, a short-term exposure guidance value of 10 μg/m³ and a chronic exposure guidance value of 5 μg/m³ have been derived based on diesel exhaust particulate matter (PM) to protect against adverse effects on the respiratory system. The available evidence indicates that respiratory effects occur at lower concentrations of DE than those associated with other non-cancer adverse effects, and so these guidance values are considered protective against the non-cancer health impacts of DE exposure. However, it is recognized that there have not been adequate large scale epidemiological studies of non-cancer effects associated with either short-term or chronic DE exposure to conclusively characterize the exposure-response relationships. More research is needed to elucidate this and to evaluate the potential role of DE in the observed non-threshold population health effects of fine particulate matter ($PM_{2.5}$).

In general, it has been shown that sensitive subpopulations, such as the elderly, children and asthmatics, can be at greater risk of adverse respiratory effects due to DE exposure. Exposure of the elderly and asthmatics to traffic-related DE has been shown to increase respiratory inflammation. Also, pulmonary function decrements have been demonstrated in asthmatics exposed to traffic-related DE. Furthermore, traffic-related DE exposure in children has been implicated in potential asthma development later in life. The guidance values for short-term and chronic DE exposure presented above account for the enhanced sensitivity of subgroups in the population.

Overall, it is concluded that DE is associated with significant population health impacts in Canada and efforts should continue to further reduce emissions of and human exposures to DE.

As part of this assessment, efforts were also made to quantify the population health impacts associated with the contribution of DE to criteria air contaminant concentrations in Canada. The analysis of population health impacts was conducted in a stepwise manner with the use of computer simulation tools to 1) estimate emissions from the Canadian diesel fleet, 2) estimate the impact of those emissions on ambient concentrations of criteria air contaminants across the country and 3) estimate population health impacts resulting from the incremental contribution of DE to air pollution levels. This was undertaken for calendar year 2015, and results were assessed on a national, provincial/territorial and regional basis. This analysis is complementary to the traditional risk assessment approach presented above.

The air quality scenarios modelled with A Unified Regional Air Quality Modelling System (AURAMS) and the Air Quality Benefits Assessment Tool (AQBAT) were selected in order to provide an indication of the potential air quality and health impacts associated with diesel fuel use in on-road and off-road applications in Canada. On-road and off-road diesel applications are responsible for substantial levels of pollutant emissions. Compared with other mobile sources, diesel vehicles and engines contribute significantly to nitrogen dioxide (NO_2) and $PM_{2.5}$ emissions, whereas gasoline mobile sources contribute the majority of carbon monoxide (CO) and volatile organic compound (VOC) emissions. Diesel source emissions are notably important in large urban areas, such as Greater Vancouver, Toronto and Montréal, where a large fraction of the Canadian population resides. Diesel emissions are also important along major trucking routes and roadways connecting major cities (e.g. Windsor-Québec corridor), as well as in agricultural and mining areas (e.g. Alberta). The characteristics of the mobile fleet and the dominating economic sectors in a particular region determine the influence of diesel emissions. The concentration of diesel emissions in specific geographic areas leads to distinct air quality impacts across Canada.

Diesel emissions are estimated to contribute significantly to ambient concentrations of NO_2, $PM_{2.5}$ and ground level ozone (O_3). The air quality modelling results show that on-road diesel emissions contribute significantly to air pollutant concentrations in urban and economically active areas and along major transportation routes. Off-road diesel emissions, which are more widely distributed than on-road diesel emissions, affect air quality in both rural and urban areas. The combination of on-road and off-road emissions leads to greater air quality impacts in the largest Canadian urban centres, notably Greater Vancouver, Edmonton, Calgary, Winnipeg, Toronto and Montréal. Off-road diesel emissions also have a relatively large impact in less developed areas characterized by few other sources of pollutant emissions (e.g. remote mining communities). Based on the current health impact analysis, on-road and off-road diesel emissions result in significant and substantial population health impacts and societal costs in Canada via the contribution of DE to ambient concentrations of criteria air contaminants. The modelling undertaken estimates that on-road diesel emissions are associated with 320 premature mortalities for 2015 (valued at $2.3 billion), with 65% and 35% of the estimated mortalities attributable to ambient $PM_{2.5}$ and NO_2, respectively. On-road and off-road diesel emissions are associated with 710 premature mortalities (valued at $5.1 billion), with 65%, 32% and 3% of the estimated mortalities being attributable to ambient $PM_{2.5}$, NO_2 and O_3, respectively. Diesel emissions are also associated with significant numbers of acute respiratory symptom days, restricted activity days, asthma symptom days, hospital admissions, emergency room visits, child acute bronchitis episodes and adult chronic bronchitis cases across Canada. Results from the AQBAT simulations for the current assessment suggest that on-road and off-road emissions each contribute approximately equally to population health impacts. The results also indicate that both on-road and off-road diesel applications have significant health impacts in major Canadian urban centres. Diesel emissions have higher health impacts in the most populated provinces, such as British Columbia, Alberta, Ontario and Quebec, and in the most populated census divisions, which correspond to the Greater Vancouver, Calgary, Winnipeg, Toronto and Montréal areas. The greatest air quality impacts are also observed in those areas. Overall, it is concluded that efforts should continue to further reduce emissions of DE in Canada, particularly in areas with large populations.

To obtain an electronic copy of the Human Health Risk Assessment for Diesel Exhaust, please contact hc.air.sc@canada.ca. The report is also available for download.

Poster to share

Air pollution: what are diesel and gasoline exhaust?

Footnotes

1 California EPA (1998). Part B: Health risk assessment for diesel exhaust. Office of Environmental Health Hazard Assessment, Air Resources Board, California Environmental Protection Agency, Sacramento, CA.

2 US EPA (2002). Health assessment document for diesel engine exhaust (final 2002). EPA/600/8-90/057F. National Center for Environmental Assessment, Office of Research and Development, US Environmental Protection Agency, Washington, DC.

3 Benbrahim-Tallaa L; Baan RA; Grosse Y; Lauby-Secretan B; El Ghissassi F; Bouvard V; Guha N; Loomis D; Straif K; International Agency for Research on Cancer Monograph Working Group (2012). Carcinogenicity of diesel-engine and gasoline-engine exhausts and some nitroarenes. Lancet Oncol 13(7): 663-664.

4 IARC (2013). Diesel and gasoline engine exhausts and some nitroarenes. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 105. International Agency for Research on Cancer, Lyon, France.

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2022-04-06

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Health effects of diesel exhaust emissions

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Health effects of diesel exhaust emissions. A. Sydbom, A. Blomberg, S. Parnia, N. Stenfors, T. Sandström, S-E. Dahlén. ©ERS Journals Ltd 2001.
ABSTRACT: Epidemiological studies have demonstrated an association between different levels of air pollution and various health outcomes including mortality, exacerbation of asthma, chronic bronchitis, respiratory tract infections, ischaemic heart disease and stroke. Of the motor vehicle generated air pollutants, diesel exhaust particles account for a highly significant percentage of the particles emitted in many towns and cities. This review is therefore focused on the health effects of diesel exhaust, and especially the particular matter components.

Acute effects of diesel exhaust exposure include irritation of the nose and eyes, lung function changes, respiratory changes, headache, fatigue and nausea. Chronic exposures are associated with cough, sputum production and lung function decrements. In addition to symptoms, exposure studies in healthy humans have documented a number of profound inflammatory changes in the airways, notably, before changes in pulmonary function can be detected. It is likely that such effects may be even more detrimental in asthmatics and other subjects with compromised pulmonary function.

There are also observations supporting the hypothesis that diesel exhaust is one important factor contributing to the allergy pandemic. For example, in many experimental systems, diesel exhaust particles can be shown to act as adjuvants to allergen and hence increase the sensitization response.

Much of the research on adverse effects of diesel exhaust, both *in vivo* and *in vitro*, has however been conducted in animals. Questions remain concerning the relevance of exposure levels and whether findings in such models can be extrapolated into humans. It is therefore imperative to further assess acute and chronic effects of diesel exhaust in mechanistic studies with careful consideration of exposure levels. Whenever possible and ethically justified, studies should be carried out in humans.
Eur Respir J 2001; 17: 733–746.

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Keywords: Air pollution, allergy incidence, animal studies, asthma exacerbation, diesel, human exposure

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There is growing international concern regarding the adverse health effects of air pollution. Pollution is becoming an important public health problem and political issue, due to the rapid growth in world population and the increasing world-wide migration from rural to urban areas [1]. Recent United Nations estimates have indicated that 47% of the global population is living in urban areas. This urbanization has brought with it an increased need for transportation and hence an increase in motor vehicle generated air pollutants. However, a large number of epidemiological studies from different parts of the world have consistently identified an association between ambient levels of air particles and various health outcomes, including mortality, exacerbation of asthma, chronic bronchitis, respiratory tract infections, ischaemic heart disease and stroke [2]. Indeed, the United Nations Environment Programme has identified particulate matter pollution as the most serious air pollution problem faced by many cities [3]. It is therefore important to evaluate the health effects of motor vehicle generated pollutants in mechanistic studies, in order to understand the relevance of associations found in the epidemiological studies. This overview is based on a literature search including papers published up to the first quarter of the year 2000. Much of the research on the adverse effects of diesel exhaust, both *in vivo* and *in vitro*, has been conducted in animals. Such experimental studies are reviewed critically and the findings are compared with those in human studies.

Diesel emission

Of the motor vehicle generated air pollutants, diesel exhaust particles (DEPs) account for a highly significant percentage of the particles emitted in many towns and cities [3, 4]. Complete combustion of diesel fuel produces water and carbon dioxide, but use of diesel in motor vehicles normally results in incomplete combustion and the formation of various gases, liquids and solid particles. Compared with petrol engines, diesel engines produce far less carbon monoxide, but give rise to a greater amount of nitrogen oxides and aldehydes, which are particularly prone to cause irritation of the upper respiratory tract. Diesel engines also produce submicron soot particles that are believed to mediate several of the observed adverse effects. It has been estimated that the particulate emission from diesel engines per travelled distance is over 10 times higher than the emission from petrol engines of equivalent power running on unleaded petrol, and over 100 times higher than that from petrol engines fitted with catalytic converters [5, 6].

The dose of particle deposited in the lung depends on their concentration in the inhaled air and their size. Particles with a diameter <5 μm [7, 8] reach the alveoli and are deposited there, whereas particles larger than 5 μm only reach the proximal airways and are eliminated by mucociliary clearance. Previous human studies using radioactive particles have demonstrated that 83% of particles with a mass median diameter of 2.5 μm are deposited in the lung, whereas only 31% of particles of 11.5 μm are deposited [9]. Recent electron microscopy studies suggest that over 80% of DEPs have a size $\leqslant 0.1$ μm; DEPs consist of a carbonaceous core similar to carbon black, onto which an estimated 18,000 different high-molecular-weight organic compounds are adsorbed [2]. Diesel exhaust (DE), in addition to DEPs, contains a complex mixture of gases such as carbon monoxide (CO), nitric oxides (NO, NO_2), sulphur dioxide (SO_2), hydrocarbons, formaldehyde, transition metals and carbon particles [10]. Regarding the health effects, recent focus has been on ultrafine particles (diameter <0.05–0.10 μm). They are highly reactive and are present in large numbers in the urban environment. They are able to penetrate the epithelium and vascular walls and enter the bloodstream. It has been hypothesized that ultrafine particles account for the systemic effects of DEPs, such as increased carcinogenicity [11], potentiation of autoimmune disorders [12], alterations in blood coagulability and increased cardiovascular disorders [13, 14].

Air pollution as a cause of increased asthma and allergy?

Parallel to the increase in air pollution, there has also been a rapid increase in the global incidence of allergic diseases such as asthma and rhinitis in the last two decades, which cannot be attributed to genetic changes, and is assumed to be related to changes in environmental factors [15]. Observations in Japan have suggested that children living close to roads with heavy traffic are more likely to develop allergies [15]. Recent epidemiological data support the theory that atopic children may constitute a group of individuals that run a heightened risk of developing negative health effects following exposure to airborne particles [16]. The existence of such sensitive subgroups amongst the general population would seem to deserve particular attention for risk assessment. This review has identified several effects of DEPs on immunological or inflammatory systems that may potentially have particular relevance for a role of chronic diesel exhaust exposure in the pandemic of allergic disease.

Irrespective of whether or not vehicle generated pollutants contribute to the increased numbers of sensitized individuals in urban areas, patients with airway diseases such as asthma have been found more adversely affected than the normal population to inhalation of air pollution components [17, 18] and in particular acid aerosols [19]. Various studies have shown that overall lung deposition is increased in patients with obstructed airways [20–22]. For example, a 30% reduction in airway cross-sectional area results in a deposition increase in the bifurcating airways of $>100\%$ [2, 23]. There is also an interesting case-report of DEPs alone causing asthma [24]; three nonsmoking railroad workers, without any previous history of asthma, developed persistent asthma after acute exposure to excessive levels of DE. This was registered in a situation where two locomotive units were coupled together and the crew riding in the second locomotive unit were exposed for 2–5 h to significant levels of DE. All three subjects developed asthma, which persisted 1–3 yrs after exposure. Although the actual levels were never measured, it is likely that such excessive exposure rarely occurs even in occupational situations.

Experimental studies of diesel emissions

Human subjects

Exposure challenge studies. Experimental human exposure studies have mainly been carried out using exposure chamber set-ups with controlled DE challenges. It is critical to ensure that the method is designed so as to maintain a certain relationship between the particulate and gaseous components and to obtain particles of the same size and chemical properties throughout the exposure series. A unique and carefully validated system for exposures has been particularly useful [25, 26]. The effects of such diesel exposures have been evaluated in humans using symptom questionnaires, lung function measurements and bronchoscopy with biopsy sampling and airway lavage.

In one study, healthy volunteers were exposed to DE, with a NO_2 concentration of 1.5 parts per million (ppm). Bronchoalveolar lavage (BAL) 18 h after DE exposure revealed a significant decrease in the total number of metachromatic cells (mast cells) in the bronchial portion and a significant increase in neutrophils in the bronchoalveolar portion. An increase in the CD4+/CD8+-ratio was found in the bronchoalveolar portion, along with a reduced phagocytosis rate by alveolar macrophages *in vitro* [26].

In another study on healthy volunteers, symptoms and lung function responses to DE were assessed. All the exposed subjects reported an unpleasant smell and eye irritation but there was no alteration in the lung function tests measured as forced expiratory volume in one second (FEV_1) [25]. Two other studies [21, 26], investigated whether the use of a particle trap on the tail pipe of an idling diesel engine would reduce the DE-induced effects on symptoms, lung function and airway inflammation, compared to effects induced by unfiltered DE. Exposure to DE without a filter caused increases in symptoms and airway resistance as well as airway inflammation with BAL neutrophilia. Macrophage phagocytosis was reduced. The particle trap reduced the number of particles by 46% but there was no significant difference in symptoms, lung function or in BAL neutrophil numbers after DE with or without the trap [26]. Therefore, for these effects, the relative importance of DEPs and other components of DE has yet to be established.

In a recent study [27], filters intended for use in the air intake into the passenger compartment of vehicles were tested for their ability to prevent DE effects. Thirty-two healthy nonsmoking subjects were exposed for 1 h in a specially designed exposure chamber, once to air and once to unfiltered DE and subsequently to DE filtered with four different air intake filters. The exposure level was 300 μg of particles with a 50% cut-off aerodynamic diameter of 10 μm per cubic metre (PM_{10} 300 $\mu g \cdot m^{-3}$). The study included measurements of lung function, symptoms and nasal responses. It proved possible to distinguish differences in efficacy between the filters, all of which gave air quality superior to the unfiltered exhaust. While no acute effects were seen on nasal lavage, rhinometry and lung function (measured as FEV_1 and FVC), there were major effects on symptoms. The use of a particle filter in combination with an active charcoal filter was demonstrated to give significantly better results than the other filters.

The effect of a high ambient concentration of DE (300 $\mu g \cdot m^{-3}$) on various airway parameters including cells and soluble components was assessed [28]. The results showed an increase in neutrophils, mast cells, CD3+, CD4+ and CD8+ T-lymphocytes in the airway mucosa, along with upregulation of adhesion molecules intracellular adhesion molecule (ICAM)-1 and vascular cell adhesion molecule (VCAM)-1 in the vascular endothelium 6 h after exposure to DE. In addition, increased numbers of cells expressing leukocyte function associated antigen (LFA)-1 (the ligand for ICAM-1) were found. This inflammatory response was an order of magnitude greater than the effects documented after allergen challenge in atopic asthmatics [29, 30] indicating a pronounced signal for inflammatory cell recruitment as a response to DE exposure. This upregulation of endothelial and leukocyte adhesion molecules provides a mechanism for the influx of inflammatory cells into the airways. Furthermore, immunohistochemical staining for cytokines has shown enhanced expression of interleukin (IL)-8 and growth related oncogene (GRO)-α in the airway epithelium, which can also play a role in the recruitment of inflammatory cells after exposure to DE [31]. The increase in neutrophils in the airway mucosa following exposure to DE was also evident in the bronchial wash, whereas the increase in the number of submucosal mast cells did not correspond to any changes in the number of metachromatic cells (mast cells) in the lavages. However, an elevated concentration of methyl-histamine detected in the BAL after exposure to DE supports increased degranulation of mast cells [28]. In contrast to the pronounced inflammatory response detected in the airways, lung function parameters were found unaffected following exposure to DE [28]. Consequently, lung function measurements alone cannot be used to exclude adverse air-pollution-associated airway responses.

These pronounced airway inflammatory responses were detected at a fairly high (300 $\mu g \cdot m^{-3}$) concentration of DE. In order to evaluate if exposure to a lower concentration (more similar to relevant exposure concentrations in ambient air), would induce a similar response, healthy and asthmatic subjects have been exposed to DE with a PM_{10} concentration of 100 $\mu g \cdot m^{-3}$ for 2 h. Bronchoscopy with biopsy sampling, bronchial wash and BAL was performed 6 h after the end of the exposure. Data from this study are forthcoming.

Studies of induced sputum have also been used to evaluate DE effects on the human airways [32]. Sixteen healthy nonsmoking subjects were exposed to air and DE at a particle concentration of 300 $\mu g \cdot m^{-3}$ for 1 h. Sputum induction was performed 6 and 24 h after each exposure. Six hours after exposure to DE, a significant increase was found in neutrophil percentage of total cells in sputum, together with an increase in the concentration of IL-6 and methyl-histamine, compared to control air exposures.

In summary, these data confirm that the acute mediator and cytokine responses, together with the enhanced expression of the vascular adhesion molecules in the airway mucosa, may represent an early stage in the inflammatory response following exposure to DE, and be of importance in the development of the DE induced airway inflammation. The results further suggest that the DE concentration is an important factor to take into account when evaluating the time course of DEPs-induced airway inflammation.

Nasal challenge studies. DEPs have been shown to potentiate immunoglobulin-E (IgE) production in human respiratory mucosal membranes. DIAZ-SANCHEZ [33] performed a study in which nasal DEP challenges at various doses were used to investigate the effect on localized immunoglobulin production. Four days after challenge with 0.3 mg DEPs a significant increase in nasal IgE, but not in other immunoglobulin classes, was detected. There was also an increase in the number of IgE secreting cells in nasal lavage, but no increase in immunoglobulin-A (IgA) secreting cells.

Human nasal provocation studies have shown that DEPs can act as an adjuvant to allergen. Nasal challenge was performed with DEPs (0.3 mg), the ragweed allergen *Amb a I*, or both, in a group of ragweed-sensitive subjects [34]. Ragweed challenge alone demonstrated an increase in IgE and immunoglobulin-G_4 (IgG_4) as well as ragweed-specific IgE in the lavage fluid. However, after challenge with allergen and DEPs there was a sixteen-fold increase in ragweed-specific IgE. DEPs alone increased total IgE, but in combination with allergen there was an increase in antigen-specific IgE and in expression of Th0 and Th2-type cytokines (IL-4, IL-5, IL-6, IL-10 and IL-13). It is currently believed that such deviations of the immune system may have a crucial role for the development of an atopic response [35]. These studies suggest that DEPs can enhance B-cell differentiation. By initiating and elevating IgE production, DEPs may theoretically play a role in the increased prevalence of allergic disease.

Nasal challenge with a combination of DEP and allergen has been shown to induce larger ragweed-specific IgE and IgG_4 responses compared with DEP alone but with similar total IgE levels [36]. There was also a change in the cytokine pattern, favouring allergic sensitization. The authors propose that synergism between DEP and natural allergens is a key feature in increasing allergen induced respiratory allergic disease.

There is also evidence of DEPs inducing IgE isotype switching. FUJIEDA *et al.* [37] exposed human volunteers, by nasal challenge, to DEPs together with ragweed allergen. There was a local increase in IgE production, cytokine production and an even greater increase in mucosa-specific ragweed IgE production. The isotype switching occurred only when DEPs and allergen exposure was combined. The findings suggest that increasing environmental DEPs with the same environmental load of allergen could be a factor behind the increasing sensitization and prevalence of allergic asthma.

Healthy, nonsmoking human volunteers have been exposed to DEPs by intranasal instillation and cytokines in nasal lavage were estimated after 18 h by an indirect approach (messenger riboneucleic acids mRNA) [38]. Before challenge, most subjects had detectable mRNA levels of only a few cytokines (Interferon IFN-γ, IL-2 and IL-13), while after challenge with 0.3 mg DEPs, these three and a number of additional cytokines (IL-4, IL-5, IL-6 and IL-10) were seen in increasing levels. Increase in such nasal cytokine expression after DEP exposure could again contribute to enhanced local IgE production.

Taken together, these studies suggest that DEPs have the ability to induce IgE responses directly by acting on B-cells and indirectly by enhancing the opportunity for cytokine production. DEPs in combination with allergens are able to generate a Th2-type cytokine response and thus favour the production of allergen-specific IgE. It has therefore been proposed that DEPs can enhance B-cell differentiation and, by initiating and enhancing IgE production, they may be of importance in the increased incidence of allergic airway diseases [34].

Animals

Some general points must be raised regarding animal studies. Apart from the possibility that mechanisms may be very different from those in man, studies using radioactive particles have also demonstrated that there is a large difference in the dosimetry of the small airways of rodents compared to humans. Therefore, care must be taken when extrapolating animal data to humans. Certainly, for ozone at least, it has been shown that in order to elicit the same response in rodents as in humans, several times higher concentrations are required [39]. In addition, in many studies on animals, the doses of DE are much higher than those humans are exposed to in daily life. Measurements in the Scandinavian countries have shown that the average 24-h particulate matter concentration varied from 30–150 $\mu g \cdot m^{-3}$ total suspended particles (TSP). However, in certain industrial areas, concentrations of up to 1,500 $\mu g \cdot m^{-3}$ have been measured. In Stockholm for example, 1-h mean values 300–500 $\mu g \cdot m^{-3}$ have been found at kerbsides and maximum levels of almost 600 $\mu g \cdot m^{-3}$ have been reached in a tunnel in the centre of the city [40].

Exposure studies in rats. Long-term studies looking at the effects of DE exposure in rats have demonstrated increased accumulation of particles and aggregates of particle laden macrophages in the alveoli and peribronchial interstitial tissues, as well as local inflammation, epithelial proliferation, fibrosis and emphysematous lesions.

For example, rats were exposed to DE for 30 months [41] and examined at 6 month intervals by electron microscopy. Changes consistent with anthracosis were seen after 6 months exposure at a concentration of 1,000 $\mu g \cdot m^{-3}$. There were foci of diesel particle laden alveolar macrophages. DEPs were found in type 1 epithelial cells and there was also hypertrophy and proliferation of type 2 cells. An infiltration of particle laden macrophages, neutrophils, mast cells and plasma cells in the interstitium of the alveolar septa was also seen. The most prominent changes, however, were focal shortening of cilia and the protrusion of nonciliated cells.

MOHR *et al.* [42] compared the effects of inhaled DE with those of coal oven gas mixed with pyrolyzed pitch. Three groups of rats were exposed to clean air, filtered DEPs or unfiltered DEPs (4,000 $\mu g \cdot m^{-3}$). Another group was exposed to coal oven flue gas mixed with pitch fumes pyrolyzed under nitrogen. Most of the DEP-exposed animals had deposits consisting of large amounts of carbonaceous particles phagocytozed by alveolar macrophages and this was associated with severe chronic inflammation, alveolar septal thickening, bronchiolo-alveolar hyperplasia and alveolar lipoproteinosis. Rats exposed to coal oven flue gas had much less severe inflammatory changes.

In a study exposing rats to increasing concentrations of DEPs (350–7,000 $\mu g \cdot m^{-3}$), for up to 24 months [43], a progressive increase in the lung burden of particles was seen at the higher DEP concentrations. Tracheal mucociliary transport was not affected, but there was a significant prolongation of long-term pulmonary clearance half-times in the two groups that were exposed to the highest concentrations of DEPs.

DEPs cause dust overloading and impairs pulmonary clearance at high doses in both rat and man. There appears to be a threshold above which particle retention and inflammation occurs. It has been calculated, mostly on the basis of evidence from animal studies, that the threshold is $\sim$500 $\mu g \cdot g^{-1}$ lung tissue [44]. However, it is difficult to assess how this correlates to levels in the inhaled air, and there may be important interactions between the actual concentration and the duration of the exposure. After acute exposure to a high concentration of DEPs (5,700 $\mu g \cdot m^{-3}$ for 3 days) the particles were found to be eliminated efficiently [45]. There was a rapid initial increase in the elimination followed by a decline in macrophage burden. A chronic low dose (50 $\mu g \cdot m^{-3}$ of DEPs; exposure for 52 weeks) was also cleared relatively efficiently. More than 80% of the inhaled DEPs had been eliminated 1 yr after the exposure. However, comparison showed that animals exposed to the higher concentrations cleared more of the total lung burden than those exposed chronically to low concentrations. At the longer low concentration exposure, the macrophage burden was relatively greater and associated with a steady development of lung maculae, suggesting that continuous low dose exposure may be more detrimental than acute high dose exposure.

Taking these experimental findings into account, a mathematical model for the prediction of lung burden and alveolar clearance in rats has been constructed [46]. At low lung burdens, the alveolar clearance rate of diesel soot was calculated to be constant and due to macrophage elimination *via* the mucociliary transport system, whereas at high lung burden, the alveolar clearance appears to be determined principally by the capacity for transport to the lymphatic system. It should be recognized however that the elimination of particles from central and peripheral airways may be vastly different and partly dependent upon the tidal airflow during the exposure. Recent data in humans suggest that elimination from the peripheral airways may be considerably slower than previously thought [47].

Exposure studies in cats. A group of cats was exposed to DEPs for >2 yrs [48]. Their exposure was divided into two periods. During the first period, which lasted 61 weeks, 6,000 $\mu g \cdot m^{-3}$ of DEPs was used. At this point, no changes in the lungs were evident. During the following 62 weeks, a higher concentration of 12,000 $\mu g \cdot m^{-3}$ DEPs was used and after the 2 yrs, a pattern of restrictive lung disease had developed.

In another similar study, cats were exposed to DEPs and NO_2 for over 2 yrs. After 62 weeks, the concentration of DEPs had increased from 6,340–11,700 $\mu g \cdot m^{-3}$ and the concentration of NO_2 from 2.68–4.37 ppm [49]. Morphological changes were seen, mainly in the proximal acinar regions of lungs, with peribronchial fibrosis, bronchiolar metaplasia, increased numbers of lymphocytes, fibroblasts and interstitial macrophages containing DEPs. The study indicated a persistent fibrogenic effect on the proximal acinar region of the lungs following long-term DE.

Intratracheal exposure studies of diesel exhaust particles in mice. In a study of *in vivo* toxicity of DEPs in the ICR mouse strain [50], an acute intratracheal instillation of DEPs (400–1,000 $\mu g \cdot mouse^{-1}$) was found to cause severe lung injury and high mortality. The cause of death was pulmonary oedema mediated by endothelial cell damage. The toxicological effect and the increased mortality were to a great extent prevented by pretreatment with the oxygen radical scavenger superoxide dismutase (SOD), supporting the hypothesis that DEP toxicity is connected to production of the radical superoxide O_2^{-1} leading to endothelial cell damage.

Studies of developing lung in the rat. Studies on humans in different geographical areas have raised the concern that children and the elderly may be particularly susceptible to the harmful effects of air pollution. In support of this, there have also been studies indicating the possibility of impaired lung development in animals exposed to oxidant gases or inhaled toxicants early in life. In one study which aimed to investigate this, rats were exposed to DE (3,500 $\mu g \cdot m^{-3}$), NO_2 (9.5 ppm), or to air as a control [51]. One group, which represented a developing lung model, was exposed first *in utero* (by exposing the mother from conception and throughout gestation) and then from birth up to 6 months of age. Another group, representing an adult model, was exposed between the ages of 6 and 12 months. It was found that DEPs altered the airway fluid constituents and tissue collagen in both groups. Interestingly, in the adult group, there was a six-fold increase in neutrophils as well as increased cellularity in the lung-associated lymph nodes, delayed clearance of particles and an increase in lung weight. However, none of these changes were seen in rats exposed during development. In adult rats there was also a focal aggregation of soot-laden alveolar macrophages, but only scattered individual macrophages were found in the young rats. The authors concluded that there was no evidence for developing rats being more susceptible to the toxic effects of NO_2 or DE; if anything, the data would indicate that developing rats may be less sensitive.

Studies in animals with experimental lung disease. Epidemiological studies have indicated that subjects with pre-existing lung disease may be more susceptible to episodic high levels of airborne pollutants than normal subjects [52]. This has been studied in a rat model [53], in which pulmonary emphysema was induced in rats by intratracheal instillation of the proteolytic enzyme elastase, and manifested as enlarged alveoli, alveolar ducts and ruptured alveolar septa. These structural changes were not by themselves associated with inflammation or alterations of bronchioles. The emphysematous rats and a group of control rats were then exposed for 24 months to DE (3,500 $\mu g \cdot m^{-3}$), NO_2 (9.5 ppm), or air as control. Different parameters were measured such as lung burden of diesel soot particles, respiratory function, BAL fluid composition, clearance of radiolabelled particles, pulmonary immune response, lung collagen, excised lung weight and volume, and histopathology. The hypothesis was that the effects of pre-existing emphysema and long-term DE exposure on lung function and morphology were additive. The results, however, showed that rats with experimentally induced emphysema were no more susceptible to inhalation of NO_2 or DE than control rats. In fact, fewer soot particles accumulated in the emphysematous lungs [53, 54].

Intraspecies comparative studies. Morphological changes have also been examined in a comparative study of Cynomolgus monkeys and rats. Both animal species received four different exposures for 24 months: DEPs (2,000 $\mu g \cdot m^{-3}$), coal dust (2,000 $\mu g \cdot m^{-3}$), a combination of DEPs and coal dust (1,000 $\mu g \cdot m^{-3}$ + 1,000 $\mu g \cdot m^{-3}$) or ambient air [55]. It was found that monkeys retained relatively more particulate matter than rats. The sites of particle retention were the same for DEPs, coal dust and the DEPs/coal dust combination. Rats retained more material in the lumen of alveolar ducts and alveoli, whereas monkeys retained more in the interstitium. Rats showed significant alveolar epithelial hyperplasia, inflammation and septal fibrosis. In contrast, such morphological changes were not seen in the monkeys. The results indicate that particle retention patterns and tissue reactions in rats exposed to DEPs may not be predictive of the reactions in primates [56]; primates may retain more DEPs, but may also be less sensitive to the harmful effects.

Immunology and allergy

In vivo *studies*

To study the effect of DEP on the accumulation of particles in lung-associated lymph nodes and the effect on antibody responses after immunization, rats and mice [57] were exposed to varying doses of DEPs (350–7,000 $\mu g \cdot m^{-3}$) for 24 months. Control and exposed animals were immunized, by intratracheal instillation of sheep red blood cells, after exposure at 6, 12, 18, and 24 months. Pathological changes were maximal after 18–24 months at 3,500 or 7,000 $\mu g \cdot m^{-3}$ exposure levels. Microscopic findings were: increase in particle content of alveolar macrophages; concentration of macrophages closer to terminal bronchioles; wall fibrosis; bronchial metaplasia; and, in some cases, squamous metaplasia. There were cholesterol clefts and increased numbers of interstitial neutrophils and intra-alveolar granular eosinophilic material with entrapped free particles. Lung-associated lymph nodes were blackened and enlarged due to clusters of DEPs. There was increased cellularity in rats exposed to the highest dose. However, the levels of specific antibodies were not significantly changed.

DEPs showed an adjuvant activity on IgE production in mice. Mice injected intraperitoneally with ovalbumin (OA) mixed with DEP showed higher IgE levels than mice immunized with OA alone. In addition, Japanese cedar pollen (JCPA) specific IgE production could be seen in mice immunized with JCPA mixed with DEPs, but not in animals immunized with JCPA alone [58]. In another study [59], DEPs and carbon black were instilled intranasally in mice and the animals were then exposed to JCPA. There was a significant adjuvant effect of the particles on JCPA specific IgE and IgG production.

In order to elucidate whether the carbon core of the DEPs or the adsorbed organic substance is responsible for the effect [60], mice were immunized four times with either OA, OA with DEPs or OA with carbon black (carbon black). Specific IgE for OA was then analysed. Both DEPs and carbon black showed an adjuvant activity for specific IgE production after intranasal instillation, indicating that they were both responsible for the effect. There have also been other studies which have demonstrated this effect in mice [61].

A difference in antibody response between acute and chronic exposure to DEP was suggested in a study using combined intratracheal inoculations of DEPs and antigen in mice. Increased airway inflammation, and antigen specific IgG_1, were seen after 6 weeks [62], whereas a longer exposure (9 weeks) was required before there was a detectable increase in antigen specific IgE.

When mice were injected intratracheally with OA alone or together with DEPs [63], there was no significant adjuvant activity of IgE production by DEPs (50 µg). However, the degree of eosinophilic inflammation in the airway corresponded to specific IgG_1 production. In another study, the combination of sensitization to allergen together with diesel exposure, led to enhanced infiltration of eosinophils and neutrophils and also an increment of goblet cells, together with enhanced airway resistance and IL-5 and IgG_1 production, but not IgE production. DE alone did not induce pathological changes [64]. Other studies carried out with higher doses of DEPs (300 µg) under similar conditions have demonstrated an increase in specific IgE [65]. Together with the aforementioned studies, this suggests that this response may be dose and time dependent. In ICR mice exposed to DEPs by intratracheal instillation, an increase in epithelial eosinophils, lymphocytes and goblet cells was seen, together with increased production of IgG and IgE and the proallergic cytokines IL-2, IL-4, IL-5 and granulocyte macrophage colocny stimulating factor (GM-CSF), but not interferon (IFN)-γ [62]. The combination of DEPs and OA has also been shown to increase the bronchoconstriction response to inhaled acetylcholine [66]. Furthermore, daily inhalation of DEPs may enhance the allergen response, possibly by increased local expression of proinflammatory cytokines such as IL-5 and GM-CSF [67]. In one study, increased IgE production was also seen in mice after intranasal administration of suspended particulate matter (SPM) together with OA at 3-week intervals for a period of 21 weeks [68].

To study the effect of DEPs on allergen-induced bronchial hyperresponsiveness, mice were sensitized to OA and then exposed to DE (3,000 $\mu g \cdot m^{-3}$) [69]. Three weeks after DEPs exposure, they were challenged with OA. DE exposure, combined with antigen challenge, induced airway hyperresponsiveness and airway inflammation, including increased numbers of eosinophils and mast cells in the lung tissue. DEP exposure alone also increased airway hyperresponsiveness, but there was no eosinophil infiltration. In a similar set-up, diesel inhalations (3,000 $\mu g \cdot m^{-3}$) in combination with OA sensitization increased the number of goblet cells in lung tissue, caused increased respiratory resistance and increased immune response measured as specific IgE, IgG_1 and IL-5 in the lung tissue [70].

A rhinitis model in guinea pigs was used to study short-term effects of DE (3 h exposure at 1,000 and 3,200 $\mu g \cdot m^{-3}$) [71]. Following diesel exposure alone, there was no induction of sneezing, nasal secretion or congestion. However, DEPs augmented the sneezing and nasal secretion induced by histamine, but had no significant effect on histamine-induced nasal congestion, suggesting that acute exposure to high levels of DE may cause nasal mucosal hyperresponsiveness, but no overt symptoms of rhinitis. Hiruma *et al.* [72] also reported effects of DEPs on the nasal mucosa of guinea pigs consistent with the development of nasal hyperreactivity. It was found that diesel exposure led to a dose dependent increase in histamine-induced vascular permeability, an increased eosinophilic infiltration into the epithelial layer and also enhanced nasal reactivity to histamine.

The mechanisms involved in asthma and allergy development after DEPs exposure may include increased penetration of allergen across the respiratory mucosa or direct modulation of the immunological response [73]. Particulate air pollution includes particles from diesel and gasoline engine exhaust and biological materials such as plant debris and tyre debris *e.g.* latex, that may be allergens [74]. Some allergens, such as the major grass pollen Lolium perenne -1 (*Lol p*1) allergen, are also shown to specifically bind to DEPs. This might be a possible mechanism for the triggering of asthma attacks and a theoretical contributing factor to the increase in asthma prevalence [75].

Ormstad *et al.* [76] have studied the allergen carrying effect of DEP. This was an *in vitro* study of allergen adsorption to particles such as indoor-suspended particles matter (SPM) and DEPs. They reported that the cat allergen (*Fel d*1), dog allergen (*Can f*1) and birch pollen allergen (*Bet v*1) could all be found on the surface of SPM, whereas house dust mite allergen (*Der p*1) was not. However, all four allergens were found to be absorbed to DEPs. A chemical characterization of the coating of Birch pollen grains collected during pollen season in the north of Stockholm has been published [77]. The greatest portion (80%) consisted of n-alkanes and n-alkenes, but methylketones, ethers, alcohols and amino alcohols were also identified.

In vitro studies. Some *in vitro* studies have been performed on animal cells, but most of the work has been conducted on cells derived from humans. The eosinophil is a major effector cell in allergic inflammatory disorders. In one study, the effects of DEPs and DEP extract on eosinophil adhesion, survival rate and degranulation were assessed [78]. Eosinophils, human mucosal microvascular endothelial cells (HMMECs) and human nasal epithelial cells (HNECs) were preincubated with and without DEP extract. Radiolabelled eosinophils were allowed to adhere to monolayers of HMMECs and HNECs with the degree of reactivity being determined after washing, and the numbers of adherent eosinophils were calculated. There was a significant increase in the adhesiveness of eosinophils to HNECs, but not HMMECs. DEP also induced eosinophil degranulation without changing the eosinophil survival rate. These results would indicate that DEPs play a significant role in the promotion of nasal hypersensitivity induced by enhanced eosinophil infiltration and degranulation.

The cytotoxicity of DEP-induced phagocytosis and the resulting immune response were studied in human bronchial and nasal epithelial cell cultures [79]. DEPs exposure induced a time and dose-dependent membrane damage. Transmission electron microscopy showed that DEPs underwent endocytosis by epithelial cells and translocated through the epithelial cell sheet. Flow cytometric measurements allowed establishment of the time and dose dependency of this phagocytosis and its lack of specificity for different particles (DEPs, carbon black and latex were tested). DEPs led to a time-dependent increase in IL-8, GM-CSF and IL-1 beta release. This inflammatory response occurred later than phagocytosis and it appeared to depend on the types of adsorbed compounds, as in this study carbon black had no effect on cytokine release.

Airway epithelial cells play a prominent role in the pathogenesis of respiratory disease. Studies have shown that exposure of nasal or bronchial epithelial cells to DEP results in increased synthesis and release of proinflammatory mediators, cytokines such as IL-6, IL-8 or GM-CSF, and adhesion molecules [80].

In line with the observations during nasal challenge *in vivo* [36, 38], studies on isolated human B-lymphocytes have demonstrated enhanced IgE synthesis following exposure to DEPs [81]. In a study of purified human B-cells stimulated by IL-4, the ability of DEPs to induce IgE production could be mimicked by polyaromatic hydrocarbons (PAH) extracted from DEPs. However, DEP-PAH did not induce IgE production in unstimulated B-cells, indicating that it only enhances ongoing IgE production. Phenanthrene, a major polyaromatic hydrocarbon and an important component of DEPs, has shown the same enhancing effect on IgE production in a human B cell line [82].

The effect of DEP-PAH on the release and mRNA expression of IL-8, monocyte chemotactic peptide-1 (MCP-1) and RANTES (Regulated on activation normal T cell expressed and secreted) was investigated by paripteral blood mononuclear cells (PBMCs) obtained from healthy subjects. The production of protein in supernatants was assessed by enzyme linked immunoabsorbent assay (ELISA), and mRNA production by semiquantitative reverse transcriptase polymerase chain reaction (RT-PCR). There was a dose dependent increase in the secretion of IL-8 and RANTES in response to increasing concentrations of DEP-PAH (range 0.5–50 $ng \cdot mL^{-1}$). However, there was a significant dose dependent inhibition of MCP-1 secretion. The expression of mRNA coding for IL-8, RANTES and MCP-1 showed variations that parallelled the production of the corresponding proteins. These results suggested that DEP-PAH can modulate chemokine pathways at the transcriptional level [83].

Other studies have been performed using cultured human bronchial epithelial cells (HBEC) exposed to DEPs [84]. Exposure of these cells to DEP at 50 $\mu g \cdot mL^{-1}$, filtered DEPs solution or DEP at 100 $\mu g \cdot mL^{-1}$ attenuated the ciliary beat frequency (CBF) dose dependently and increased the release of IL-8, GM-CSF and soluble ICAM-1 (s/CAM-1). The observations support the hypothesis that DEPs exposure may lead to functional changes and the release of proinflammatory mediators with the potential to influence the development of airway disease. Specifically, infiltration of neutrophils and other inflammatory cells would be promoted by the observed changes.

In another report, the effect of DEPs on the CBF, and production of IL-8, GM-CSF, RANTES and sICAM-1 by cultured human bronchial cells was compared between nonatopic, nonasthmatic subjects and atopic patients with mild asthma. Bronchial cells from these two groups were exposed to 10–100 $\mu g \cdot mL^{-1}$ DEP for 24 h. The baseline CBF was the same in both groups. There was a significant attenuation in the CBF, in response to increasing DEP levels in both groups, with the largest changes at 100 $\mu g \cdot mL^{-1}$. The cell cultures from asthmatics constitutively released significantly greater amounts of IL-8, GM-CSF and sICAM-1 and were the only cultures to release RANTES. In response to 10 $\mu g \cdot mL^{-1}$ of DEP, there was a significant increase in the release of IL-8, GM-CSF and sICAM-1 in cells from asthmatics. However, exposure to doses of 50 and 100 μg·mL^{-1} led to a decrease in the release of IL-8 and RANTES. In contrast, only these higher concentrations of DEPs caused a significant increase in the release of IL-8 and GM-CSF in cells from nonasthmatics. These results suggest that the bronchial epithelial cells of asthmatics are more sensitive than cells from normal subjects to DEPs, and that they are also different with regard to the amounts of proinflammatory mediators released [85].

The effect of DEPs has also been studied in three different *in vitro* systems of human airway epithelial cells: nasal polyps, bronchial cells obtained at lung tumour resection or at autopsy, and the bronchial epithelial cell line BEAS-2B [86]. DEP (10–100 μg·mL^{-1}) induced a dose- and time-dependent stimulation of IL-8 and GM-CSF production by all three kinds of epithelial cells. Using double chamber plates, it was shown that the cells could only be stimulated from the apical side. As a control, neither coal nor graphite showed any stimulatory effect, whereas benzpyrene, a constituent of DEPs, did. Thus it appears that human epithelial cell exposure to DEP might stimulate cytokine production, with possible relevance for the allergic inflammation.

In another investigation, the effect of DEPs in doses 40–330 μg·mL^{-1} was recorded using the human bronchial epithelial cell line, BEAS-2B [87]. DEP diameter ranged 25–35 nm and the particles were phagocytized by these cells. There was an increase in IL-6 and IL-8 production (11-fold and 4-fold, respectively). Exposure of these cells to tumour necrosis factor (TNF)-α also stimulated a strong increase in IL-6 and IL-8 production. There was an additive effect on the production of IL-6 and IL-8 after TNF-α priming and subsequent exposure to DEPs, seen only at low doses of DEPs (10–70 μg·mL^{-1}) and TNF-α (0.05–0.2 ng·mL^{-1}).

To elucidate the molecular mechanism of action of DEPs, IL-8 gene expression was studied by northern blot analysis, and run-on transcription assay in human bronchial epithelial cells. Suspended DEPs (1–50 μg·mL^{-1}) increased the steady state levels of IL-8 mRNA. Electrophoretic mobility shift assay (EMSA) demonstrated that DEPs induced increased binding to the specific motif of the nuclear transciption factor κB (NF-κB), but not of transcription factor AP-1. NF-κB is known to stimulate the trancription of genes coding for inflammatory molecules like TNF-α and IL-8. The luciferase reporter gene assay using wild type and mutated NF-κB binding sequences showed that DEP-induced NF-κB activation was involved in IL-8 transcription. These results indicate that DEPs activate NF-κB, which may act as an important mechanism for the increased inflammatory cytokine release [88].

The effects of DEP extract on the expression of histamine H1 receptor (H1R) mRNA and the production of IL-8 and GM-CSF in human nasal and mucosal microvascular endothelial cells have also been investigated. The change in expression of H1R mRNA was evaluated by RT-PCR and southern blot analysis. The amount of IL-8 and GM-CSF was measured by ELISA. It was found that DEP led to a significant upregulation of the H1R gene expression as well as an increase in histamine-induced IL-8 and GM-CSF production [89].

Yang *et al.* [90] studied the possible role of cytokines in the toxic effect of DEPs on rat alveolar macrophages (AM). The macrophages were incubated with DEPs in different concentrations as well as with methanol, washed DEPs or DEP methanol extracts. High concentrations of DEPs and methanol extracts increased IL-1 secretion by AM, while there was no effect on TNF-α. DEPs inhibited production of IL-1 and TNF-α stimulated by endotoxin (lipopolysaccharide). The results suggest that the pro-inflammatory cytokine IL-1 may play a role in the pulmonary response to DEP inhalation. The suppressive response of AM pretreated with DEPs, to endotoxin stimulation may be a factor contributing to the impairment of pulmonary defence systems after prolonged DEPs exposure.

In one study, the effect of DEPs on isolated tissues and cultured cells from the respiratory tract of guinea pigs was examined [91]. DEPs induced a dose dependent relaxation of tracheal smooth muscle and time dependent cytotoxicity on tracheal smooth muscle cells and lung fibroblasts. On the basis of pharmacological interventions, it was suggested that the cytotoxicity of DEPs may be mediated *via* generation of oxygen radicals. DEPs have also been shown to produce aggressive oxygen radicals in a cell-free *in vitro* system in the presence of appropriate electron donors [92], which in part may explain the potential toxicity and mutagenicity of DEPs.

The role of endogenous nitric oxide

Nitric oxide (NO) is found in the exhaled air of animals and humans. Increased levels of NO in exhaled air are associated with asthma and airway disease and NO has been observed to suppress Th1 cells leading to a Th2 type response that is associated with allergy [93]. The role of NO in asthma-like symptoms induced by DEPs has been studied in mice [94]. Repeated intratracheal instillation of DEPs in mice induced a four-fold increase in macrophages, neutrophils, eosinophils and lymphocytes in BAL fluid. DEPs induced a two-fold increase of NO in exhaled air and an increase in staining for the enzyme nitric oxide synthetase (NOS) in the airway epithelium. The increase in respiratory resistance induced by the DEP instillation was suppressed by the NOS inhibitor N^{G}-methyl-L-arginine (L-NMA). These findings in mice suggest that some effects of DEPs may be mediated by endogenous NO. In contrast, Muto *et al.* [95] found that DEP, like L-NMA, abolished the acetylcholine (Ach)-induced relaxation of aortic rings preconstricted with phenylephrine. NO release from aortic rings in response to Ach was inhibited by DEPs (100 μg·mL^{-1}, 60 min). NO released by the bronchial epithelium in rabbit bronchial strips attenuated the bronchoconstriction induced by Ach and this attenuation was abolished by 60 min preincubation with DEPs (100 μg·mL^{-1}) or L-NMA. Their conclusion was that inhibition of NO release by DEPs may be a part of the observed respiratory effects of DEPs. Clearly further studies are required to establish the significance of these opposite results in two different animal models.

Cardiovascular effects

Epidemiological studies have associated increased mortality in cardiovascular diseases with episodes of heavy air pollution [96, 97]. SEATON *et al.* [14] suggested that the ultra fine particles would induce airway inflammation in susceptible individuals, release of mediators and an increase in blood coagulability. A literature survey has provided some support for the hypothesis of possible association between occupational exposure to dust and increased risk of ischaemic heart disease [98–100]. For example, coal miners showed manifestations of pneumoconiosis and increased incidence of ischaemic heart disease. There were also increased levels of fibrinogen in the blood of coal miners with pneumoconiosis, and fibrinogen is a risk factor for ischaemic heart disease. A hypothesis has been put forward that long-term inhalation of particles retained in the lung induces an inflammation which is accompanied by an increase of plasma fibrinogen, leading to elevated risk for blood clotting and ischaemic heart disease [100].

In a recent study combining measurement of air pollution exposure with personal meters and of haematological markers in collected blood, it was found that there was a relationship between exposure to particulate matter, measured as PM_{10}, and changes in haemoglobin concentration, haematocrit (packed cell volume) and red blood cell count [101]. There were concomitant decreases in platelet number and fibrinogen levels. By also measuring plasma albumin, the authors concluded that the decrease in haemoglobin was caused by increased peripheral sequestration of red blood cells, rather that generalized haemodilution. The study supports particulate air pollution, or a very closely associated confounding factor, having the potential to affect important cardiovascular phenomena. Studies of acute episodes of increased air pollution have documented effects on plasma viscosity [102], and acute exposure to DE has effects on inflammatory cells in the blood [28]. In a time series panel study of particulate air pollution, there was an association between particle levels and pulse, but not with oxygen saturation [103]. There was a time lag between exposure and the effect on pulse that the authors interpreted as an indication of lung inflammation with consequent release of mediators and cytokines being the primary event. Some recent studies in the elderly [104–106] have implied an association between increased particulate matter ($PM_{2.5}$) in ambient air pollution and decreased heart rate variability, suggesting a possible contribution to increased cardiovascular mortality and decreased autonomic control.

The studies of the direct influence of DE on various cardiovascular responses, however, remain very few. Pretreatment of human serum with DEP extracts (500–2,500 $\mu g \cdot mL^{-1}$) gave a dose-dependent reduction in complement haemolytic activity of up to 20% [107], and activation of the alternative complement pathway. A direct toxic action of DEPs was examined in a model of isolated atria from guinea pigs [108]. DEPs in lower doses (10–500 $\mu g \cdot mL^{-1}$) induced a transient but dose-dependent increase in contractile force. DEPs in doses >500 $\mu g \cdot mL^{-1}$, only decreased contractile force and induced cardiac arrest. It was concluded that cardiac toxicity contributes to the lung oedema that is known to be one prominent cause of death in DEPs exposed animals. It appears unlikely, however, that inhalation of DEPs by humans could produce the concentrations employed in these particular experiments. The experiments indicating effects of DE on the NO system and oxygen radical formation have been discussed above. All in all, the possible mechanisms involved in the alleged role of DE on various cardiovascular events remain unknown.

Discussion

The epidemiological support for particle effects on asthma and respiratory health is very evident. The experimental studies of DEPs include *in vitro* models, animal *in vivo* models, studies of healthy humans and occasional observations in patients. Respiratory, immunological and systemic effects have indeed been documented. The main effects on the respiratory system are summarized in table 1.

The acute effects include irritation of the nose and eye, lung function changes, airway inflammation, headache, fatigue and nausea. In addition to symptoms, exposure studies in healthy humans have documented a number of profound inflammatory changes in the airways, notably, before changes in pulmonary function can be detected. It is likely that such effects may be even more detrimental in asthmatics and other subjects with compromised pulmonary function.

Chronic exposure to DE induces cough, sputum production and lung function decrements. Pathological and histological findings in the lung after DEPs exposure have mostly been studied in rats and include increases in lung weight, increased numbers of particles in the lung and an increased burden of soot, associated with alveolar infiltration of macrophages, macrophage aggregation, chronic inflammatory responses, proliferation and hyperplasia of alveolar epithelium and type 2 cells, thickening of alveolar septa and wall fibrosis.

Due to the complexity of DE, it is likely that some effects are caused by the gaseous components whereas other effects relate to the particle content. The suggested mechanisms of detrimental actions of particulate matter include oxidative stress and actions of particulate matter content such as metals, hydrocarbons, acids and carbon core. The ultrafine particles are currently suspected of being the most aggressive particulate component of DE. Comparison of DEPs and carbon black in animal inhalation studies show that both induce a reduction in lung function and accumulation of macrophages, suggesting that the toxic effect of DEPs is, in part, coupled to the carbon core. However, much more work is needed to pinpoint the relative role of different components of DE, as well as the interaction between the different components, and other environmental factors.

There are several observations that support the hypothesis that DE is one important factor contributing to the allergy pandemic. For example, DEPs introduced by different routes, intraperitoneally, intranasally or intratracheally, may act as adjuvant to allergen and

Table 1. – Some effects of diesel emission with relevance to the respiratory system

System	Effects	Reference
Human volunteers	↑ airway resistance and inflammation	[21, 26]
Exposure chamber	↑ neutrophils in BAL and sputum	[26, 28, 31, 32]
challenge	↓ mast cells in BAL, ↑ mast cells in airway mucosa	[26, 28]
	↑ in ICAM-1, VCAM-1	[28, 29, 30]
	↑ in IL-8 in airway epithelium	[31]
	↑ in IL-6 in sputum	[32]
Humans	↑ in local IgE	[33, 37]
Nasal provocations	↑ in IgE secreting cells	[33]
	↑↑ spec IgE (DEP + antigen) → allergic sensitization	[36, 37]
	↑ in IL-4, IL-5, IL-6, IL-10	
Rat Chronic exposure	Increased lung weight, chronic inflammation with increased number of inflammatory cells, chronic degenerative changes	[41–43, 51, 55, 57]
	Bronchiolo-alveolar hyperplasia	[42, 55, 57]
	Prolongation of clearance	[43, 51]
Cat Chronic exposure	Pattern of restrictive lung disease, inflammatory reactions, bronchiolo metaplasia	[48, 49]
Mice Acute high exposure (intratracheally)	Severe lung injury, high mortality, cause of death: pulmonary oedema	[50]
Mice Chronic exposure	Airway inflammation with increased number of inflammatory cells	[62, 63, 65, 94]
	↑ goblet cells	[65, 70]
	↑ respiratory resistance	[70]
Mice	↑ IgE levels	[58, 59]
DEP + allergen	↑ spec IgE levels	[58, 59, 65, 70]
Exposure	↑ spec IgG_1 levels	[62, 63, 70]
	↑ IL-2, IL-4, IL-5	[62, 70]
	↑ GM-CSF	[62]
Human nasal epithelial cells	↑ adhesion and degranulation of eosinophils	[78]
(HNEC)	↑ IL-1β, IL-6, IL-8	[79, 80]
In vitro exposure	↑ GM-CSF	[79, 80]
	↑ adhesion molecules	[80]
Human bronchial cell culture	↑ IL-1β, IL-6, IL-8	[79, 80]
In vitro exposure	↑ GM-CSF	[79, 80, 85]
	↑ adhesion molecules	[80, 85]
Human bronchial epethelial cell	↑ IL-6, IL-8	[84, 87]
(HBEC)	↑ IL-8 mRNA	[88]
In vitro exposure	↑ GM-CSF	[84]
	↑ sICAM-1	[84]
Human B-cell line *In vitro* exposure	↑ IgE production	[82]
Human peripheral blood	↑ IL-8	[83]
mononuclear cells (PBMC)	↑ RANTES	[83]
In vitro exposure	↓ MCP-1 secretion	[83]
Rat alveolar macrophages	↑ IL-1	[90]
In vitro exposure	↓ IL-1, TNF-α - stimulated by endotoxin	[90]

BAL: bronchoalveolar lavage; DEP: diesel exhaust particles; GM-CSF: granulocyte macrophage colony stimulating factor; ICAM-1: intracellular cell adhesion molecule; IL: interleukin; MCP-1: monocyte chemotactic peptide 1; MRNA: messenger ribonucleic acid; RANTES: regulated on activation normal T-cell expressed and secreted; ICAM-1: soluble intracelluler adhesion molecule; TNF-α: tumour necrosis factor alpha; VCAM-1: vascular cell adhesion molecule-1; ↑: increase; ↓: decrease.

hence increase the sensitization response. This has been observed both in human and animal studies. IgE production in response to allergen has been shown to be enhanced by DE. DEPs affect human B-cells and may enhance IgE production by several mechanisms. In addition, DEPs show effects on the allergic response that involve inflammatory cells in the respiratory mucosa, such as T cells, mast cells and epithelial cells, and also on local production of various pro-inflammatory cytokines. Another possible mechanism of action of DEPs on allergic responses is to act as a carrier of pollen allergens, allowing enhanced deposition of pollen in the lower airways. Allergens bound to DEPs may trigger asthma attacks and DEP-binding may facilitate penetration of allergen through the airway mucosa.

It is often believed that atopic children are a specially sensitive group, but the few animal studies that have been carried out have not supported the hypothesis that the developing lung [51] or lungs with induced emphysema [53] are more prone to lung injury due to particulate matter. On the basis of published data, there is no single mechanism of action, that can explain the various public health effects of particulate air pollution shown in epidemiological studies. One major shortcoming of many experimental studies relates to their inability to establish whether or not the exposures used for the studies are relevant to the background or peak exposures which may occur in real life, acutely or chronically. In addition, theoretically, both acute exposure to high levels of diesel exhaust particles and chronic exposure to low levels may impair respiratory functions and have various other detrimental effects, but the mechanisms may be different. Such a situation exists in the case of a classical trigger of asthma such as allergen: acute exposure to high allergen doses produces effects that differ from those caused by repeated low dose exposure [109–111]. As reviewed, some of the studies of chronic exposure of rats to diesel exhaust particles (*vide supra*) also highlight such differences between high and low dose exposures. It is therefore imperative to further assess acute and chronic effects of diesel exhaust in mechanistic studies with careful consideration of exposure levels. Whenever possible and ethically justified, such studies should be performed in humans, but animal and cell culture models that are sufficiently predictive and sensitive, may also provide important information on these matters.

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Chemicals and Materials

Diesel Exhaust

On this page

What is diesel exhaust?

Diesel exhaust is produced by the combustion (burning) of diesel fuel. The exhaust is a complex mixture of gases, vapours, aerosols, and particulate substances. The exact nature of the exhaust depends on a number of factors including the type of engine, how well serviced/maintained the engine is, type of fuel, type of oil, speed and load on the engine, and emission control systems.

Diesel exhaust may contain:

- Carbon (soot)
- Carbon monoxide
- Carbon dioxide
- Oxygen
- Water vapour
- Ammonia
- Nitrogen
- Oxides of nitrogen (e.g., nitrogen oxide, nitrogen dioxide)
- Oxides of sulphur (e.g., sulphur dioxide)
- Alcohols

- Aldehydes
- Ketones
- Hydrocarbons
- Aromatic compounds such as benzene, toluene, and polycyclic aromatic hydrocarbons (PAHs)
- Diesel particulate matter (DPM)

Diesel particulate matter (DPM) is primarily made up of soot particles, carbon, ash, polycyclic aromatic hydrocarbons (PAHs), metallic abrasion particles, sulfates, and silicates. Almost all particulate emitted by diesel engines is respirable (PM <10 micron), with the majority of the particulates have diameters less than 1.0 micron.

What are the main health concerns?

Short term exposure to diesel exhaust can cause coughing, and irritation of the eyes, nose, throat, and respiratory tract. Breathing in diesel exhaust can cause lung irritation and/or an allergic reaction causing asthma (wheezing and difficult breathing), or making pre-existing asthma worse. Other symptoms may include feeling lightheaded, headache, or nausea.

Long term exposure may lead to serious health effects. The International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), classified diesel engine exhaust as carcinogenic to humans (Group 1), determining that exposure to diesel exhaust emissions increases the risk for lung cancer and possibly bladder cancer.

Who is at risk of exposure to diesel exhaust?

The most common way individuals are exposed is by breathing air that contains the diesel particulate matter. The fine and ultra fine particles are respirable, which means that the particles can avoid many of the human respiratory system defense mechanisms and enter deeply into the lung.

Workers may be at risk:

- In areas where diesel powered vehicles are used repaired, or tested such as forklift trucks, railway locomotive, buses, trucks, construction vehicles, farm vehicles.
- Where diesel exhaust can accumulate, such as warehouses, car/bus depots, ferries/ships, garages, vehicle testing sites, fire stations, mines, or where diesel generators or winch motors are used.

- In occupations that work in areas where exhaust levels are high or can accumulate, such as police and traffic officers, custom officer/border control booths, ticket/toll booth operators, drivers of diesel vehicles (buses, subway/railway, truck, taxi, forklift, etc.), airline ground crew, farm workers, vehicle maintenance workers, dock/cargo/passenger ship workers, miners, tunnel construction workers, landscapers, etc.

Is there an exposure limit for diesel exhaust in workplaces?

All jurisdictions in Canada have regulated occupational exposure limits . For diesel exhaust, these limits may apply to the specific component, or to diesel exhaust (as a whole), and/or may apply to specific industries (such as mining).

In the absence of such legislation, the "general duty clause" applies. This clause, common to all Canadian occupational health and safety legislation, states that an employer must provide a safe and healthy workplace. Making sure workers know the health effects of diesel exhaust, how to perform work safely, and precautions to take is, therefore, the employer's duty.

In addition, as diesel exhaust is classified as a carcinogen, it is a good practice to keep exposures to carcinogens to a minimum.

How do I know if exposure to diesel exhaust is an issue?

The workplace should have a competent person (such as an occupational/industrial hygienist, safety professional, or others) conduct a risk assessment to determine the health risks from exposure, and to identify the necessary steps needed to control these risks. See the OSH Answers for more information on how to do a risk assessment.

Questions to investigate include:

- How likely is exposure?
- How long is exposure?
- Who/how many are affected?
- Have health concerns been reported?
- Can engines be turned off or idling avoided? Can engines be operated outdoors only?
- Are the engines in good repair?
- How exhaust is currently ventilated or removed from the location?
- Is there visible smoke from the engine?
- Is soot accumulating in the workplace?
- What controls are currently in place?

- How can exposure be reduced or eliminated?

This checklist is not complete. Be sure to investigate all relevant issues for your workplace or situation.

How can exposure to diesel exhaust be controlled?

Various measures can help lower exposure to diesel exhaust. Workplaces may investigate the measures that work best in their situation. Control measures may include:

- Eliminate by replacing diesel powered engines with electric or other types of power sources (remember to manage any risks introduced by alternative power sources).
- Use alternate fuels or cleaner sources of energy (such as propane, natural gas, low sulfur diesel, etc.) where possible.
- Use low-emission engines or fuel additives that will reduce emissions.
- Use exhaust treatment systems such as filters, catalysts and/or converters, and a corresponding maintenance program.
- Run engines outdoors (instead of indoors).
- Maintain the body of the vehicle to make sure that exhaust is not leaking into the cab or passenger area. Replace cabin air filters as required.
- Ventilate appropriately, such as providing positive pressure ventilation, exhaust extraction devices, inlet and exhaust general (dilution) ventilation, and/or local exhaust (such as tail pipe hose exhaust). Place exhaust hoses so they exhaust outdoors, and not allow the emissions re-entre the workplace.
- Modify the layout of the work area to separate the area where people must work and areas where exhaust is generated, such as isolate the generator in a separate, ventilated space, or isolate the worker in a sealed, air conditioned cabin (air filtered) where possible.
- Keep openings for border, ticket, toll, or food booths as small as possible and closed as much as possible when there is exposure to exhaust. If booths are in a place where exhaust accumulates, ventilate the booth with fresh air appropriately.

- Use administrative controls such as:
  - Education and training to workers about the exposure to diesel exhaust and proper use of control measures.
  - Turning off engines whenever possible and/or opening doors and windows where possible.
  - Regularly maintaining engines, ventilation systems, and filters.
  - Reduce the hours of work exposed to exhaust through job rotation and scheduling.
- Use of personal protective equipment, such as respirators.

Fact sheet last revised: 2021-11-30

Disclaimer

Justine Brotherston

From: [redacted]
Sent: Sunday, March 12, 2023 12:01 PM
To: James Seeley; Russel Hurst; Jessica Goyda; John Sepulis; Admin; Sara Bailey
Subject: Changes to zoning Gilmour Road and Brock Road

Follow Up Flag: Follow up
Flag Status: Flagged

Puslinch Mayor and Council members:

My [redacted] and I were absolutely horrified to see the plans for the end of our very peaceful street, Gilmour Road. I really don't know what A) that company is thinking and B) how anyone could think this is a good idea.

First: traffic! Over 150 employees coming and going. This is a small road and I don't believe the majority of the residents want the road paved.

Second: noise! 3 storey office building? 123 parking spaces for big rigs? 170 parking spaces for employees?

Third: destruction of the nature of the area! If this plan goes through, the people who will be most impacted will be homes that are directly across from the buildings/parking of big rigs and the residents of the Meadows of Aberfoyle. How can they begin to deal with all the traffic this will bring in? Indeed how can anyone on this road be happy with such a zone change? Certainly we are not. Every single home on Gilmour Road will be impacted by this.

The placement of this company and the changes to the environment will likely bring home prices down. I surely wouldn't consider buying a home that close to the end of Gilmour Road with this company across from me.

Already many people cut through back roads and use Gilmour as a cut through to Gordon. Once they find out they can get to work that way from Victoria, the road will just turn into a thorough fare.

We moved here to enjoy the peace and quiet and also the nature of the land. I know that Brock Road is becoming busy, but this change at the end of Gilmour Road seems ridiculous to us.

We sincerely hope that those in charge will do the right thing, and that would be to disallow the zone change. We are in opposition to this rezoning and Wellington Motors moving to that spot at the end of Gilmour Road.

[redacted]

****

[redacted]

Justine Brotherston

From: [redacted]
Sent: Friday, March 10, 2023 4:27 PM
To: Admin
Subject: Rezoning at 128 Brock Rd South

Follow Up Flag: Follow up
Flag Status: Flagged

We are writing this letter in response to the application for rezoning at 128 Brock Road South.

We have been residents on Gilmour Road since October 1993, almost 30 years.

We are asking that this rezoning NOT be permitted by council.

We moved to this area to get away from the noise, traffic, and busyness of the city.

Several residents like us are retired. We look forward to our leisurely walks with our pets,

as well as taking our grandchildren for walks down the road.

This would have to stop, should the rezoning be approved, as our road would become very unsafe.

Over the years, the noise from the 401 has increased significantly and now the noise

from such a warehouse would make things much worse.

The peace and quiet that we pay very high taxes to have, will dramatically change.

Traffic along Brock Road is already very heavy to the point that a roundabout

at Gilmour and Brock Rd had to be built. We have witnessed accidents and many more close calls,

due to high vehicle volume.

Heavy trucks are not permitted on Gilmour Road, or so the signs says.

We witness on a regular basis, the lack of compliance by many truck drivers, as they continue

to drive along Gilmour Rd to cut through to highway 6.

On several occasions, we have been out walking, and have had to jump out of the way

to prevent getting hit and to attempt to dodge the excess dust and flying gravel that is produced by these trucks.

With the number of new employees that will be hired at the facility in question, we will see a dramatic increase in vehicle volume on Gilmour Rd, which in turn,

will decrease the safety of the residents most significantly.

In discussion with neighbors, we realized that we had another concern.

This area was originally zoned wetland.

What has happened to this protection?

[redacted]

Justine Brotherston

From: [redacted]
Sent: Sunday, March 12, 2023 6:06 PM
To: Admin
Subject: File #D14/WEL - application to amend By-law 023-2018

Follow Up Flag: Follow up
Flag Status: Flagged

Hello
My [redacted] and I would like to go on record as opposing this by-law change. The proposal would have the impact of changing Gilmour Road into an industrial side street. The new traffic circle presents a danger to traffic in that area already, a truck entrance on Brock and an employee entrance on Gilmour would greatly amplify this danger.
Ourselves and our children and grandchildren all walk on Gilmour regularly. We have lived here since 1987 (36 years).
We also feel this development would adversely affect our property value.
We urge you to please consider the wishes and well-being of the residents of this area, and vote to turn down this application.
Sincerely
[redacted]

Sent from my iPad

Justine Brotherston

To: John Sepulis
Subject: RE: Wellington Motor Freight Change of Zoning Proposal

From: [redacted]
Sent: Tuesday, March 14, 2023 8:38 AM
To: John Sepulis <jsepulis@puslinch.ca>
Subject: Wellington Motor Freight Change of Zoning Proposal

Subject: Wellington Motor Freight Change of Zoning Proposal

I would like to state my concerns regarding the proposal for Wellington Motor Freight's rezoning request for 128 Brock Road south. I have many reservations about this project as follows:

1) Property Values:

   I am very concerned that the impact on the residential area of Aberfoyle will be detrimental and will affect the value and demand of the residential properties.

2) Light and Noise Pollution:

   The light pollution will increase dramatically as this size of project will be lighting approximately 65% of the almost 652,000 sq. ft. property. We can already see the light pollution from the Dufferin Aggregates Aberfoyle Pit, DB Schenker of Canada and the Mammoet Puslinch Branch in the surrounding areas to the south and west of this proposed site.

3) Traffic Congestion:

   For years the Highway 6 Bypass has been postponed. The main reason for this project is to **reduce/divert** the 25000+ vehicles from using Hwy 6 South and Brock Road South corridor. Why are we looking at making decisions to put more and more vehicles through this 401/Hwy 6 South / Brock Road South corridor?

4) Size of Office/Warehouse Building, 218,000 Sq. Ft.:

   The Wellington Motor Freight's earlier presentation to the Township of Puslinch indicated that the anticipated quantity of trucks would be 15 trucks in and out per day. This volume does not match the total size of this proposed project. It is more likely that there will be a much higher volume of vehicles in order for this company to be profitable.

5) Traffic on Gilmour:

   An additional 200-300 cars per day will be entering and exiting through the Gilmour access at the roundabout (only 1 direction each way with no side walk) to access the employee parking lot. This will have a dramatic effect at the round about and will surely increase the traffic from Victoria St. onto Gilmour at the east end of Gilmour which is currently a gravel road.

In conclusion, I am asking for your support to insure that this Wellington Motor Freight's rezoning application is not approved.

Thank you

Sincerely,

[redacted]

March 13, 2023

[redacted]

Re: D14/WEL

To Whom This May Concern;

We are writing this letter today to express our concerns in the development of Part Lot 24, Conc 7 & 8, application D14/WEL,

We are not against the development of the land on County Road 46 (Brock Road South). As we understand the necessity for commercial growth along this business corridor. However, we hope to work through the concerns we have, listed below, as residents of 6 Gilmour Road.

1. Vehicle entrance/exit on Gilmour road. Gilmour is a residential street and should not be used for commercial use, including employee vehicles. The volume of traffic poses a safety risk for the residents, especially at the traffic circle. It is also a partially unpaved and narrow road and can not handle this volume of traffic. All incoming and outgoing traffic of this property, including employee vehicles should be on County Road 46, Brock Road South.
2. Loading doors. It would be less noisy and invasive to have the loading doors at the East and South side of the building, verses toward the residential (North) side of the building.
3. We would like to also recommend a berm around the property line and fence and/or trees on top of the berm to help shield from the building and keep business noise and light to a minimum.

Otherwise, as the owners stated, the business is mostly brokerage and logistics trucking. This does not seem too invasive for the neighbours. It will be nice to have more locals own the land and business within the community.

We will also be requesting to see any updated site plan changes going forward.

Thank you,

[redacted]

[redacted]

March 14, 2023

To: Courtenay Hoytfox,
Municipal Clerk, Township of Puslinch

Ms Hoytfox,
As a concerned citizen who has watched children get on a bus on Gilmore Road for 13 years, it scares me to think that that much traffic will be driving in and out to get to work on that road.

The trucking distribution centre claims that they will restrict their hours of operation to daytime. This may not last. My fear is that if the company submitting the application does not succeed, the path for another major company to come in and multiply the size of the operation would not be unforeseen.

We bought our homes knowing that the adjacent property was zoned highway commercial. Now, the Township is considering changing it so that somebody can make a tremendous amount of money, while the homeowners will lose a tremendous amount of money.

There will be over 60 homes in the vicinity of this new facility. We request that you keep with the current plan that is in place when we bought our homes. If any changes are made, could it be to continue and enhance the area rather than allow something contentious to encroach and destroy what is Aberfoyle. Further, I request that you not make this change, when we relied upon the plan to make our decision to purchase our properties.

Further, please consider the noise of these trucks coming in and out and the pollution that they will create for all the residents who live adjacent to this facility.

As a person that worked for a facility with a trucking company, I know that people have to warm up the trucks in the mornings. That smell and the noise was overwhelming,

Thank you,

[redacted]

admin@puslinch.ca and planning@puslinch.ca

Justine Brotherston

From: [redacted]
Sent: Wednesday, March 08, 2023 5:49 PM
To: Admin; Planning
Subject: File number D14/WEL

Attention Township Clerk's Office,

As a taxpayer in this county, I am writing to oppose the above file application.

Gilmore road and Aberfoyle Mill crescent are currently residential roads. The proposed plan of changing a section of Gilmour road to industrial zoning would have a considerable negative effect to the residents.

The negative effects on residents include additional traffic along Gilmour Rd., additional noise and pollution in the area, lessening of property values due to the close proximity to industrial zoning, potential lengthening of selling time for homes as the area will become less disireable.

Also of great concern is the possibility of additional growth to the industrial area along Gilmour Rd. should this application be approved.

I urge you to oppose this application as it is detrimental to the residents in the area.

Sincerely,
[redacted]

Your Name

[redacted]

Your Email

[redacted]

Your Address

[redacted]

Subject

Objection to Proposal to rezone land south of Gilmour at Brock Road

---

Your Message

Dear John, we asking for your support to ensure Aberfoyle and our lovely community of Aberfoyle Meadows does not fall further into an industrial image vs a lovely little town with adjacent business park. The proposal to rezone yet another parcel of land so close to residential is threatening our lovely little town which has endured already too many trucks, noise and pollution. The rezoning of this land will spoil our community of Aberfoyle Meadows bringing unwanted:

Additional traffic
Noise
Pollution
Water concerns
Property value reductions
Lack of interest for others to live here

Massive lighting very close to us....as we see already from afar to our south
Further loss of our natural beauty of the area

Our community vision for a family friendly area is only achieved by ensuring businesses such as this are not permitted too close to residential areas. We are asking that you please support us and ensure this re-zoning application is denied.

Thank you for your support of our families adjacent to this area. I would be happy to speak with you regarding this and have included my phone # below.

[redacted]

Sent from Township of Puslinch

Justine Brotherston

From: [redacted]
Sent: Tuesday, March 14, 2023 4:10 PM
To: Admin
Cc: John Sepulis; [redacted]
Subject: Proposed Application of Trucking Company - Location Brock Rd & Gilmour Road

To Whom it May Concern,

I am writing to express our concerns and opposition to the proposed application to locate a trucking company at the corner of Brock Road and Gilmour Road.

As residents of the Aberfoyle Mill Cres community we have several concerns, including and not limited to:

- our property values
- increased traffic on Brock Road - this is in complete contradiction to the proposal to extend the Hanlon Parkway south of the 401 to south of Morriston. This is specifically intended to decrease the trucking traffic through Aberfoyle.
- increased noise pollution - a company that could be in operation possibly outside normal working hours.
- Increased risk of accidents on the roundabouts (since many drivers are unaware of the rules pertaining to roundabouts and trucks make it that much more difficult and challenging).
- Increased risk of traffic accidents involving trucks and private vehicles (as demonstrated by last week's horrific accident resulting in personal injuries on Brock Road near Fox Run).
- Increased night time lighting required by a trucking company to run business as well as avert possible theft (lighting would probably be on all night in this case).
- Increased Risk of Criminal Activity - this has been evident with the shortages and high demand of goods and resulting thefts from trucks carrying these goods. This criminal element could spread to the surrounding community.
- Air quality - increase due to volume of trucks and cars
- Soil Contamination - increase due to volume of trucks and cars
- Water Contamination - increase due to volume of trucks and cars
- Requirement of additional wells for large volumes of water
- Safety Concerns of neighbours using Gilmour for walking as well as children who use this road to get to school and/or wait for school buses

This proposal does not adhere to the bylaws of our community's right to quiet and peaceful enjoyment of our property.

We look forward to having our concerns heard at the community meeting on March 22, 2023.

Sincerely,

[redacted]

Sent from my iPad

24 Gilmour Road
Puslinch, ON
N0B 2J0

March 14, 2023

Township of Puslinch
7404 Wellington Road 34
Puslinch, ON
N0B 2J0

Dear Township Council,

We are aware that there is an application for a proposed re-zoning at the corner of Gilmour and Brock Roads for the possible construction of a warehouse and truck transportation hub. **We want you to know that we in no way support this and strongly oppose** the development and re-zoning for which Wellington Motor Freight have applied to the Township of Puslinch.

We have been residents of Aberfoyle, living on Gilmour Road, since 1995. We moved here specifically for the quiet, rural atmosphere that we found here. We are deeply concerned that this new development will entirely change this atmosphere as well as errode our land values. We are also extremely concerned about the increase in noise, light, traffic, plus the air and water pollution that will result from having a warehouse and truck transportation hub located in our neighbourhood.

We are respectfully asking you to reject this proposal by Wellington Motor Freight so that the character and quality of our rural community not be eroded by such a development.

Yours sincerely,

[redacted]

Comments on Proposed Wellington Motor Freight Development on 128 Brock Road

I have reviewed the application and supporting documentation related to the proposed Wellington Motor Freight (WMF) development at the corner of Gilmour and Brock Road (128 Brock Road) in the Township of Puslinch. The subject property is located in the Mill Creek subwater shed and what is being proposed by WMF gives me concerns that the proposed development will be a direct threat to the groundwater resources in the area.

Specific concerns

1. **Road Salt**

The proposed development includes a 5.7-acre parking lot. The parking area is large, suggesting that substantial amounts of road salt and/or de-icing compounds will be required. The impact of road salt and de-icing compounds on groundwater quality in the area of the proposed WMF facility is an important concern for me and the surrounding community.

If the project moves forward, we request that rock salt alternatives be used for de-icing; or that if rock salt must be used, that monitoring of water quality in both the shallow and deep aquifers is required by the Township.

2. **Stormwater management**

The proposed design indicates that parking surface water runoff will be directed through an oil-water separator to remove oils from trucks, before being sent via a ditch to Mill Creek. It is not known whether additional truck washing/maintenance is planned, which would result in the need for additional hydrocarbon management.

At a minimum, the WMF facility should have an extensive monitoring program to ensure that its operations do not compromise groundwater quality in the Mill Creek subwater shed. The monitoring program should also require prompt notification of any releases from the facility.

3. Buffer zones

The Wellington County Official Plan part 5 indicates policies on the County's Greenland System, which includes natural heritage areas. A portion of 128 Brock Road is adjacent to the core Greenland designation and contains wetlands and significant woodlands. In their Planning Justification Report the proponents propose a 37m buffer between the proposed development and the wetlands and wooded areas(sec4.3.5). However in section 6.3 of the report they only suggest a buffer of 15m for the wetlands and 5m with an additional 5m for grading for the wooded areas. It is recommend that the 37m buffer for the wetlands and woodlands be required.

Conclusion

As a resident of Puslinch who is concerned with water quality across the Township, I appreciate the opportunity to comment on the proposed Wellington Motor Freight facility. Mill Creek depends on groundwater quality, thus, I am extremely concerned with this type of operation potentially being constructed, without plans to provide further setbacks to the wetlands and wooded areas and an extensive monitoring and reporting program, the proposed development is a direct threat to the groundwater resources in the area.

[redacted]

[redacted]

March 14, 2023

Township of Puslinch
7404 Wellington Road 34
Puslinch, ON
N0B 2J0

Dear Township Council,

We are aware that there is an application for a proposed re-zoning at the corner of Gilmour and Brock Roads for the possible construction of a warehouse and truck transportation hub. **We want you to know that we in no way support this and strongly oppose** the development and re-zoning for which Wellington Motor Freight have applied to the Township of Puslinch.

We have been residents of Aberfoyle, living on Gilmour Road, since 1995. We moved here specifically for the quiet, rural atmosphere that we found here. We are deeply concerned that this new development will entirely change this atmosphere as well as errode our land values. We are also extremely concerned about the increase in noise, light, traffic, plus the air and water pollution that will result from having a warehouse and truck transportation hub located in our neighbourhood.

We are respectfully asking you to reject this proposal by Wellington Motor Freight so that the character and quality of our rural community not be eroded by such a development.

Yours sincerely

[redacted]

[redacted]

March 10, 2023 **Hand Delivered**

Township of Puslinch
7404 Wellington Rd. 34
RR#3
Guelph, ON
N1H 6H9

Attention: Ms. Courtenay Hoytfox

Re: Zoning By-law Amendment Application (D14/WEL)
Wellington Motor Freight
Pt. Lt. 24, Concession 7; Pt. Lt 24, Concession 8; Part Road Allowance between Concessions 7 & 8; Township of Puslinch
128 Brock Road South

Dear Ms. Hoytfox

As a resident and property owner at [redacted] I would like to express the following concerns regarding the above zoning amendment application, which would allow for industrial development at 128 Brock Road South, to accommodate Warehouse/Office facility, trailer parking and loading spaces.

As we all know, Brock Road S. is a very busy road for access to and from Hwy. 401 which already causes delays when attempting to access Brock Road S. Having additional tractor-trailer vehicles accessing Brock Road S. would further increase delays, as well as safety risk.

In addition, having vehicular traffic to and from the property onto Gilmour Rd. for appr. 100 employees would dramatically increase traffic on Gilmour Rd., for access to and from Brock Road S. as well as to and from Victoria Rd. Gilmour Rd. is mainly a gravel road and not in a condition to handle such a traffic increase. We have already experienced substantial traffic increase on Gilmour Rd. creating heavy dust accumulation and safety concerns because some vehicles over speeding. Gilmour Rd. would have to be upgraded to Victoria Rd. to eliminate the dust created by vehicles traveling on the current gravel surface.

Although I am not against development in principle, before mentioned concerns should be seriously considered.

Thank you in advance for your attention to this matter.

If you have any questions or concerns, please don't hesitate to contact me.

Yours truly,

[redacted]

[redacted]

[redacted]

March 10, 2023

Hand Delivered

Township of Puslinch
7404 Wellington Rd. 34
Puslinch, ON N0B 2J0

Attention: *Ms. Courtney Hoytfox*

Re: **128 Brock Road South, Puslinch, ON**
Zoning By-Law Amendment Application – D14/WEL

Dear Ms. Hoytfox,

As the owner and resident of [redacted] I would like to express the concerns below regarding the zoning by-law amendment application for 128 Brock Road South, Puslinch, Ontario:

The primary concern is from a traffic perspective. Brock Rd S is a main artery used by many to access Hwy. 401, among other areas. The site plan for the proposed development shows a truck entrance to the site from Brock Rd S. Tractor-trailers attempting to turn left onto Brock Rd S to access Hwy. 401 will create even further congestion and potential safety issues. Tractor-trailers exiting the site by turning north to access Hwy. 401 via the roundabout at Gilmour Rd will also further congest the roundabout. Delays have already been experienced trying to access Brock Rd S from Gilmour Rd.

The site plan also shows an employee entrance to the site from Gilmour Rd. Gilmour Rd is not in a condition to handle increased traffic, as employees would not only access the site from Brock Rd S, but also via Victoria Rd S. For the most part, Gilmour Rd is a gravel road. In recent years, we have already experienced increased traffic along Gilmour Rd (some at ridiculous vehicle speeds), creating safety concerns, as well as significant amounts of dust. In order for Gilmour Rd to handle additional traffic, I believe it would need to be widened and paved. The increased traffic from approximately 100 employees accessing the site via the Gilmour Rd at similar times would increase the congestion at the roundabout and overall traffic volumes on Gilmour Rd to unacceptable levels.

One of the requirements of the Places to Grow legislation is: "The transportation system for the GGH must be planned and managed for the safe and efficient movement of goods and people,…". The proposed development meets neither of the above requirements, and therefore, in my opinion, does conform with the Places to Grow legislation.

The subject site currently has a specialized Highway Commercial zoning and is designated as Secondary Agricultural and within the Puslinch Economic Development Area Policy Area of Wellington County's Official Plan. It is my understanding that the intent of both the current zoning and the Official Plan is for these lands to contain uses that service the residents of the Township and travelling public. "The land identified as PA7-1 on Schedule "A7" is known as the Puslinch Economic Development Area. This is an area intended to service the Township..." The proposed development serves neither the Township, nor the travelling public. In my opinion, the site would provide a better service to the Township, its residents and visitors by keeping the current zoning in place.

I would like to state that this is not an objection to development on the site in general, or a "Not In My Backyard (NIMBY)" objection, but I believe development in line with what the current zoning already allows on the site would be better suited for the site and the Township as a whole than a trucking facility, and hope that the above concerns are taken into consideration.

Thank you in advance for your attention to this matter.

Please don't hesitate to contact me should you have any questions.

Sincerely,

[redacted]