LANARK COUNTY

TYPE OF APPLICATION

Plan of Subdivision

OFFICE USE ONLY:			
Date Application Received:		File Number:	
Date Application Deemed Complete:		Application Fee:	Receipt:

Print in black or blue ink, complete or (✓)appropriate box(es)

1. APPLICATION INFORMATION

➢ **1.1 Name of Owner(s).** An owner's authorization is required in Section 11.1, if the applicant is not the owner.

Name of Owner(s)	Home Telephone No.	Business Telephone No.
1394706 Ontario Inc. c/o Wilburt Crain		613-268-2308
Address	**Postal Code**	**Fax No.**
1800 Maberly-Elphin Road Maberly, ON	K0H 2B0	
	Email Address	
	[redacted]	

➢ **1.2 Agent/Applicant** - Name of the person who is to be contacted about the application, if different than the owner. (This may be a person or firm acting on behalf of the owner.)

Name of Contact Person	Home Telephone No.	Business Telephone No.
ZanderPlan Inc. c/o Tracy Zander		[redacted]
Address	**Postal Code**	**Fax No.**
P.O. Box 20148, Perth, ON	K7H 3M6	
	Email Address	
	[redacted]	

1.3 Planner

Name of Planner		Business Telephone No.
ZanderPlan Inc. c/o Tracy Zander		[redacted]
Address	**Postal Code**	**Fax No.**
P.O. Box 20148, Perth, ON	K7H 3M6	
	Email Address	
	[redacted]	

1.4 Ontario Land Surveyor

Name of Surveyor		Business Telephone No.
Stantec Geomatics Ltd.		[redacted]
Address	**Postal Code**	**Fax No.**
1331 Clyde Avenue, Suite 300 Ottawa, ON	K2C 3G4	
	Email Address	
	[redacted]	

2. LOCATION OF THE SUBJECT LAND (Complete applicable boxes in Section 2.1)

2.1 Local Municipality	Geographic Village/Town/Township	Concession No.	Lot(s)
Drummond/North Elmsley	Drummond	1	Part Lot 7
		Registered Plan No	Lot(s) Block(s)
Name of Street/Road	Street No.	Reference Plan No.	Part(s)
Cty Rd 10 & Drummond Con 1	N/A		

Assessment Roll No(s).

0919-919-010-03300

➢ 2.2 Are there any easements or restrictive covenants affecting the subject land?

No ■ Yes ☐ If **Yes**, describe the easement or covenant and its effect.

3. PROPOSED AND CURRENT LAND USE

➢ 3.1 Complete **Table A** on Proposed Land Use

Table A - Proposed Land Use

Proposed Land Use		Number of Units or Dwellings	Number of Lots and/or Blocks on Draft Plan	Area (ha.)	Density (Units/Dwellings per ha.)	Number of Parking Spaces
Residential	Detached	42	42	359,502m2	1.17upha	84 (1)
	Semi-Detached					(1)
	Multiple Attached					
	Apartment					
	Seasonal					
	Mobile Home					
	Other (specify)					
Commercial						
Industrial						
Institutional (specify)						
Park, Open Space		nil			nil	nil
Roads		nil	2 Blocks and 3 Street parcels	33,030.38 m2	nil	nil
Other (specify)	Reserves		4	146.35 m2	N/A	0
Totals		42	48	392,684.3m2		

(1) Complete only if for approval of condominium description

3.2 What is the current use of the subject land?

Vacant Lands

➢ 3.3 How the subject land is currently designated in the County Official Plan, local Official Plan or any Official Plan Amendment?

County OP - Rural Area, Twp OP - Rural designation, Twp Zoning - Rural (RU) zone

3.4 Has there been an industrial or commercial use, or an orchard on the subject land or adjacent land?
☐ Yes ■ No If **Yes**, specify the uses.

	Yes	No	Unknown
3.5 Has the grading of the subject land been changed by adding earth or other material?	■	☐	☐
3.6 Has a gas station been located on the subject land or adjacent land at any time?	☐	■	☐
3.7 Has there been petroleum or other fuel stored on the subject land or adjacent land?	☐	■	☐
3.8 Has the site ever been used for the spreading of septage or sludge?	☐	■	☐
3.9 Is there reason to believe the subject land may have been contaminated by former uses on the site or adjacent sites?	☐	■	☐

3.10 What information did you use to determine the answers to the above questions?

Aerial mapping shows some site alteration has occurred where subdivision roads are proposed. Some fill piles can be seen on the south side of the property. The lands historically consisted of open fields. There have been no former uses that may have caused contamination

3.11 If **Yes**, to (3.4), (3.5), (3.6), (3.7), (3.8) or (3.9), a previous use inventory showing all former uses of the subject land or, if appropriate, of the adjacent land, is needed. Is the previous use inventory attached? If not, when will it be provided?

Yes ☐ No ■

There are no previous uses, as stated in 3.10 the reason 3.5 was checked was due to site works that have been started

4. CONSULTATION WITH COUNTY and LOCAL MUNICIPALITY

4.1 Has the draft plan of subdivision or condominium description that is subject of this application been presented to the local Municipal Council?
☐ Yes ■ No

4.2 Have you confirmed with the local municipality that the proposed development meets all of the requirements of the applicable official plans?
■ Yes ☐ No **If an official plan amendment is needed, it should be submitted prior to or concurrently with this application.**

4.3 Have you confirmed with the County that the proposed development meets all of the requirements of the county official plan?
■ Yes ☐ No **If an official plan amendment is needed, it should be submitted prior to or concurrently with this application.**

5. STATUS OF OTHER APPLICATIONS UNDER THE PLANNING ACT

➢ 5.1 Has the subject land ever been the subject of an application for approval of a plan of subdivision under Section 51 of the Act or consent under Section 53 of the Act, for a minor variance, for approval of a site plan, or for an amendment to an official plan, a zoning by-law , development permit by-law or a Minister's zoning order.

■ Yes ☐ No ☐ Unknown If **Yes** and if **Known**, indicate the application file number and the decision made on the application.

B21/064 to B21/066 granted in the west half of Lot 7 in 2021

➢ 5.2 Is the subject also subject of a proposed official plan or plan amendment that has been submitted for approval?

☐ Yes ■ No ☐ Unknown If **Yes** and if **Known**, indicate the application file number and status of the application.

➢ 5.3 Is the subject land also subject of an application for consent, approval of a site plan, minor variance, zoning by-law, development permit by-law or zoning order amendment?

☐ Yes ■ No ☐ Unknown If **Yes** and if **Known**, indicate the application file number and status of the application.

➢ 5.4 If the subject land is covered by a Minister's zoning order, what is the Ontario Regulation Number? _____

5.5 Are the water, sewage or road works associated with the proposed development subject to the provisions of the **Environmental Assessment Act**? ☐ Yes ■ No

If **Yes**, will the notice of public meeting for this application be modified to state that the public meeting will address the requirements of both the **Planning Act** and the **Environmental Assessment Act**? ☐ Yes ☐ No

6. PROVINCIAL POLICY

➢ 6.1 Briefly explain how this proposal is consistent with the Provincial Policy Statement issued under Section 3(1) of the **Planning Act**.

**See Planning Report for full write-up

The proposal will add to the mix and range of available residential lots to support the long term needs of the municipality (Sec. 1.1.1), development including lot creation by subdivision is permitted on rural lands (1.1.4), Individual site services are permitted where municipal and communal servicing is not feasible (1.6.6), an EIS shows development will not impact natural features (2.1), the subdivision will not impact aggregate resources or cultural heritage (2.6).

➢ 6.2 Is this application within an area of land designated under any provincial plan or plans?

☐ Yes ■ No If Yes, please specify which plan and whether the application conforms or conflicts with the applicable plan or plans.

6.3 Table B below lists the features or development circumstances of interest to the Province. Complete Table B and be advised of the potential information requirements in noted section.

TABLE B - Significant Features Checklist

Feature or Development Circumstances	(1) If a feature, is it on site or within 500m OR (2) if a development circumstance, does it apply?		If a feature, specify distances in metres	Potential Information Needs
	Yes (✓)	No (✓)		
Non-farm development near designated urban areas or rural settlement area	☐	☑	_____ metres	Demonstrate sufficient need within 20-year projections and that proposed development will not hinder efficient expansion of urban or rural settlement areas
Class 1 industry[1]	☐	☑	_____ metres	Assess development for residential and other sensitive uses within 70m
Class 2 industry[2]	☐	☑	_____ metres	Assess development for residential and other sensitive uses within 300m
Class 3 industry[3]	☐	☑	_____ metres	Assess development for residential and other sensitive uses within 1000m
Land Fill Site	☐	☑	_____ metres	Address possible leachate, odour, vermin and other impacts
Sewage Treatment Plan	☐	☑	_____ metres	Assess the need for a feasibility study for residential and other sensitive land uses
Waste Stabilization pond	☐	☑	_____ metres	Assess the need for a feasibility study for residential and other sensitive land uses
Active railway line	☐	☑	560 metres	Evaluate impacts within 100m
Controlled access highways or freeways including designated future ones	☐	☑	_____ metres	Evaluate impacts within 100m
Operating mine site	☐	☑	_____ metres	Will development hinder continuation or expansion of operations?
Non-operating mine site within 1000m	☐	☑	_____ metres	Have potential impacts been address? Has the mine been rehabilitated so there will be no adverse effects?
Airports where noise exposure forecast (NEF) or noise exposure projection (NEP) is 28 or greater	☐	☑	_____ metres	Demonstrate feasibility of development above 28 NEF for sensitive land uses.. Above the 35 NEF/NEP, development of sensitive land uses is not permitted
Electric transformer station	☐	☑	_____ metres	

Feature or Development Circumstances	(1) If a feature, is it on site or within 500m OR (2) if a development circumstance, does it apply?		If a feature, specify distances in metres	Potential Information Needs
	Yes (✓)	No (✓)		
High voltage electric transmission line	☐	☑	_____ metres	Consult the appropriate electric power service
Transportation and infrastructure corridors	☐	☑	_____ metres	Will the corridor be protected?
Prime agricultural land	☐	☑	_____ metres	Demonstrate need for use other than agricultural and indicate how impacts are to be mitigated
Agricultural operations	☑	☐	See MDS Report _____ metres	Development to comply with the Minimum Distance Separation Formulae
Mineral aggregate resource areas	☐	☑	_____ metres	Will development hinder access to the resource or the establishment of new resource operations?
Mineral aggregate operations	☐	☑	_____ metres	Will development hinder continuation of extraction?
Mineral and petroleum resource areas	☐	☑	_____ metres	Will development hinder access to the resource or the establishment of new resource operations?
Existing pits and quarries	☐	☑	_____ metres	Will development hinder continued operation or expansion?
Significant wetlands	☐	☑	670 _____ metres	Development is not permitted
Significant portions of habitat of endangered and threatened species	☐	☑	_____ metres	Development is not permitted
Significant fish habitat, woodlands south and east of the Canadian Shield, valley lands, areas of natural and scientific interest, wildlife habitat	☐	☑	_____ metres	Demonstrate no negative impacts
Sensitive groundwater recharge areas, headwaters and aquifers	☐	☑	_____ metres	Demonstrate that groundwater recharge areas, headwaters and aquifers will be protected
Significant built heritage resources and cultural heritage landscapes	☐	☑	_____ metres	Development should conserve significant built heritage resources and cultural heritage landscapes
Archaeological resources	☐	☑	_____ metres	Assess development proposed in areas of archaeological potential. Assessment to be prepared by person licensed under Part VI of the *Ontario Heritage Act*. Conservation plan for any archaeological resources identified in the assessment.
Erosion hazards	☐	☑	_____ metres	Determine feasibility within the 1:100 year erosion limits of ravines, river valleys and streams
Floodplains	☐	☑	_____ metres	Where one-zone flood plain management is in effect, development is not permitted within the floodplain Where two-zone flood plain management is in effect, development is not permitted within the floodway Where a Special Policy Area (SPA) is in effect, development must conform with official plan policies for the SPA

Hazardous sites[4]	☐	☑	_____ metres	Demonstrate that hazards can be addressed
Rehabilitated mine sites	☐	☑	_____ metres	Application for approval from Ministry of Northern Development and Mines should be made concurrently
Contaminated sites	☐	☑	_____ metres	Assess an inventory or previous uses in areas of possible soil contamination

1. Class 1 industry - small scale, self-contained plant, no outside storage, low probability of fugitive emissions and daytime operations only.
2. Class 2 industry - medium scale processing and manufacturing with outdoor storage, periodic output of emissions, shift operations and daytime truck traffic.
3. Class 3 industry - indicate if within 1000m - processing and manufacturing with frequent and intense off-site impacts and a high probability of fugitive emissions.
4. Hazardous sites - property or lands that could be unsafe for development or alteration due to naturally occurring hazard. These hazards may include unstable soils (sensitive marine clays (Leda), organic soils) or unstable bedrock (Karst topography).

6.4 For applications that include permanent housing (i.e. not seasonal) complete Table C - Housing Affordability. For each type of housing and unit size, complete the rest of the row. If lots are to be sold as vacant lots, indicate the lot frontage. Information should be based on the best information available at the time of application. If additional space is needed, attach on a separate page.

Table C - Housing Affordability

For example: Semi-detached - 10 units; 1000 sq. ft./5.5 metres, $119,900

Housing Type	# of Units	Unit Size (sq. ft.) and/or Lot Frontage	Estimated Selling Price/Rent
Semi-Detached			
Link/Semi-Detached			
Row or Townhouse			
Apartment Block			
Other Types or Multiples			

6.5 Is there any other information which may relate to the Affordability of the proposed housing, or the type of housing needs served by the proposal? ☐ Yes ■ No If **Yes**, explain in Section. 9.1 or attach on a separate page.

7. SERVICING

7.1 Indicate in a) and b) the proposed servicing type for the subject land. Select the appropriate servicing type from **Table D**. Attach and provide the title of the servicing information/reports as indicated in Table D.

➢ a) Indicate the proposed sewage disposal system

Private individual septic systems

➢ b) Indicate the proposed water supply system

Private individual on-site wells

Table D - Sewage Disposal and Water Supply			
Sewage Disposal	a)	Public piped sewage system	Municipality should confirm that capacity will be available to service the development at the time of lot creation or re-zoning
	b)	Public or private communal septic	Communal systems for the development of **5 or more lots/units**: servicing options report[1], hydrogeological report[2], and indication whether a public body is willing to own and operate the system[3] Communal systems for the development of **less than 5 lots/units** and generating **more than 4,500 litres per day effluent**: servicing options report[1], hydrogeological report[2]
	c)	Individual septic system(s)	Individual septic systems with daily sewage flow of less than 4,500 l/day and system entirely located on each property: hydrogeological report[2] and site development plan[4] Individual septic systems with daily sewage flow of more than 4,500 l/day and system entirely located on each property: servicing options report[1], hydrogeological report[2]
	d)	Other	To be described by applicant
Water Supply	a)	Public piped water system	Municipality should confirm that capacity will be available to service development at the time of lot creation or re-zoning
	b)	Public or private communal well(s)	Communal well systems for the development of **more than 5 lots/units**: servicing options statement[1], hydrogeological report[2] and indication whether a public body is willing to own and operate the system[3] Communal well systems for **non-residential development where water will be used for human consumption**: hydrogeological report[2]
	c)	Individual well(s)	Individual wells for the development of **more than 5 lots/units**: servicing options statement[1], hydrogeological report[2] Individual wells for **non-residential development where water will be used for human consumption**: hydrogeological report[2]
	d)	Communal surface water	Approval of a "water taking permit" under section 34 of the Ontario Water Resources Act is necessary for this type of servicing
	e)	Individual surface water	Servicing options report
	f)	Other	To be described by applicant

NOTES:
1. Confirmation that the municipality concurs with the servicing options statement will facilitate the review of the proposal
2. Before undertaking a hydrogeological report, consult the Subdivision Approval Authority about the type of hydrogeological assessment that is expected given the nature and location of the proposal
3. Where communal services are proposed (water and/or sewage), these services will include a responsibility agreement with the municipality
4. Comments from the Health Unit for individual sewage disposal systems (Section C-Sewage disposal), or a certificate of approval from MOE for all other sections, submitted with this application will facilitate the review.

7.2 Indicate in a) and b) the proposed type of storm drainage and access to the subject land. Select the appropriate type from **Table E**. Attach and provide the servicing information as indicated in Table E.

➢ a) Indicate the proposed storm drainage system

Proposed swales will direct storm runoff to available municipal ditches

➢ b) Indicate the proposed road access

County Road 10 and Drummond Concession 1

➢ c) Is water access proposed?
☐ Yes ■ No If **Yes**, attach a description of the parking and docking facilities to be used and the approximate distance of these facilities from the subject land and the nearest public road ☐ Attached

➢ d) Is the preliminary stormwater management report attached?
■ Yes ☐ No If not attached as a separate report, in what report can it be found?

Table E - Storm Drainage, Road Access and Water Access

Service Type		Potential Information/Reports
Storm Drainage	a) Sewers	A preliminary stormwater management report is recommended and should be prepared concurrent with any hydrogeological reports for submission with the application. A stormwater management plan will be needed prior to final approval of a plan of subdivision or as a requirement of site plan approval
	b) Ditches or Swales	
	c) Other	
Road Access	a) Provincial highway	Application for an access permit should be made prior to submitting this application. An access permit is required from MTO before any development can occur
	b) Municipal or other public road maintained all year	Detailed road alignment and access will be confirmed when the development application is made
	c) Municipal road maintained seasonally	Subdivision or condominium development may not be permitted on seasonally maintained roads. Confirm with the local municipality.
	d) Right of way	Access by right of ways on private roads may be permitted, in certain areas and as part of condominium. Confirm with the local municipality.
Water Access		Information from the owner of the docking facility on the capacity to accommodate the proposal will assist the review

➢ 7.3 Name of servicing information/reports

Hydrogeological Report –

Consolidated Hydrogeological Investigation & Terrain Analysis Proposed Residential Subdivision

Servicing Options Report –

Preliminary Stormwater Management Report –

Draft Plan of Subdivision and Stormwater Management Report: BURN'S FARM SUBDIVISION

NOTES:

1. If the plan would permit development of more than five lots or units on privately owned and operated individual or communal wells, (a) a servicing options report and (b) a hydrogeological report are required.
2. If the plan would permit development of five or more lots or units on privately owned and operated individual or communal septic systems, (a) a servicing options report and (b) a hydrogeological report are required.
3. If the plan would permit development of fewer than five lots or units on privately owned and operated individual or communal septic systems, and more than 4500 litres of effluent would be produced per day as a result of the development being completed, (a) a servicing options report and (b) a hydrogeological report.
4. If the plan would permit development of fewer than five lots or units on privately owned and operated individual or communal septic systems, and 4500 litres of effluent or less would be produced per day as a result of the development being completed, a hydrogeological report is required.

8. OTHER INFORMATION

8.1 Is there any other information that may be useful to the County in reviewing this development proposal (e.g. efforts made to resolve outstanding objections or concerns)? If so, explain below or attach a separate page.

9. AFFIDAVIT OR SWORN DECLARATION

➢ I/We, Tracy Zander, ZanderPlan Inc of the Twp of DNE in the County of Lanark make oath and say (or solemnly declare) that the information contained in this application is true and that the information contained in the documents that accompany this application is true.

Sworn (or declared) before me
at the Town of Perth
in the County of Lanark
this 8 day of November, 2023.

Commissioner of Oaths

Danielle Kathleen Morrow, a Commissioner, etc., Province of Ontario, for Anderson Foss Professional Corporation, Barristers and Solicitors. Expires April 3, 2025.

Tracy Zander
Applicant

Applicant

10. AUTHORIZATIONS

10.1 If the applicant is not the owner of the land that is the subject of this application, the written authorization of the owner that the applicant is authorized to make the application must be included with this form or the authorization set out below must be completed.

Authorization of Owner(s) for Agent to Make the Application

➢ I/We, 1394706 Ontario Inc (Wilburt Crain) am/are the owner(s) of the land that is the subject of this application for approval of a plan of subdivision (or condominium description) and I authorize ZanderPlan Inc. to make this application on my behalf.

Nov-7/23
Date

Wilburt D Crain
Signature of Owner

Date

Signature of Owner

10.2 **If the applicant is not the owner of the land** that is the subject of this application, complete the authorization of the owner concerning personal information set out below.

Authorization of Owner(s) for Agent to Provide Personal Information

I/We, 1394706 Ontario Inc. c/o Wib Crain am /are the owner (s) of the land that is the subject of this application for approval of a plan of subdivision (or condominium description) and for the purposes of the **Freedom of Information and Protection of Privacy Act**, I authorize ZanderPlan Inc. c/o Tracy Zander, as my agent for this application, to provide any of my personal information that will be included in this application or collected during the processing of the application.

Nov. 7/23
Date

Wilbert D. Crain
Signature of Owner

Date

Signature of Owner

11. CONSENT OF THE OWNER(S)

Complete the consent of the owner concerning personal information set out below.

Consent of the Owner(s) to the Use and Disclosure of Personal Information

I/We, 1394706 Ontario Inc. c/o Wib Crain am/are the owner(s) of the land that is the subject of this application for approval of a plan of subdivision (or condominium description) and acknowledge that certain personal information is collected and distributed to public bodies under the authority of the **Planning Act**.

For the purposes of the **Freedom of Information and Protection of Privacy Act**, I further authorize and consent to the use of my name in any Notices required under the authority of the Planning Act for the purpose of processing this application.

Nov. 7/23
Date

Wilbert D. Crain
Signature of Owner

Date

Signature of Owner

12. AGREEMENT TO INDEMNIFY

The Owner/Applicant agrees to reimburse and indemnify the Corporation of the County of Lanark (hereinafter referred to as the *"County"*) for all fees and expenses incurred by the County to process the application for plan of subdivision or condominium, as the case may be, including any fees and expenses attributable to proceedings before the Ontario Municipal Board or any court or other administrative tribunal if necessary to defend the County's decision to support the application.

Without limiting the foregoing, such fees and expenses shall include the fees and expenses of consultants, planners, engineers, lawyers and such other professional and technical advisors as the County may, in its absolute discretion acting reasonably, consider necessary or advisable to more properly process and support the application.

Attached to this application is a cheque payable to "*Lanark County*" representing payment of the application fee.

The Owner/Applicant further agrees to provide the municipality, upon request, a deposit against which the County may, from time to time charge against the deposit any fees and expenses incurred by the County in order to process the application. If such fees and expenses exceed the deposit, the Owner/Applicant shall pay the difference forthwith upon being billed by the County with interest at the rate of 1.25% per month (15% per annum) on accounts overdue more than 30 days.

The Owner/Applicant further agrees that, upon request by the County from time to time, the Owner/Applicant shall make such additional deposits as the County considers necessary, and until such requests have been complied with, the County will have no continuing obligation to process the application or attend or be represented at the Ontario Municipal Board or any court or other administrative proceeding in connection with the application.

Nov. 7/23
Date

Signature of Owner

Date

Signature of Owner

The County will assign a File Number for complete applications and this number should be used in all communications with the County.

Applicant's Checklist:	Have you remembered to attach:	Yes
	• 5 completed application forms (1 original and 4 copies)? (Ensure you have a copy for yourself)	☑
3	• ~~5~~ copies of the draft plan with key maps, folded to 8½" X 14" size?	☑
3	• ~~5~~ copies of the draft plan reduced to 8½" X 14" size?	☑
3	• ~~5~~ copies of the information/reports as indicated in the application form?	☑
	• 2 copy of the registered transfer/deed for the subject lands?	☑
3	• ~~5~~ copies of the planning rationale?	☑
1 memory stick	• ~~15 CD~~'s containing a copy of the plan, application form, all relevant Reports and the planning rationale?	☑
	• The required fee and deposit, either as a certified cheque or money order, payable to Lanark County?	☑

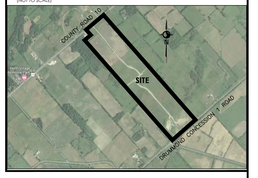
FORWARD TO:

Lanark County
Planning Department
99 Christie Lake Rd.
Perth, Ontario K7H 3C6

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED
THIS DRAFT PLAN IS APPROVED BY THE COUNTY OF LANARK UNDER SECTION 51 OF THE PLANNING ACT.
THIS_____DAY OF_____,20____.

COUNTY PLANNER
COUNTY OF LANARK

KEY PLAN
(NOT TO SCALE)



DRAFT PLAN OF SUBDIVISION

PART OF EAST HALF OF LOT 7
CONCESSION 1
(GEOGRAPHIC TOWNSHIP OF DRUMMOND)
TOWNSHIP OF DRUMMOND / ELMSLEY
COUNTY OF LANARK

Scale 1:1250
20 0 20 40 60 80 METRES

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 OF THE PLANNING ACT.

(A)–AS SHOWN ON DRAFT PLAN
(B)–AS SHOWN ON DRAFT PLAN
(C)–AS SHOWN ON DRAFT AND KEY PLANS
(D)–RESIDENTIAL
(E)–AS SHOWN ON DRAFT PLAN
(F)–AS SHOWN ON DRAFT PLAN
(G)–AS SHOWN ON DRAFT PLAN
(H)–NO WELLS PROPOSED
(I)– SILTY CLAY
(J)–AS SHOWN ON DRAFT PLAN
(K)–MUNICIPAL SERVICES UNAVAILABLE
(L)–AS SHOWN ON DRAFT PLAN

LAND USE

AREA OF LOTS =	35.950 Hectares 88.83 (Acres)
AREA OF ROADS =	2.971 Hectares 7.34 (Acres)
AREA OF BLOCKS =	0.347 Hectares 0.86 (Acres)
TOTAL AREA OF SUBDIVISION =	39.268 Hectares 97.03 (Acres)

METRIC CONVERSION
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

OWNER'S CERTIFICATE
I HEREBY AUTHORIZE STANTEC GEOMATICS LTD. TO SUBMIT THIS DRAFT PLAN OF SUBDIVISION ON MY BEHALF

NOVEMBER 15TH, 2023
DATE

WILBURT CRAIN
PRESIDENT
CRAINS' CONSTRUCTION LTD.
I HAVE THE AUTHORITY TO BIND THE CORPORATION

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO ADJOINING LANDS HAVE BEEN ACCURATELY AND CORRECTLY SHOWN.

Nov 14, 2023
DATE

FRANCIS LAU
ONTARIO LAND SURVEYOR

Stantec
Stantec Geomatics Ltd.
CANADA LANDS SURVEYORS
ONTARIO LAND SURVEYORS
1331 CLYDE AVENUE SUITE 300
OTTAWA, ONTARIO, K2C 3G4
TEL: 613-722-4420
stantec.com

DRAWN: TM/JWE | CHECKED: FL | PM: FL | PROJECT No.: 161614340-131

ZANDERPLAN
Your rural land planning experts

November 7, 2023

Township of Drummond/ North Elmsley
310 Port Elmsley Road
Perth, ON K7H 3C7

County of Lanark
99 Christie Lake Road
Perth, ON K7H 3C6

RE: Plan of Subdivision Application - Burns Farm
Part of Lot 7, Concession 1, Geographic Drummond
Township of Drummond/ North Elmsley
Owner: 1394706 Ontario Inc (Crains' Construction)

ZanderPlan has been retained by the property owner to provide planning support for a subdivision application for the property known as Burns Farm, located at Part of Lot 7, Concession 1, Geographic Drummond, in the Township of Drummond/ North Elmsley. The owner is seeking to create a Plan of Subdivision which will result in the creation of 42 residential lots along with a new street that will connect from Drummond Concession 1 to County Road 10. The subject property is currently zoned Rural (RU) as per the Zoning By-Law for the Township of Drummond/ North Elmsley. Plans of Subdivision are permitted within the Rural zone by the Township of Drummond North Elmsley Official Plan and Zoning By-Law. However, it is assumed that the lots will need to be rezoned to the Residential zone in the future as a condition of Draft Plan Approval.

SITE DESCRIPTION

The subject property, shown in Figure 1, is a 39.3 hectare property located between Drummond Concession 2/County Road 10 to the north and Drummond Concession 1 to the south. The property is currently zoned Rural (RU). The surrounding land uses are primarily zoned Rural and are used for agricultural and residential purposes. A similar residential subdivision exists approximately 2.4 kilometres to the east of the subject property, in an area characterized by single detached residential dwellings. The subject property is located approximately 1.5 kilometres east of the limits of the Town of Perth. The Drummond-Elmsley Municipal Drain is present across the subject property. Provincially significant wetlands are present approximately 700m to the west of the property.

Figure 1. Site location

The property is currently vacant and undeveloped, with the exception of a roughed in road, with former agricultural uses. The applicant proposes to develop a 42 residential lot subdivision over two phases, with Phase 1 including the 21 southernmost proposed lots and Phase 2 including the remaining lots. The proposed subdivision will involve the development of 42 single detached dwellings with private wells and septic systems. A new road connecting Drummond Concession 1 and Drummond Concession 2/County Road 10, with an east-west jog in the middle to slow traffic, is also proposed within the subdivision area; the subdivision plan also includes blocks to allow for future road access to the lands on the east and west side of the land holding. All of the lots in the subdivision have a minimum frontage of 45 metres and a minimum area of 2 acres. It Is understood that future rezoning of the lots to the Residential zone will be required as a condition of draft plan approval.

PROVINCIAL POLICY STATEMENT, 2020

The Provincial Policy Statement (PPS, 2020), created under the authority of Section 3 of the *Planning Act*, identifies matters of Provincial interest which must be considered when planning applications are filed in Ontario. Approval authorities are required to ensure that decisions on planning matters are consistent with these policies.

Section 1.0 of the PPS speaks to Building Strong Healthy Communities with policies for Managing and Directing Land Use to Achieve Efficient and Resilient Development and Land Use Patterns

found under **Section 1.1**. The proposed development will contribute to the financial well-being of the Municipality by providing new property tax income (Sec. 1.1.1a). Introducing 42 single detached residential lots on the site will help accommodate future residential development to help meet the long -term needs of the Municipality (Sec. 1.1.1b). The proposed development will not pose any environmental or public health or safety concerns or prevent the efficient expansion of settlement areas (Sec. 1.1.1.c; Sec. 1.1.1d). Ultimately the proposed subdivision will help build a healthy, liveable and safe community.

Section 1.1.4 speaks to Rural Areas in Municipalities. The proposed development will build upon the rural character of the area by providing single-detached dwellings, similar to those on surrounding properties (Sec. 1.1.4.1a). Rural infrastructure will be utilized effectively through the denser form of residential development (Sec. 1.1.4.1e).

Section 1.1.5 speaks to Rural Lands in Municipalities. Residential development, including lot creation, is a permitted use of rural lands under Section 1.1.5.2c. The proposed subdivision will create lots which are locally appropriate, compatible with the rural landscape, and which can be sustained with rural service levels (Sec. 1.1.5.4).

Section 1.2.6 speaks to Land Use Compatibility, noting that "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". The proposed development does not meet the definition of a major facility as defined by the Provincial Policy Statement as there are no adverse effects expected from contaminant discharges, noise, odour, or other public health risks from the proposed use of the existing lot and building (Sec. 1.2.6). Further, the subject property is not located in proximity to any major facilities that would result in a conflict with the proposed use.

Section 1.4 speaks to Housing and providing an appropriate range and mix of housing options and densities. The proposed subdivision will provide 42 single-detached dwellings to meet the social, health, economic and well-being requirements of future residents (Sec. 1.4.3b).

Section 1.6 speaks to Infrastructure and Public Service Facilities. **Section 1.6.6** of the PPS speaks to sewage, water and stormwater. Municipal services are not available on the subject property, nor is it feasible to extend such services to the subject property. The proposed development will therefore be serviced with individual wells and septic systems. These services are allowed under Section 1.6.6.4 where site conditions are suitable for the long-term provision of such services with no negative impacts. A Stormwater Management report was completed by Stantec in October 2023, which indicated stormwater on the subject property could be adequately managed, and a Hydrogeological Investigation was completed by GEMTEC in October 2023,

which indicates private services can be developed on the subject property without negative impacts.

Section 1.6.7 of the PPS speaks to Transportation Systems, noting connectivity among transportation systems should be maintained. The development already fronts onto existing roads (Drummond Concession 1 and Drummond Concession 2/County Road 10) which connect to Perth to the west. A future street, onto which the lots will front, is proposed as part of the subdivision. The area shall continue to facilitate the movement of people and goods in a safe and energy efficient manner. Blocks have been included in the subdivision design to allow for future street connections to the lands located on the east and west sides of the subdivision.

Section 1.7 of the PPS speaks to Long-Term Economic Prosperity. The proposed subdivision will provide necessary housing supply and a range of housing options for a diverse workforce, which will support economic prosperity (Sec.1.7.1b). The proposed development will contribute to the housing supply locally, support housing needs in the nearby urban centres, and respond to the current market demand for single family homes in the Township.

Section 2.0 of the PPS speaks to the Wise Use and Management of Resources. **Section 2.1** of the PPS speaks to Natural Heritage, requiring natural features and areas to be protected for the long term (Sec. 2.1.1) and the diversity and connectivity of natural features shall be maintained, restored, or where possible improved (Sec. 2.1.2). An Environmental Impact Statement was completed by GEMTEC in October 2023 which did not identify any negative impacts on natural features or their ecological functions; this report is described in greater detail below.

Section 2.2 of the PPS speaks to water. No significant waterbodies are present in close proximity to the subject property, hence no water system impacts are anticipated. A Hydrogeological Investigation was completed by GEMTEC in October 2023 which identified no adverse impacts from the use of groundwater to provide private services or the proposed development. A Stormwater Management Report was completed by Stantec in October 2023 which concluded that stormwater for the proposed development could be adequately managed to prevent any adverse impacts.

Section 2.3 speaks to Agriculture. The subject property is not designated for agricultural use. The property is in proximity to an urban area and is not in close proximity to any prime agricultural lands. The required Minimum Distance Separation (MDS) calculations have been completed to address nearby livestock operations; the MDS report is included in this submission.

Section 2.4 of the PPS speaks to Minerals and Petroleum. The subject property does not contain any known significant minerals and petroleum resources that need to be preserved.

Section 2.5 speaks to Mineral Aggregate Resources; there are no known mineral aggregate resources on or within close proximity to the subject property.

Section 2.6 of the PPS speaks to Cultural Heritage and Archaeology; there are no known cultural heritage or archaeological resources on or within close proximity to the subject property. A Stage 1 and 2 Archaeological Assessment was completed by Past Recovery Archaeological Services in November 2013 which identified no evidence of archaeological interest on the subject property.

Section 3 of the PPS speaks to protecting public health and safety. The subject site does not contain any known Natural Hazards per section 3.1, nor any known Human-Made Hazards per section 3.2, allowing for development to occur on the site.

Overall, the proposed subdivision is consistent with the policies in the 2020 Provincial Policy Statement.

LANARK COUNTY OFFICIAL PLAN, 2012

The Lanark County Official Plan provides planning goals, objectives, and policies for development within the County. The subject property is designated as a Rural Area in Schedule A of the Official Plan, hence policies advising this land use designation must be consulted, in addition to the general policies within the Official Plan that apply to all areas of the County.

Section 1.2 speaks to objectives the County is seeking to achieve through the Official Plan. Objective 3 speaks to broadening the range of housing types permitted to meet the requirements of a growing population. The proposed subdivision supports this objective as it will provide 42 additional dwellings within the County to support the growing population.

Section 2.0 speaks to Settlement Policies within the County. This Section is intended to ensure local Councils have ability and authority to shape their communities in accordance with local needs and local characteristics. The proposed development fits local needs by providing 42 additional dwellings in the area. The section notes that the historical pattern of settlement in Lanark County includes rural subdivisions dispersed thought the rural area, hence the proposed subdivision is consistent with historic development in the County.

Section 3.0 speaks to Rural Area Policies. This Section provides policies intended to support the long-term orderly development of the rural area in a manner which is consistent with ensuring the protection of natural and environmental resources and which will respect the objective of protecting the character of our rural and urban area. The development proposal is consistent with the general intent of this section as it is located on a lot without significant natural features and fits in with the character of the rural area.

Section 3.3 speaks to Land Use Policies in Rural Areas. The proposed development will create 42 new lots on private servicing, therefore remaining consistent with rural service levels (Sec. 3.3.1.1). The proposed residential development will be single-detached dwellings on large lots, which is consistent with the housing on surrounding properties and will thus maintain the character of the area (Sec. 3.3.1.2). The proposed development is compatible with natural heritage features and natural resource uses (Sec. 3.3.1.3). The development will proceed on the basis of private water and waste water systems (Sec. 3.3.4.2). The lots meet the minimum required lot frontage and depth for the in the Rural Zone under the Township of Drummond/ North Elmsley Zoning By-law requirements (Sec. 3.3.4.6).

Section 4.0 of the Plan speaks to Infrastructure Policies. **Section 4.3** speaks to Transportation. The proposal will see the addition of a new road to the local road system through a Plan of Subdivision, connecting Drummond Concession 1 to County Road 10/Drummond Concession 2. Under Section 4.3.6, no amendment to this Plan or local Official Plans are required for new roads added as a result of the approval of a Plan of Subdivision.

Section 4.4 policies speak to Water, Wastewater and Stormwater Services. The site will be serviced with individual wells and septic systems, with stormwater to be connected to the local networks. A Stormwater Management Plan was completed by Stantec in October 2023, which meets the requirements identified under Section 4.4.3.

Section 4.4.4 speaks to Municipal Drains. The Drummond-Elmsley Municipal Drain runs through the subject property. The potential impacts on the municipal drainage system from the proposed subdivision are discussed in the Stormwater Management Report completed by Stantec. No significant impacts to the municipal drainage system from the proposed development are identified in the report.

Section 5.0 speaks to Natural Heritage. An Environmental Impact Statement was completed by GEMTEC in October 2023 which determined the proposed project will not negatively impact any natural features present on the subject property. No areas of natural and scientific interest, significant woodlands, significant valleylands, significant wetlands, or fish habitat was identified on the subject property. Specialized wildlife habitat and species at risk habitat was identified on the subject property, however no negative impact to the natural heritage features or their ecological functions were identified, provided mitigation measures are followed; habitat compensation or monetary compensation will be required to address the species at risk impacts (Sec. 5.5.2; Sec. 5.5.5).

Section 6.0 speaks to Resources. No significant natural resources were identified on the subject property.

Section 7.0 speaks to Public Health and Safety. The proposed development will not pose any hazard to people. As identified in the Stormwater Management Report completed by Stantec, an

erosion and sediment control plan will be necessary during construction to prevent erosion and the associated risks (Sec.7.3)

Section 8.2.1 speaks to Plans of Subdivision and outlines a summary list of types of studies commonly required for plans of subdivision in Lanark County. It is recognized that the list is not exhaustive and other studies may be required in certain situations; a pre-consultation checklist was completed with the County on February 10, 2021 to identify the required studies for the Plan of Subdivision. The development is consistent with the list set out in Section 8.2.1.

Overall, the proposed subdivision aligns with the policies and objectives in the Lanark County Official Plan.

TOWNSHIP OF DRUMMOND/ NORTH ELMSLEY OFFICIAL PLAN, 2012

The Township of Drummond/ North Elmsley Official Plan provides planning goals, objectives, and policies for development within the Township. The subject property is designated for Rural land use in Schedule A of the Official Plan, hence policies advising this land use designation must be consulted, in addition to the general policies within the Official Plan that apply to all areas of the Township.

Section 2.2 speaks to the basis and objectives of the Official Plan, outlining the history of development and economic activity in the area. The proposed subdivision aligns with the objectives identified under this Section. The proposed development is not located in an area characterized by natural features or any land uses that may be incompatible with the proposed residential dwellings (Sec.2.3.2; Sec.2.3.3). The proposed development contributes 42 additional dwellings to the supply of housing options (Sec.2.3.8). The proposal is not in an area of Prime Agriculture and is strategically located close to Highway 43 and the Town of Perth (Sec.2.3.10).

Section 3.16 speaks to Rural Character. This Section notes that the Official Plan recognizes the traditional uses of the Rural Lands as an integral part of the rural character of the Township. The proposed development will not interfere with surrounding rural land uses, which include primarily other residential lots and agricultural uses. The subdivision will introduce a new street that will connect to the existing street network. The required separation to nearby livestock facilities has been considered. There are no conflict with surrounding land uses.

Section 3.18 speaks to Water and Wastewater Services. The proposed lots will be serviced by private well and sewage systems, as has historically been done for development within the Township (Sec.3.18.1). A Hydrogeological Investigation was completed by GEMTEC in October 2023 to ensure the proposed lots can provide adequate and safe water supply and wastewater management without adverse human or environmental impact (Sec.3.18.5; Sec.3.18.6). A

Stormwater Management Plan was completed by Stantec in October 2023 which concluded stormwater can be adequately managed on the subject property (Sec.3.18.8)

Section 4.3 speaks to land use policies within the Rural land designation. The Rural designation is placed on all areas of the Township which have not otherwise been designated for a particular purpose under another land use designation. The Official Plan recognizes that a majority of the Township's existing and future residential development will be located in the Rural designation. Section 4.3.4.1 notes that residential development in the Rural designation is intended to take place on a limited basis within the context of the regional housing market. Demand for single family homes has been increasing steadily; this development will contribute to the supply of residential dwellings currently existing in the Township by providing 42 additional dwellings.

Section 5.3 speaks to Local Roads. Section 5.3.1 states that all plans of subdivision, severances and site plans which are approved along a Township road, shall be subject to a road widening dedication sufficient to achieve the minimum right-of-way width established by this Plan, as such the development has considered the necessary road widening. A new street will be established which connects Drummond Concession 1 to Drummond Concession 2/County Road 10. One foot reserves are proposed along both existing road frontages to prevent future driveway to the existing roads and ensuring that all driveway accesses to the new lots will come from the new subdivision street.

Section 6.3 speaks to the Division of Land through the discussion of lot creation policies; the proposed development would create 42 new lots. The proposed lots will be serviced by private well and septic systems, hence undue extension of major services is not required (Sec.6.3.1.2). The size of lots created, ranging from 0.8 to 2.03 hectares, are appropriate for the proposed use and conform with the provisions of the Zoning By-law (Sec.6.3.1.4).

Section 6.3.1 provides additional lot creation policies for Plans of Subdivisions. Supporting reports, including a Stormwater Management Report and a Hydrogeological and Terrain Analysis Study, have been completed as required under Section 6.3.3.2. The proposed lots in the subdivision will front to a new internal road network (Sec.6.3.3.3). Though the maximum size for residential subdivisions is identified as generally 30 lots, Section 6.3.3.5 notes that where an applicant owns abutting lands intended for development, the overall development shall be submitted in order to properly assess the subdivision; the proposed development intends to create 42 lots over two phases. As per Section 6.3.3.5, at least 50% of the lots of the preceding phase must have been developed and existing wells examined prior to the commencement of the following phase.

It is understood that under Section 6.3.3.6 the developers will be required to enter into a subdivision agreement with the Township in Accordance with the *Planning Act* before final approval of the subdivision is recommended by Council.

Section 6.8 speaks to Environmental Impact Studies and Ecological Site Assessments. Based on pre-consultation with the County, an Environmental Impact Statement was completed for the subject property by GEMTEC in October 2023 to support the proposed development (Sec. 6.8.1). No areas of natural and scientific interest, significant woodlands, significant valleylands, significant wetlands, or fish habitat was identified on the subject property. Specialized wildlife habitat and species at risk habitat was identified on the subject property, however no negative impact to the natural heritage features or their ecological functions were identified, provided mitigation measures are followed; habitat compensation or monetary compensation will be required to address the species at risk impacts

Overall, the proposed subdivision aligns with the policies and objectives in the Township of Drummond/ North Elmsley Official Plan.

TOWNSHIP OF DRUMMOND/ NORTH ELMSLEY COMPREHENSIVE ZONING BY-LAW NO. 2012-060

The subject property is currently zoned Rural (RU) as indicated in the Township of Drummond/ North Elmsley Zoning By-law map, hence policies advising this zone must be consulted, in addition to the general provisions within the Zoning By-law.

Section 4 of the Zoning By-Law provides General Provisions for development. Greater assessment of the provisions for development will be completed following Draft Plan Approval; however the lots are proposed of sufficient size to accommodate the proposed dwelling, private servicing, driveways, amenity spaces and accessory buildings that would be contemplated on each lot.

Section 4.22 indicates that no more than one dwelling house shall be located on a lot. The proposed development will involve one single-detached dwelling on each of the proposed 42 lots.

Section 4.25 speaks to Parking Area Regulations. A minimum of 2 parking spaces per single-detached dwelling is required (Sec.4.25.1); the proposed development will include driveways on each lot which will provide sufficient parking space for the dwellings (Sec.4.25.8).

Section 4.27 speaks to Setbacks. **Section 4.27.3** speaks to Watercourse Setbacks; municipal drains are included in the definition of watercourses. As per this Section, all buildings and structures, including septic tanks, must be a minimum horizontal distance of 30 metres from the top-of-bank of a watercourse. Modifications to the drainage system on the subject property are indicated in the Stormwater Management Report completed by Stantec in October 2023; the

setback requirements will be assessed in relation to the proposed drainage during Draft Plan Approval.

Section 7.0 speaks to policies in the Rural Zone. Residential uses, including single-detached dwelling houses, are permitted in the Rural Zone (Sec.7.1). **Section 7.2** provides Zone Provisions. The minimum lot size for single detached dwellings is identified at 0.4 hectares; the proposed lot sizes range from 0.8 to 2.03 hectares. Zone provisions will be further assessed during draft plan approval. It is anticipated that the proposed lots will need to be rezoned to the Residential zone as a condition of draft plan approval; the proposed lots will all meet/exceed the minimum requirements of the Residential zone.

Overall, the proposed subdivision aligns with the policies and objectives in the Township of Drummond/ North Elmsley Zoning By-law.

SUPPORTING STUDIES

STORMWATER MANAGEMENT REPORT

A Stormwater Management Report was completed by Stantec Consulting Ltd., dated October 5, 2023. The purpose of the Report was to demonstrate adherence to the established design criteria in the proposed subdivision development. The Report provides preliminary servicing and grading plans but does not include a detailed design of a stormwater management facility or offsite drainage ditches. The Report states that the stormwater management plan can effectively control on-site runoff and meet the target allowable release rates. The stormwater from the subdivision will be collected in roadside ditches to be directed to the Drummond-Elmsley Municipal Drain, which runs through the subject property. The drainage system will be able to maintain the water within the system without flooding; it is recommended that the drainage system be re-evaluated and verified at the detailed design stage to ensure conditions are accurately represented. An erosion and sediment control plan will be required for the subdivision at the time of construction to ensure adjacent areas, watercourses, and environmentally sensitive areas are protected. The Rideau Valley Conservation Authority will need to be consulted to obtain municipal approvals for site development.

STAGE 1 AND 2 ARCHAEOLOGICAL ASSESSMENT

A Stage 1 and 2 Archaeological Assessment was completed by Past Recovery Archaeological Services Inc., dated November 20, 2013. The purpose of the Stage 1 assessment was to assess the archaeological potential of the subject property and provide recommendations for the mitigation of any known of potential archaeological resources of significance. The results of this assessment indicated potential for pre-Contact and historic period archaeological resources

within parts of the subject property and study area. A Stage 2 assessment was completed to determine if there were any archaeological resources within the study area. No cultural material or evidence of archaeological interest was identified during this Stage 2 assessment and no further archaeological investigation was recommended.

ENVIRONMENTAL IMPACT STATEMENT

An Environmental Impact Statement was completed by GEMTEC Consulting Engineers and Scientists Ltd., dated October 17, 2023. The purpose of the investigation was to identify the presence or absence of natural heritage features and potential species at risk (SAR) or their habitat on the subject property. Potential impacts to the natural heritage features resulting from the development were primarily associated with the loss of meadow habitat primarily associated with avian SAR and their regulated habitat, and indirect impacts to significant wildlife habitat. Two SAR – bobolink and eastern meadowlarks – were confirmed to be present on the subject property and their regulated habitat was identified; loss of Category 1, 2, and 3 habitats for both species is likely.

To address the SAR impacts, a Notice of Activity for Bobolink and Eastern Meadowlark – Activities Impacting 30 Hectares or Less of Habitat must be submitted to the Kemptville Ministry of Environment, Conservation and Parks and habitat compensation or monetary compensation will be required. The report recommends reptile and amphibian exclusion fencing be installed around the development area to protect potential SAR and their habitat. The report indicates that the proposed Plan of Subdivision complies with the natural heritage policies of the Provincial Policy Statement and Lanark County Official Plan and that no negative impacts to the identified natural heritage features or their ecological functions are anticipated, provided mitigation measures recommended are followed.

HYDROGEOLOGICAL INVESTIGATION AND TERRAIN ANALYSIS

A Hydrogeological Investigation and Terrain Analysis was completed GEMTEC Consulting Engineers and Scientists Ltd., dated October 5, 2023. This report follows extensive pre-consultation and earlier reporting and review in with the County of Lanark and associated peer reviewers. The purpose of the investigation was to characterize subsurface conditions in the vicinity of the Site, develop a hydrogeological conceptual model, characterize shallow subsurface conditions as they relate to the design of sewage disposal systems, assess potential impacts to the receiving aquifer and nearby surface water from on-site septic disposal systems, investigate the quantity and quality of groundwater for potential domestic supply, and assess long-term groundwater supply impacts of the proposed subdivision. The Investigations concludes the groundwater of the proposed water supply aquifer meets acceptable concentrations or treatability limits for measured parameters under the applicable standards. Groundwater quantity availability was determined to be more than sufficient for the proposed subdivision

needs. The Investigation states that no negative surface water body impacts or aquifer impacts are expected from the proposed septic systems. The Investigation concludes that the proposed subdivision will have no adverse impact on the reasonable use of groundwater at the subject property. Recommendations regarding the construction of wells and septic systems are provided in the Investigation, and can be implemented through the Subdivision Agreement.

SUMMARY

ZanderPlan has been retained by the applicant, Wilburt Crain, to provide planning support for a subdivision application for the property known as Burns Farm, located at on Part of Lot 7, Concession 1, on Drummond Concession 1 in the Township of Drummond/ North Elmsley, Ontario. The applicant is seeking to create a Plan of Subdivision which will result in the creation of 42 residential lots; planning justification is required as a component of Plans of Subdivision. The subject property is currently zoned rural (RU) as per the Zoning By-Law for the Township of Drummond/ North Elmsley. Plans of Subdivision are permitted within the Rural land designation by the Township of Drummond North Elmsley Official Plan and Zoning By-Law. It is assumed that the lots will need to be re-zoned to the Residential zone in the future as a condition of draft plan approval.

The property is currently vacant and undeveloped, save for a roughed in future road. The applicant proposes to develop a 42 residential lot subdivision over two phases, with Phase 1 including the 21 southernmost proposed lots and Phase 2 including the remaining lots. The proposed subdivision will be created for the development of single detached dwellings with private wells and septic systems. A new road connecting Drummond Concession 1 and Drummond Concession 2/County Road 10, with an east-west jog in the middle to slow traffic, is also proposed within the subdivision area. Blocks for future road connections to the lands on the east and west side are also included in the subdivision design.

The proposed subdivision is consistent with the 2020 Provincial Policy Statement and aligns with the policies and objectives of the County of Lanark Official Plan, Township of Drummond/ North Elmsley Official Plan, and Township of Drummond/ North Elmsley Zoning By-law. The proposed subdivision will provide 42 additional lots which will support housing demands. The single-detached residential dwellings will be compatible with the surrounding land uses and rural character as the proposed lots are large and adjacent residential lots have similar dwellings. The proposed subdivision is in close proximity to the Town of Perth hence the development can provide additional dwelling units to support the urban centre. Supporting studies identified sufficient and safe resources available on the subject property to support the proposed development without adverse environmental or human health impacts. Zanderplan is of the

opinion that the proposed subdivision is supported by and consistent with the relevant local and provincial planning policies and documentation.

Should you require any additional information in order to process this application, please don't hesitate to contact the undersigned.

All respectfully submitted by:

Tracy Zander, M.Pl, MCIP, RPP

GEMTEC
www.gemtec.ca

Environmental Impact Statement Proposed Plan of Subdivision – Burns Farm Part of Lot 7, Concession 1 Geographic Township of Drummond

Lanark County, Ontario

GEMTEC
www.gemtec.ca

Submitted to:
Crains' Construction Ltd.
1800 Maberly Elphin Road
Ottawa, Ontario
K0H 2B0

Environmental Impact Statement
Proposed Plan of Subdivision – Burns Farm
Part of Lot 7, Concession 1
Geographic Township of Drummond
Lanark County, Ontario

October 17, 2023
Project: 100227.008

EXECUTIVE SUMMARY

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Crains' Construction Ltd. to complete an Environmental Impact Statement (EIS) for the property located on part of Lot 7, Concession 1 in the Geographic Township of Drummond, Lanark County, Ontario.

This EIS has been completed in support of a proposed plan of subdivision to permit the development of an approximately 40-hectare (ha) parcel of land to facilitate the building of 42 single-family residential dwellings. The proposed development is anticipated to be staged over two phases. Each phase is anticipated to develop 21 of the lots at a time, starting from the southern half of the property and moving northwards. All lots are to be serviced through private wells and septic systems. The EIS report outlined below has been completed in support of both the Phase 1 and Phase 2 lands. This EIS was completed in accordance with all federal, provincial and municipal policies and guidelines, as applicable.

In support of this EIS a desktop review and numerous field investigations were completed to identify the presence or absence of natural heritage features and species at risk (SAR) on-site. Field investigations were completed throughout the spring of 2021. The focus of the site investigations was to describe, in general, the natural and physical setting of the subject property with a focus on confirming the presence or absence of natural heritage features and potential SAR or their habitat as identified in the desktop review.

Following completion of the desktop review and site investigations the following natural heritage features were identified on-site or within the study area: woodlands, and special concern and rare wildlife habitat (eastern wood-pewee). The following SAR and their habitat were identified as having a potential to occur on-site: eastern small-foot myotis, little brown myotis and tri-colored bat. The following SAR were *confirmed* to be present on-site: bobolink and eastern meadowlark. Regulated Category 1, 2 and 3 habitats were identified on-site for both bobolink and eastern meadowlark.

Potential impacts to the natural heritage features resulting from the development were primarily associated with the loss of meadow habitat primarily associated with avian SAR and their regulated habitat, and indirect impacts to significant wildlife habitat. Impacts to bobolink and eastern meadowlark include the loss of regulated Category 1, 2 and 3 habitats.

Potential impacts to natural heritage features on-site, most notably regulated SAR habitat, are unlikely to be fully avoided. Due to the presence of avian SAR on-site Bobolink and Eastern Meadowlark, further regulatory review and permitting is required prior to any site disturbance or development within regulated SAR habitat discussed in Section 6.

To address impacts to Bobolink and Eastern Meadowlark, a *Notice of Activity for Bobolink and Eastern Meadowlark – Activities Impacting 30 Hectares or Less of Habitat* must be submitted to

the Kemptville Ministry of Environment, Conservation and Parks. Habitat compensation or monetary compensation will be required.

To provide protection to potential SAR and their habitat on-site, reptile and amphibian exclusion fencing should be installed around all future construction areas prior to any development or site alteration, to prevent the immigration of SAR turtles and other wildlife into the construction area. Should any SAR be discovered throughout the course of any development on-site, operations should stop and the species at risk biologist with the local MECP district should be contacted immediately for further direction. Furthermore, to ensure compliance with all applicable legislation, all best management practices and adherence to vegetation clearing windows for reptiles, birds and bats, outlined in Section 7 should be followed to ensure no negative impacts occur to natural heritage features on-site.

The proposed plan of subdivision complies with the natural heritage policies of the Provincial Policy Statement and the Lanark County Official Plan. No negative impacts to identified natural heritage features or their ecological functions are anticipated as a result of the proposed development as long as all mitigation measures in Section 7 are enacted and best management practices followed.

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Crains' Construction Ltd. to carry out an Environmental Impact Statement (EIS) for the property located on Part Lot 7, Concession 1, in the Geographic Township of Drummond, Perth, Lanark County, Ontario (hereafter referred to as “the subject property”). The general location of the subject property is illustrated on Figure A.1 in Appendix A.

1.1 Purpose

The proponent is seeking approval for a proposed plan of subdivision on an approximately 40 hectare (ha) property. Based on Section 5 of the Lanark County Official Plan (Lanark County, 2012), an EIS is required showing that the proposed project will not negatively impact any potential natural heritage features which may be present within the study area. The study area is defined as the property boundary and the adjacent lands encompassing an area of 120 m beyond the property boundary. The subject project and the extents of the study area are illustrated on Figure A.2.

1.2 Objective

The 2020 Provincial Policy Statement (MMAH, 2020) issued under Section 3 of the Planning Act states that “development and site alteration shall not be permitted in: habitats of species at risk, significant wetlands, significant woodlands and significant wildlife habitat unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.” Similarly, the 2020 Provincial Policy Statement dictates that ‘development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.”

The objective of the work presented herein is twofold; 1) to identify and evaluate the significance of any natural heritage features, as defined in the Provincial Policy Statement (MMAH, 2020), on the subject property and within the broader study area and; 2) to assess the potential impacts from the proposed plan of subdivision on any natural heritage features identified and to recommend appropriate and defensible mitigation measures to ensure the long-term protection of any natural heritage features identified.

To meet these objectives, the EIS presented herein has been completed in accordance with the following provincial and municipal regulations, policies and guidelines:

- Provincial Policy Statement (MMAH, 2014);
- Endangered Species Act (Ontario, 2007);
- Conservation Authorities Act (Ontario, 1990);
- Natural Heritage Reference Manual (OMNR, 2010);
- Township of Drummond/North Elmsley Official Plan (TDNE, 2012); and
- Lanark County Official Plan (Lanark County, 2012).

1.3 Physical Setting

The subject property is located on part of Lot 7, Concession 1, in the Geographic Township of Drummond, Lanark County, and is comprised of cultural meadows representing historical agricultural practices at the site. The subject property is bound to the North by Drummond Concession 2 and to the south by Drummond Concession 1. To the east the site is bound by neighbouring properties of Lot 8, Concession 1, and to the west by the remainder of part of Lot 7, Concession 1.

1.4 Land Use Context

The subject property is situated in a larger agricultural area. The existing land use designation from the Lanark County OP is rural area. The land-use from the Township of Drummond/North Elmsley Official Plan is rural.

2.0 METHODOLOGY

2.1 Desktop Review

A desktop information gathering exercise was completed to aid in the scoping of field investigations and to gather information relating to natural heritage features which may be present on the subject project or within 1 km of the subject property. An additional component of the desktop review was to assess the potential presence of SAR to occur on the subject property or within the study boundary based on a review of publicly accessible occurrence records, and review of SAR habitat requirements and range maps.

Information regarding the potential presence of natural heritage features and SAR within the vicinity of the site was obtained from the following sources:

- Make A Map: Natural Heritage Areas (OMNRF, 2022a);
- Land Information Ontario (OMNR, 2019);
- Township of Drummond/North Elmsley Official Plan (TDNE, 2012);
- Ontario Geological Survey (OGS, 2019);
- Fisheries and Oceans Canada Aquatic SAR Maps (DFO, 2022);
- Natural Heritage Information Centre Biodiversity Explorer (OMNRF, 2022b);
- Breeding Bird Atlas of Ontario (Cadman et al., 2007);
- Atlas of Mammals of Ontario (Dobbyn, 1994);
- Ontario Herpetofaunal Atlas (Oldham and Weller, 2000);
- Ontario Ordonata Atlas (OMNR, 2005);
- Wildlife Values Area (OMNRF, 2023a);
- Wildlife Values Site (OMNRF, 2023b); and
- Ontario Reptile and Amphibian Atlas (Ontario Nature, 2019).

2.2 Field Investigations

Field investigations were undertaken to describe in general, the natural and physical setting of the subject property with a focus on natural heritage features and to identify any potential SAR or their habitat that may exist at the subject property.

Field investigations completed in support of this EIS are outlined in Table 2.1 below. Photographs of site features taken during field investigations are provided in Appendix B.

Table 2.1 Summary of Field Investigations

Date	Time	Weather	Purpose
April 22, 2021	09:15-12:15	-1°C, overcast with ~90% cloud cover, Beaufort 3, no precipitation	Preliminary Constraints, Ecological Land Classification
June 1, 2021	05:30-07:15	12°C, ~100% cloud cover, Beaufort 1, light precipitation	Breeding Bird Survey, Ecological land Classification
June 17, 2021	07:45-09:45	17°C, ~0% cloud cover, Beaufort 1, no precipitation	Breeding Bird Survey
June 29, 2021	08:05-09:10	20°C, ~20% cloud cover, Beaufort 0, no precipitation	Breeding Bird Survey

2.2.1 Ecological Land Classification

Vegetation communities on the subject property were delineated during the desktop review stage of this EIS using publicly available air photos and confirmed in the field on April 22 and June 1, 2021, following the Ecological Land Classification System for Southern Ontario (Lee et al., 2008). Vegetation communities were confirmed in the field by employing the random meander methodology while documenting dominant vegetation species within the various vegetation community forms.

2.2.2 Breeding Bird Surveys

Breeding bird surveys were conducted on three occasions at seven point count locations. Breeding bird surveys followed protocols from the Canadian Breeding Bird Surveys (Downes and Collins, 2003) and the Ontario Breeding Bird Atlas (Cadman et al., 2007). Surveys were conducted no earlier than 30 minutes before sunrise and were completed within 5 hours of sunrise, to encompass peak songbird activity. Breeding bird surveys consisted of 5 minutes of passive listening in which all birds heard or seen within the survey period were recorded, including species, sex and breeding behaviour, if possible. Breeding bird survey locations are provided on Figure A.2 in Appendix A.

A list of all avian species identified on-site is provided in Table C.1 in Appendix C.

2.3 Data Analysis

An evaluation of the significance of natural heritage features, the sensitivity of identified flora and fauna and the potential impacts posed by the proposed development was undertaken through an analysis of desktop and field investigation data using the approaches and criteria outlined in the following documents:

- Natural Heritage Reference Manual (OMNR, 2010);
- Significant Wildlife Habitat Technical Guide (OMNR, 2000);

- Significant Wildlife Habitat Ecoregion Criterion Schedules (OMNRF, 2015); and
- Significant Wildlife Habitat Mitigation Support Tool (OMNRF, 2014b).

3.0 EXISTING ENVIRONMENT

3.1 Ecoregion

The site is situated Ecoregion 6E-11 (Lake Simcoe-Rideau), which extends from Lake Huron in the west to the Ottawa River in the east. The climate of Ecoregion 6E is categorized as humid, high to moderate temperate ecoclimate with a mean annual temperature range between 4.9°C to 7.8°C and an annual precipitation ranging between 759 mm to 1,087 mm (Crins et al., 2009).

The eastern portion of the Ecoregion, which the subject property is located, is underlain by glaciomarine deposits as a result of the brief post-glacial incursion of salt water from the Champlain Sean along the St. Lawrence Valley. This Ecoregion falls with Rowe's (1972) Great Lakes-St. Lawrence Forest Region, including its Huron-Ontario and Upper St. Lawrence sections, and a small part of the Middle Ottawa Forest section (Crins et al., 2009).

3.2 Landforms, Soils and Bedrock Geology

The topography of the site is relatively flat, with a gentle downward slope from a topographical high of 139 mASL to a topographical low of 136 mASL.

A single topographical landform, as mapped by Chapman and Putnam (1984) is described on the subject property, the limestone plains of the Smiths Falls Limestone Plains physiographic region.

The Ontario Geological Survey (OGS, 2019) identifies two surficial soil units on the subject property, the largest of which is a bedrock-drift complex in Paleozoic terrain that occurs in the entirety of the site excluding the northeastern corner. A pocket of fine-textured glaciolacustrine deposits comprised of silt, clay and minor sand and gravel is found in the northeastern corner of the property.

Bedrock at the site, is described by OGS (2019) as entirely the Beekmantown Group comprised of dolostone and sandstone.

3.3 Surface Water, Groundwater and Fish Habitat

Surface water features on-site was limited to two unnamed watercourses: one towards the northerly extents of the subject property and one within the central area of the site. Both of these watercourses are identified through the Rideau Valley Conservation Authority (RVCA) GeoPortal (undated) and classified as intermittent streams. The Township of Drummond/North Elmsley Community Map (undated), classified the watercourses as municipal drains.

The northerly watercourse originates approximately 830 m southwest of the site in an agricultural field, enters a roadside ditch upon leaving the site, and continues for approximately 415 m northeast where it confluences with the Drummond-Elmsley Municipal Drain. It is unclear where the central watercourse originates, but likely receives input flows from adjacent surface runoff

from the immediate area. The central watercourse travels north from the site for approximately 514 m where it also discharges into the Drummond-Elmsley Municipal Drain.

A hydrogeological investigation has been prepared by GEMTEC (2023) under a separate cover in support of the proposed subdivision development. Based on the results of the hydrogeological investigation, the following conclusions and professional opinions were provided:

- The Site is considered to be hydrogeologically sensitive and protective measures are recommended to minimize potential impacts to the water supply aquifer;
- The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed residential development;
- The surface water assessment demonstrates that no surface water bodies will be negatively impacted by the proposed development; and
- The proposed development will have no adverse impact on the reasonable use of groundwater on existing and future adjacent properties.

Observations made during field investigations determined the watercourses contained intermittent surface water, and were noted to be shallow and stagnant where water was present. Based on field observations and historical air photos, the watercourses are more likely akin to drainage features from previous agricultural purposes or other historical alterations.

A direct fisheries assessment was not conducted as part of this EIS. The RVCA Geoportal (undated) did not classify either of these watercourses as fish bearing or contributing to fish habitat. No other known records were found confirming fish habitat within the watercourses. Fish were not observed during investigations. Based on observations, including lack of sufficient water depth and permanency, and absence of flow, it is assumed that the watercourses do not provide direct or permanent fish habitat. The watercourses are assumed to contribute to base flow conditions for downstream fish habitat, particularly during spring freshet and following major precipitation events.

3.4 Vegetation Communities

Vegetation communities on-site were confirmed by GEMTEC in 2021, following protocols utilized in the Southern Ontario Ecological Land Classification System (Lee et al., 2008). Vegetation at the site represents a mosaic of meadows and areas of active earthworks. Table 3.1 below provides a summary of the various vegetation communities identified on-site while Figure A.3 in Appendix A provides an illustration of the various vegetation communities.

Table 3.1 Vegetation Communities On-site

ELC Type	Description	Size (ha)
Forb Meadow (MEF)	This community is located in the northern area of site. Historically used for agriculture, the community appears to have since gone fallow and is characterized by short herbaceous growth, bare soil, and evidence of disturbances.	11.8
Mixed Meadow (MEM)	Occupying the majority of the site, this community was heavily dominated by various grasses (*Poacea sp).* Similar to the forb meadow, this community was historically used for agriculture but has since gone fallow. Vegetation was noted as being a dense mixture of grasses and other herbaceous plants.	23.2
Staging Area/Construction (CV)	Limited to southernmost portion of site, an area of active earthworks and/or staging area was identified. The area has multiple large mounds of soft aggregates and large machinery. The ground was heavily disturbed with bare soils. Vegetation was dominated by stunted herbaceous plants.	4.3

3.5 Wildlife

Wildlife observed on-site and within the study area during field investigations completed in 2021 are summarized in Table C.1 in Appendix C.

4.0 NATURAL HERITAGE FEATURES

Natural heritage features are defined in the PPS as “features and area, including *significant wetlands, significant coastal wetlands, fish habitat, significant woodlands* south and east of the Canadian Shield, *significant valleylands* south and east of the Canadian shield, *significant habitats of endangered species and threatened species, significant wildlife habitat* and *significant areas of natural and scientific interest*, which are important for their environmental an social values as a legacy of the natural landscape of an area”.

4.1 Significant Wetlands

As described in the Natural Heritage Reference Manual (OMNR, 2010), wetlands “mean lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface.” While *significant* in regards to wetlands means “an area identified as provincially significant by the Ontario Ministry of Natural Resources and Forestry using evaluation procedures established by the Province, as amended from time to time.”

No significant wetlands were identified on-site or within the study area during the desktop review or any of the site investigations. Further to that, no local unevaluated wetlands were identified on-site nor within the study area. As no wetlands occur on-site or within the study area, neither significant wetlands nor local wetlands are evaluated or discussed further in this EIS.

4.2 Significant Woodlands

Significant woodlands are defined in the natural heritage reference manual (OMNR, 2010) as “an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history.”

At the local scale, significant woodlands are defined and designated by the local planning authority. Generally, most planning authorities have defined significant woodlands as any woodland that contains any of the four criteria listed in Section 7.2 of the natural heritage reference manual (OMNR, 2010), including: woodland size, ecological functions, uncommon characteristics and economic and social functional values.

Table C.2 in Appendix C, presents the screening rationale for significant woodlands applied in this EIS. For comparison of woodland criteria used in Table C.2, the Drummond/North Elmsley Official Plan identified that the woodland coverage within the planning area is between 30% and 60% of the land area, therefore the minimum woodland size for determining significance is 50 ha or greater, based on the guidance outlined in the natural heritage reference manual (OMNR, 2010).

Based on the results of the significant woodland screening presented in Table C.2, significant woodlands are not present on-site. As no significant woodlands occur on-site or within the study area, significant woodlands are not evaluated or discussed further in this EIS.

4.3 Significant Valleylands

Valleylands are defined in the natural heritage reference manual (OMNR, 2010) as 'a natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of time". The identification and evaluation of significant valleys lands in Ontario is based on the recommended criteria from the MNRF and is the responsibility of local planning authorities.

In Southern Ontario, conservation authorities have identified valleylands as part of their regulation mapping (i.e., floodplain mapping); however, where valleys lands have not been defined, their physical boundaries are generally determined as the 'top-of-bank' or 'top-of-slope' associated with a watercourse. For less well-defined valleys, the physical boundary may be defined by riparian vegetation, flooding hazard limits, ordinary high-water marks or the width of the stream meander belt (OMNR, 2010).

As discussed in Section 3.2, the site is relatively flat and no valleylands have been identified on-site, as such valleylands are not discussed or evaluated further in this EIS.

4.4 Significant Areas of Natural and Scientific Interest

The MNRF identifies two types of areas of natural and scientific interest (ANSI) in Ontario: life sciences ANSIs typically represent significant segments of Ontario's biodiversity and natural landscapes, while earth science ANSIs typically represent significant examples od bedrock, fossils or landforms in Ontario (OMNR, 2010).

No ANSI have been identified on-site or adjacent to the site during the desktop review or during site investigations. Therefore, ANSI are not discussed or evaluated further in this EIS.

4.5 Significant Wildlife Habitat

The natural heritage reference manual (OMNR, 2010), in combination with the significant wildlife habitat technical guide (OMNR, 2000) and the significant wildlife habitat ecoregion criterion schedules (OMNRF, 2015) were used to identify and evaluated potential significant wildlife habitat on-site. The significant wildlife habitat is broadly categorized as habitats of seasonal concentration of animals, rare vegetation communities, specialized habitats for wildlife, habitats of species of conservation concern and animal movement corridors. Tables C.3, C.4, C.5 and C.6 in Appendix C, provide the screening rationale for each category of significant wildlife habitat, respectively.

4.5.1 Habitats of Seasonal Concentrations of Animals

Seasonal concentration areas are habitats where large numbers of species congregate at one particular time of the year. The significant wildlife habitat technical guides (OMNR, 2000) and Significant Wildlife Habitat Ecoregion Criterion Schedules (OMNRF, 2015) identify 11 types of seasonal concentration habitats that may be considered significant wildlife habitat (SWH). These 11 types of seasonal habitat are presented in Table C.3 in Appendix C, including a brief description of the rationale as to why or why they are not assessed further in this EIS.

Following review of Table C.3 in Appendix C, no habitats of seasonal concentration of animals are present on-site.

4.5.2 Rare Vegetation Communities

Rare vegetation communities in the province are described generally as those with an S1 to S3 ranking by the NHIC, and typically include communities such as sand barrens, alvars, old growth forests, savannahs and tallgrass prairies.

The vegetation communities identified on-site and described in Section 3.4 of this report are not ranked by the NHIC as S1, S2 or S3 and are therefore not considered to be rare vegetation communities. As such, rare vegetation communities are not discussed or evaluated further in this EIS.

4.5.3 Specialized Habitats for Wildlife

Specialized wildlife habitats are microhabitats that provide a critical resource to some groups of wildlife. The significant wildlife habitat technical guide (OMNR, 2000), defines eight specialized habitats that may constitute significant wildlife habitat, these eight types of specialized wild habitat are evaluated in Table C.4 in Appendix C.

Following review of Table C.4 in Appendix C, no specialized habitats for wildlife are present on-site or within the broader study area.

4.5.4 Habitats of Species of Conservation Concern

Provincial rankings are used by the Natural Heritage Information Centre to set protection priorities for rare species, similar to those described in Section 4.5.2 above for vegetation communities. Provincial rankings (S-ranks), are not legal designations such as those used to define the various protection statuses of species at risk, they are only intended to consider factors within the political boundaries of Ontario that might influence a particular species abundance, distribution or population trend.

Based on the guidance provided in the Significant Wildlife Habitat Ecoregion Criterion Schedules (MNRF, 2015), when a plant or animal element occurrence is recorded for any species with an S-rank of S1 (extremely rare), S2 (very rare), S3 (rare to uncommon) or SH (historically present),

the corresponding vegetation ecosite is considered to provide *candidate* habitat for species of conservation concern and further consideration within the EIS is warranted.

The Significant Wildlife Habitat Ecoregion Criterion Schedules (OMNRF, 2015), provides five general habitat types known to support a wide range of species of conservation concern in Ontario. The five general habitat types for Ecoregion 6E-11 are provided in Table C.5 in Appendix C, including a brief rationale as to why they are or are not considered further in this EIS.

Following review of Table C.5 in Appendix C, one habitat of species of conservation concern have been identified on-site, habitat for special concern and rare wildlife species for eastern wood-pewee. The SWH is discussed in detail in the subsections below.

4.5.4.1 Special Concern and Rare Wildlife Species SWH

Based on observation data from the field investigations, one species of special concern has been identified on-site or within the broader study area, eastern wood-pewee. No other species of special concern or rare wildlife species were identified on-site or within the broader study area.

Eastern Wood-pewee

The eastern wood-pewee is a small flycatcher bird with an S-rank of S4 (uncommon but not rare), and is listed as a species of special concern in Ontario. The most recent Ontario Breeding Bird Atlas indicated that the eastern wood-pewee has a probability of occurrence of over 80% (Cadman et al, 2007). Furthermore, the area extending from Ottawa to Lake Ontario is considered to have some of the highest density of wood-pewee in Ontario (Cadman et al, 2007). Eastern wood-pewee is a woodland species that is often found near clearings and edges. Eastern wood-pewee was identified during the site investigations, limited to the wooded areas in study area, adjacent to the subject property. As such, there is a high potential for eastern wood-pewee and their habitat to occur on-site.

4.5.5 Animal Movement Corridors

Animal movement corridors are elongated areas used by wildlife to move from one habitat to another and allow for the seasonal migration of animals (OMNRF, 2015). The Significant Wildlife Habitat Ecoregion Criterion Schedules for Ecoregion 6E-11 (OMNRF, 2015), identifies two types of animal movement corridor: amphibian movement corridors and deer movement corridors. As per guidance presented in MNRF, 2015, animal movement corridors should only be identified as significant wildlife habitat when a *confirmed or candidate* significant wildlife habitat has been identified by the MNRF district office or by the regional planning authority.

Following a review of Table C.6 in Appendix C, no animal movement corridors have been identified on-site. As such, animal movement corridors are not discussed or evaluated further in this EIS.

4.6 Fish Habitat

According to the Provincial Policy Statement (MMAH, 2020), “development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.” Fish habitat as defined in the Fisheries Act (Canada, 1985) means “spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.”

The protection of fish and fish habitat is a federal responsibility and is administered by the Department of Fisheries and Oceans Canada (DFO). Fish habitat as defined in the Fisheries Act (Canada, 1985) means, “spawning grounds and nursery, rearing food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.”

When development is unable to avoid resulting in the harmful alteration, disturbance or destruction of fish habitat from typical project impacts such as temperature change, sedimentation, infilling, reduction of nutrient and food supply, etc., an authorization under the Fisheries Act is required for the project to proceed.

A direct fisheries assessment was not conducted as part of this EIS. As mentioned previously in Section 3.3, surface water features on-site were limited to two intermittent drains. The RVCA Geoportal (undated) did not classify either of these watercourses as fish bearing or contributing to fish habitat.

As mentioned in Section 3.3, it is assumed that the drains do not provide direct or permanent fish habitat. The drains are assumed to contribute to base flow conditions for downstream fish habitat, particularly during spring freshet and following major precipitation events. Furthermore, no fish were observed within either features during field investigations. No critical habitat or aquatic species at risk have been identified on-site or within the adjacent surface water features.

As such, the drains on-site are not considered to provide direct fish habitat and are not further discussed within this EIS.

4.7 Species at Risk

The probability of occurrence for species at risk to occur on-site and within the broader study area was determined through the desktop review stage of this EIS, as described in Section 2.1, and through the site-specific surveys conducted as part of this EIS, outlined in Section 2.2.

Table C.7 in Appendix C, provides a summary of all species at risk which were determined to have the potential to occur on-site or within the broader study area, their protection status under the provincial Endangered Species Act (Ontario, 2007), their probability of occurrence and a brief rationale of that probability. Impacts to endangered or threatened SAR determined to have a moderate or high potential to occur on-site or within the broader study area are discussed further in Section 6.

5.0 PROPOSED PROJECT

The proposed project assessed for potential impacts on the natural heritage features determined to be present within the broader study area is a plan of subdivision application for part of Lot 7, Concession 1, Lanark County.

The proposed plan of subdivision includes the creation of 42 residential lots on an approximately 40 ha property, and is anticipated to be staged over two phases. Each phase is anticipated to develop 21 of the lots at a time, starting from the southern half of the property and moving northwards. All lots are to be serviced through private wells and septic systems.

Access to the proposed subdivision will be from Drummond Concession 2 to the north and Drummond Concession 1 to the south. A pre-existing roadway bisects the property connecting to both concession roads. Based on conceptual development plans, future roadway construction is expected to be limited to improvements of the pre-existing road, and not the construction of new or additional roads. The proposed plan of subdivision is provided on Figure A.4.

Future components of the proposed project considered in the impact assessment presented in Section 6 include: vegetation grubbing, fill placement and elevation grading, road improvements, laneway construction, culvert installation, excavation and pouring of foundations, construction of single-family dwellings all on private services, general landscaping activities and the creation of stormwater management infrastructure.

A Stormwater Management Plan (SMP) has been prepared by Stantec Consulting Ltd. (Stantec) (Stantec, 2023), in support of the proposed plan of subdivision. The stormwater management plan provided can effectively control on-site runoff and meet the target allowable release rate. Ditches in the drainage system will be served as storage for retention of excess water volume by controlling the expected post-development 100-year storm run-off from the proposed development area to the existing 100-year storm runoff release rate (Stantec, 2023).

Stormwater from the subdivision will be collected in roadside ditches and ultimately directed to the Drummond-Elmsley Municipal Drain, through three outlets. The post-development model was built on top of the pre-development model. It includes new ditches along the future roadside and backyard of lots. To meet the stormwater discharge criteria for the proposed development, the proposed ditches will be used to promote stormwater detention and to reduce peak flow discharge from the area. It is anticipated that the on-site drains previously described in Section 3.3 are to be utilized as part of the SMP. Municipal drains are to be reinstated and confirmed at the detailed design stage along with any proposed ditches (Stantec, 2023).

A pre- and post-development model was simulated with 100-year 24-hour SCS rainfall event. Flow discharge will be regulated to meet the allowable discharge rate of the predevelopment stage and future ditches in the area will serve as storage to retain the waters during and after the rainfall event. Moreover, the post-development model was also evaluated with potential climate

change impact. The drainage system will be able to maintain the water within the ditch system without causing any surface flooding, but it will result in an overflow in the northwest and central outlet through an emergency weir and will exceed the pre-development stage discharge limits at northwest and central outlet locations (Stantec, 2023).

The timeline for the proposed project, from lot creation to completion of residential construction is currently unknown. For the purposes of assessing impacts to natural heritage features, it is assumed in this EIS that the creation of individual residential lots will happen in the near-term and will not result in any physical alterations to the natural environment of the site and the broader study area. Future construction of single-family residential homes on each of the subdivision lots is assumed to occur over a several year period, and that the construction of any one residential home will be completed such that the duration of any potential impacts on the natural environment during construction will be approximately six months.

6.0 IMPACT ASSESSMENT

Potential impacts to natural heritage features on-site and within the broader study area are assessed for direct, indirect and cumulative effects based on the proposed project outlined in Section 5. Natural heritage features identified in Section 4 of this report as present or likely to be present are discussed in the subsections below.

Potential effects to the natural environment from the proposed development outlined in Section 5 include: vegetation removal, former agricultural use, habitat encroachment, habitat loss, increased noise generation, increased human disturbance, increase storm water generation, potentially increased nutrient loading to adjacent surface water features, increase in impervious surfaces and short-term increases in sedimentation and/or erosion.

6.1 Significant Wildlife Habitat

The potential presence of significant wildlife habitat on-site and within the study area was evaluated in Section 4.5. As a result of this assessment one type of significant wildlife habitat was determined to be present on-site or within the study area: habitats of special concern and rare wildlife species: eastern wood-pewee.

Potential impacts to significant wildlife habitats are discussed in greater detail in the following subsections, while mitigation measures indented to prevent such impacts are presented in Section 7.

6.1.1 Habitats of Special Concern and Rare Wildlife Species SWH

Eastern Wood-Pewee

Eastern wood-pewee (*Contupus virens*) is a small, avian insectivore that lives in a variety of deciduous, mixed, and to a lesser extent, coniferous woodland habitat (COSEWIC, 2012a). Adult eastern wood-pewee are grey-olive with pale wing-bars, the breast and sides are slightly darker green than the wings. It is best identified by its three-phrased song, often paraphrased as a whistled ‘pee-ah-wee’ (COSEWIC, 2012a). In Ontario, the eastern wood-pewee is listed as a species of special concern.

Threats to eastern wood-pewee are not well understood however, loss of suitable forest habitat does not appear to be a significant issue across their Canadian breeding range (COSEWIC, 2012a). Furthermore, research indicates that the species is not very sensitive to forest fragmentation effects or forest size (COSEWIC, 2012a). Eastern wood-pewee may be sensitive to human habitation, in Ontario they occur less frequently in woods with surrounding development than those without houses (COSEWIC, 2012a). Other threats to eastern wood-pewee may include changes in the availability of aerial insects, mortality during migration and/or wintering, nest predation and habitat changes due to white-tailed deer browsing (COSEWIC, 2012a).

Impacts to eastern wood-pewee and their habitat from the proposed development is limited to a wooded section in the study area adjacent to the northwest concern of the site, situated beside the current Phase 2 plan. The wooded section in the study area may provide suitable nesting and foraging habitat, while the open areas on-site are not likely to provide suitable habitat to support eastern wood-pewee. As the wooded section is outside of the proposed development plan, direct impacts to eastern wood-pewee and their habitat are not anticipated.

Impacts to eastern wood-pewee are anticipated to be indirect and associated with increased human presence and disturbance. However, impacts from increased human presence are anticipated to be negligible given the existing land use surrounding the proposed development and the availability of suitable habitat in the broader study area.

Mitigation measures intended to prevent negative impacts to nesting and foraging eastern wood-pewee are presented in Section 7.

6.2 Species at Risk

As outlined in the Endangered Species Act (Ontario, 2007), only species listed as threatened or endangered and their general habitat receive automatic protection. When a species-specific recovery strategy is developed, a specific habitat regulation will be established, which eventually replaces the automatic habitat protection. Species of special concern and their habitat do not receive protection under the ESA.

Potential impacts associated with the proposed project to threatened or endangered species identified as having a moderate or high potential to occur on-site in Section 4.7, are discussed on a species-by-species basis in subsections below.

6.2.1 Bobolink

Bobolink (*Dolichonyx oryzivorus*) are small, omnivorous songbirds with large, somewhat flat heads, short necks and short tails. The male bobolink has a white back, black underside and a straw-yellow coloured patch on the back of the head. Female bobolinks have a non-descript buff and brown plumage not unlike most species of sparrows.

In Ontario, bobolink are restricted to southern Ontario and occur south of the Highway 17 corridor between North Bay and Sault Ste. Marie. Scattered populations exist in correlation with Clay Belt areas in Timiskamin, Cochrane and Thunder Bay areas. Between the first and second breeding bird atlas, the probability of bobolink observations declined by 28% province wide (Cadman et al., 2007).

Bobolink breed primarily in hayfields and other grasslands with tall vegetation that provides cover for nests which are established on the ground (Cadman et al., 2007). The bobolink is generally sensitive to vegetation structure and composition within its habitat; its preferred habitat structure is generally found in old (> 8 years old) forage crops. Abundance and density are positively

correlated with a moderate litter depth, high lateral litter cover, high grass-to-legume rations, an abundance of small shrubs, and a high percentage of forb cover (COSEWIC, 2010). Bobolinks typically avoid nesting in habitats that are dominated by overly dense shrub vegetation with an overly deep littler layer or a high percentage of bare soil (COSEWIC, 2010).

Three diurnal breeding bird surveys were conducted during June 2021, under optimum weather conditions (minimal to no rain, low winds) to target breeding birds. The surveys were conducted at seven point count locations, all of which targeted potentially suitable habitat for grassland birds such as bobolink; the survey locations are illustrated on Figure A.2 in Appendix A. Bobolink were observed during two of the breeding bird surveys conducted on June 1 and June 17, 2021. The general location of observed birds is illustrated on Figure A.5 in Appendix A.

Bobolink are late spring migrants, as such their breeding period is identified as June through to the first week of July (OMNR, 2011b). To avoid disturbing nesting bobolink, precise nest locations were not confirmed during site investigations, however Bobolink detected calling, foraging and/or in pairs during the typical breeding bird period (June to the first week of July) were assumed to indicate the presence of Category 1 habitat (nest or approximate centre of defended territory). Bobolink observed on-site prior to the start of the breeding season were assumed to be transient and not associated with an established nest or territory.

Category 1, Category 2 and Category 3 bobolink habitat, as defined in the MNRF general habitat description occurs on-site and is illustrated on Figure A.5 in Appendix A. The MNRF general habitat description for bobolink is provided in Appendix D.

The proposed development on-site impacts bobolink Category 1, Category 2 and Category 3 habitat. As outlined in the MNRF general habitat description for bobolink, Category 2 habitat is defined as “the area between 10 m and 60 m from the nest or centre of approximated defended territory” and Category 3 habitat is defined as “the area of continuous, suitable habitat between 60 m and 300 m from the nest or centre of approximated defended territory.” Based on this description and field observations, the Mixed Meadow (MEM) on-site is of an appropriate vegetation structure to provide an area of suitable habitat for bobolink and are considered to provide continuous habitat for bobolink.

The current proposed development plan will result in the loss of approximately 0.02 ha of Category 1 habitat, 0.56 ha of Category 2 and 9.56 ha of Category 3 habitat. Figure A.5 in Appendix A illustrates the locations of bobolink observations, as well as their regulated habitats.

Where the development cannot avoid regulated habitat, impacts may include loss of suitable nesting and foraging habitats, vegetation removal, increased human disturbance and noise generation and short-term construction impacts including heavy machine encroachment, increased noise, and fill placement.

Development that occurs outside of the regulated Category 1, Category 2 and Category 3 habitat is not anticipated to have any negative impacts on bobolink or their habitat.

Any development that cannot avoid regulated areas on-site will require the project to be registered with the Ministry of Environment, Conservation and Parks (MECP), and will require compensation through habitat management or payment into the Species at Risk Fund. The general habitat description for bobolink is provided in Appendix D.

Avoidance, mitigation and compensation measures intended to protect bobolink and their habitat during construction are provided in Section 7.

6.2.2 Eastern Meadowlark

Eastern meadowlark (*Sturnella manga*) is a chunky, medium-sized grassland songbird, with a short tail, and a long spear-shaped bill. The colour pattern of the species is pale brown marked with black, the underside is bright yellow and a bold black 'V' pattern across the chest.

The eastern meadowlark was once well established in southern Ontario, however, due to the natural succession of abandoned agricultural fields transitioning back to forested habitat on the Canadian shield and through the northern portion of the Lake Simcoe-Rideau region, along with intensive farming practices and expanding of urbanization in southwestern and eastern Ontario, the eastern meadowlark has suffered significant habitat loss (Cadman et al., 2007). Between the first and second breeding bird atlas, the probability of observation declined by 13% province wide (Cadman et al., 2007). The current distribution of eastern meadowlark is concentrated through the Lake Simcoe-Rideau region, primarily from Kingston to Lake Simcoe.

The eastern meadowlark prefers native grassland, pasture and savannah habitat; however, it is known to use a variety of anthropogenic grassland habitats including hayfields, weedy meadows, young orchards, grain fields and herbaceous fence rows (COSEWIC, 2011). Preferred grassland habitat typically contains moderately tall (25 to 50 cm) grass species with abundant litter cover, with a high proportion of grass, moderate to high forb density a low percent of shrub cover (typically <5%) and low percent cover of bar ground (COSEWIC, 2011).

Three diurnal breeding bird surveys were conducted during June 2021, under optimum weather conditions (minimal to no rain, low winds) to target breeding birds. The surveys were conducted at seven point count locations, all of which targeted potentially suitable habitat for grassland birds such as eastern meadowlark; the survey locations are illustrated on Figure A.2 in Appendix A. Eastern meadowlark were observed during two of the targeted breeding bird surveys conducted on June 1 and June 17, 2021. The general location of observed birds is illustrated on Figure A.5 in Appendix A.

Similarly to bobolink, the breeding bird season for eastern meadowlark is identified as June through to early July (OMNR, 2011b). The proposed development on-site impacts eastern

meadowlark Category 1, Category 2 and Category 3 habitat. As outlined in the MNRF general habitat description for eastern meadowlark, Category 1 habitat is defined as the “nest and area within 10 m of the nest”, Category 2 habitat is defined as “the area between 10 m and 60 m from the nest or centre of approximated defended territory” and Category 3 habitat is defined as “the area of continuous, suitable habitat between 60 m and 300 m from the nest or centre of approximated defended territory.”

Based on this description and field observations, the Mixed Meadow (MEM) on-site is of an appropriate vegetation structure to provide an area of suitable habitat for eastern meadowlark, and are considered to provide continuous habitat for eastern meadowlark.

The current proposed development plan will result in the loss of approximately 0.03 ha of Category 1 habitat, 2.91 ha of Category 2 and 13.8 ha of Category 3 habitat. Figure A.5 in Appendix A illustrates the locations of eastern meadowlark observations, as well as their regulated habitats.

Where the development cannot avoid regulated habitat, impacts may include loss of suitable nesting and foraging habitats, vegetation removal, increased human disturbance and noise generation and short-term construction impacts including heavy machine encroachment, increased noise, and fill placement.

Development that occurs outside of the regulated Category 1, Category 2 and Category 3 habitat is not anticipated to have any negative impacts on eastern meadowlark or their habitat.

Any development that cannot avoid regulated areas on-site will require the project to be registered with the Ministry of Environment, Conservation and Parks (MECP), and will require compensation through habitat management or payment into the Species at Risk Fund. The general habitat description for eastern meadowlark is provided in Appendix D.

Avoidance, mitigation and compensation measures intended to protect eastern meadowlark and their habitat during construction are provided in Section 7.

6.2.3 Eastern Small-footed Myotis

Eastern small-footed Myotis (*Myotis leibii*) is the smallest (typically 3-5 g), insectivorous bat found in Ontario. The fur of an eastern small-footed Myotis is golden-brown in colour, with a distinct black mask across the face. The eastern small-footed Myotis is very similar in appearance to the little brown Myotis, and is distinguishable by their small foot and keeled calcar (Fraser, MacKenzie & Davy, 2007).

The eastern small-footed Myotis is found throughout eastern North America. In Ontario the species has been observed in the areas sough of Lake Superior across to the Ontario-Quebec border (Humphrey, 2017).

Eastern small-footed Myotis overwinter primarily in caves and abandoned mines with low humidity and temperatures and stable microclimates (Humphrey, 2017). In comparison to other Ontario bat species, they are able to tolerate much colder temperatures, drier conditions and draftier locations for hibernating (Humphrey, 2017). During the spring and summer months, they utilize a variety of habitats for roosting, including under rocks or rock outcrops, in buildings, under bridges, or in caves, mines or hollow trees (Ontario, 2019a).

Although the forest habitat in the study area does not meet the requirements to support bat maternity colonies, given the availability of habitat and buildings within the study area, there is a potential for eastern small-footed Myotis to occur on the property, primarily for foraging or non-maternal roosting. Impacts to eastern small-footed Myotis are primarily associated with habitat loss, encroachment and increased wildlife-human interaction. Mitigation measures intended to protect eastern small-footed Myotis from impacts of the proposed development are discussed in Section 7.

6.2.4 Little Brown Myotis

Little brown Myotis (*Myotis lucifugus*) is a small (typically 4-11 g), insectivorous bat. The fur of a little brown Myotis is bi-coloured; fur is a glossy brown with a darker coloured base. The tragus of the Little Brown Myotis is long and thin, with a rounded tip (Fraser, MacKenzie & Davy, 2007).

In Canada, little brown Myotis' occur throughout all of the provinces and territories (except Nunavut), with its range extending south through the majority of the United States as well. In Ontario, the little brown Myotis is widespread in southern Ontario and has been found as far north as Moose Factory and Favourable Lake (Ontario, 2019b).

Little brown Myotis overwinter in caves and abandoned mines, they require highly humid conditions and temperatures that remain above the freezing mark (Ontario, 2019b). During the summer months, maternity colonies are often located in buildings or large-diameter trees. Little brown Myotis roost in trees and buildings. Foraging occurs over water and along waterways, forest edges and in gaps in the forest. Open fields and clearcuts are not typically utilized for foraging (COSEWIC, 2013).

Although the forest habitat in the study area does not meet the requirements to support bat maternity colonies, given the availability of habitat and buildings within the study area, there is a potential for little brown Myotis to occur on the property, primarily for foraging or non-maternal roosting. Impacts to little brown Myotis are primarily associated with habitat loss, encroachment and increased wildlife-human interaction. Mitigation measures intended to protect little brown Myotis from impacts of the proposed development are discussed in Section 7.

6.2.5 Tri-Colored Bat

Tri-colored bat (*Perimyotis subflavos*) is a small (typically 5-7 g), insectivorous bat. The fur is uniformly coloured on the ventral and dorsal sides, however when parted fur shows three distinct

colour bands. The base of the hair is blackish, with a blonde middle and brownish tip. The snout of the tri-coloured bat is also distinct, with swollen bulbous glands present (Fraser, MacKenzie & Davy, 2007).

In Canada, the tri-colored bat has only been recorded in southern parts of Nova Scotia, New Brunswick, Quebec and central Ontario. In Ontario it occurs primarily from the southern edge of Lake Superior across to the Ontario-Quebec border and south (COSEWIC, 2013).

Tri-colored bat overwinter in in caves or mines, and have very rigid habitat requirements; they typically roosting the deepest parts where temperatures are the least variable, and have the strongest correlation with humidity levels and warmer temperatures (COSEWIC, 2013). In the spring and summer, tri-colored bat utilize trees, rock crevices and buildings for maternity colonies. Foraging is mainly done over watercourses and streamside vegetation (COSEWIC, 2013).

Although the woodlands in the study area do not meet minimum snag density requirements to support bat maternity colony habitat, given the availability of habitat in the study area, there is a potential for tri-colored bat to occur on the property, primarily for foraging or non-maternal roosting. Impacts to tri-colored bat are primarily associated with habitat loss, encroachment and increased wildlife-human interaction. Mitigation measures intended to protect tri-colored bat from impacts of the proposed development are discussed in Section 7.

6.3 Cumulative Impacts

Potential cumulative impacts associated with the proposed project include an increase in storm water generation, potential increases in nutrient loading to aquatic features, and the loss of meadow habitat, primarily for avian species.

Cumulative impacts to the natural environment at the site due to increased human presence, increased wildlife and human interaction and increased noise, are expected to be negligible given the existing residential and agricultural land use in the surrounding project area.

Cumulative impacts such as those listed above can be mitigated by implementing the proposed setbacks and recommended mitigation measures outlined in Section 7 below.

7.0 RECOMMENDED AVOIDANCE AND MITIGATION MEASURES

The following avoidance and mitigation measures have been recommended by GEMTEC in order to minimize or eliminate potential environmental impacts identified in Section 6. As such, the following avoidance and mitigation measures should be enforced throughout the development through application of Site Plan Controls.

For the purpose of this report, a setback is defined as the minimum required distance between any structure, development or disturbance and a specified line. A buffer, for the purpose of this report, is defined as the area located between a natural heritage feature and the prescribed setback. For the purpose of the following subsections, buffers should be located between natural heritage features and lands subject to development or alteration, be permanently vegetated by native or non-invasive, self-sustaining vegetation and protect the natural heritage feature against the impact of the adjacent land use.

Vegetated buffers, particularly buffers that are vegetated with a mix of grassy herbaceous vegetation and shrubby or woody vegetation are most effective in mitigating impacts associated with anthropogenic activities in adjacent lands (Beacon, 2012). Buffers recommended in the following subsections are done so within the context of the existing environmental disturbances but also to promote reasonable natural rehabilitation.

7.1 Significant Wildlife Habitat

7.1.1 Habitats of Special Concern and Rare Wildlife Species – Eastern Wood Pewee

Impacts to eastern wood-pewee are primarily concerned with increased human presence and disturbances. To minimize the impact of the proposed development on eastern wood-pewee habitat, vegetation removal should occur outside the key breeding bird period (typically March 31 to August 31) as identified by Environment Canada for the protection of nesting and foraging eastern wood-pewee and to avoid contravention of the Migratory Bird Convention Act. If vegetation clearing activities must take place during the aforementioned timing window than a nest survey shall be conducted by a qualified professional.

7.2 Species at Risk

7.2.1 Bobolink and Eastern Meadowlark

As indicated in Section 6.2.1 and 6.2.2, bobolink and eastern meadowlark, avian species at risk, were identified on-site. Based on the MNRF General Habitat Description (Appendix D), Category 1, Category 2 and Category 3 habitat all occur on-site. The current proposed development plan could result in the loss of approximately 0.02 ha of Category 1 habitat, 0.56 ha of Category 2 and 9.56 ha of Category 3 bobolink habitat, as well as 0.03 ha of Category 1 habitat, 2.91 ha of Category 2 and 13.8 ha of Category 3 eastern meadowlark habitat.

In order to avoid contravention of the Endangered Species Act, the following mitigation measures are provided:

- Prior to any potential disturbance associated with construction within regulated Category 1, Category 2 or Category 3 bobolink or eastern meadowlark habitat on the site, the activity shall be registered with the MECP be submitting a Notice of Activity for Bobolink and Eastern Meadowlark – Activities impacting 30 hectares or less of habitat. No disturbance can take place prior to receiving conformation from the MECP.
- As of 2023, proponents have two options to provide compensation for impact habitat:
    - Option 1 – Traditional Habitat Compensation
        - A habitat management plan must be prepared by a qualified professional detailing the proposed activity, the habitat that will be affected, and created or enhanced, how new habitat will be created or enhanced.
        - Create and enhance habitat: habitat created or enhanced must be equal to the greater of (1) 1.5 times larger than the habitat destroyed, or (2) 4 ha.
            - As the project is impacting approximately 0.24 ha, created or enhanced habitat must be 4 ha in size.
        - Manage new habitat: for a minimum of 5 years, afterwards new habitat must be managed for 20 years since its creation or until the impacted habitat is returned to its original state. Management is to maintain grasses, forbs and legumes, remove woody vegetation and avoid harvesting, mowing, cutting or grazing activities between April 1 and July 31 of any year.
        - Monitor new habitat: new habitat must be monitored for 5 years, a minimum of 3 surveys per year when birds are likely to be present.
    - Option 2 – Payment into the Species Conservation Fund
        - Payment to the fund based on the amount of habitat impacted by the proposed development.
        - Registration and payment must be made prior to any habitat impacts.

7.2.2 Eastern Small-footed Myotis, Little Brown Myotis and Tri-Colored Bat

To protect roosting and foraging bats, tree removal where required should take place outside of the spring and summer active season (typically March 15 to November 30), when bats are more likely to be using forest habitat. If vegetation clearing must be conducted during the spring and summer timing window, then an acoustic and roost survey should be conducted by a qualified professional.

7.3 Wildlife

The following avoidance and mitigation measures are provided in effort to minimize impacts to on-site and off-site wildlife:

- Vegetation removal should occur outside of March 15 to November 30 to avoid the key breeding bird period, bat summer active season, and reptile and amphibian active season. The timing windows provides protection of migratory birds, roosting bats, migrating reptiles and amphibians and avoids contravention of the Migratory Bird Convention Act and Endangered Species Act. If vegetation clearing activities must take place during the aforementioned timing window than a nest and roost survey shall be conducted by a qualified professional.
- Installation of silt fence barriers around the entire construction envelope of each future residential dwelling to prohibit the emigration of wildlife into the construction area.
- Cover all stockpiled material with a geotextile to prevent turtles from nesting in the material between May 1 and August 1 of any year.
- Perform daily pre-work sweeps of the construction area to ensure no species at risk are present and to remove any wildlife from inside the construction area.
- Should any species at risk be discovered throughout the course of the proposed works, the species at risk biologist with the local MECP district should be contacted immediately and operations modified to avoid any negative impacts to species at risk or their habitat until further direction is provided by the MECP.

7.4 Best Practice Measures for Mitigation of Cumulative Impacts

The following best management practice measures are provided for the mitigation of cumulative impacts resulting from general construction and development activities;

- To protect trees identified to be retained during construction, the Critical Root Zone (CRZ) should be identified and fenced. The CRZ is defined as 10 cm from the base of the tree for every centimetre in diameter of the tree trunk measured at breast height.
- Maintain as much permeable surface as possible in future development plans to minimize the generation of storm water runoff.
- Silt fencing should be installed along all setbacks to provide visual demarcation of the setbacks and to prevent machinery encroachment and sediment transport.
- Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized.
- In effort to offset the effect of vegetation clearing, consideration should be given to landscape planting with native tree species indicative of the Great Lakes – St. Lawrence Forest Region, such as white cedar, white spruce, red maple and red oak.

General mitigation measures recommended for the protection of water quality include:

- Buffers should remain vegetated and where possible, be comprised of a mixture of native, self-sustaining trees, shrubs and tall grasses.

- All future development and construction activities within the study area, including ditching, culvert installation, erosion and sediment control and storm water management should be completed in accordance with Ontario Provincial Standard Specification 182 and OPSS 805.
- Install and maintain effective sediment and erosion control measures before starting work.
- When native soil is exposed, sediment and erosion control work in the form of heavy-duty sediment fencing shall be positioned along the down gradient edge of any construction envelopes adjacent to waterbodies.
- Schedule work to avoid wet, windy and rainy periods.
-
- Stormwater management on-site shall follow plans and recommendations as described in the Draft Plan of Subdivision and Stormwater Management Report (Stantec, 2023), included in Appendix E. Maintain as much permeable surface area as possible in future development plans to limit the generation of stormwater runoff.
- In order to protect aquatic habitat from contamination, it is recommended that all machinery be maintained in good working condition and that all machinery be fueled a minimum of 30 m from the high-water mark.
- Any temporary storage of aggregate material shall be set back from the water's edge by no less than 40 m and be contained by heavy-duty silt fencing.
- Septic systems shall be installed no closer than 30 m from the high-water mark of any surface water feature and not located in areas of exposed bedrock.
- Best practices for siting of septic systems should be adhered to and be installed by a licenced septic system contractor ensuring all applicable regulations are met and required permits obtained.

8.0 CONCLUSIONS

The proposed project supported by this EIS is the proposed plan of subdivision, permitting the development of 42 single-family residential dwellings, on Part Lot 7, Concession 1, in the Geographic Township of Drummond, Lanark County, Ontario

Based on the results of the impact analysis, impacts to the natural environment are anticipated to be minimal. Provided that mitigation measures recommended in Section 7 are implemented as proposed, no significant residual negative impacts are anticipated from the proposed future development.

Following review of the information pertaining to the natural heritage features of the site, the following general conclusions are provided by GEMTEC in regards to the Environmental Impact Statement.

- No significant impacts to natural heritage features identified on-site, including fish habitat, significant wildlife habitat or habitats of species at risk are anticipated as a result of future residential development.
- The proposed project complies with the natural heritage policies of the Provincial Policy Statement.
- The proposed development complies with the natural heritage policies of the Lanark County Official Plan.

9.0 LIMITATION OF LIABILITY

This report and the work referred to within it have been undertaken by GEMTEC Consulting Engineers and Scientists Ltd (GEMTEC), and prepared for Crains' Construction Ltd. and is intended for the exclusive use of Crains' Construction Ltd. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC and Crains' Construction Ltd. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgements of GEMTEC based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared.

This report has been prepared for the application noted and it is based, in part, on visual observations made at the site, all as described in the report. Unless otherwise stated, the findings contained in this report cannot be extrapolated or extended to previous or future site conditions, or portions of the site that were unavailable for direct investigation.

Should new information become available during future work, including excavations, borings or other studies, GEMTEC should be requested to review the information and, if necessary, re-assess the conclusions presented herein.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Emily Young
Junior Biologist

Adam Alaimo, B.Sc.
Biologist

Drew Paulusse, B.Sc.
Senior Biologist

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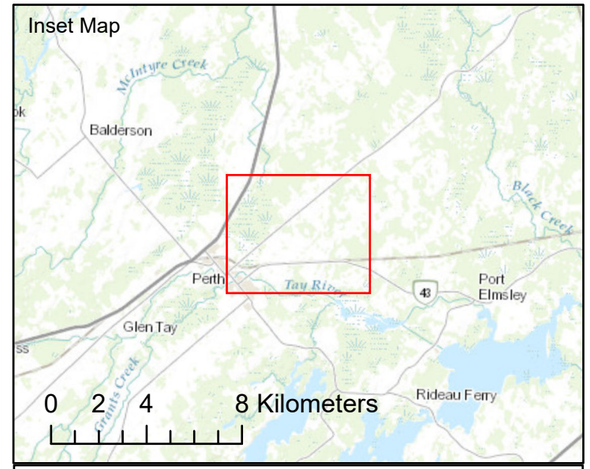
APPENDIX A

Report Figures

Figure A.1 – Site Location
Figure A.2 – Site Layout
Figure A.3 – Vegetation Communities
Figure A.4 – Proposed Development Plan
Figure A.5 – Natural Heritage Features

Legend

- Property Boundary
- Study Area



Scale
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Client: Crains' Construction Ltd.	Project: 100227.008

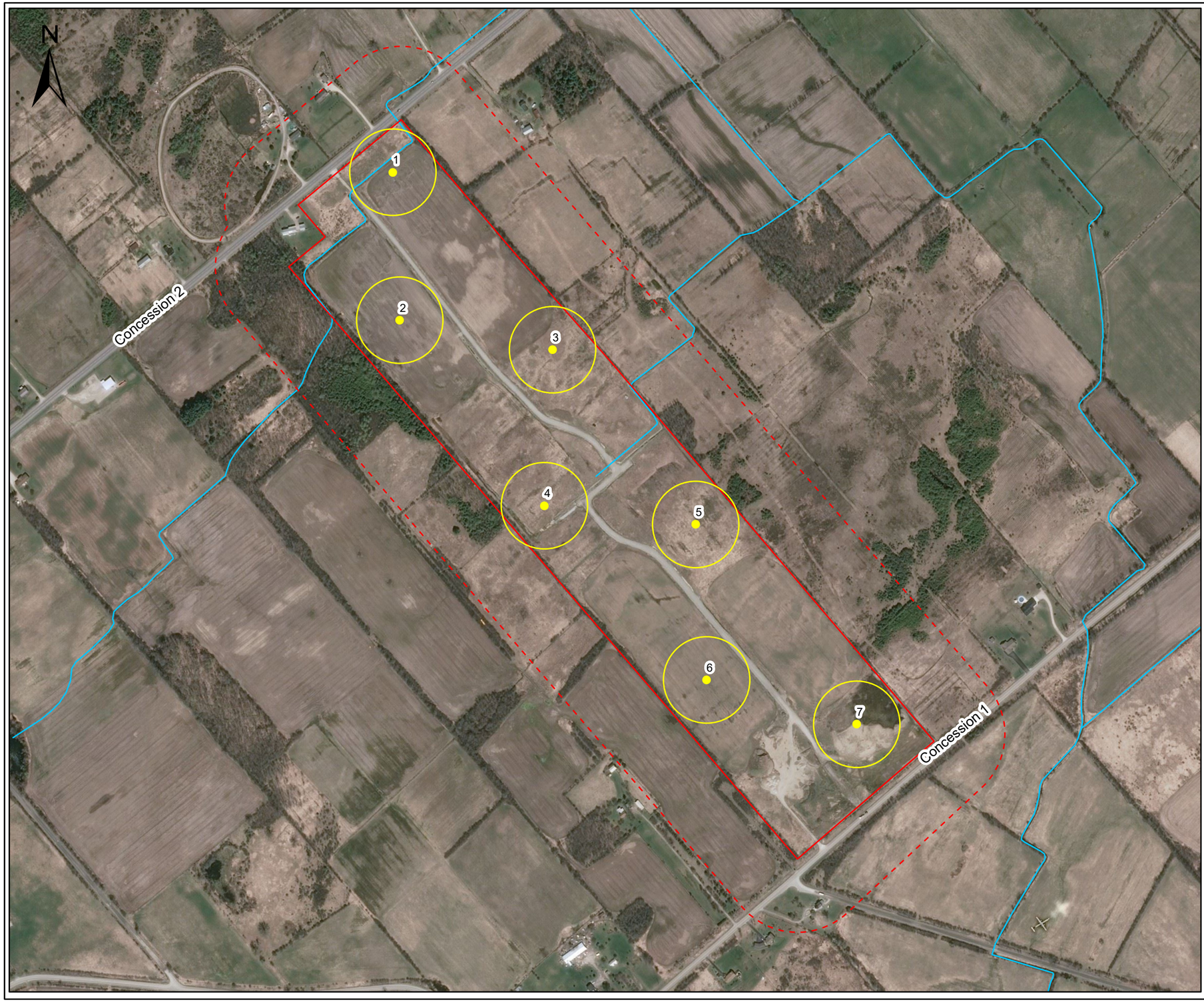
Location: Part of Lot 7, Concession 1
Township of Drummond
Perth, Ontario

Drwn By:	Chkd By:	
JD	DP	Site Location

Date: October 2023

Rev. 0

Figure A.1



Legend

- Property Boundary
- Study Area
- Watercourse
- Breeding Bird Survey (100 m)

Scale
1:6,500
0 45 90 180 270 360 Meters

GEMTEC
Consulting Engineers and Scientists
32 Steacie Drive,
Ottawa, ON K2K 2A9
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ottawa@gemtec.ca

Client: Crains' Construction Ltd.

Project: 100227.008

Location: Part of Lot 7, Concession 1
Township of Drummond
Perth, Ontario

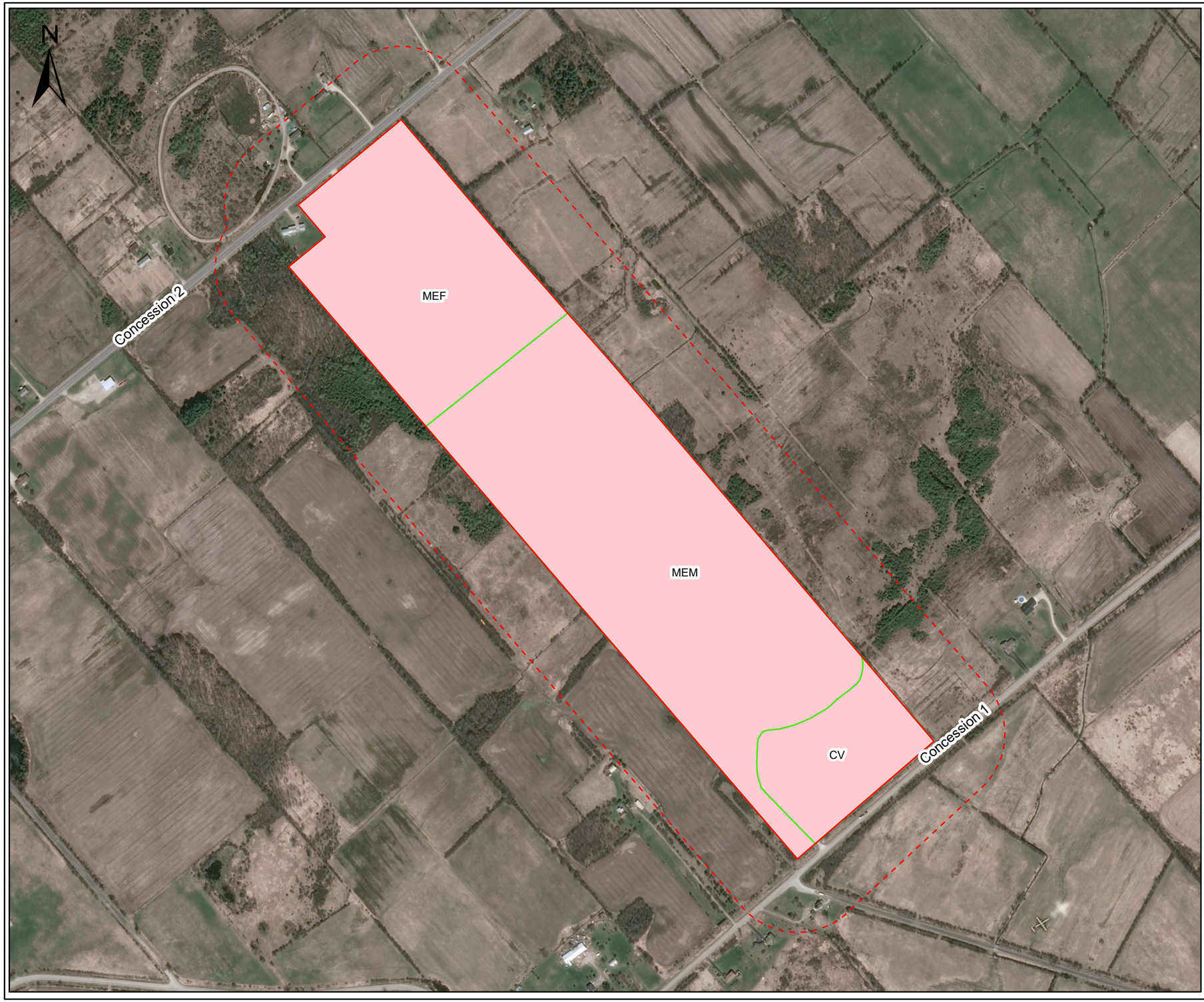
Drwn By: JD | Chkd By: DP

Site Layout

Date: October 2023

Rev. 0

Figure A.2



Legend

- Property Boundary
- Study Area
- Vegetation Community

MEF: Forb Meadow
MEM: Mixed Meadow
CV: Staging Area/ Construction

Scale
1:6,500
0 45 90 180 270 360 Meters

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Perth, Ontario

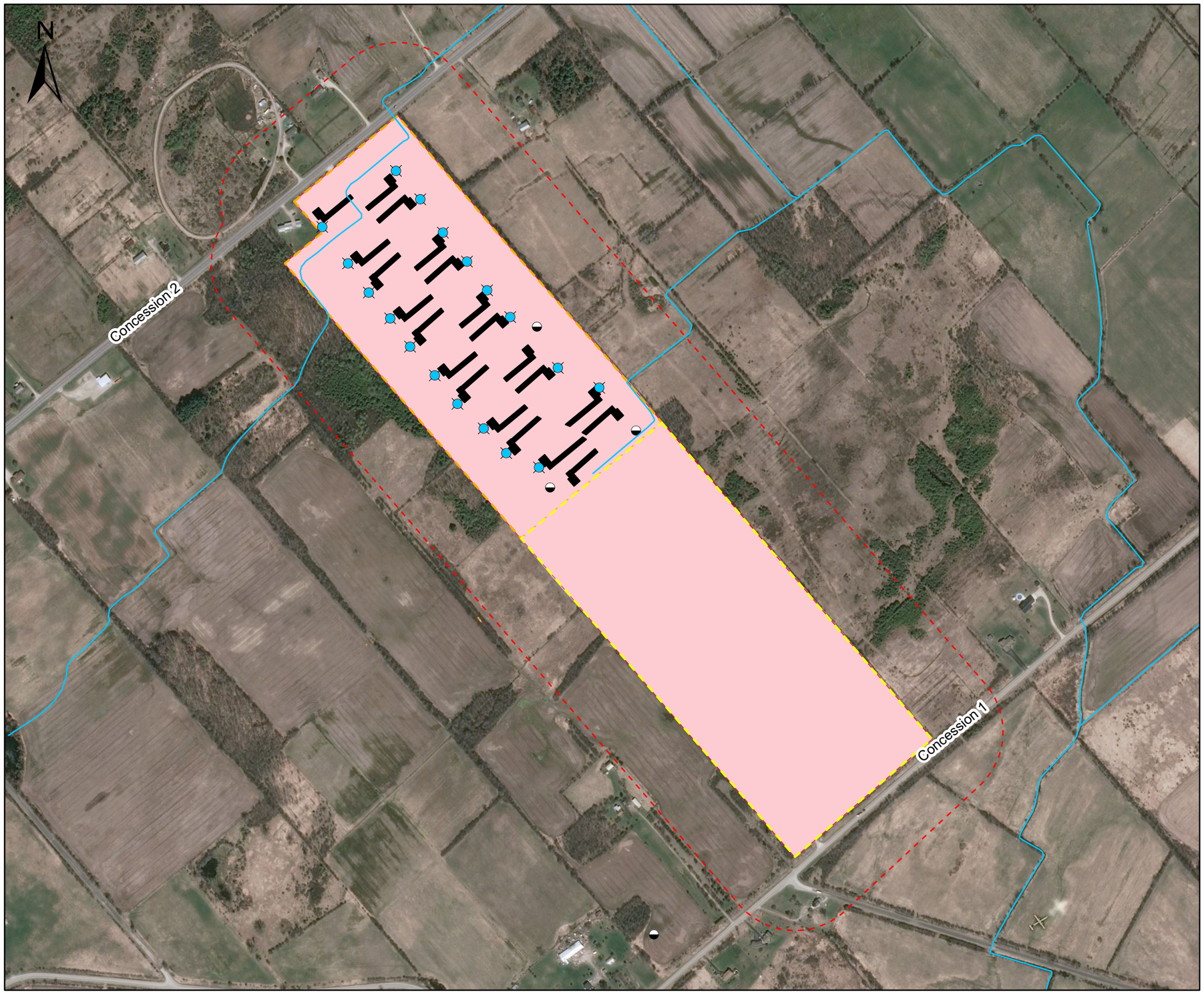
Drwn By: JD
Chkd By: DP

Vegetation Communities

Date: October 2023

Rev. 0

Figure A.3



Legend

- Property Boundary
- Study Area
- Proposed Phase 1
- Proposed Phase 2
- Conceptual Dwelling Footprint
- Proposed Lot Boundaries
- Conceptual Septic System Location
- Proposed Private Well Location
- Existing Private Well Location
- Watercourse

Scale

1:6,500

0 45 90 180 270 360 Meters

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Project: 100227.008

Location: Part of Lot 7, Concession 1
Township of Drummond
Perth, Ontario

Drwn By: JD

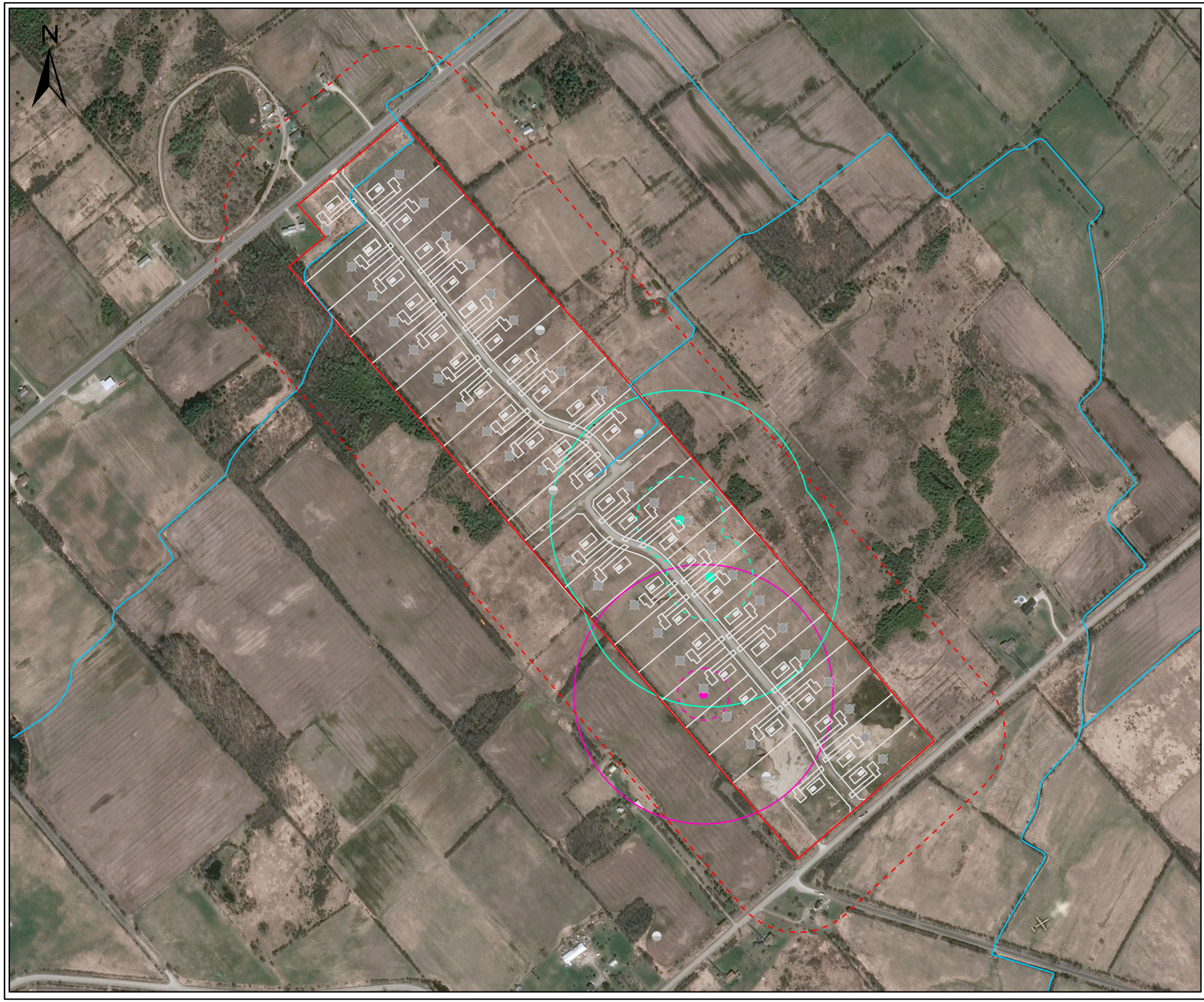
Chkd By: DP

Proposed Development Plan

Date: October 2023

Rev. 0

Figure A.4



Legend

- Study Area
- Property Boundary
- Watercourse
- Proposed Development
- Proposed Private Well Location
- Existing Private Well Location
- Bobolink Observation
- Bobolink Category 1 Habitat (10 m radius)
- Bobolink Category 2 Habitat (60 m radius)
- Bobolink Category 3 Habitat (300 m radius)
- Eastern Meadowlark Observation
- Eastern Meadowlark Category 1 Habitat (10 m radius)
- Eastern Meadowlark Category 2 Habitat (100 m radius)
- Eastern Meadowlark Category 3 Habitat (300 m radius)

Scale
1:6,500
0 45 90 180 270 360 Meters

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Perth, Ontario

Drwn By: JD | Chkd By: DP

Natural Heritage Features

Date: October 2023

Rev. 0

Figure A.5

APPENDIX B

Site Photographs

Site Photograph 1 – Example of disturbed Forb Meadow (MEF)

Site Photograph 2 – Example of grass dominated, Mixed Meadow (MEM)

Site Photograph 3 – Example of Staging Area/Construction (CV).

Site Photograph 4 – Example of on-site drain, adjacent to on-site roadway.

GEMTEC Consulting Engineers and Scientists	Project Environmental Impact Statement Burns Farm Residential Development Part of Lot 7, Concession 1, Lanark County Ontario	**ATTACHEMNT B** File No. 100227.008	**Site Photographs**

APPENDIX C

Report Summary Tables

TABLE C.1
SUMMARY OF WILDLIFE OBSERVED ON-SITE AND ADJACENT TO SITE

Common Name	Scientific Name	S-Rank	Evidence
Avian Species			
American crow	*Corvus brachyrhynchos*	S5B	Heard calling
American goldfinch	*Spinus tristis*	S5B	Heard calling
American robin	*Turdus migratorius*	S5B	Heard calling, observed foraging
Belted kingfisher	*Magaceryle alcyon*	S4B	Heard calling
Black-capped chickadee	*Poecile atricapillus*	S5	Heard calling, observed
Black-and-white Warbler	*Mniotilta varia*	S5B	Heard calling
Blue jay	*Cyanocitta cristata*	S5	Heard calling
* Bobolink	*Dolichonyx oryzivorus*	S4B	Heard calling, observed on-site
Canada goose	*Branta canadensis*	S5	Heard calling
Common grackle	*Quiscalus quiscala*	S5B	Heard calling
Common yellowthroat	*Geothlypis trichas*	S5B	Heard calling
* Eastern meadowlark	*Sturnella magna*	S4B	Heard calling, observed on-site
Eastern phoebe	*Sayornis phoebe*	S5B	Heard calling
* Eastern wood-pewee	*Contopus virens*	S4B	Heard calling
Field sparrow	*Spizella pusilla*	S4B	Heard calling, observed on-site
Hairy woodpecker	*Picoides villosus*	S5	Heard calling
House wren	*Troglodytes aedon*	S5B	Heard calling
Kildeer	*Charadrius vociferus*	S5B, S5N	Heard calling, observed foraging
Mourning dove	*Senaida macroura*	S5	Heard calling
Northern harrier	*Circus hudsonius*	S4B	Observed foraging on-site
Northern mockingbird	*Mimus polyglottos*	S4	Heard calling
Red-eyed Vireo	*Vireo olivaceus*	S5B	Heard calling
Red-tailed hawk	*Buteo jamaicensis*	S5	Heard calling, observed active nest
Red-winged blackbird	*Agelaius phoeniceus*	S4B	Heard calling
Savannah sparrow	*Passerculus sandwichensis*	S4B	Heard calling
Song sparrow	*Melospiza melodia*	S5B	Heard calling
Turkey vulture	*Cathartes aura*	S5B	Observed flying overhead
Wild turkey	*Meleagris gallopavo*	S5	Observed on-site
Yellow warbler	*Setophaga petechia*	S5B	Heard calling
Yellow-bellied sapsucker	*Sphyrapicus varius*	S5B	Heard calling and drumming
Mammalian Species			
Deer	*Odocoileus virginianus*	S5	Observed on-site, tracks
Porcupine	*Erethizon dorsatum*	S5	Observed on-site

Notes:
* Denotes a Species at Risk
Subnational Conservation Status Ranks:
S1 - Critically Imperilled, at very high risk of extirpation, very few populations or occurrences or very steep population decline
S2 - Imperiled, at high risk of extirpation, few populations or occurrences or steep population decline
S3 - Vulnerable, at moderate risk of extirpation, relatively few populations or occurrences, recent and widespread population decline
S4 - Apparently Secure, at a family low risk of extirpation, many populations or occurrences, some concern for local population decline
S5 - Secure, at very low or no risk of extirpation, abundant populations or occurrences, little to no concern for population decline
Qualifiers:
S#B - Conservation status refers to the breeding population of the species
S#N -Conservation status refers to the non-breeding population of the species
S#M - Migrant species, conservation status refers to the aggregating transient population of the species

TABLE C.2
SCREENING RATIONALE FOR SIGNIFICANT WOODLANDS

Woodland Criteria	Further Considered in EIS	Rationale
Woodland Size	No	Contiguous woodlands are not located on-site.
Ecological Functions		
a) Woodland Interior	No	Contiguous woodlands are not located on-site.
b) Proximity	No	Contiguous woodlands are not located on-site.
c) Linkages	No	Contiguous woodlands are not located on-site.
d) Water Protection	No	Contiguous woodlands are not located on-site.
e) Diversity	No	Contiguous woodlands are not located on-site.
Uncommon Characteristics	No	Contiguous woodlands are not located on-site.
Economical and Social Functional Values	No	Contiguous woodlands are not located on-site.

TABLE C.3
SCREENING RATIONALE FOR HABITATS OF SEASONAL CONCENTRATION AREAS

Wildlife Habitat	Further Considered in EIS	Rationale
Winter Deer Yard	No	Suitable woodland habitat is not present on-site. As outlined in the the Signficant Wildlife Habitat Criteria Schedules (OMNRF, 2015) winter deer yards and deer managment are an MNRF responsibility. Based on review of publically available data from the OMNRF on Land Information Ontario Geo-hub, no Stratum I deer yards, Stratum II deer yards, or winter congregation areas have been identified on-site or within the broader study area. The closest deer yard to site is a patch of Stratum I deer yard located approximately 20 km to the west.
Colonial Bird Nesting Habitat	No	No suitable habitat located on-site or within the study area to support colonial bird nesting.
Waterfowl Stopover and Staging Areas	No	No suitable wetland or terrestrial habitat on-site to provide waterfowl stopover and staging areas.
Shorebird Migratory Stopover Area	No	Shorebird stopover sites are typically well-known and have a long history of use. The site does not contain suitable shoreline habitat for shorebird foraging.
Raptor Wintering Area	No	Suitable combination of habitat to support species not present on-site.
Bat Hibernacula	No	Cave and crevice habitat is not present on-site or within the study area.
Bat Maternity Colonies	No	Woodlands on-site do not meet minimum snag density (>10 snags/hectare) requirement to be considered SWH for bat maternity colonies.
Turtle Wintering Area	No	No suitable wetlands are present on-site to support turtle wintering areas.
Reptile Hibernaculum	No	No structures such as large rock piles, bedrock outcrops, cervices or other karstic features have been identified on-site.
Migratory Butterfly Stopover Area	No	The site is not located within 5 km of Lake Ontario and therefore does not meet the defining criteria.
Landbird Migratory Stopver Area	No	The site is not located within 5 km of Lake Ontario and therefore does not meet the defining criteria.

TABLE C.4
SCREENING RATIONALE FOR SPECIALIZED WILDLIFE HABITATS

Specialized Wildlife Habitat	Further Considered in EIS	Rationale
Waterfowl Nesting Area	No	No wetland habitat is present adjacent to the uplands ecosites on-site.
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	No	The site is located >120 m from any habitat which could support foraging bald eagles or osprey. Nesting sites for these species are uncommon in Ecoregion 6E (MNRF, 2012).
Woodland Nesting Raptor Habitat	No	Nesting may occur in any ecosite and species preference is towards mature forest stands >30 ha with >10 ha of interior habitat with a 200 m buffer. Contiguous forest stands >30 ha are not present on-site.
Turtle Nesting Habitat	No	No suitable habitat (exposed mineral soil with minimal vegetation conver) is present within 100 m of the wetlands on-site.
Seeps and Springs	No	No seeps and springs were identified on-site.
Woodland Amphibian Breeding Habitat	No	No suitable wetland and pond habitat within or adjacent to a woodland occurs on-site to support woodland amphibian breeding habitat.
Wetland Amphibian Breeding Habitat	No	No suitable wetland occurs on-site to support wetland amphibian breeding habitat.
Woodland Area-Sensitive Bird Breeding Habitat	No	Woodland area-senstive birds require interior forest habitat located >200 m from the forest edge in large (>30 ha) forest stands. Suitable woodlands are not found within the study area.

TABLE C.5
SCREENING RATIONALE FOR HABITAT FOR SPECIES OF CONSERVATION CONCERN

General Habitats of Species of Conservation Concern	Further Considered in EIS	Rationale
Marsh Breeding Bird Habitat	No	No suitable marsh habitat present on-site to support marsh breeding bird habitat.
Open Country Breeding Bird Habitat	No	No suitable meadow habitat on-site to support open country bird breeding due to recent (< 5 years) agricultural disturbances.
Shrub/Early Successional Breeding Bird Habitat	No	Candidate early successional breeding bird habitat typically includes fallow fields transitioning to early successional forest habitats that are > 10 ha but have not been actively used for farming. Suitable habitat is not found on-site.
Terrestrial Crayfish Habitat	No	Terrestrial crayfish are only found within southwestern Ontario (MNRF, 2012).
Special Concern and Rare Wildlife Species	Yes	The following species of special concern were identified on-site during the site investigation: eastern wood-pewee.

TABLE C.6
SCREENING RATIONALE FOR ANIMAL MOVEMENT CORRIDORS

General Habitats of Species of Conservation Concern	Further Considered in EIS	Rationale
Amphibian Movement Corridor	No	No *confirmed* wetland amphibian breeding habitat has been identified on-site.
Deer Movement Corridor	No	No winter deer yards have been identified on-site by the OMNRF.

TABLE C.7
SCREENING RATIONALE FOR POTENTIAL SPECIES AT RISK ON-SITE OR WITHIN STUDY AREA

Species	ESA Status	Habitat Use	Probability of Occurrence On-Site or Within Study Area	Rationale
Avian				
Bald Eagle	Special Concern	Nest in mature forests near open water.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Bank Swallow	Threatened	Colonial nester, burrows in eroding silt, to sand banks, sand pit walls, etc.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Barn Swallow	Special Concern	Nests in barns and other semi-open structures. Forages over open fields and meadows.	Low	Suitable habitat may be found in study area. Species not observed during field studies. No historical records for species.
Black Tern	Special Concern	Breeds in loose colonies in shallow marshes, particularly cattails.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Bobolink	Threatened	Nests in dense tall grass fields and meadows, low tolerance for woody vegetation.	High	Suitable grassland habitat available on-site and within the study area. NHIC indicates species has been observed within 1 km of the site. Species was observed on-site during field investigations.
Canada Warbler	Special Concern	Prefers wet forests with dense shrub layers	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Cerulean Warbler	Threatened	Prefers mature deciduous forest habitat.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Chimney Swift	Threatened	Nests in traditional-style open brick chimneys.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Common Nighthawk	Special Concern	Nests in a variety of open sites: beaches, fields and gravel rooftops.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Eastern Meadowlark	Threatened	Nests and forages in dense tall grass fields and meadows, higher tolerance to woody vegetation.	High	Suitable grassland habitat available on-site and within the study area. NHIC indicates species has been observed within 1 km of the site. Species was observed on-site during field investigations.
Eastern Whip-poor-will	Threatened	Nests on the ground in open deciduous or mixed woodlands with little underbrush, and bedrock outcrops.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Eastern Wood-Pewee	Special Concern	Woodland species, often found near clearings and edge habitat.	High	Suitable habitat to support species limited to forested areas adjacent to site in study area. Species was observed on-site during field investigations.
Evening Grosbeak	Special Concern	Nests in trees or large shrubs, preference to large coniferous forests, will use deciduous. Overwinters in Ottawa.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Golden Eagle	Endangered	Nests on remote, bedrock cliffs, overlooking large burns, lakes or tundras	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Golden-winged Warbler	Special Concern	Ground nesting, edge species. Breeds in successional scrub habitats surrounded by forests.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Grasshopper Sparrow	Special Concern	Ground-nesting grassland species. Prefers fields with low sparse vegetation on sand, alvars or poor soils.	Low	Suitable habitat may be present in study area. Species not observed. No historical records for species.
Henslow's Sparrow	Endangered	Prefers open, moist, tallgrass fields.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Least Bittern	Threatened	Prefers marshes, shrub swamps, usually near cattails	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Loggerhead Shrike	Endangered	Prefers grazed pastures with short grass and scattered shrubs, especially hawthorn.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Olive-sided Flycatcher	Special Concern	Forest edge species, forages in open areas from high vantage points in trees.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Peregrine Falcon	Special Concern	Nests on cliffs near water and on more anthropogenic structures such as tall buildings, bridges, and smokestacks.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Red-headed Woodpecker	Endangered	Prefers open deciduous woodlands, particularly those dominated by oak and beech.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Rusty Blackbird	Special Concern	Wet wooded or shrubby areas (nests at edges of Boreal wetlands)	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Short-eared Owl	Threatened	Ground nester, prefers open habitats, fields and marshes.	Low	Suitable field habitat may be present on-site or within the study area. Species not observed on-site. No historical occurrence records for species on-site or within the study area.
Wood Thrush	Special Concern	Prefers deciduous or mixed woodlands.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Mammalian				

TABLE C.7
SCREENING RATIONALE FOR POTENTIAL SPECIES AT RISK ON-SITE OR WITHIN STUDY AREA

Eastern small-footed Myotis	Endangered	Roosts in rock crevices, barns and sheds. Overwinters in abandoned mines. Summer habitats are poorly understood in Ontario, elsewhere prefers to roost in open, sunny rocky habitat and occasionally in buildings (Humphrey, 2017).	Moderate	Potentially suitable anthropogenic structures on-site and adjacent to site. Available habitat on-site may meet bat maternity colony requirements and provide foraging and non-maternal roost habitat.
Little Brown Myotis	Endangered	Maternal colonies known to use buildings, may also roost in trees during summer. Affinity towards anthropogenic structures for summer roosting habitat and exhibit high site fidelity (Environment Canada, 2015).	Moderate	Potentially suitable anthropogenic structures on-site and adjacent to site. Available habitat on-site may meet bat maternity colony requirements and provide foraging and non-maternal roost habitat.
Northern myotis (Northern Long-eared Bat)	Endangered	Occurs throughout eastern North America in associated with Boreal forests. Roosts mainly in trees, occasionally anthropogenic structures during summer (Environment Canada, 2015). Overwinters in caves and abandoned mines.	Low	Species affinity is for Boreal forests and rarely roosts in anthropogenic structures.
Tri-colored Bat	Endangered	Roosts in trees, rock crevices and occasionally buildings during summer. Overwinters in caves and mines.	Moderate	Potentially suitable anthropogenic structures on-site and adjacent to site. Available habitat on-site may meet bat maternity colony requirements and provide foraging and non-maternal roost habitat.
Reptilian				
Blanding's Turtle	Threatened	Inhabits quiet lakes, streams and wetlands with abundant emergent vegetation. Frequently occurs in adjacent upland forests.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Eastern Musk Turtle	Special Concern	Wetlands. Highly aquatic habtiats.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Eastern Ribbonsnake	Special Concern	Marshy edfes of wetlands and watercourses.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Northern Map Turtle	Special Concern	Highly aquatic species, found only in lakes and large rivers.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Snapping Turtle	Special Concern	Highly aquatic species, found in a wide variety of wetlands, water bodies and watercourses.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Spotted Turtle	Endangered	Secretive wetland species.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Wood Turtle	Endangered	Primarily terrestrial forest species. Associated with clear, gravelly streams.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Plants				
American Ginseng	Endangered	Rich, moist, relatively mature deciduous forests.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Black Ash	Endangered	Predominantly a wetland species, found in swamps, floodplains and fens.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Butternut	Endangered	Inhabits a wide range of habitats including upland and lowland deciduous and mixed forests.	Low	Potentially suitable areas in a regenerative state on-site. Species was not observed on-site during the site investigation. No occurrence record for species on-site or within broader study area.
Lichens				
Pale-bellied Frost Lichen	Endangered	Grows on the bark of hardwood trees such as white ash, black walnut, American elm and ironwood. Can also be found growing on fence posts and boulders.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Fish				
American Eel	Endangered	Primarily nocturnal, hiding in soft substrate or submerged vegetation during the day.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Bridle Shiner	Special Concern	Prefers clear water with abundant vegetation over silty or sandy vegetation	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Channel Darter	Special Concern	Prefers clear water with abundant vegetation over silty or sandy vegetation	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Lake Sturgeon	Endangered	Large lakes and rivers. Forages in cool water, 4-9m deep over soft substrates. Spawns in shallower, fast-flowing areas over rocks or gravel.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Northern Brook Lamprey	Special Concern	Prefers shallow areas with warm water. Larvae burrows in soft substrate for up to 7 years.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
River Redhorse	Special Concern	Prefers fast-flowing, clear rivers over rocky substrate	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.

TABLE C.7
SCREENING RATIONALE FOR POTENTIAL SPECIES AT RISK ON-SITE OR WITHIN STUDY AREA

Silver Lamprey	Special Concern	Larvae live 4-7 years in burrows, preference to soft substrate.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Insects				
American Bumble Bee	Special Concern	Habitat generalist; mixed woodlands, variety of open habitat	Moderate	Potentially suitable foraging habitat may be available on-site. Species not observed. No historical records for species.
Bogbean Buckmoth	Endangered	Preferred food plant is bog bean, present in a variety of wetlands including bogs, swamps and fens.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Gypsy Cuckoo Bumble Bee	Endangered	Inhabits a wide range of habitats: open meadows, agricultural and urban areas, boreal forests and woodlands.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Monarch Butterfly	Special Concern	Caterpillars require milkweed plants confined to meadow and open areas. Adult butterflies use more diverse habitat with a variety of wildflowers	Moderate	Potentially suitable foraging habitat may be available on-site. Species not observed. No historical records for species.
Mottled Duskywing	Endangered	Larval food plant (New Jersey Tea) found in sandy areas and alvars.	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Nine-spotted Lady Beetle	Endangered	Habitat generalist	Low	No recent occurrence reports in the area, thought to be locally extirpated.
Rusty-patched Bumble Bee	Endangered	Habitat generalist	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
Traverse Lady Beetle	Endangered	Habitat generalist	Low	Suitable habitat not present in study area. Species not observed. No historical records for species.
West Virginia White Butterfly	Special Concern	Requires mature moist deciduous woods with larval host plant toothwort.	Low	Necessary vegetation and toothwort plant are not present on-site or within study area.
Yellow-banded Bumble Bee	Special Concern	Habitat generalist; mixed woodlands, variety of open habitat	Moderate	Potentially suitable foraging habitat may be available on-site. Species not observed. No historical records for species.

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civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité

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Consolidated Hydrogeological Investigation & Terrain Analysis Proposed Residential Subdivision Part of Lot 6 and Lot 7 Concession 1

Drummond Township, Ontario

GEMTEC
www.gemtec.ca

Submitted to:

Wilburt Crain
1800 Maberly Elphin Road
Maberly, Ontario
K0H 2B0

Consolidated Hydrogeological Investigation & Terrain Analysis Proposed Residential Subdivision Part of Lot 6 and Lot 7 Concession 1

Drummond Township, Ontario

October 5, 2023
Project: 100227.008

experience • knowledge • integrity

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Wilburt Crain to conduct a hydrogeological investigation and terrain evaluation at the site of a proposed residential subdivision on the Burns Farm, located in the Township of Drummond / North Elmsley, Ontario, and herein referred to as the 'Site'.

The Site is a rectangular shaped lot consisting of approximately 39.3 hectares (97 acres) of rural zoned land (RU Zoning), located approximately 2.5 kilometres east of the Town of Perth. The Site is located between Drummond Concession 2 to the north and Drummond Concession 1 to the south. The extent of the Site is illustrated on Figure 1 in Appendix A.

A total of 42 residential lots are being proposed, with lot sizes ranging from 0.80 to 2.03 hectares, with an average lot size of 0.84 hectares.

1.1 Project Timeline

This consolidated hydrogeological investigation report serves to compile several previous hydrogeological investigation reports for the proposed Burns Farm Subdivision and residential severances / lot addition on the adjacent property parcel (refer to Figure 1 for severance locations). A brief summary of the project timeline and peer-review comment responses are provided in Appendix B.

Table 1.1 – Report Submission and Peer-Review Summary

Date	Application	Document	Key Comments / Notes
Aug 11, 2021(1)	Subdivision	Technical Review Memorandum, Claire Milloy to Phil Mosher – Hydrogeological Assessment / Terms of Reference, GEMTEC, June 30, 2021	Initial concerns identified: • Existing and potential nitrate impacts ("the potential for nitrate impacts should be further investigated…"). • Potential pathogenic impacts (chlorine residual in samples) • Concerns about development on advanced septic systems – need HU input. • Need multiple lines of evidence to show site is not hydrogeologically sensitive (include groundwater gradients (recharging or discharging),

Date	Application	Document	Key Comments / Notes
			existing chemistry (indicators of impacts), groundwater temperature and chemistry changes following groundwater recharge events etc.). • Nitrate dilution calculations are not applicable. • Clay seals may be a best practice but they are not to be used to justify new development in vulnerable/ sensitive terrain. • Clay seals may be a best practice but they are not to be used to justify new development in vulnerable/ sensitive terrain.
Jan 19, 2022(1)	Subdivision	Technical Review Memorandum, Jennifer Gorrell to Phil Mosher - Hydrogeological Investigation & Terrain Analysis, Proposed Residential Subdivision, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario, GEMTEC, 2021-10-28	• Same and comparable concerns previously expressed. • Data presented to support previous argument of agricultural impact was insufficient. Result was finding that water quality at the Fellingers Mills subdivision had deteriorated since the original test well chemistry, adding support to the concern about hydrogeological sensitivity/development impacts.
Feb 8, 2022(1)	Severances	Technical Review Memorandum, J. Gorrell to Phil Mosher Re: Proposed Drummond	• No issue with lot addition, but impact of third residential lot also needs to be considered.

Date	Application	Document	Key Comments / Notes
		Concession 1 Residential Severances, Scoped Hydrogeological Evaluation, Part Lot 7, Concession 1, Township of Drummond, Ontario, GEMTEC, 2022-01-04	
Jun 24, 2022(1)	Severances	RE: Potential process for finalizing Crain/Kenny severance applications; e-mail with attachments (listed below) to Phil Mosher, GEMTEC, 2022-06-09	• Issues partially resolved • Feedback on additional information • Nitrate concentrations above background are present to at least 30 metres • No further wells should be drilled with the 60' casing
Aug 18, 2022(1)	Severances	Re: Proposed Drummond Concession 1 Residential Severances Scoped Hydrogeological Evaluation Part Lot 7, Concession 1 Township of Drummond, Ontario	• No comment
Dec 12, 2022(1)	Severances	Re: Proposed Drummond Concession 1 Residential Severances, Scoped Hydrogeological Evaluation, Part Lot 7, Concession 1, Township of Drummond, Ontario, GEMTEC, 2022-12-09	• Between August and Dec, there were communications between RVCA and GEMTEC to try and optimize use of time and resources. Focus was on analysing the available data to try and find a well construction method that would assure that the test wells would not continue to provide pathways for downward migration. Area well records were plotted

Date	Application	Document	Key Comments / Notes
			according to approximate elevation. • Wells cased and grouted to 36.6 m seem to produce water without nitrate contamination. The water quality also met the ODWS or limits considered reasonably treatable by D-5-5. Mn is very high, and it is recommended a warning about the potential impacts identified by Health Canada be considered. • 10 test wells were constructed and discussion was related to results from all wells. The review considered the data from the well that was constructed to the recommended design. • Test wells that don't meet the recommended design should be abandoned, except for the wells on private property that are in service. Test wells on private property that are not being used should also be abandoned. • **Severances approved**
Apr 19, 2023	Subdivision	Re: Hydrogeological Investigation Work Program, Proposed Residential Subdivision – Burns Farm, Part of Lot 6 and Lot 7, Concession 1,	• Work program submitted to newly assigned peer-reviewer Bluemetric Inc.

Date	Application	Document	Key Comments / Notes
		Perth, Ontario, GEMTEC, 2023-04-19	
Jul 11, 2023	Subdivision	Re: Consolidated Hydrogeological Investigation & Terrain Analysis, Proposed Residential Subdivision Phase 1, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario, GEMTEC, 2023-07-11	• GEMTEC report submission.
Aug 8, 2023	Subdivision	Re: Technical Review Memorandum, Burns Farm Subdivision (1660 Drummond Concession 2, Proposed 30 Lot Subdivision, Hydrogeology Assessment by GEMTEC dated July 11, 2023. Peer-review completed by BluMetric Environmental, Russell Chown, P.Geo. and Robert Hillier, P.Geo.	• Provided in Appendix B.
Sep 29, 2023	Subdivision	Re: Response to Peer Review Comments, Proposed Residential Subdivision Phase 1, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario, GEMTEC, 2023-09-23.	• Response to peer-review comments addressed by GEMTEC, provided in Appendix B.

Date	Application	Document	Key Comments / Notes
Sep 29, 2023	Subdivision (Phase 1 and 2)	Current Submission	• Hydrogeological Investigation and Terrain Analysis Report submitted to support 42-lot subdivision (previous submissions were for 30-lot 'Phase 1' of Burns Farm).

Notes: 1. August 11, 2021 to December 12, 2022 summary provided by Jennifer Gorrell of GRI Inc., summary memo provided in Appendix B.

1.2 Objectives of Investigation and Reporting

The objectives of this investigation are as follows:

- To consolidate current and previous hydrogeological investigation results from investigations completed on-site and on adjacent lands;
- To review available background information to assist in characterization of subsurface conditions in the vicinity of the Site and develop a hydrogeological conceptual model;
- To identify and characterize the shallow subsurface conditions on the site as they relate to the design of septic sewage disposal systems under the Ontario Building Code (OBC);
- To assess the potential for impact on the receiving aquifer(s) and any nearby surface water features from on-site septic disposal systems;
- To investigate the potential quantity and quality of groundwater available from drilled test wells on the site for potential domestic supply; and,
- To assess the long-term impacts on groundwater supply from existing developments on drilled water supply wells in the vicinity of the Site.

Following a review of available background information and analysis of the results of the field investigation, conclusions and recommendations for the proposed residential development of the site are provided.

2.0 REVIEW OF BACKGROUND INFORMATION

2.1 Land Uses in the Study Area

Much of the Site is currently vacant undeveloped land which was previously used for agricultural activities. The former agricultural activities included rotating crops such as soybean, oats, and barley prior to 2019.

Specific land uses within the study area near the site boundaries are documented in Table 2.1.

Figure 2 in Appendix A presents the known land uses in the vicinity of the Site. In summary, this consists primarily of a combination of vacant undeveloped agricultural land use areas and forested areas, and residential properties on private services. Lands south of the Site have had earth fill removed for the construction of the existing Site temporary roads. There are currently 11 dwellings located within 500 metres of the proposed development. Based on historical air photo review, there also appears to be a stable and circular path around the property to the north across Drummond Concession 2 Road. Based on information provided by the property owner (via the client), there are only three horses that are kept on the property. The Site and the majority of surrounding lands are zoned rural, with one highway commercial and one industrial rural property within 500 metres of the Site and a mobile home development and aggregate pit zoned lands within one kilometre of the Site (refer to Figure 3).

Potential impacts to groundwater quality from adjacent lands within 500 metres of the Site boundary are limited to those associated with local wetlands, residential septic systems, equestrian properties, commercial/industrial properties (landscaping company) and both past and present agricultural land use.

No large-scale water takings capable of causing adverse impacts to groundwater quantity were identified within 500 metres of the site boundary (https://www.ontario.ca/page/map-permits-take-water; accessed June 21, 2023).

Table 2.1 – Summary of Land Uses in Study Area

Site Boundary	Existing Land Use
North	• Residential properties, vacant/agricultural lands, equestrian (3 horses), and wetlands
East	• Residential properties and vacant/agricultural lands
South	• Residential properties and vacant/agricultural lands
West	• Residential properties and vacant/agricultural lands, provincially significant wetland (Perth Long Swamp)

2.2 Topography and Hydrology

Overall, the Site is relatively flat with a regional slope to the southeast. According to topographic maps, the ground surface elevations across the site range from about 136 to 140 metres above sea level (refer to Figure 1 in Appendix A). The maps indicate a topographic divide located approximately 800 metres west of the Site where the slope is to the southwest towards the Tay River, consistent with subwatershed mapping.

The Site is located within the Tay River – Port Emsley catchment system. Based on RVCA watershed report (2017), the Site drains towards the north-east, influenced by the local topography, eventually reaching the local agricultural drainage network where it flows south towards the Tay River. The nearest Provincially Significant Wetland is present approximately 600 metres northwest of the proposed development and is within the Tay River – Perth watershed. Based on local topography and drainage networks (RVCA, 2017), drainage from the site ultimately flows south towards the Tay River and is not expected to flow towards Provincially Significant Wetlands (refer to Figure 4).

2.3 Regional Surficial and Bedrock Geology

Surficial geology maps (Ontario Geologic Survey, 2010) of the area indicate that the Site is underlain by shallow and discontinuous deposits of fine textured glaciolacustrine soils consisting of silt and clay with minor sand and gravel overlying bedrock at depths ranging between about 0 to 2 metres.

Bedrock geology maps (Armstrong and Dodge, 2007) indicate that the bedrock at this site consists of Paleozoic age Beekmantown Group sandstone, dolomitic sandstone and dolostone of the March Formation. The March Formation is underlain by sandstone of the Nepean Formation. Based on our previous subsurface investigations and bedrock outcrops observed at the Site, dolostone bedrock is horizontally bedded in this region. Available karst mapping (Brunton and Dodge, 2008) does not indicate the presence of any inferred or potential karstic features within 500 metres of the Site.

The maps indicate the presence of a northeast-southwest trending fault, known as the Madawaska Fault, through the wetlands northwest of the Site. The regional geologic cross section prepared by MVRVCA (2011; Figure 2-5) indicates Nepean sandstone underlain by Precambrian granite is located west of the Madawaska fault and Oxford/March Formations dolostone and limestone, underlain by Nepean sandstone and Precambrian granite is located east of the fault.

Surficial and bedrock geology maps are provided on Figures 5 and 6 in Appendix A.

2.4 Environmental Considerations

Regional scale investigations have been carried out to assess groundwater vulnerability and impacts to the water supply aquifer. Groundwater characterization and vulnerability studies of the

March/Nepean Formation aquifer have been completed in the Mississippi-Rideau Source Protection Region (MRSPR), where communal groundwater wells supply the towns of Kemptville and Merrickville (MRSPR, 2011; Golder, 2003).

In review of Mississippi-Rideau Source Protection Region's Assessment Report (MRSPR, 2011), the relevant background information is provided (figure references presented below are from MRSPR, 2011):

- The site, along with the majority of the MRSPR is located within an area of highly vulnerable aquifer (Figure 5-1d);
- The primary water supply aquifer is a sandstone aquifer (Figure 3.5-3);
    - MRSPR (2007) mapping indicates the upper dolostone/limestone aquifer of the Oxford/March Formations are underlain by sandstone of the Nepean Formation, followed by Precambrian granite (Figure 3.4-6).
- The Site is not located within a significant recharge area (Figure 5-3c);
- The annual shallow groundwater elevations decrease to the southeast (Figure 3-12) and,
- The annual deep groundwater elevations decrease to the southeast, towards the St. Lawrence River (Figure 3-13).
- Nitrate concentrations in the vicinity of the Site are identified as <1.00 mg/L and 1.01 to 5.00 mg/L, with no concentrations greater than 10.00 mg/L identified within 35 kilometres of the Site (Figure 2-18).

As part of the Kemptville and Merrickville communal supply vulnerability investigations, isotope sampling was completed to characterize age of groundwater and estimate travel times (Golder, 2009). The groundwater residence times increased with depth, from 12 years (screened interval 6.0 to 10.1 metres below ground surface) to a maximum estimate age of 45 years (screened interval of 45.4 to 49.5 metres; Golder, 2009). The isotope results indicated that the groundwater supplying the Merrickville communal wells was well mixed, and groundwater was recharged at a distance (Golder, 2009). The resultant travel times for the deep aquifer range from 2 to 25 years (Figure 5-4 of MRSPR, 2011).

2.5 Ontario Ministry of Environment, Conservation and Parks Water Well Records

The Ministry of the Environment, Conservation and Parks (MECP) Water Well Records for existing private wells in the surrounding development were obtained to determine the characteristics of existing private wells on and in the vicinity of the Site (500 metres radius). The locations of the water well records are provided in Figure 7.

Table 2.2 provides a summary of the well characteristics for the 18 water well records for depth to water found, static water levels, depth to bedrock, depth into bedrock, and total well depth. The MECP Water Well Records are summarized in Appendix C.

Table 2.2 – Summary of Water Well Records Search Results

Parameter	10th Percentile	90th Percentile	Average
Depth Water Found[1] (m)	10.1	17.7	13.6
Static Water Level (m)	2.3	7.7	4.4
Depth to Bedrock (m)	0.2	1.8	1.2
Total Well Depth (m)	12.2	18.9	16.3
Well Yield / Recommended Pumping Rate (L/min)	49.2	75.7	68.8

Notes. 1. Depth water found as reported by well technician (refers to water bearing fractures encountered at the time of drilling).

A total of 18 well records were reviewed from the MECP online water well record mapping resource. All of the drinking water well records were for wells completed in bedrock. Based on the offsite MECP Water Well Records, the Site and adjacent lands are characterized by wells with an average overburden thickness of 1.0 metres and completed to an average depth of 16.3 metres. Groundwater was encountered at an average depth of 13.6 metres.

The sedimentary bedrock lithologies from the March Formation consist of interbedded grey quartz sandstone, dolomitic quartz sandstone, and blue-grey sandy dolostone and dolostone. Dolostones of the lower portions of the March Formation are described as light to medium brownish to greenish grey dolostone, making it difficult to distinguish using drill cuttings. These can frequently be identified in drilling records as 'limestone'. The transition between the March Formation and the underlying Nepean Formation can be transitional – the lower presenting as a sedimentary sandstone unit. Precambrian aged bedrock underlies the Nepean formation at greater depths.

2.6 Summary of Previous Hydrogeological Investigations

2.6.1 Houle Chevrier Engineering (2005)

In 2006 Houle Chevrier Engineering Ltd. (HCENG) completed a hydrogeological investigation and terrain analysis in support of a 49-lot residential development, referred to as the Fellinger Mills Residential Subdivision, located approximately 2.5 kilometres east of the Site. The findings of the investigation were provided in a report is titled "Hydrogeological Assessment and Terrain Evaluation, Proposed Subdivision, Part of Lot 12, Concession1, Township of Drummond/North Elmsley, County of Lanark, Ontario, File: 09-T-05010, 09-T-05011" and dated November 2, 2005.

A summary of the relevant conclusions and recommendations from the HCENG (2005) investigation are provided below:

- Proposed Development: 49-lot residential development on private services (individual well and septic), typical lot size of 0.6 hectares and total development area of 36.8 hectares.
- Aquifer Vulnerability: The Site is underlain by thin soil cover consisting of topsoil, silty sand, silty clay and glacial till ranging from 0.3 to 1.3 metres in thickness. The bedrock observed on-site was horizontally bedded and water bearing zones are likely not connected to the shallow fractured bedrock. Protective measures for water supply wells and septic systems were recommended.
- Test Well Construction: Five on-site test wells were advanced, with 10 metres of casing below ground surface and well depths ranging from 22.9 to 27.4 metres.
- Water Quality: The water quality of the proposed water supply aquifer (cased to a minimum depth of 10.0 metres) was considered to be suitable for consumption based on MOE health related criteria. Some treatment, such as conventional water softeners, may be necessary to reduce aesthetic issues.
- Water Quantity: Water quantity is sufficient for residential use and will sustain repeat pumping at the test rate of 25 to 50 litres per while causing minimal to negligible interference effects on neighbouring wells.
- Septic Impact: The septic impact assessment was completed in accordance with MECP Procedure D-5-4 nitrate dilution assessment. The calculated nitrate concentration at the property boundary was 7.6 mg/L.
- Septic System Recommendations: 150 millimetre thick silty clay seal between bedrock and imported septic sand.
- Construction Considerations: Bedrock excavation could be carried out using drill and blasting, hoe ramming or a combination of both.

2.6.2 McIntosh Perry (2015)

McIntosh Perry Consulting Engineers Ltd. (McIntosh Perry) conducted a hydrogeological investigation for Phase 1 of the proposed plan of subdivision in January 2015. A hydrogeological investigation report was not prepared, and available data files were provided to GEMTEC by Wilburt Crain.

Five test wells were constructed as part of the McIntosh Perry (2105) investigation. The wells were installed in sandstone to a depth ranging between 18 and 20 metres below ground surface. The reported overburden thickness at the well locations ranged between 0.3 and 2 metres.

Well yields from the five test well were in the order of 20 gallons per minute.

Groundwater quality sampling was conducted in all five test wells by McIntosh Perry on January 15, 2015. Groundwater quality met Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) for the most part except for hardness in all wells, iron, and turbidity in TW 2 and TW 3 and manganese in TW 3 only. All concentrations were within treatability limits. However, the presence of nitrate at concentrations ranging from 2.9 mg/L (TW 5) to 5.24 mg/L (TW 4) in the northern half of the subdivision were noted.

2.6.3 GEMTEC (2022)

GEMTEC completed a hydrogeological investigation and terrain analysis in support of three proposed severance lots adjacent to the Site (refer to severance Site Plan provided in Appendix B). GEMTEC prepared a report titled "Scoped Hydrogeological Evaluation – Consolidated Report, Proposed Residential Severances, Part Lot 7, Concession 1, B21/064, B21/065, B21/066, Perth, Ontario" and dated December 9, 2022 in support of the proposed severances. The three proposed severance lots were approved by the Township of Drummond/North Elmsley and reviewing agency (GRI Inc. on behalf of Rideau Valley Conservation Authority).

A summary of the relevant conclusions and recommendations from the GEMTEC (2022) investigation, which was completed in conjunction with the current investigation, are provided below:

- Proposed Development: Three severance lots of size 1.9 hectares, 2.5 hectares and 27.5 hectares, and one retained lot of size 2.3 hectares.
- Aquifer Vulnerability: The lots are located within a mapped highly vulnerable aquifer and detectable nitrate concentrations were encountered in all private wells tested, except for the newly constructed on-site test well with deep casing. The source of nitrate is attributed to multiple sources including; agricultural, residential septic systems, and geothermal systems with shallow casings/ poorly constructed wells on neighbouring properties.
- Test Well Construction: One newly constructed test well TW1710D (well tag #A361167) which has 36.6 metres of casing was completed to a depth of 42.7 metres.
- Water Quality: The water quality of the proposed water supply aquifer (TW1710D cased to a depth of 36.6 metres) meets the ODWQS health related and maximum acceptable concentrations for all parameters tested and is representative of long-term water quality from which future lot owners are likely to obtain from their wells.
- Water Quantity: Water quantity is sufficient for residential use and will sustain repeat pumping at the test rate and duration at 24-hour intervals over the long term.
- Septic Impact: The septic impact assessment was completed in accordance with MECP Procedure D-5-4 lot size considerations (all lots are greater than 1.0 hectares) and also

nitrate dilution assessment. The calculated nitrate concentration at the property boundary ranged from 2.59 to 3.34 mg/L.

2.7 Site Servicing Options Statement

2.7.1 Provincial Policy Statement

The Provincial Policy Statement (Ministry of Municipal Affairs and Housing, 2020) indicates that:

- Municipal sewage and water services are to be utilized where possible to support the protection of the environment and minimize potential risks to human health and safety;
- Private communal sewage and water services can be utilized where municipal services are not available and are the preferred solution for multi-unit lot developments; and
- Where communal services are not available, planned, or feasible, “individual on-site sewage and water services may be used if site conditions are suitable for the long-term provision of such services with no negative impacts”.

2.7.2 Official Plan for Township of Drummond / North Elmsley

The Official Plan for Township of Drummond / North Elmsley (DNE; Delcan Corporation, 2012) indicates that:

- All developments within the DNE (2012) had taken place on individual water and sewage services and will generally continue to do so where the conditions are suitable;
- All subdivision and site plans applying individual private services must include reporting on servicing options and a hydrogeological and terrain analysis study;
- Attachment to municipal services would be considered where it consists of an extension of existing municipal infrastructure from Perth or Smith Falls.

The Site is located within the DNE. Municipal services are not available, planned, or economically feasible for the development at this time. Shallow bedrock and a minimum distance of 1.5 kilometres from the Town of Perth would make connecting to the nearest system cost prohibitive, given that the proposed subdivision includes only 42 single-family units. Further developments in the area may make connecting municipal services viable in the future and would comply with the general provisions of the Official Plan of the DNE (Delcan Corporation, 2012).

The use of individual sewage and water services for the proposed development adheres with the provisions set out in Section 3.18 of the Official Plan of the DNE (Delcan Corporation, 2012).

3.0 TERRAIN EVALUATION

3.1 Field Procedure

A total of 14 test pits numbered 21-1 to 21-14, inclusive, were advanced using a backhoe on April 19, 2021 on the Site and surrounding lands owned by the Mr. Crain. Six test pits were completed within the footprint of the proposed subdivision. These test pits are numbered 21-2 to 21-7, inclusive. Locations of on-site test pits are shown on Figure 1 in Appendix A.

The test pits excavation depths ranged between 0.2 metres and 1.8 metres below ground surface. The test pits were terminated at these depths due to practical refusal on bedrock.

The subsurface conditions in the test pits were identified by visual and tactile examination of the materials exposed on the sides and bottom of the test pits. The short-term groundwater condition within the open test pits was observed upon completion of excavating.

Following the completion of the test pit excavation, soil samples were returned to our laboratory for examination by an environmental engineer/geoscientist. Descriptions of the subsurface conditions logged in the test pits are provided on the Record of Test Pit sheets, Test Well records and grain size analysis results appended (Appendix C).

The ground surface elevations at the test pit locations were determined by GEMTEC using a Trimble R10 GPS survey instrument. The elevations are referenced to geodetic datum. All field work was observed by a member of GEMTEC engineering staff.

3.2 Soil and Groundwater Conditions

3.2.1 General

As previously indicated, the soil and groundwater conditions identified in the test pits are given on the Record of Test Pit sheets in Appendix C. The logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends on the method of excavation, the recovery of samples, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions at other than the test locations may vary from the conditions encountered in the test pits. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the Site or on adjacent properties.

The groundwater conditions described in this report refer only to those observed at the place and time of observation noted in the report. These conditions may vary seasonally or as a consequence of construction activities in the area.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil

involves judgement and GEMTEC does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

The following presents an overview of the subsurface conditions encountered in the test pits advanced during this investigation.

3.2.2 Topsoil

A surficial layer of topsoil was encountered at all the test pit locations. The topsoil is generally composed of dark brown silty sand with varying amounts of organic material. The topsoil layer has a thickness ranging between 0.2 to 0.3 metres.

3.2.3 Silty Sand to Sandy Silt

In all test pits, except TP21-3 and 21-5, native deposits of varying amounts of light brown silty sand to sandy silt were encountered underlying the topsoil layer.

The sandy deposits have a thickness ranging between approximately 0.18 and 1.95 metres and are found at depths ranging between approximately 0.18 and 2.20 metres below ground surface.

3.2.4 Bedrock

The depth to bedrock varies throughout the site, with excavator refusal on inferred bedrock encountered in all test pits at depths ranging between 0.2 and 1.8 metres below ground surface. Based on bedrock observed in test pits, shallow bedrock at the Site consists of dolostone. It should be noted that the type and quality of bedrock was not confirmed by bedrock coring.

An overburden contour map was created (see Figure 8) to assess the hydrogeological sensitivity of the Site. Much of the Site has an overburden thickness ranging from 0.4 metres to 0.8 metres, except for the portion of the Site north of test well TW-04 where the overburden thickness increases from 0.8 metres to more than 1.6 metres to the north. Based on the shallow bedrock found at a depth of less than 2 metres, the Site is considered hydrogeologically sensitive and recommendations pertaining to the use of a clay liner for septic systems, increased casing depth and increased separation distances between wells and septic systems are included in this report.

3.2.5 Groundwater Conditions: Overburden – Bedrock Interface

Groundwater was observed on April 19, 2021, in at the overburden-bedrock interface in test pits TP21-4, 21-6 and 21-9. Groundwater conditions were only observed for the short period of time when the test pits were open.

The observed shallow groundwater conditions are summarized in Table 3.1.

Table 3.1 – Observed Groundwater Conditions on April 19, 2021

Test Pit	Groundwater Depth Below Ground Surface (metres)
21-3	-
21-4	0.8 (seepage on bedrock surface)
21-5	-
21-6	0.6 (seepage on bedrock surface)
21-7	-

Horizontal fractures were observed in exposed bedrock at the site. The presence of some vertical joints was also noted, suggesting that groundwater, if present in the overburden, would be hydraulically interconnected with the shallow bedrock aquifer. However, based on standing water observed in excavated trenches in bedrock during the test pitting program, groundwater appeared to be found approximately 0.5 metres below the bedrock surface in the excavated areas (see site photos provided in Appendix I). This condition may potentially be different during the spring or following periods of high precipitation.

Table 3.2 below provides a summary of water levels measured in test wells TW-01 to TW-05 inclusive, completed in bedrock.

Table 3.2 – Test Well Groundwater Levels on July 15, 2021 and March 18, 2022

Test Well	Ground Surface Elevation (masl)[1]	Groundwater Level (mbgs)[2]		Groundwater Elevation (masl)	
		2021-Jul-15	2022-Mar-18	2021-Jul-15	2022-Mar-18
TW-01	135.90	3.23	0.98	132.67	134.92
TW-02	138.00	5.37	3.08	132.63	134.92
TW-03	136.50	3.38	1.18	133.12	135.32
TW-04	136.50	4.03	1.73	132.48	134.77
TW-05	136.50	3.54	1.22	132.95	135.28

Notes:
1- masl: metres above sea level
2- mbgs: metres below ground surface

It should be noted that groundwater elevation increases seasonally by 2.2 to 2.3 metres between the months of July and March. In order to assess if the water table is seasonally present in overburden at the site, groundwater elevations at the test pit locations were derived from groundwater contours generated using groundwater levels measured at the test wells in July 2021 and March 2022. This approach assumes a hydraulic connection between the shallow aquifer and water supply aquifer. Groundwater elevation estimates were compared to bedrock elevation obtained at on-site test pit locations. If a hydraulic connection is not present, the exercise remains valid to evaluate the potential for the occurrence of seasonal artesian conditions at the site.

Table 3.3 below provides a summary of ground surface, bedrock surface and groundwater elevations. Despite seasonal groundwater elevation fluctuations of 2.2 to 2.3 metres, the estimated groundwater elevation remains below the bedrock surface at all test pit and test well location, with the exception of TW-05 where groundwater elevation was estimated to exceed that of the bedrock surface by approximately 0.5 m. It should be noted that the bedrock surface elevation is lower in this area and that the overburden thickness reaches 1.8 metres at that location. As a result, it appears groundwater may rise in the overburden material at that location, but it would likely remain below the ground surface elevation by more than 1 metre.

Table 3.3 – Assessment of Shallow Groundwater Conditions

Test Well	Ground Surface Elevation (masl)[1]	Overburden Thickness (m)	Bedrock Surface Elevation (masl)	Groundwater Elevation (masl)	
				2021-07-15	2022-Mar-22
TP21-03	137.30	0.30	137.0	132.9[2]	135.2[2]
TP21-04	137.70	0.79	136.9	132.8[2]	135.1[2]
TP21-05	136.80	0.20	136.6	132.7[2]	135.0[2]
TP21-06	136.80	0.56	136.2	132.9[2]	135.2[2]
TP21-07	137.60	0.84	136.8	132.9[2]	135.1[2]
TW-03	136.50	0.91	135.59	133.12	135.32
TW-04	136.50	0.31	136.69	132.48	134.77
TW-05	136.50	1.80	134.8	132.95	135.28

Notes:
1- masl: metres above sea level
2- Groundwater elevation estimates at test pit locations were interpolated based on groundwater elevation contours obtained from test well data

Based on groundwater elevation contours generated using groundwater elevations measured on July 15, 2021 and March 22, 2022, the local groundwater flow direction is to the southwest (see Figure 7). Despite the occurrence of seasonal groundwater elevation variations, the changes appear to be uniform across the Site as the groundwater elevation contours patterns remained consistent. However, it should be noted that given the elongated geometry of the proposed subdivision, test wells are generally aligned, and their spatial distribution is not ideal for estimating the regional groundwater flow direction. To provide a more reliable assessment of the regional groundwater flow direction, static water levels obtained from MECP water well records within a radius of more than 5 kilometres were converted to groundwater elevations based UTM coordinates provided in the water well records and ground surface elevations estimates for each record location extracted from a digital elevation model (DEM) of the area.

The DEM was extracted from Canadian Digital Elevation Model obtained from the Government of Canada Geospatial Data Extraction webpage: https://maps.canada.ca/czs/index-en.html on March 18, 2022. Despite some inherent uncertainty related to the UTM coordinates provided in the well records and the resolution of the DEM, this approach provides a reasonable estimate of the groundwater flow direction at the regional scale. Groundwater elevation contours were generated using the regional groundwater estimates and despite showing local fluctuations, it appears that the regional groundwater flow direction is easterly and differs from the westerly estimate obtained at the site scale. This localized variation is also observable in the regional scale contours. The regional scale contour map is provided as Figure 9 in Appendix A.

4.0 HYDROGEOLOGICAL CONCEPTUAL MODEL

Based on the results of the review of MECP water well records, land use observations and available geology maps, the local hydrogeology on the Site and adjacent lands are characterized by thinly veneered quaternary sediments consisting of silty clay, sands and glacial till.

The overburden thickness varies across the site, ranging from 0.2 to 1.8 metres based on test well and test pit information (Figure 8). The overburden thickness is less than 1.0 metres over the majority of the site, except in the northern portion and within 150 metres of Drummond Concession 2 road where the soil thickness ranges from 1.0 to 1.8 metres. The site-specific geology findings are consistent with the findings of the available background information.

4.1 Hydrogeological Conceptual Model

The framework for the hydrogeological conceptual model for the Site is summarized in Table 4.1 below.

Table 4.1 – Framework of Hydrogeological Conceptual Model

Stratigraphic Unit	Generalized Composition	Thickness
Overburden	• Topsoil; • Discontinuous unconfined overburden aquifer (0.2 to 1.8 metres; less than 1 metre thickness in the southern portion of the site) • Deposits of primarily silty sand to sandy silt, and some silty clay;	• 0.2 to 1.8 metres
Shallow Fractured Bedrock	• Horizontally bedded dolostone bedrock of the Oxford and/or March Formation, Beekmantown Group at the overburden / bedrock interface.	• Undetermined
Upper Bedrock	• Dolostone and Sandstone of the Oxford and March Formations, Beekmantown Group(1)	• Undetermined on-Site. Reported to range from 0 to 100 metres and 0 to 70 metres for Oxford and March Formations respectively in the Mississippi-Rideau Source Protection Region (MVRVCA, 2007).
Lower Bedrock	• Sandstone of the Nepean Formation, Postdam Group(1)	• Undetermined on-Site. Reported to range from 0 to 150 metres in the Mississippi-Rideau Source Protection Region (MVRVCA, 2007).

Notes:
1. Boundary between dolostone and sandstone of the March Formation (upper bedrock) and sandstone of the Nepean Formation (lower bedrock) not defined on-site.

The hydrogeological conceptual model for the Site is consistent with regional mapping and Mississippi-Rideau Source Protection Region reports, which indicate that the Site is underlain by

dolostone/limestone of the Oxford/March Formations followed by sandstone of the Nepean Formation and Precambrian granite (Figure 3.4-6 presented in MRSPR, 2007).

Ground surface elevations for each of the test wells were obtained from the Topographic Sketch of East Half of Lot 7 Concession 1 provided by Stantec. The elevations are referenced to geodetic datum. The bedrock surface elevation ranges from about 131.2 to 132.3 metres Above Mean Sea Level (AMSL) and the base of the well casings range from 125.8 to 127.9 metres AMSL. The elevation of the water bearing zones (depth water found) ranges from 118.5 to 126.7 metres AMSL and the elevation of the bottom of test wells ranged from 117.6 to 119.6 metres AMSL.

Based on the onsite test well water well records and test pit information, the total thickness of the overburden ranges from approximately 0.2 to 1.8 metres and generally consists of thinly veneered quaternary sediments (silty clay, glacial till and silty sand). The average overburden thickness across the site, based on test pit and test well data, is less than 1.0 metre. All test pits were terminated on bedrock and groundwater was encountered in two locations and only as seepage on bedrock surface. Based on estimated groundwater elevations presented in Table 3.3 and water levels observed in areas of shallow bedrock trench excavations at the site, the water table is found below the bedrock surface for the majority of the site, except potentially in the spring in the vicinity of TW-05 where the bedrock surface elevation is approximately 0.8 to 2 metres lower than other test well and test pit locations, resulting in water levels potentially approximately 0.5 m above the bedrock surface. The ground surface topography is generally flat with a regional slope to the southeast. However, topographic maps indicate a divide located approximately 800 metres west of the proposed subdivision and where the slope is to the southwest towards the Tay River.

Although the Site is considered hydrogeologically sensitive, the 18 water well records located within 500 metres of the Site as well as the five test wells located on the Site all indicate “water found” depths ranging from 9.1 metres to 24.1 metres. No significant water bearing zone was identified between the bedrock surface and a depth of 9.1 metres, suggesting that a significant layer of relatively competent bedrock is present beneath the site. This would suggest that horizontal and vertical fractures observed at surface in exposed bedrock areas may mostly be limited to shallow bedrock. However, given the significant seasonal water level variations observed in the test wells following snow melt in the spring, a certain level of hydraulic connectivity is expected between the shallow and deep bedrock aquifers. The water bearing zones are therefore not considered isolated from the surface and nitrate dilution calculations are warranted as discussed in Section 5.2 below. Measures should be implemented in the design of septic systems to add additional protection above the bedrock.

According to the Ontario Source Protection Information Atlas (MECP, 2017), significant groundwater recharge areas are local wetlands situated northwest and north of the Site. These areas are consistent with elevated groundwater areas in the regional groundwater elevation contour map as well as the regional groundwater flow direction generally to the southeast. Some agricultural lands located northeast of Perth also fall within the significant recharge areas. These

agricultural lands, as well as the agricultural lands located north and west of the Site may contribute to background nitrate concentrations found in the area.

5.0 GROUNDWATER SUPPLY

The results of the groundwater supply investigation are summarized in the following sections.

5.1 Test Well Construction

The bedrock water supply aquifer has been characterized in the vicinity of the Site by means of a total of 16 test wells advanced on-site and on adjacent properties. The numerous test wells serve to characterize the groundwater quality and quantity both spatially and with depth (varying casing lengths). A summary of the test well locations and construction details, separated by primary test wells (proposed water supply aquifer) and secondary test wells (upper bedrock aquifer) are summarized in Tables 5.1, 5.2 and 5.3 below. Water well records are compiled in Appendix C.

Table 5.1 – Well Construction Details – Secondary Wells with 10.1 metre casings

	TW-01	TW-02	TW-03	TW-04	TW-05
Well Tag	A174613	A174607	A174614	A174609	A174608
Year Drilled	2015	2015	2015	2015	2015
Depth to Bedrock	0.9	0.3	0.9	0.5	1.8
Length of Well Casing Below Ground Surface	10.1	10.1	10.1	10.1	10.1
Length of Well Casing Set into Bedrock	9.2	9.8	9.8	9.6	8.3
Depth Water Found (i.e., depth to water bearing fractures)	11.0 14.9 17.4	11.3 18.0 19.2	11.9 17.4	11.3 17.7	15.2 16.2
Total Well Depth	18.3	19.8	18.3	18.3	18.3
Well Production (litres per minute)	75.7	75.7	75.7	75.7	75.7
Bedrock Description	Grey/brown sandstone	Grey/brown sandstone	Grey/brown sandstone	Grey/brown/ white sandstone	Grey/brown/ white/green sandstone

Table 5.2 – Well Construction Details – Secondary Wells with 15.2 to 18.3 metre casings

	TW22-01	TW22-6	TW22-7	TW22-8	TW1710	TW A318695	PW4063
Well Tag	A342215	A342440	A342439	A342438	A342159	A318695	A342214
Year Drilled	2022	2022	2022	2022	2022	2021	2022
Depth to Bedrock	0.3	1.2	0.6	0.6	0	1.2	2.7
Length of Well Casing Below Ground Surface	**18.3**	**18.3**	**18.3**	**18.3**	**15.2**	**15.2**	**18.3**
Length of Well Casing Set into Bedrock	18.0	17.1	17.7	17.7	15.2	14.0	15.6
Depth Water Found (i.e., depth to water bearing fractures)	19.5 21.9 23.2	27.4 30.2	22.3 23.2	29.9 31.7	22.9	24.4, 28.3	28.9
Total Well Depth	25.0	30.5	24.4	33.5	25.0	30.5	31.1
Well Production (litres per minute)	75.7	37.9	37.9	37.9	75.7	75.7	37.9
Bedrock Description	Grey and white sandstone	Brown sandstone with grey limestone, white sandstone	Grey limestone with brown sandstone	Grey limestone with brown sandstone, white sandstone	Grey and black limestone, grey and red sandstone	Brown sandstone	Grey and white sandstone

Table 5.3 – Well Construction Details – Primary Test Wells 36.6 metre casings

	TW22-01 Lined	TW22-8 Lined	TW A318695 Lined	TW1710D
Well Tag	A342215	A342438	A318695	A361167
Year Drilled	2023	2023	2023	2022
Depth to Bedrock	0.3	0.6	1.2	2.1
Well Diameter (metres)	0.10	0.10	0.10	0.15
Length of Well Casing Below Ground Surface (metres)	**36.6**	**36.6**	**36.6**	**36.6**
Length of Well Casing Set into Bedrock (metres)	36.3	36.0	35.4	34.5
Depth Water Found[1] (i.e., depth to water bearing fractures, metres)	38.4, 42.1, 43.9	39.6, 39.6, 42.1, 43.9	39.6, 40.8, 43.3	39.9
Total Well Depth (metres)	45.7	45.7	45.7	42.7
Bedrock Description	Grey and black limestone with white sandstone mix	Grey limestone with white sandstone mix	Grey and black limestone with white sandstone mix	Grey and yellow sandstone

Notes: 1. Depth water found including small water bearing fractures noted by well driller at the time of well drilling, which was supervised by a member of GEMTEC staff.

The MECP Procedure D-5-5 document indicates that a minimum of five test wells are required for sites of more than 25 and up to 40 hectares, with the Site under investigation being under 40 hectares. Four primary test wells (Table 5.3) are completed within the proposed water supply aquifer, with three located on-site (TW22-01 lined, TW22-8 lined and TW A318695 lined).

5.2 Private Wells

A significant number of private wells were sampled by GEMTEC and Mr. Crain in the area surrounding Site and existing Fellinger Mills Estates subdivision east of the proposed Site. In total, 35 private wells have been sampled. Of these, 19 were private wells sampled in the vicinity of the Site and 16 were private wells within and around the Fellinger Mills Estates residential subdivision. The private well sampling program included the following (refer to Figure 10 in Appendix A for private well locations):

- A total of 6 private wells located in the vicinity of the Site were sampled by GEMTEC personnel for subdivision package parameters and trace metals. The sampling locations included:

    - PW-1562, PW-1744, PW-1802, PW-3896, PW-3928 and PW-4063.

- GEMTEC personnel also sampled a total of 8 private wells within the Fellinger's Mills subdivision for subdivision package parameters and trace metals. The sampling locations included:

    - PW-727, PW-746, PW-850, PW-853, PW-885, PW-966, PW-977, and PW-981.

- Additionally, GEMTEC personnel sampled 8 private wells for nitrates around the Fellinger's Mills Estates subdivision to better understand the distribution of nitrate around the existing subdivision. The private well sampling locations surrounding the existing subdivision include (refer to Figure 10, Appendix A, for sample locations):

    - PW-124, PW-230, PW-306, PW-941, PW-1082, PW-3246, PW-3401, and PW-3672.

In order to expand the nitrate concentration dataset, Mr. Crain collected 13 samples (refer to Figure 10, Appendix A, for sampling locations). Samples were collected by residents from accessible taps (i.e., kitchen tap or outdoor taps) in laboratory supplied sample bottles. Field parameters were not measured at the time of sampling, and it is unknown whether the samples were collected pre or post water treatment. It is noted that conventional water treatment systems typically utilized in the area would not reduce nitrate concentrations; therefore, the samples collected by the client provide suitable background nitrate concentrations that were incorporated into our study. Samples collected by residents include:

- PW-1548 Drummond 1, PW-1562 Drummond 1, PW-1699 Drummond 1, PW-1700 Drummond 1, PW-1715 Drummond 1, PW-1772 Drummond 1, PW-1801 Drummond 1, PW-1802 Drummond 1, PW-1804 Drummond 1, PW-3935 Drummond 2, PW-4005 Drummond 2, PW-4033 Drummond 2, PW-4038 Drummond 2.

5.3 Chronological Summary of Groundwater Investigations

Groundwater investigations were conducted at the Site and the adjacent property for residential severances over a period of approximately eight years. A chronological summary of water quality sampling is provided below. All water quality sampling was completed by GEMTEC, unless otherwise noted.

- 2015: Secondary Test Wells with 10.1 metres of casing
    - Initial hydrogeological assessment, including pumping tests and water quality sampling of five test wells completed by McIntosh Perry in 2015 (refer to subsection 2.6.2)
- April 2021: Secondary Test Wells with 10.1 metres of casing
    - Water quality sampling of five on-site 'secondary' test wells (TW-01 to TW-05, inclusive).
- April 2021: Background Homeowner Sampling – In the vicinity of Burns Farms
    - Homeowner water quality sampling at five private wells within the vicinity of the Site.
- July 2021: Secondary Test Wells with 10.1 metres of casing
    - Pumping tests and water quality sampling of five on-site 'secondary' test wells (TW-01 to TW-05, inclusive).
- August 2021: Fellinger's Mills – Homeowner Sampling
    - Private well water quality sampling at three private wells located within Fellinger's Mills Estates residential subdivision (PW-746, 853 and 981).
- March 2022: Secondary Test Wells with 10.1 metres of casing
    - Water quality sampling of five on-site 'secondary' test wells (TW-01 to TW-05, inclusive).
- March – April 2022: Expanded Homeowner Sampling Program - Nitrates
    - A total of 13 homeowner samples collected by the client submitted for analysis of nitrates.
    - A total of 16 homeowner samples submitted for analysis of nitrates.
- March - November 2022: Secondary Test Wells with 15.2 to 18.3 metres of casing
    - March: TW1710 drilled, pumping test and water quality sampling.
    - April - May: TW22-01 and PW-4063 drilled, pumping test and water quality sampling.

- July: TW22-6, TW22-7 and TW22-8 drilled, pumping test and water quality sampling.

- November 2022: Primary Test Wells with 36.6 metres of casing
  - TW1710D drilled, pumping test and water quality sampling.

- April – May 2023: Primary Test Wells with 36.6 metres of casing
  - Lining of TW22-01, pumping test and sampling of TW22-01 (liner)
  - Lining of A318695 (liner) and TW22-8 (liner), pumping test and sampling of A318695 (Liner) and TW22-8 (Liner).

5.4 Field Procedure

5.4.1 Pumping Tests

Pumping tests in the 10 on-site test wells (TW-01, TW-02, TW-03, TW-04, TW-05, TW1710D, TW22-01 (lined), TW22-8 (lined), PW-4063 and TW A318695 (lined)) were conducted over a multi-year period, from 2021 to 2023. All pumping tests were completed for a period of six hours at constant flow. The pump discharge was directed to the ground surface a minimum of 10 metres from the test wells and in a manner such that the flow of water on the ground surface was directed away from the test wells.

5.4.2 Flow Rate Measurements

The wells were pumped using an electric submersible pump and portable generator supplied by Crains Construction. The flow rate of the pump discharge hose was constantly monitored using a timed-volume method. Multiple flow measurements were taken within the first hour of the pumping test and then at 60 to 120-minute intervals throughout the remainder of the pumping test to ensure that the discharge rate maintained a relatively constant flow rate (i.e. within 5%).

5.4.3 Water Level Measurements

During the pumping tests, water level measurements were taken at regular intervals in the well being pumped using an electric water level tape and on a continuous basis using electronic data loggers. After the pump was shut off, water level data was collected until a minimum of 95 percent of the drawdown in water level had recovered in the test well or two hours had passed – which ever occurred first. The water level measurements for the drawdown and recovery data for the pumping tests are provided in Appendix G. The drawdown data was measured with reference to the top of the well casings. Given that minimal drawdown was observed in pumping of the primary test wells, water levels were not recorded in observation wells during the completion of each test due to the lack of hydraulic response outside of the pumping wells.

5.4.4 Groundwater Sampling Procedures

During the completion of the pumping tests and private well water sampling program, total chlorine tests were conducted in the field to ensure that chlorine levels were below the instrument detection limit of 0.02 mg/L prior to sampling for bacteriological parameters.

The temperature, conductivity, total dissolved solids, pH, turbidity, colour and total chlorine levels of the groundwater were measured at periodic intervals sampling, which is summarized in Appendix D.

The water quality monitoring equipment used by GEMTEC was calibrated in the field prior to monitoring. A summary of the field equipment is provided in Table 5.4. The groundwater samples were collected in laboratory supplied bottles and preserved in a cooler filled with ice, to ensure all samples were kept between 4 and 10°C. All samples collected by GEMTEC were submitted directly to the laboratory within 24 hours of sampling. Chain of custody for each sample submission is provided at the end of all lab reports in Appendices D (test wells) & E (private wells).

Table 5.4 – Field Equipment Overview

Field Parameters	Manufacturer	Model No.
Total Chlorine	Hach	CN-60
pH, temperature, TDS and Conductivity	Hanna	HI 98129
Turbidity	Hanna	HI 98703
Colour	Hach	DR 890

5.4.5 Sample Submission Procedure

All groundwater samples were submitted to Paracel laboratories in Ottawa, Ontario for analysis of chemical, physical, and bacteriological parameters as listed in the MECP guideline titled “Technical Guideline for Private Wells: Water Supply Assessment”, dated August 1996 as well as for total and dissolved trace metals. The chain of custody including sampling time, holding time and other sampling information is included with the lab reports in Appendix C.

5.5 Groundwater Quality

The following section summarizes water quality results obtained from on-site and off-site test wells located adjacent to the Site and the nearby Fellinger’s Mills Estates subdivision. Summary tables

provided in Appendix E include sampling dates and pumping durations before sampling at each of the test wells.

5.5.1 Test Wells

The water quality parameters analyzed for each test well and their respective ODWQS exceedances is summarized in Table 5.5 below. Please note test wells sampled for solely for analysis of nitrates are not included in the Table but are discussed separately in this report.

Table 5.5 – Test Well Water Quality Summary

Test Well ID	Casing Depth (metres)	Parameters Analyzed	ODWQS Exceedances
TW-01	10.1	Subdivision Package, Trace Metals	Hardness
TW-02	10.1	Subdivision Package, Trace Metals	Hardness, manganese, iron
TW-03	10.1	Subdivision Package, Trace Metals	Hardness
TW-04	10.1	Subdivision Package, Trace Metals	Hardness, total coliform
TW-05	10.1	Subdivision Package, Trace Metals	Hardness
TW22-01	18.3	Subdivision Package, Trace Metals	Hardness, manganese
PW-4063	18.3	Subdivision Package, Trace Metals	Hardness, manganese
TW22-01 Liner	36.6	Subdivision Package (no bacteria), Trace Metals (total and dissolved)	Hardness, manganese

Test Well ID	Casing Depth (metres)	Parameters Analyzed	ODWQS Exceedances
TW22-8 Liner	36.6	Subdivision Package, Trace Metals (total and dissolved)	Hardness, iron, turbidity (lab measured only)
TW-A318695	36.6	Subdivision Package, Trace Metals (total and dissolved)	Hardness, manganese
TW1710D	36.6	Subdivision Package, Trace Metals (total and dissolved)	Hardness, manganese

Generally, the water quality is similar between all test wells with ODWQS operational guideline exceedances of hardness and aesthetic objective exceedances of iron and manganese, all of which are within MECP Procedure D-5-5 treatable limits.

All test wells, with the exception of those completed with 36.6 metres of casing, reported detectable levels of nitrates, which is further discussed in section 7. All nitrate concentrations are within the ODWQS maximum acceptable concentration of 10 mg/L.

Test well TW-1710D analyses included both total and dissolved trace metals. Some total (unfiltered) concentrations were found to be lower than the dissolved (filtered) concentrations of some metals which, in theory, should not be the case. This discrepancy is interpreted to be within the laboratory's margins of analytical error and reflective of minor variability in water quality (i.e., representative of duplicate samples). Further discussion is provided in Appendix E along with the laboratory certificates of analysis.

5.5.2 Ontario Drinking Water Quality Standards (ODQWS) Exceedances

5.5.2.1 Bacteriological Parameters

Groundwater samples for laboratory analysis were collected from the test wells and five private wells in the area during a preliminary sampling event between April 21 and April 23, 2021, Following the completion of the initial sampling event, detections of low levels of chlorine during field tests were noted in test wells TW-03, TW-04 and TW-05 and in private wells PW-3896, PW-3928, PW-1802 and PW-1562. As per procedure D-5-5, no chlorine should be detected at the time of sampling to validate bacteria sampling results. However, these low detections were interpreted as a malfunction of the field equipment at the time of sampling. In effect, chlorine detections in private wells PW-3896, PW-3928, PW-1802 and PW-1562 were not supported by site information given that the wells were not recently disinfected, and no chlorine was added to

the private water distribution systems prior to sampling. Low chlorine detections in the on-site test wells during that sampling event were therefore also not considered relevant in the interpretation of bacteria results.

In order to confirm the absence of bacteria in the on-site test wells in light of chlorine detections in the initial spring 2021 sampling event, additional samples were collected in TW-01 to TW-05 between March 8 and March 11, 2022 and were submitted for analysis of nitrate and bacteriological parameters. Chlorine levels were monitored during purging and were confirmed to be below the detection limit of 0.02 mg/L prior to collecting the samples.

The proposed water supply aquifer, based on water samples collected from ten test wells and 13 private wells where subdivision package parameters were sampled, contains total coliform concentrations within the MECP Procedure D-5-5 limit for private wells, with the exception of one private well, TW-4. Based on the extensive sampling program, test well TW4, featuring a relatively shallow casing depth of 10.1 metres, is not considered to be representative of the water supply aquifer. Two private wells sampled reported low levels of total coliforms, 1 CFU/100mL, which is not unusual for wells that are not disinfected on a regular basis. As a result, bacterial concentrations are not indicative of aquifer-scale bacteriological impact. Fecal coliform and *E.coli* were not detected in any test wells or private wells sampled. Based on the bacteriological testing, the water is considered suitable for consumption.

5.5.2.2 Operational Guideline Exceedances

Operational guideline exceedances of the ODWQS were noted for hardness in all test and private well samples. The concentrations ranged from 211 to 329 mg/L as $CaCO_3$ and were higher than the operational guideline of 80 to 100 mg/L of $CaCO_3$ as specified in the ODWS.

Water having a hardness level above 80 to 100 mg/L as $CaCO_3$ is often softened for domestic use. The MECP Procedure D-5-5 document states that water having a hardness value of more than 300 mg/L is considered “very hard”. The Ontario Ministry of the Environment publication entitled “Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines”, states that water with hardness in excess of 500 mg/L is considered to be unacceptable for most domestic purposes. There is no upper treatable limit for hardness specified in MECP Procedure D-5-5.

The concentrations of hardness in all the test wells and private wells are below the reported threshold of 500 mg/L as CaCO3 specified in the Technical Support Document for the ODWQS. The concentration of hardness observed in the test wells is considered to be reasonably treatable using a conventional water softener. Based on our experience, most water supply wells within rural eastern Ontario are equipped with water softeners.

Water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water that may be of concern to persons on a sodium

restricted diet. The use of potassium chloride in the water softener (which adds potassium to the water instead of sodium) could be considered as a means of keeping sodium concentrations in the water at background levels. Consideration could also be given to providing a bypass of the water softener for drinking water purposes (for example, a bypass of the softener to the cold-water kitchen tap).

5.5.2.3 Aesthetic Objective Exceedances

The iron concentrations from all test wells and private wells sampled ranged from <0.1 to 0.42 mg/L. Some wells slightly exceeded the ODWQS aesthetic objective for iron of 0.3 milligrams per litre with a concentration of up to 0.42 mg/L. Detectable levels of iron may cause staining to plumbing fixtures and laundry. However, the iron level is well within the maximum reasonably treatable limits (5.0 mg/L) provided in Table 3 of the Appendix in the MECP Guideline D-5-5.

The manganese concentrations from all test wells and private wells sampled ranged from <0.005 to 0.292 mg/L. Some wells exceeded the ODWQS aesthetic objective for manganese of 0.05 mg/L with a concentration of up to 0.292 mg/L. Like iron, manganese may cause staining to plumbing fixtures and laundry. Similarly, the manganese level is well within the maximum reasonably treatable limits (1.0 mg/L) provided in Table 3 of the Appendix in the MECP Guideline D-5-5. Test wells TW-02, TW22-01 Liner and TW1710D reported manganese concentrations greater than 0.12 mg/L, which exceeds the Guidelines for Canadian Drinking Water Quality maximum acceptable concentration (Health Canada, 2019). However, those concentrations remain within treatable limits and can be readily reduced by the use of filters.

Colour was reported to range from 0 to 16 TCU (filtered) for the sampled residential private wells and test wells. It is noted that field measured colour was reported to be < 5 TCU for all wells, which is within the ODWQS aesthetic objective of 5 TCU. The laboratory reported colour for the primary test wells were all less than 5 TCU. Colour is likely the result of elevated iron/manganese concentrations and can be treated through filtration (e.g. manganese greensand treatment systems). Based on the MECP Guideline D-5-5, higher iron-related colour (exceeding the maximum concentration considered reasonably treatable limit of 7 TCU) may be removed by manganese greensand treatment. Generally, where elevated laboratory colour was reported, it can be associated with elevated iron concentrations and therefore, it is our professional opinion that the field measurements for colour are considered to be more representative of the raw groundwater quality.

The laboratory measured turbidity levels ranged from 0.3 to 6.2 NTU, with turbidity exceeding the aesthetic objective of 5 NTU at TW22-8. Field measured turbidity of TW22-8 was reported to be 0.8 NTU, which is below the ODWQS aesthetic objective of 5 NTU. Turbidity levels may increase during the wait time between sampling time and lab analysis due to chemical precipitation resulting from changing conditions (e.g., change in temperature, exposure to oxygen). Generally, where elevated laboratory turbidity was reported, it can be associated with elevated iron

concentrations and therefore, it is our professional opinion that the field measurements for turbidity are considered to be more representative of the raw groundwater quality.

5.5.2.4 Warning Level for Persons on Sodium Restricted Diets

The sodium concentrations from all test wells and private wells sampled ranged from 3 to 41 mg/L. Some wells slightly exceeded the ODWQS health-related warning level limit of 20 mg/L, while meeting the aesthetic objective of 200 mg/L. The concentration of sodium reported may be significant for persons with medical conditions requiring low salt diets. Accordingly, as listed in MECP Guideline D-5-5, the local Medical Officer of Health should be notified in order to alert persons with relevant medical conditions. Since water softening results in high sodium levels, consideration could be given to providing a cold-water bypass water line for drinking purposes.

5.5.3 Off-site Water Quality Sampling

As part of the August 2021 and April 2022 field investigations, GEMTEC personnel sampled a total of 21 private wells off-site wells (refer to Figure 10 for private well locations). The off-site sampling included private wells within the Fellinger's Mills Estates subdivision, which was developed around 2005, meaning that sampling at those locations reflects performance monitoring after a period of more than 15 years of the development being in active use.

Groundwater samples were submitted for analysis of subdivision package parameters in 13 private wells, five of which included trace metals, and nitrate/nitrite in eight private wells. Generally, the water quality is similar to what was observed at the wells near the Site, with ODWQS operational guideline exceedances of hardness, sodium warning levels, and aesthetic objective exceedances of iron and manganese, all of which are within MECP Procedure D-5-5 treatable limits (refer to water quality summary tables in Appendix E). Although the nitrate maximum acceptable concentration of 10 mg/L was not exceeded at any of the locations, detectable nitrate concentrations compared to pre-development nitrate concentrations were detected within the subdivision. The nitrate impacts are further discussed in Section 6.0 below.

5.5.4 Groundwater Quality of Primary Test Wells – Proposed Water Supply Aquifer

The hydrogeological conceptual model suggests that the water supply consists of dolostone and sandstone of the March Formation underlain by sandstones of the Nepean Formation. The boundary between the two Formations is not well defined and water supply wells may span both Formations. The groundwater quality of on-site wells with various casing lengths (10.1, 15.3, 18.3 and 36.6 metres below ground surface) are similar, with the exception of notable differences in nitrate and fluoride concentrations.

The nitrate concentrations of test wells with casing lengths of 36.6 metres is significantly lower, with concentrations of >0.1 to 0.2 mg/L. Fluoride is typically lower than 0.3 mg/L in the majority of test wells with casing lengths ranging from 6.0 to 18.3 metres, compared to fluoride concentrations ranging from 0.7 to 1.0 mg/L in wells with casing lengths of 36.6 metres. The

fluoride concentrations are well within the ODWQS maximum acceptable concentration of 1.5 mg/L. The notable differences in nitrate and fluoride concentrations suggests that the proposed water supply aquifer, with wells cased to 36.6 metre casings may be completed in the lower March and / or upper Nepean Formation, as opposed to the upper March Formation where the majority of wells (secondary wells) are likely completed.

Based on the groundwater quality results from the primary test wells, the groundwater quality meets the ODWQS maximum acceptable concentrations, health-related limits and maximum concentrations considered to be reasonably treatable.

5.6 Groundwater Quantity

5.6.1 Pump Test Analysis

The drawdown and recovery water level data from the 10 pumping tests conducted on the test wells is provided in Appendix G. The details of the pumping tests carried out on the test wells are provided in Table 5.6 and 5.7 (secondary test wells) and Table 5.8 (primary test wells).

The transmissivity of the water supply aquifer was estimated from the pump test drawdown and recovery data using Aqtesolv version 4.5, a commercially available software program from HydroSOLVE Inc. An analysis of the pump test and recovery data was carried out using the Cooper-Jacob method of analysis. Despite pumping at rates that are significantly more than 18.8 litres per minute, no significant well drawdown was observed in the wells and the wells recovered within a few minutes. Given the minimal drawdown observed in the pumped wells, the confidence level in the estimated transmissivity values is low. The results of the Aqtesolv 4.5 analysis are provided in Appendix G.

Table 5.6 – Pumping Tests Details – Secondary Wells with 10.1 metre casing wells

Parameter	TW-01	TW-02	TW-03	TW-04	TW-05
Duration (minutes)	360	360	360	360	360
Flow Rate (litres per minute)	95	91	91	91	91
Static Water Level (m BGS)	3.23	5.37	3.38	4.03	3.54
Well Depth (m BGS)	18.3	18.3	18.3	18.3	18.3
Available Drawdown (m)	15.1	12.9	14.9	14.3	14.7

Parameter	TW-01	TW-02	TW-03	TW-04	TW-05
Water Level at End of Pumping (m BGS)	3.25	5.48	3.42	4.07	3.60
Observed Drawdown at End of Pumping (m)	0.02	0.11	0.04	0.04	0.06
Percent Drawdown Utilized (%)	0.1	0.9	0.3	0.3	0.4
Estimated Transmissivity (m^2/day)	1300	2000	2700	764	2900
Aquifer Thickness[1] (m)	8.2	8.2	8.2	8.2	8.2
Estimated Hydraulic Conductivity (m/s)	2×10^{-3}	3×10^{-3}	4×10^{-3}	1×10^{-3}	4×10^{-3}

Notes: 1. Aquifer thickness equal to open rock interval (total depth – casing length)

Table 5.7 – Pumping Test Details – Secondary Wells with 15.3 to 18.1 metre casing wells

Parameter	TW22-01	PW-4063
Duration (minutes)	360	360
Flow Rate (litres per minute)	70	26.5
Static Water Level (m BGS)	5.02	4.82
Well Depth (m BGS)	25.0	31.1
Available Drawdown (m)	20.0	26.3
Water Level at End of Pumping (m BGS)	5.05	5.11
Observed Drawdown at End of Pumping (m)	0.03	0.29
Percent Drawdown Utilized (%)	> 1	1
Estimated Transmissivity (m^2/day)	403	570
Aquifer Thickness[1] (m)	6.7	12.8

Parameter	TW22-01	PW-4063
Estimated Hydraulic Conductivity (m/s)	7×10^{-6}	5×10^{-4}

Notes: 1. Aquifer thickness equal to open rock interval (total depth – casing length)

Table 5.8 – Pumping Test Details – Primary Wells with 36.6 metre casing wells

Parameter	TW22-01 Lined	TW22-8 Lined	TW A318695 Lined	TW1710D[(1)]
Duration (minutes)	360	360	360	270
Flow Rate (litres per minute)	75.0	80	90	80
Static Water Level (m BGS)	4.48	2.20	2.03	8.60
Well Depth (m BGS)	45.7	45.7	45.7	42.7
Available Drawdown (m)	41.2	43.5	41.5	34.1
Water Level at End of Pumping (m BGS)	4.51	3.10	3.21	8.70
Observed Drawdown at End of Pumping (m)	0.03	0.90	1.18	0.10
Percent Drawdown Utilized (%)	> 1	2	3	> 1
Estimated Transmissivity (m^2/day)	5600	160	170	-
Aquifer Thickness[2] (m)	9.1	9.1	9.1	6.1
Estimated Hydraulic Conductivity (m/s)	7×10^{-3}	2×10^{-4}	2×10^{-4}	-

Notes: 1. Water levels measured at the time of water quality sampling. Pumped well not supervised by GEMTEC, initial static water level from water well record.
2. Aquifer thickness equal to open rock interval (total depth – casing length)

As per MECP Procedure D-5-5, each of the test wells was pumped at a flow rate greater than 18.8 litres per minute for six hours. The maximum drawdown observed at the end of pumping was less than 1.2 metres, which represents less than 3% of the available drawdown. Based on these results, all of the onsite test wells are capable of supplying water at a rate significantly greater

than 18.8 litres per minute for a period greater than six hours. This is considered more than sufficient for typical domestic use.

5.7 Hydraulic Interference and Safe Yield

Hydraulic interference effects were only monitored during pumping of the secondary test wells TW-01 to TW-05, inclusive, where the closest test well was monitored during pumping (e.g., TW-02 monitored during pumping of TW-01). As expected, given the negligible drawdown during pumping of the test wells, no interference was measured in the closest observation well. No observation wells were monitored during pumping of the primary test wells (TW22-01 lined, TW22-8 lined, TW A318695 lined and TW1710D) as they are spaced greater than 200 metres apart and the wells with shallower casings had been abandoned.

Interference between on-site and off-site water supply wells are not anticipated based on the negligible drawdown during all pumping tests, negligible drawdown in observations wells (where monitored), high estimated transmissivity values and large lot sizes (minimum lot size of 0.8 hectares).

To further assess the potential well interference, the long term well yield was assessed. The British Columbia Ministry of the Environment (2012) estimates the long-term well yield by first determining the well's specific capacity after 100 days of pumping (theoretical drawdown without recharge). The assessment was carried out using the following data:

- Time (t) - 100 days;
- Pumping Rate (Q) - 27 m^3/day (based on peak flow of 18.75 litres per minute);
- Transmissivity (T) – 160 m^2/day (based on Table 5.9);
- Distance (r) - 0.078 metres (based on radius of open hole test well);
- Storativity (S) – 5 x 10^{-4} (average storativity from Todd, 1980, which typically ranges from 5 x 10^{-3} to 5 x 10^{-5}); and,
- Maximum Available Drawdown (D) – 34.1 metres (based on TW1710D current investigation).

First, the drawdown in the aquifer after 100 days of pumping is calculated using the Modified Nonequilibrium Equation (Groundwater and Wells 2nd Ed., Driscoll, 1986):

$$s = \frac{0.183 \cdot Q}{T} \cdot Log \frac{2.25 \cdot T \cdot t}{r^2 \cdot S}$$

The specific capacity after 100 days (SC) is calculated using the pumping flow rate (Q) and estimated drawdown after 100 days (s):

$$SC = \frac{Q}{s}$$

The safe well yield (Q_{safe}) can then be estimated by multiplying the specific capacity after 100 days of pumping (SC) by the maximum available drawdown (D) by a safety factor of 0.7:

$$Q_{safe} = 0.7 \times SC_{100} \times D_{available}$$

Using this approach, the safe well yield was calculated for the average scenario based on a conservative transmissivity values. The safe well yield was calculated to be approximately 2,070 litres per minute of continuous pumping for 100 days. This is significantly more than the peak pumping rates of MECP Procedure D-5-5 of 18.9 litres per minute for a period of 2 hours. The safe yield estimate is consistent with the pumping tests results, which saw negligible water level drawdown at pumping rates of approximately 75 litres per minute, which is four times greater than that required to support a 4-bedroom residential dwelling.

Based on these results, it is our opinion that the long term safe well yield of the onsite test wells and future wells constructed in accordance with the well construction recommendations is greater than the demand of the proposed development. That is, no concerns with long term sustainability of the proposed water supply aquifer were identified.

5.8 Vertical Gradients

Regional studies (MVRVCA, 2011) indicate that the Site is located within a transitional area, where the water level between shallow and deep wells is +/- 5 metres, and not considered to be significantly recharging or discharging. The assessment of vertical gradients at the regional scale have limitations based on the assessment approach, including assumptions that the deep wells are connected to the unconfined aquifer and without taking into account geologic setting.

The on-site investigations were completed in stages, where the majority of secondary test wells (shallow aquifer) were abandoned prior to testing of the primary test wells (deep aquifer) and as such, there is limited data to assess vertical gradients. Where data is available for TW22-01 pre and post well lining, the water level data indicates slightly upward vertical gradients; however, given the time period between measurements, the assessment of vertical gradients may be impacted by seasonal variations in water levels.

Table 5.9 – TW22-01 Vertical Gradients

Test Well ID	Date of Measurement	Water Level (m TOC)	Water Level (m, elevation)
TW22-01	May 24, 2022	5.63	133.6

Test Well ID	Date of Measurement	Water Level (m TOC)	Water Level (m, elevation)
TW22-01 (lined)	April 25, 2023	5.09	134.2

Notes: Ground surface elevation obtained from available DEM mapping (TW22-01 = 140 metres) and casing heights measured in the field (TW22-01 = 0.72 metres).

6.0 IMPACT ASSESSMENT

The potential impact on groundwater and surface water resources due to wastewater treatment and disposal by individual onsite sewage disposal systems is assessed in the following sections.

6.1 Sewage Disposal Systems

It should be noted that the following information is provided for general guidance purposes only and that all septic systems installed on the site should be designed on a lot-by-lot basis using a lot specific investigation involving test holes to determine the actual subsurface conditions at the location of the proposed septic system. In all cases, the septic system design must conform to the Ontario Building Code (OBC) requirements.

6.1.1 Class IV Septic Sewage Disposal Systems

The septic system envelope area (septic envelope) represents the area on a lot set aside for the construction of the leaching bed and is for the leaching bed only. It does not include that area required for the septic tank or the isolation/separation distances required by the Ontario Building Code (OBC). The size of the septic system envelope is a function of the percolation rate of the native soil in the vicinity of the septic envelope (or the fill used for the construction of a septic bed) and the daily effluent loading to the septic bed.

The septic envelope sizes were estimated for the purposes of preparing a Conceptual Lot Development Plan (Figure 14, Appendix A). The conservative average septic system envelope required to service a single-family dwelling at this Site; which was calculated using a conservative design flow of 3,500 litres/day and a conservative loading rate of 4 litres/m^2/day. The septic envelope area required under this scenario is 875 m^2 (0.088 hectares). This septic system envelope should be readily accommodated on the lot sizes that are proposed, as demonstrated in the Conceptual Lot Development Plan (Figure 14, Appendix A).

Prior to establishing the actual septic envelope (leaching bed) location on any particular lot, test holes should be excavated to determine the actual subsurface conditions in the area of the proposed leaching bed. The septic leaching bed design must ensure that the bottom of the absorption trenches is at least 0.9 metres above low permeability soils (such as silty clay), bedrock, and the seasonally high groundwater table. Based on the soil conditions which were

observed in the test pits and boreholes, it is expected that some or all of the septic leaching beds at this site will be partially or fully raised.

A site-specific investigation should be carried out on each lot for septic system design purposes to determine the thickness and type of overburden present in any areas proposed for installation of leaching beds.

6.1.2 Tertiary Septic Systems

Approved septic disposal systems that meet the OBC requirements for tertiary treatment could also be considered for this development in place of conventional Class IV septic systems. The disposal beds for tertiary treatment systems require a smaller area than conventional Class IV septic systems. Furthermore, the required separation distance between the underside of the crushed stone layer in the disposal bed and low permeability soils, bedrock, or the seasonally high groundwater table is less than the required 0.9 metres for conventional septic systems. Some tertiary treatment systems are also effective in reducing contaminants, such as nitrate, prior to disposal to the leaching bed.

6.2 Groundwater Impacts

The potential risk to groundwater resources on and off the site was assessed in accordance with Ministry of Environment Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment. To evaluate the groundwater impacts, the Three-Step Assessment Process outlining in MECP D-5-4 was followed.

6.2.1 Three-Step Assessment: Step 1 – Lot Size Considerations

Lot sizes of 1.0 hectares or larger on sites that are not hydrogeologically sensitive are assumed to be sufficient for attenuative processes to reduce nitrate-nitrogen to acceptable concentrations in groundwater below adjacent properties.

The proposed lot sizes (42 lots and road over an area of 27.5 hectares) do not meet this consideration.

6.2.2 Three-Step Assessment: Step 2 – Isolation

Where proposed lot sizes are less than 1.0 hectares, as is the case with this Site, the risk of sewage effluent contamination must be assessed for the proposed subdivision. As per Procedure D-5-4, it is required to:

- Evaluate the most probable groundwater receiver for sewage effluent; and,
- Define the most probable lower hydraulic or physical boundary of the groundwater receiving the sewage effluent.

Based on the hydrogeological conceptual model and as per the isolation requirements of MECP Procedure D-5-4, the groundwater receiver for the septic effluent is the bedrock aquifer and the septic effluent may not be fully isolated from the water supply aquifer.

The result of the hydrogeological conceptual model indicates that the thin surficial overburden deposits across the site generally do not meet the above requirements for isolation.

6.2.3 Three-Step Assessment: Step 3 – Nitrate Dilution Calculations

Where it cannot be demonstrated that the effluent is hydrogeologically isolated from the water supply aquifer and the proposed lot sizes are less than 1.0 hectares and/or the site is considered hydrogeologically sensitive, the risk of individual on-site septic systems will be assessed using nitrate-nitrogen contaminant loading. The maximum allowable concentration of nitrate in the groundwater at the boundaries of the Site is 10 milligrams per litre as per MECP Procedure D-5-4, dated August 1996.

The nitrate concentration at the site boundaries was calculated using the information in Table 6.1, below.

Table 6.1 – Nitrate Dilution Assumptions

Parameters	Nitrate Dilution Calcs
Subdivision Area	392,684 m^2
Hard Surface Areas	35,942 m^2 (approx. 9% of total site area) *Average house footprint = 277 m^2 (x 42 lots = 11,634 m^2), Average driveway footprint = 329 m^2 (x 42 lots = 13,818 m^2), internal roadway = 10,490 m^2.*
Infiltration Area *Lot area – 10% for hard surfaces (e.g. roof, driveways)*	356,742 m^2
Water Holding Capacity[1]	75 mm *Shallow rooted crops/urban lawns, fine sandy loam*
Annual Water Surplus[2]	390 mm/year
Topography Factor (TF)	0.21 *Rolling lands with average slope of 2.5m/km*
Soil Factor (SF)	0.3 *In between medium combinations of clay and loam (0.2) and fine sandy loam (0.4)*
Cover Factor (CF)	0.1 *Cultivated Land*
Infiltration Factor[3] (TF + SF + CF)	0.61

1. Water holding capacity of soils (WHC) based on information obtained from Table 3.1 of the Ministry of Environment Stormwater Management Planning and Design Manual, dated March 2003.
2. Annual water surplus based on Environment Canada Water Surplus Datasheets (Appendix F) for weather station Drummond Centre (1985-2021).
3. Infiltration factors based on information provided in MOEE, 1995.

The predictive assessment was conducted using a mass balance calculation to determine the sewage loading for nitrate at the property boundary (see equation below).

$$C_{Nitrate} = \frac{Mass}{Volume} = \frac{Annual\ Nitrate\ Loading(grams/year)}{Annual\ Dilution\ Volume(cubic\ metres/year)} = \frac{grams}{cubic\ metre} = \frac{mg}{L}$$

Given the historical agricultural land use at the site and the detection of nitrate in groundwater at the site as part of the hydrogeological investigation conducted by McIntosh Perry in 2015, on-site test wells were sampled to assess current groundwater conditions. A total of 5 existing test wells at the site, TW-01 to TW-05, inclusive, were disinfected on April 22, 2021 using bleach solution and purged and sampled on April 23 and 24, 2021. Nitrate was found at concentrations ranging from 2.7 mg/L to 3.2 mg/L in all wells except TW-02 where the nitrate concentration was below the detection limit.

A total of five off-site private wells located north, south and east of the proposed subdivision, namely PW-1562, PW-1744, PW-1802, PW-3928, and PW-3896 were also sampled on April 21, 2021. Samples were also collected in 15 off-site wells were also sampled for nitrate on March 23, 2022. Nitrate was found at concentrations ranging from 0.6 mg/L to 5.5 mg/L in all private wells, which is consistent with current and historical on-site nitrate concentrations. It should be noted that wells with nitrate concentrations exceeding 4 mg/L were located south and west of the Site, with the exception of one well located approximately 570 metres west of the proposed development and where the water well record indicated a shallow casing not meeting O. Reg. 903. Those higher concentrations are not considered representative of background concentrations for the Site based on the regional groundwater flow direction to the southeast. The average of all off-site well nitrate concentrations is 2.8 mg/L and the average concentration of all samples collected within Phase 1 of the development (including test wells TW-03, TW-04 and TW-05 and including data from 2015, which was likely biased high due to the application of fertilizer shortly before testing in 2015) is 3.4 mg/L. As such, GEMTEC considered that a nitrate concentration of 3.4 mg/L is a conservative representation of background conditions for the nitrate dilution calculations.

The nitrate dilution calculations are provided in Appendix F and summarized in Table 6.2 below. The predictive assessment was conducted for Phase 1 of the proposed development with conventional septic systems.

Table 6.2 – Nitrate Dilution Calculations

Parameters	Nitrate Dilution Calcs Conventional Systems
Number of Lots	42
Annual Nitrate Loading	613,200 grams/year *(42 lots x 40 grams/lot/day *365 days/year)*
Annual Dilution Volume	84,720 m^3/year *(surplus 0.390 m/year * infiltration factor 0.61 * infiltration area 356,115 m^{2-}) + (septic flows of 1 m^3/lot/day * 42 lots * 365 days/year)*
Nitrate Concentration at Property Boundary	**6.1 mg/L** *(Annual nitrate Loading/Annual Dilution Volume)*
Background Nitrate Concentration	3.4 mg/L (Calculated average historical concentrations of wells withing the proposed Phase 1, which is higher that the average concentration of 18 off-site wells of 2.9 mg/L)
Total Nitrate Concentration at Property Boundary	9.5 mg/L *(Annual nitrate Loading/Annual Dilution Volume + Background concentration)*

Based on the above information, the total nitrate concentration at the site boundaries, including background concentrations averaging 3.4 mg/L, was calculated to be 9.5 mg/L for 42 lots with conventional systems (refer to the calculation in Appendix F). The nitrate impact assessment, using conservative assumptions, meets the acceptable nitrate impact requirement of 10 mg/L established by the MECP for conventional septic systems.

6.3 Surface Water Impacts

Based on the hydrogeological conceptual model, the primary septic effluent receiver is the shallow bedrock aquifer. Effluents will be distributed over a larger surface area and undergo additional dilution prior to infiltrating in the shallow bedrock. If runoff occurs during wet periods of the year, it will be directed towards the ditches. Roadside ditches will connect to the existing roadside ditch network along Drummond Concession 1 and Drummond Concession 2 roads and therefore, runoff during those periods would travel multiple kilometers and undergo significant dilution in the ditch network before reaching a surface water body. Impacts to surface water features are therefore not anticipated.

7.0 HYDROGEOLOGICAL SENSITIVITY – NITRATES

To provide informed future water well construction recommendations that will provide a safe water supply for future residents in the long term, GEMTEC has assessed the potential sources of nitrates and characterized the distribution of nitrate in groundwater both horizontally and with depth. Results of this characterization are discussed in Sections 7.1 to 7.3 below.

7.1 Potential Sources of Nitrates

Based on the results of our investigation, the potential sources of nitrates include:

- Septic systems: This is most evident at Fellinger Mills Estates, where there is no historic or current agricultural land use. This residential subdivision has been occupied for 15+ years and the current nitrate concentrations are considered to be representative of stabilized nitrate concentrations, as the input source (i.e., residential septic systems) is consistent over time. One test well has anomalously high nitrate compared to neighbouring private wells, and the elevated nitrates are likely associated with poor well maintenance or damage.
- Agricultural fertilizers: Off-site agricultural practices are unknown. On-site agricultural activities included rotating crops of barley, soybeans and oats prior to 2019. Given the agricultural setting, it is expected that fertilizers would have been used. Where seasonal sampling is available, the majority of test wells do not show evidence of significant increases/decreases in nitrate concentrations, suggesting that the water supply aquifer is not highly vulnerable to surface impacts. This can be supported by the low to non-detectable bacteriological parameters (total coliform, fecal coliform and *E.coli* in test wells and private wells) and low concentrations of other surface water impact indicators. Two on-site test wells, TW-01 and TW-04 did have significant variability in nitrates over time, with TW-04 located within an active agricultural setting having decreasing nitrates over time (2015 to 2022), consistent with a change in land use from fertilized crops (soybeans, oats, and barley) to unfertilized hay. The nitrate concentration in TW-01 increased significantly from 2015 to 2022 and based on the variability of nitrates and location, the likely source of nitrates is from a point source – possibly from a poorly constructed neighbouring well (see below).
- Geothermal systems and agricultural/private wells with shallow casings or poor construction: A geothermal open loop system consisting of an on-site private well (4063 Drummond 2) had a nitrate concentration in excess of 5 mg/L. This may also explain the increased depth of nitrate impacts noted near 4063 Drummond Concession 2 on Figure 10. The old shallow casing well was abandoned and replaced by a new well (PW-4063) featuring a casing depth of 18.3 metres. The new well has significant reduction in nitrate concentrations between 1.7 mg/L and 2.2 mg/L.
    - It should also be noted that a well abandonment record for an old farm well can be found in the vicinity of PW-1700. The presence of an old farm well may have

impacted the water quality in the aquifer on that property, which may explain the unusually high nitrate concentration found in PW-1700. This may also explain the increased depth of nitrate impacts noted near TW-1710 on Figure 10.

- In the Fellinger's Mills Estates subdivision, PW-981 featuring a nitrate concentration of 6.5 mg/L may indicate issues with the well construction as it is the only well featuring such high concentration in the entire area. Based on its location, that well may be former Test well TW1, but that remains to be confirmed. If it is the case, the well record indicates that this well would feature a 10-metre casing sealed with quick grout. It appears other surrounding water supply wells were constructed with a mixture of cement and quick grout that may offer a better seal over time. If PW-981 is one of the test wells drilled before the construction of the subdivision, it may also have been damaged during construction of the nearby houses if bedrock removal was required and blasting took place.

- Livestock: Based on aerial photographs and site reconnaissance (via homeowner water quality sampling), there are no significant livestock operations within 500 metres of the Site. The property to the north has a stable and horse track, although based on information provided, there are only three horses on the property. Therefore, there are no significant livestock operations in the area and livestock is not likely to be a significant contributor to nitrate contamination.

7.2 Regional Distribution of Nitrate

Detectable nitrate concentrations, ranging from 0.1 to 6.5 mg/L are present in all test wells and private wells sampled as part of this investigation, with the exception of wells cased to depths of 36.6 metres below ground surface. Figure 10 illustrates the distribution of the nitrate concentrations in private wells and test wells in the area. The latest sampling data was used for the nitrate inputs, with the sampling dates ranging from 2021 to 2022. Where seasonal or long-term sampling data is available from on-site test wells, the difference in concentrations did not typically exceed 0.2 mg/L (with the exception of TW-01 and TW-04), which may imply that there is no significant seasonality in nitrate concentrations in the source aquifer.

Based on the concentrations observed on-site and off-site, it appears that nitrate concentrations ranging from 1.5 mg/L to slightly above 3.0 mg/L are frequently observed. A few wells near along Drummond Concession Road 1, south of the Site, feature concentrations ranging from 3.6 mg/L to 5.5 mg/L. It appears that the localized elevated concentrations may be linked to impacted wells with shallow casings in the area. In effect, based on the water well record of PW-1700 located southwest of the Site (Figure 10), the well appears to feature a casing depth of only 6 metres.

In the Fellinger's Mills Estates subdivision area one well had a nitrate concentration of 6.5 mg/L, but this result appears to be an outlier given that other locations typically feature concentrations in the range of 1.0 mg/L to 3.8 mg/L, with most results in the order of 1.0 mg/L to 2.0 mg/L (Figure 10).

Although they are slightly lower than concentrations observed in the vicinity of the Site, detectable nitrate concentrations are present in the area surrounding the Fellinger's Mills subdivision as well. Based on findings of the original hydrogeological investigation completed by HECL in 2005, it appears the nitrate concentrations in groundwater have increased since the construction of the subdivision, suggesting a limited impact from septic systems in the area. However, it should be noted that nitrate appears to be the only indicator of potential septic impacts, and the detectable nitrate concentrations remained well below the guideline for nitrate at 10 mg/L for the last 15 years. As such it appears that nitrate should not represent a concern in the long term.

7.3 Vertical Distribution of Nitrates

GEMTEC has prepared three cross sections to delineate the water bearing zones and nitrate concentrations within the water supply aquifer (Figures 11, 12, and 13). Based on the distribution of water bearing zones and nitrate concentrations, it appears that nitrate impacts are primarily concentrated in water bearing zones located within 20 to 25 metres below ground surface, or to an elevation of approximately 114 metres above mean sea level. The new test wells with 36.6 metres of casing, extending to an elevation of approximately 102 metres above sea level, did not encounter any detectable nitrate concentrations.

Two existing test wells, TW22-01 and TW22-8, had well casings extended from 18.3 and 15.3 metres respectively, to 36.6 metres. Following the casing extension, the nitrate concentrations decreased from 1.7 to 0.2 mg/L and 2.5 to 0.1 mg/L in TW22-01 and TW22-8 respectively (refer to Figure 11).

7.4 Fellinger's Mills Estates Subdivision

In order to assess the effects of the long-term presence of septic systems on the groundwater quality with respect to nitrate impacts, nitrate concentrations from both divisions were compared. Nitrate concentrations from both subdivisions are presented in Table 7.1 below.

Table 7.1 – Comparison of On-Site and Offsite Fellinger's Mills Estate (Daniel Crain Dr. and Leslie Crain Dr.) Nitrate Concentrations

Parameter	On-Site Test Wells	Fellinger's Mills wells
Minimum Nitrate Concentration (mg/L)	1.7	1.8
Maximum Nitrate Concentration (mg/L)	5.1	6.5
Average Nitrate Concentration	3.4	3.7

Parameter	On-Site Test Wells	Fellinger's Mills wells
Number of wells sampled	3	3

Nitrate concentrations presented in Table 7.1 above suggest that nitrate concentrations after 15 years of development are similar to concentrations obtained at the Site. However, after review of initial conditions of the Fellinger's Mill Estate original hydrogeological study, nitrate concentrations at that property used to be below 1 mg/L pre-development. In effect, background nitrate concentrations in 2005 ranged from <0.01 to 1.15 mg/L, with an average of 0.40 mg/L. The concentration measured in 2021 ranged from 1.80 mg/L to 6.50 mg/L with an average of 3.67 mg/L. Analytical data from PW-746, PW-853 and PW-981 suggest an overall increase of the average nitrate concentration in the order of 3.3 mg/L above background values over that period of time. Although a notable increase in nitrate concentrations was observed during that time period, all concentrations remained below 10 mg/L and the observed increases in concentrations did not exceed increases in concentrations predicted (7.6 mg/L) at the Site.

The source of nitrates within the Fellinger's Mills Estates is likely from on-site septic systems, which are expected to have a relatively constant septic loading in the residential dwellings. Some variability in nitrate concentrations is expected and although seasonal sampling was not completed, the three samples collected in August 2021, when nitrate concentrations are expected to be the highest, were all below that predicted in the original hydrogeological investigation (HCEL, 2005). Given the residential subdivision has been fully developed for over 15 years, the background nitrate concentrations are considered to be relatively stable now.

A total of eight private wells were sampled within the Fellinger's Mills Estates subdivision between August 2021 and April 2022 (analytical data is provided in Appendix E). *E.Coli* was not detected in any well, and only two out of the eight wells had a count of 1 CFU/100 ml for total coliform, which is not unusual for wells that are not disinfected on a regular basis. Dissolved organic carbon, turbidity, and chloride all met their respective guidelines.

It is GEMTEC's opinion, similar to the Fellinger's Mills subdivision nitrate loading, nitrate impacts to the aquifer originating from the Site should be negligible given the similar hydrogeological setting and additional mitigation measures.

8.0 CONCLUSIONS

Based on the results of the hydrogeological investigation, the following conclusions and professional opinions are provided:

8.1 Hydrogeologic Setting

- The geology of the Site generally consists of thinly veneered unconsolidated quaternary sediments, consisting of silty clay, sandy silt and silty sand and/or glacial till. The on Site overburden thickness ranges from approximately 0.2 to 1.8 metres. The Site is considered to be hydrogeologically sensitive and protective measures are recommended to minimize potential impacts to the water supply aquifer.

- Hydrostratigraphic Units
    - Overburden (thin deposits of silty sand to sandy silt, and silty clay over bedrock)
    - Shallow fractured bedrock at overburden / bedrock interface
    - Upper aquifer (dolostone and sandstone of the March and Oxford Formations)
    - Lower aquifer (sandstones of the Nepean Formation)
        - March and Nepean Formations are significant regional aquifers in the area, which provide groundwater to a number of local municipalities, including communal water supply wells in Kemptville and Merrickville, Ontario.
        - The Nepean Formation is locally known to be a high yielding aquifer with good water quality.
        - Regional mapping and on-site measurements indicate the Site is not located within a significant recharge or discharge area and is located within a transitional zone (+/- 5 metres).

- The Site is located within an area of highly vulnerable aquifer based on background mapping resources (MRSPR, 2011). Based on extensive water quality sampling, with a total of 44 test wells and private wells, the water supply aquifer is impacted by nitrates, ranging from <0.1 to 6.5 mg/L.
    - The source of nitrates has not been conclusively identified; however, based on the investigations completed to date, there are likely multiple sources including:
        - Septic systems (most evident on the Fellinger's Mills Estates subdivision, which appears to have reached equilibrium and is within the predicted nitrate concentration for the subdivision).
        - Agricultural fertilizers potentially used on-site and on surrounding lands.
        - Geothermal systems and agricultural or private wells with shallow casings or poor construction that may act as vertical conduits are documented in the area surrounding the proposed subdivision. Those geothermal systems and shallow casing wells appear to be located in areas where nitrate was noted a greater depth in the aquifer.

- Despite the elevated nitrate concentrations, all test well and private wells sampled do not indicate significant septic or agricultural contamination, i.e., acceptable bacteriological parameters (total coliform, *E.coli* and fecal coliform), relatively low chloride concentrations and no significant surface water indicator parameters, which would be more evident in a highly vulnerable aquifer. Lower nitrates levels were noted in water wells with deeper well casings.
- Test wells with extended well casing depths of 36.6 metres have been demonstrated to extend below zones impacted by nitrates.

8.2 Water Quality

- The groundwater quality of the water supply aquifer has been extensively characterized through sampling of on-site test wells (with varying depths and casing lengths), off-site test wells, off-site private wells, and Fellinger's Mills residential subdivision private wells. The groundwater quality of the proposed water supply aquifer, based on testing of the primary test wells meets all ODWQS maximum acceptable concentrations, health-related limits and maximum concentrations considered to be reasonably treatable, with operational guideline exceedances of hardness, aesthetic objective exceedances of iron and manganese and warning level for persons on sodium restricted diets. All exceedances are within MECP Procedure D-5-5 treatability limits using conventional water softener and/or manganese greensand filters.
  - Test wells TW-02, TW22-01 Liner and TW1710D reported manganese concentrations greater than 0.12 mg/L, which exceeds the Guidelines for Canadian Drinking Water Quality maximum acceptable concentration (Health Canada, 2019). However, those concentrations remain within treatable limits and can be readily reduced by the use of filters.

- The water quality of the proposed water supply aquifer determined in the course of this investigation is representative of long-term water quality from which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.
  - Given the high well yields of the primary test wells completed in the Nepean Formation, the proposed development consisting of 42 residential wells is not anticipated to induce drawdown from the upper aquifer which is impacted by nitrates. This is supported by the estimated safe pumping rate (Qsafe) of approximately 2,070 litres per day, which is significant greater than the proposed 18.9 litres per day required to support a 4-bedroom dwelling.

8.3 Water Quantity

- The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed residential development and will sustain repeated pumping at the test rate (to supply 4-bedroom residential dwellings) and duration at 24-hour intervals over the long term.

- No groundwater quantity issues were identified during homeowner surveys in the vicinity of the Site or the Fellinger's Mills Estates subdivision (which has a higher density than the proposed subdivision).

- Given the high well yields and proposed minimum lot size of 0.8 hectares, interference between drinking water wells is expected to be negligible under typical usage for residential developments. Negligible drawdown in pumping wells were observed pumping at rates 2 to 4 times greater than that required to support a 4-bedroom dwelling. Further, no interference was observed in any test wells during pumping tests completed on TW-01 to TW-05, inclusive. The calculated safe well yield significantly exceeds that required to support a 4-bedroom dwelling and pumping from the proposed water supply aquifer is not anticipated to induce groundwater from the upper aquifer (and thereby induce nitrate to the deeper aquifer).

- The well yields determined in the course of the investigation are representative of the yields which residents of the development are likely to obtain from their wells in the long term.

- The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term.

8.4 Septic Impact Assessment

- Based on the proposed lot sizes and incorporating conservative estimates of background nitrate concentrations, the nitrate dilution calculations indicate the site can support development of the proposed 42-lots. The estimated nitrate concentration at the property boundary is 6.4 mg/L, and when conservatively adding the background nitrate concentration of 3.4 mg/L, remains below 10 mg/L. No significant negative impacts to the bedrock aquifer are anticipated based on nitrate dilution calculations which demonstrate that offsite nitrate impacts are less than 10 mg/L using conventional septic systems.
    - No on-site impacts anticipated due to recommended increased casing lengths of 36.6 metres which have demonstrated to extend below the zone impacted by nitrates.

- The water quality obtained from the nearby Fellinger's Mills Estates residential subdivision, which has a higher density than the Site, suggests that low nitrate impacts related to septic systems are anticipated in the future. The low increase of nitrate concentrations over a 15-year period is within the predicted nitrate concentration (HCEL, 2005) and suggests that nitrate dilution calculations performed as part of this assessment are conservative and mitigation measures based on the results should be protective of future groundwater quality.
- Further, the Site was formerly used for agricultural purposes. Although the farming practices, specifically fertilizer application are unknown, it is expected that the change in land use from agricultural to residential will result in an overall decrease in nitrate input to the water supply aquifer.

- The surface water assessment demonstrates that no surface water bodies will be negatively impacted by the proposed development.

8.5 Test Well Construction

- The test well construction (TW1710D, TW22-01 lined, TW22-8 lined and TW-A318695 lined) is representative of wells which will be used in the development in the future.
- All on-site test wells cased less than 36.6 metres have been abandoned, with the exception of TW-03, which may serve as a long-term monitoring well. If no longer required, TW-03 should be abandoned by a licensed well technician.

8.6 Site Phasing

Under MECP Procedure D-5-4, a phased construction approach is recommended in situations where there is no existing development in place at a site, such that downgradient lands can be monitored for impacts prior to approving further development on the downgradient lands.

In GEMTEC's professional opinion sufficient information is available from existing developments nearby, specifically at the Fellinger's Mill Estates residential subdivision. Technically representative information is available from the Fellinger's Mill Estates residential subdivision located east of the Site. The Fellinger's Mill Estates subdivision is in a similar geologic setting and has a higher density than that proposed for the Site. More specifically:

- The Fellinger's Mill Estates subdivision has been constructed and occupied for greater than 15 years and has an average lot size of 0.75 hectares per lot (49 lots over 36.8 hectares).

- The nitrate concentrations in Fellinger's Mills Estates range from 1.0 to 6.5 mg/L, with an average of 1.8 mg/L. The nitrate concentrations are less than that calculated in the nitrate impact assessment of 7.6 mg/L (HCEL, 2005).

- The proposed residential subdivision at the Site will be serviced by individual private wells and septic systems in accordance with recommendations provided in Section 9 of this report.

Notwithstanding, it may be pragmatic to proceed with a phased approach to confirm the hydrogeological assessment made herein. The proposed site phasing is as follows:

- Proceed with development of 21 southern lots (refer to Figure 14).
    - The groundwater flow direction measured on-site within the upper receiving aquifer is to the west (refer to Figure 7). As such, monitoring wells should be installed downgradient of the proposed subdivision, to the west on lands owned by the client.
- Install and implement a test well monitoring program to support the second phase of the development (12 northern lots, refer to Figure 14).
- Two well cluster monitoring locations are proposed, refer to Figure 14 for locations.
    - Proposed monitoring wells should include: 1) well installed with 10.1 metres of casing to a depth of no more than 18.3 metres (TW-03 can be considered for this purpose) and 2) well installed with 36.6 metres of casing to a depth of approximately 42.7 metres.
- Water quality sampling for analysis of nitrate and nitrite to be completed seasonally (spring, summer, fall and winter) for the first year of monitoring to establish baseline conditions and then twice annually (summer and winter) moving forward.
- Water level monitoring will be completed at the time of water quality sampling, to assess vertical gradients between the upper and lower bedrock aquifers.
- The performance review study in support of the second phase should be completed in accordance with MECP Procedure D-5-5 site phasing requirements. The work program and timing should be developed in consultation with the Township and reviewing hydrogeologist.

8.7 Concluding Remarks

- It is our professional opinion that the proposed development will have no adverse impact on the reasonable use of groundwater on existing and future adjacent properties.

9.0 RECOMMENDATIONS

Recommendations regarding well construction, well ownership and water quality, and septic systems to address issues identified in this report are provided in Sections 9.1 to 9.3 respectively.

9.1 Well Construction Recommendations

- All wells that are drilled in the subdivision should be constructed in accordance with local and MECP regulations, including, but not limited to, Ontario Reg. 903 as well as casing recommendations provided below.

- Well casings should be extended 36.6 metres (120 feet) below ground surface and be completed in competent bedrock.

    - The entire annular space between the steel casing and the overburden/ bedrock should be filled with a suitable cement and/or bentonite grout. Cement grout mixtures should be allowed to set for a minimum 48-hour period for normal cement or twelve hours for a high early strength cement prior to continued well drilling into the bedrock. Significant grout loss has been observed during test well grouting. Well drillers should allow for multi-day well grouting.

    - Due to the potential for bedrock removal on-site for the proposed development, it is recommended that the upper six metres of annual space (equivalent to one standard casing length) is sealed with bentonite grout, which is considered to be more malleable than neat cement, which may reduce potential impacts from nearby bedrock removal (e.g., cracking).

    - A well grouting certification inspection should be conducted during the installation and grouting of the well casing for all future wells installed on the Site. The well grouting certification inspection should be conducted under the supervision of a professional engineer or professional geoscientist.

    - If significant bedrock removal is required for the proposed lots / development (e.g., blasting for building footings, basements, etc.) it is recommended that the water supply wells are constructed after bedrock removal.

- Drinking water wells should be located so that they meet and preferably exceed the minimum setback distances from septic systems, property lines and any other sources of contamination, as required in the Ontario Building Code and/or Ontario Reg. 903.

    - This is considered feasible and drinking water wells should be located in general accordance with the Conceptual Lot Development Plan, prepared by GEMTEC shown in Figure 14 of Appendix A.

- It is recommended that newly drilled water wells be developed by the well driller for a minimum of one hour of pumping following completion of the well drilling. This well

development can be carried in conjunction with the one-hour pumping test that is required for the MECP Water Well Record.

- It is recommended that newly drilled water wells be chlorinated by the well driller following completion of the well drilling and pumping.

- It is recommended that any test wells not utilized as future water supply wells be decommissioned by a licensed well technician in accordance with O.Reg 903.

9.2 Well Ownership and Water Quality Recommendations

- It is recommended that the property owners construct, maintain and test their drinking water well in accordance with the Ministry of the Environment and Climate Change (MOECC) document “Water Supply Wells - Requirements and Best Management Practices, Revised April 2015”.

- For all newly drilled wells, it is recommended that a raw water sample be collected and analyzed for potability requirements (E. Coli. and total coliform bacteria).

    - If any bacteriological exceedances of the Ontario Drinking Water Quality Standards (ODWQS) are noted in the sampling, then it is recommended that the homeowner take remedial actions such as chlorination of the well to eliminate bacteria and retest a raw water sample.

- It is recommended that homeowners be informed that hardness levels may exceed the ODWQS operational guideline for hardness.

    - On heating, hard water tends to form scale deposits and can form excessive scum with regular soaps. Conventional water softeners may be desired by homeowners to treat minor aesthetic objective and operational guideline exceedances of hardness.

- It is recommended that homeowners be informed that water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water which may be of concern to persons on a sodium restricted diet.

    - The use of potassium chloride in the water softener (which adds potassium to the water instead of sodium) could be considered as a means of keeping sodium concentrations in the water at background levels. Consideration could also be given to providing a bypass of the water softener for drinking water purposes.

- It is recommended that homeowners be informed that manganese levels and Colour may exceed the ODWS aesthetic objective of 0.05mg/L and 5 TCU respectively.
    - Elevated levels of manganese may lead to staining of plumbing fixtures and laundry. Filtration systems may be used to reduce manganese concentrations to acceptable limits.
    - Color may be associated with elevated iron concentrations. Filtration systems may be used to reduce iron concentrations to acceptable limits, thereby reducing its effect on color.

9.3 Septic System Construction and Ownership Recommendations

- Septic systems should be positioned on each lot in general accordance with the Conceptual Lot Development Plan, prepared by GEMTEC (Figure 14 in Appendix A).

- In areas with thin overburden (less than 0.15 metres), augmentation of native soils will be required to meet the minimum overburden thickness required for on-site septic systems. Given the conditions as described in this document it is recommended that the soil thickness exceeds the minimum thickness requirement.

    - It is recommended that a minimum 150-millimetre-thick silty clay seal be placed beneath the septic bed on all lots.

- In areas with thin overburden, augmentation of native soils will be required to meet the minimum overburden thickness required for on-site septic systems. It is recommended that the soil exceed the minimum thickness.

- It is recommended that the separation distance between the well and septic should be increased from 15 metres to 30 metres. As indicated in Figure 14 of Appendix A, increased separation distances are considered feasible based on proposed lot sizes;

- The proposed lots may feasibly be serviced by conventional septic systems. The use of tertiary treatment systems with a target of 50% reduction of nitrate loading, i.e., featuring a maximum nitrate concentration of 20 mg/L in septic effluents is recommended for all lots. Any conventional or advanced treatment septic systems should be designed according to the Ontario Building Code. Irrespective of the type of system used, a site-specific investigation should be conducted on each lot for the design of the septic system;

    - It is recommended that tertiary treatment septic systems are BNQ or NSF (or equivalent certification) certified for 50% nitrate reduction.

- It is recommended that property owners who install advanced treatment septic systems be required to enter a maintenance agreement with authorized agents of the system manufacturer for the service life of the system; and,

- It is recommended that the property owners construct, maintain and check their onsite septic system in accordance with the Ontario Building Code.

- Future lot owners should refer to the Best Management Practices for individual wastewater treatment systems: https://www.oowa.org/homeowner-resources/.

10.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Andrius Paznekas, M.Sc., P.Geo.
Hydrogeologist

Shaun Pelkey, M.Sc.E., P.Eng.
Principal, Environmental Engineer

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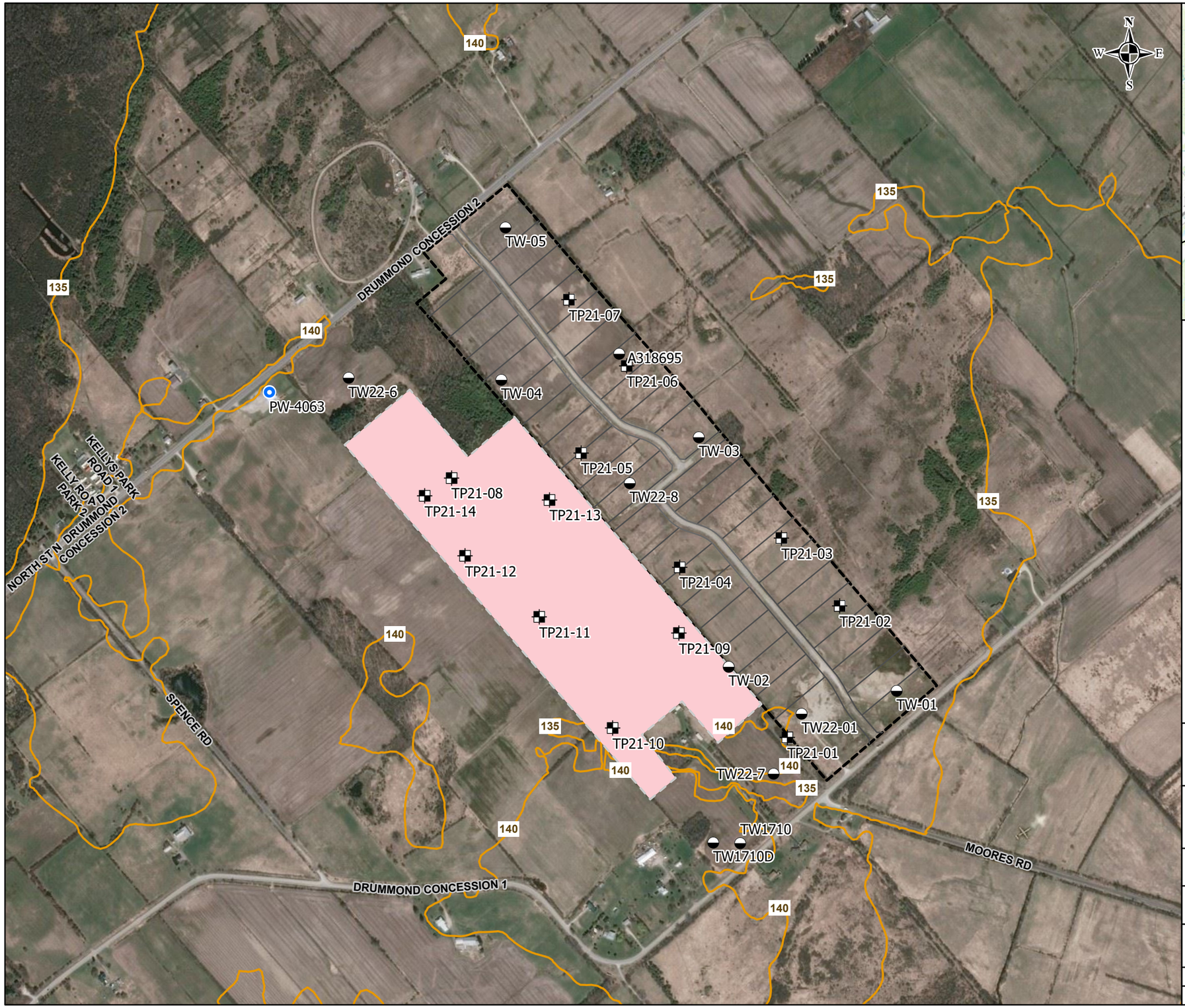
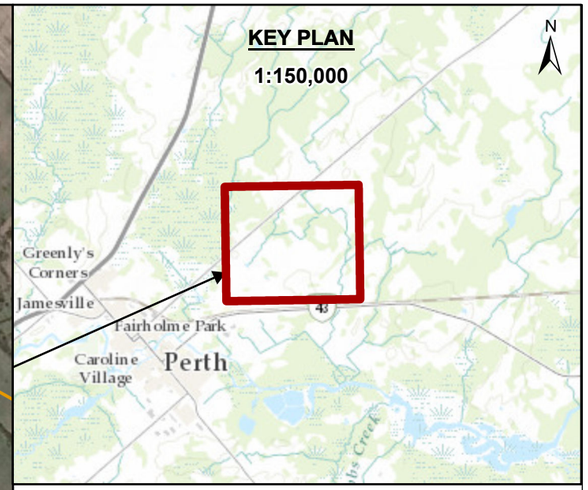
APPENDIX A

Figures





LEGEND

TP/ TW/ PW # ⟸ TEST PIT/ TEST WELL/ PRIVATE WELL ID

- TEST PIT
- TEST WELL APPROXIMATE LOCATION (current investigation)
- PRIVATE WELL APPROXIMATE LOCATION
- LIMIT OF SITE
- LOT BOUNDARY
- OBM CONTOUR INTERVALS, IN METRES
- LANDS OWNED BY THE CLIENT

References:

Service Layer Credits: World Topographic Map: County of Frontenac, Leeds and Grenville, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, AAFC, NRCan
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Ontario Base Maps (OBM), 2022. Contours

Scale
1:8,000
0 62.5 125 250 375 500 625 Meters

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Drawing	Project
SITE PLAN	100227.008

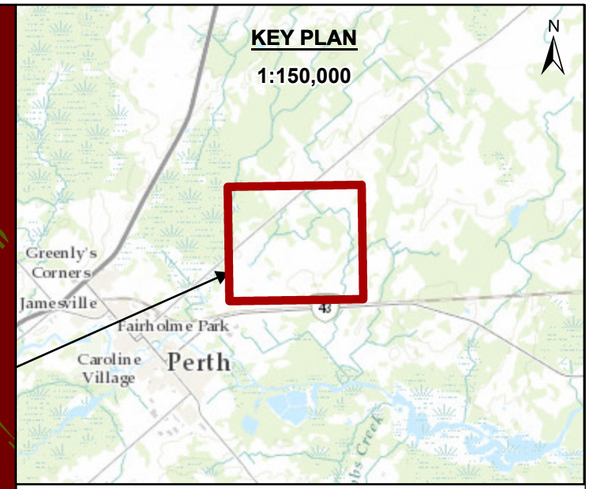
Title: **CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO**

Drwn By	Chkd By	Client
C.Z.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 1



LEGEND

- LIMIT OF SITE
- LOT BOUNDARY

LAND USE:

- WOODED AREA
- LOCAL WETLAND
- PROVINCIALLY SIGNIFICANT WETLAND
- AGRICULTURAL/ FALLOW
- EQUESTRIAN PROPERTY
- PLANNED RESIDENTIAL
- RESIDENTIAL
- TRAILER PARK

References:

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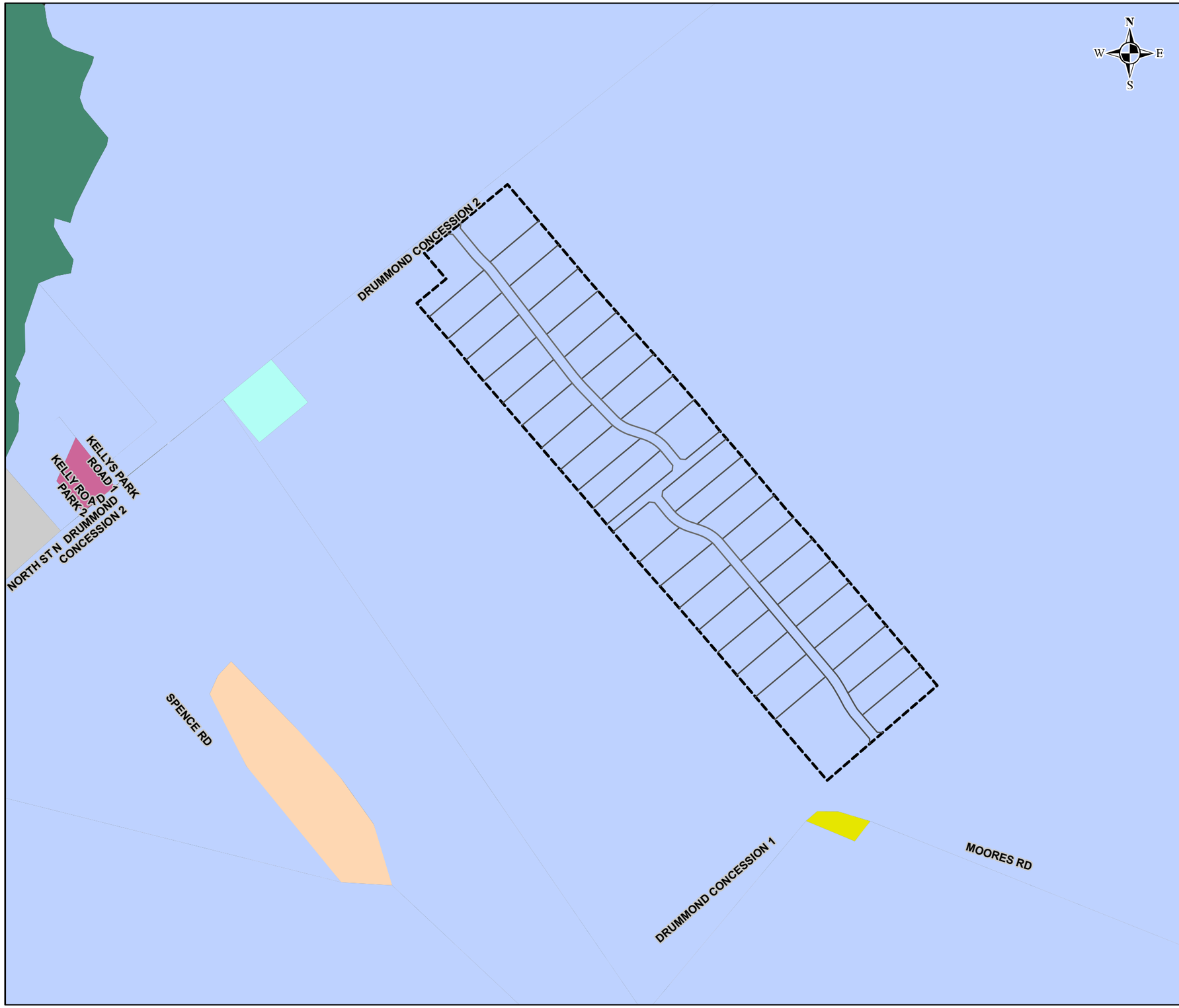
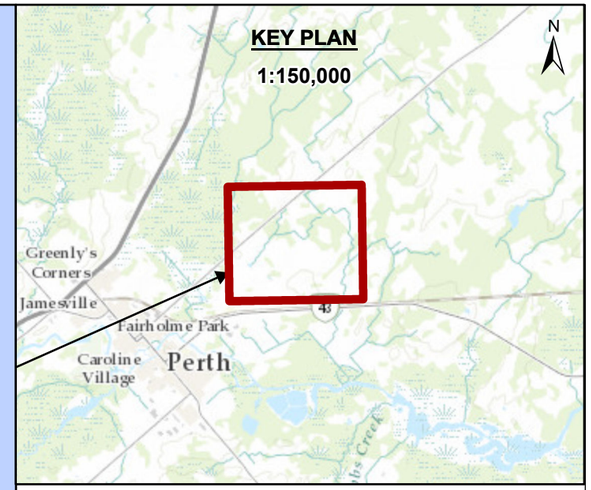
Drwn By	Chkd By	Client
C.Z.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 2





LEGEND

- LIMIT OF SITE
- LOT BOUNDARY

ZONING:

- AGGREGATE PIT (AP)
- COMMERCIAL - HIGHWAY (CH)
- INDUSTRIAL - RURAL (M2)
- MOBILE HOME DEVELOPMENT (MHP-1)
- RURAL (RU)
- RURAL EXCEPTION (RU-79)
- WETLAND (W)
- TOWN OF PERTH

References:

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Drawing	Project
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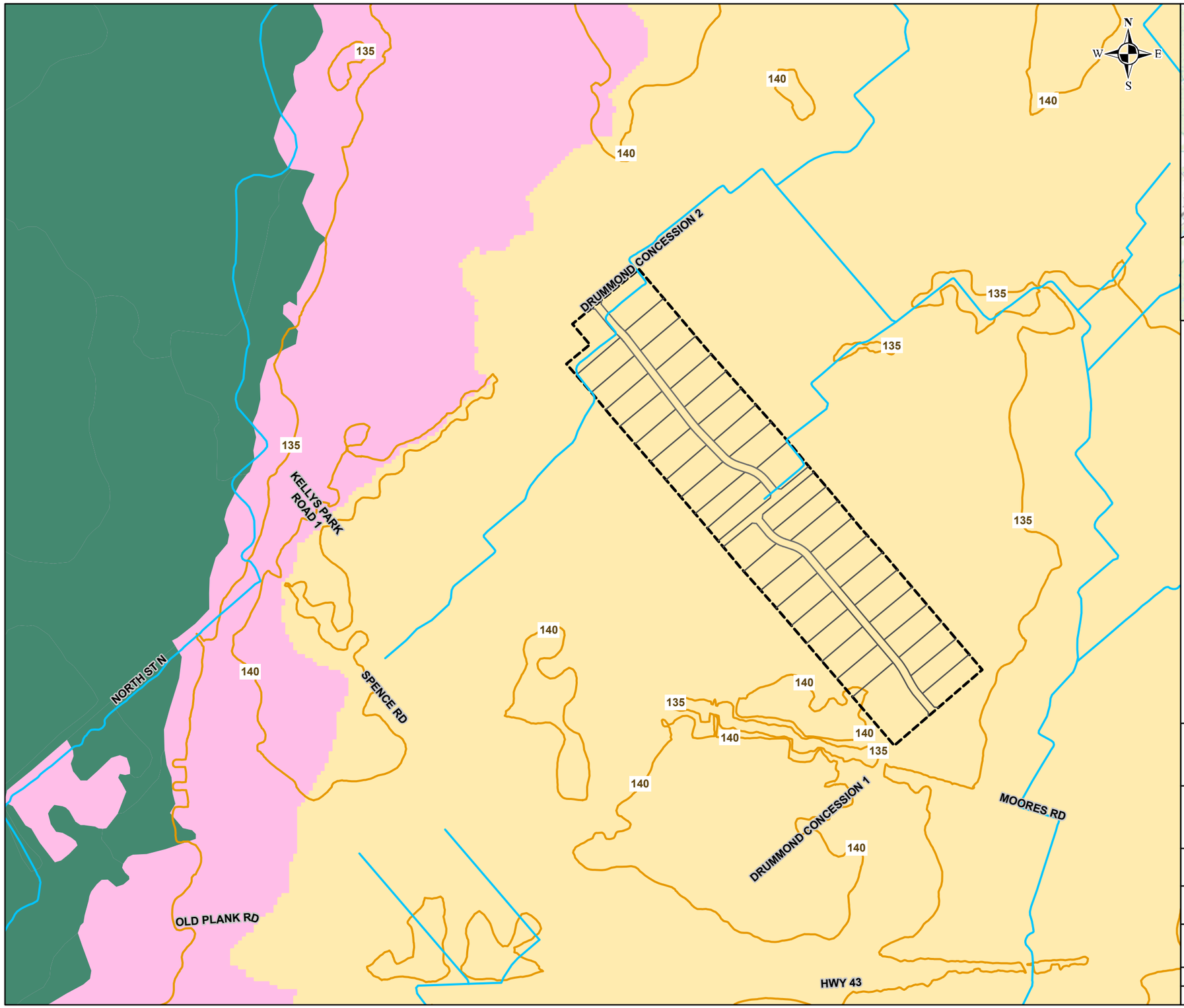
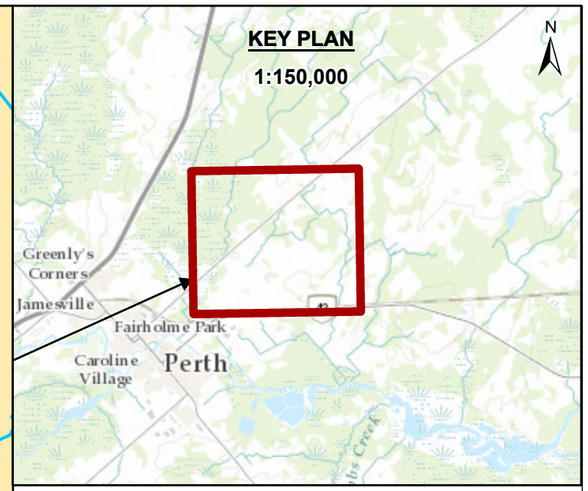
Drwn By	Chkd By	Client
C.Z.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 3





LEGEND

- LIMIT OF SITE
- LOT BOUNDARY
- OBM CONTOUR INTERVALS, IN METRES
- WATERCOURSE
- PROVINCIALLY SIGNIFICANT WETLAND

RVCA CATCHMENT

- TAY RIVER - PERTH
- TAY RIVER - PORT ELMSLEY

References:

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1:10,000
0 80 160 320 480 640 800 Meters

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Drawing	Project
SITE HYDROLOGY MAP	100227.008

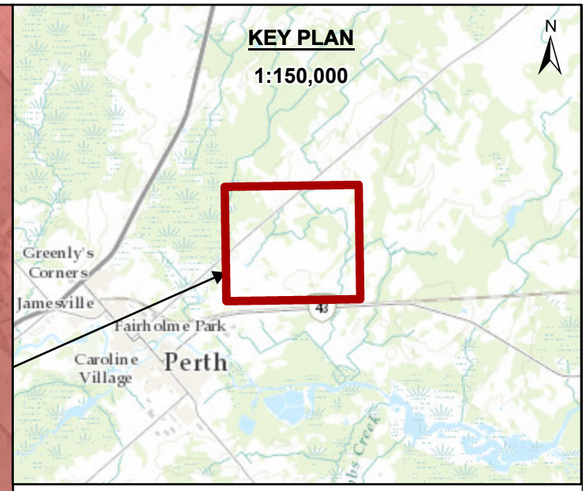
Title: CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

Drwn By	Chkd By	Client
C.Z.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 4



LEGEND

TP/ TW/ PW # ⟸ TEST PIT/ TEST WELL/ PRIVATE WELL ID

- TEST PIT
- TEST WELL APPROXIMATE LOCATION
- PRIVATE WELL APPROXIMATE LOCATION
- LIMIT OF SITE
- LOT BOUNDARY

SURFICIAL GEOLOGY (ID, PRIMARY MATERIAL)

- 4, PALEOZOIC BEDROCK (REFER TO FIGURE 4)
- 8A, SILT
- 9A, GRAVEL
- 10A, CLAY
- 11A, GRAVEL
- 20, ORGANIC DEPOSITS

References:

Service Layer Credits: World Topographic Map: County of Frontenac, Leeds and Grenville, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, AAFC, NRCan
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Ontario Geological Survey, 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 128 – Revised.

Scale
1:8,000
0 62.5 125 250 375 500 625 Meters

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Drawing	Project
SURFICIAL GEOLOGY	100227.008

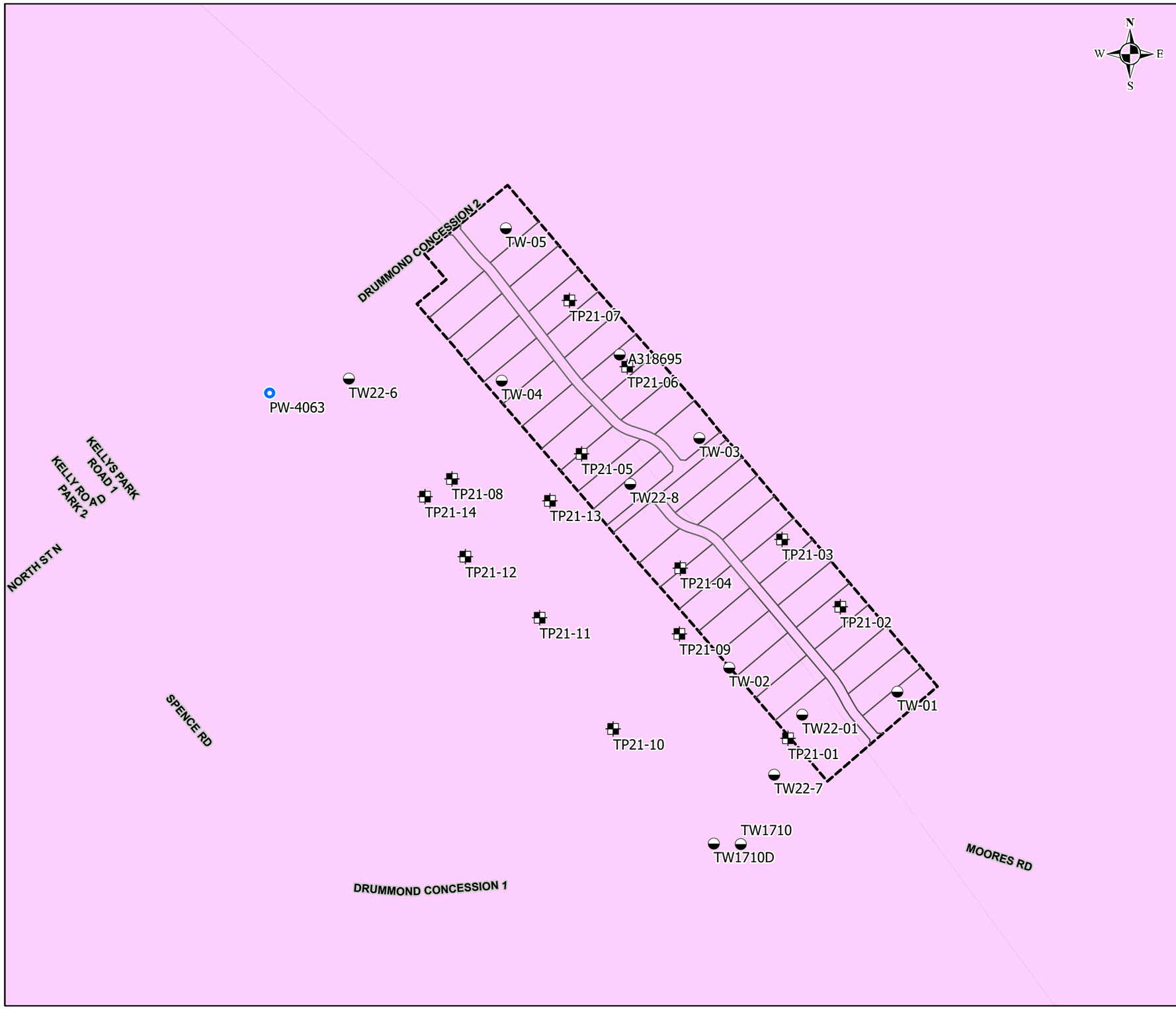
Title: CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

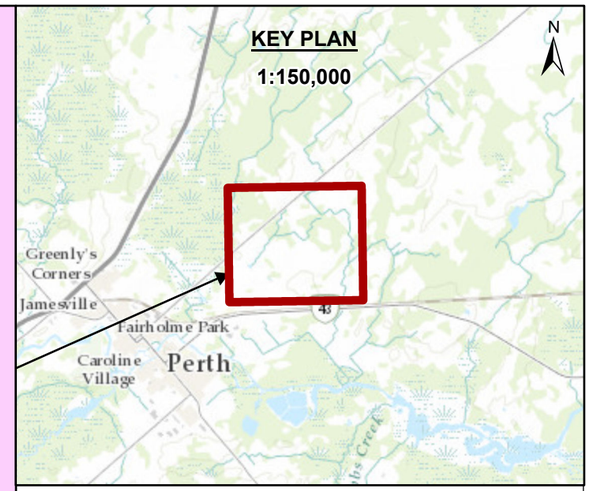
Drwn By	Chkd By	Client
S.L.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 5





LEGEND

TP/ TW/ PW # ⟸ TEST PIT/ TEST WELL/ PRIVATE WELL ID

- TEST PIT
- TEST WELL APPROXIMATE LOCATION
- PRIVATE WELL APPROXIMATE LOCATION
- LIMIT OF SITE
- LOT BOUNDARY

BEDROCK GEOLOGY

53, DOLOSTONE, SANDSTONE

References:

Service Layer Credits: World Topographic Map: County of Frontenac, Leeds and Grenville, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, AAFC, NRCan
Bing Maps Aerial: © 2023 Microsoft Corporation © 2023 Maxar ©CNES (2023)

Armstrong, D.K. and Dodge, J.E.P. Paleozoic Geology Map of Southern Ontario; Ontario Geologic Survey, Miscellaneous Release - Data 2019.

Scale
1:8,000
0 62.5 125 250 375 500 625 Meters

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Drawing	Project
BEDROCK GEOLOGY	100227.008

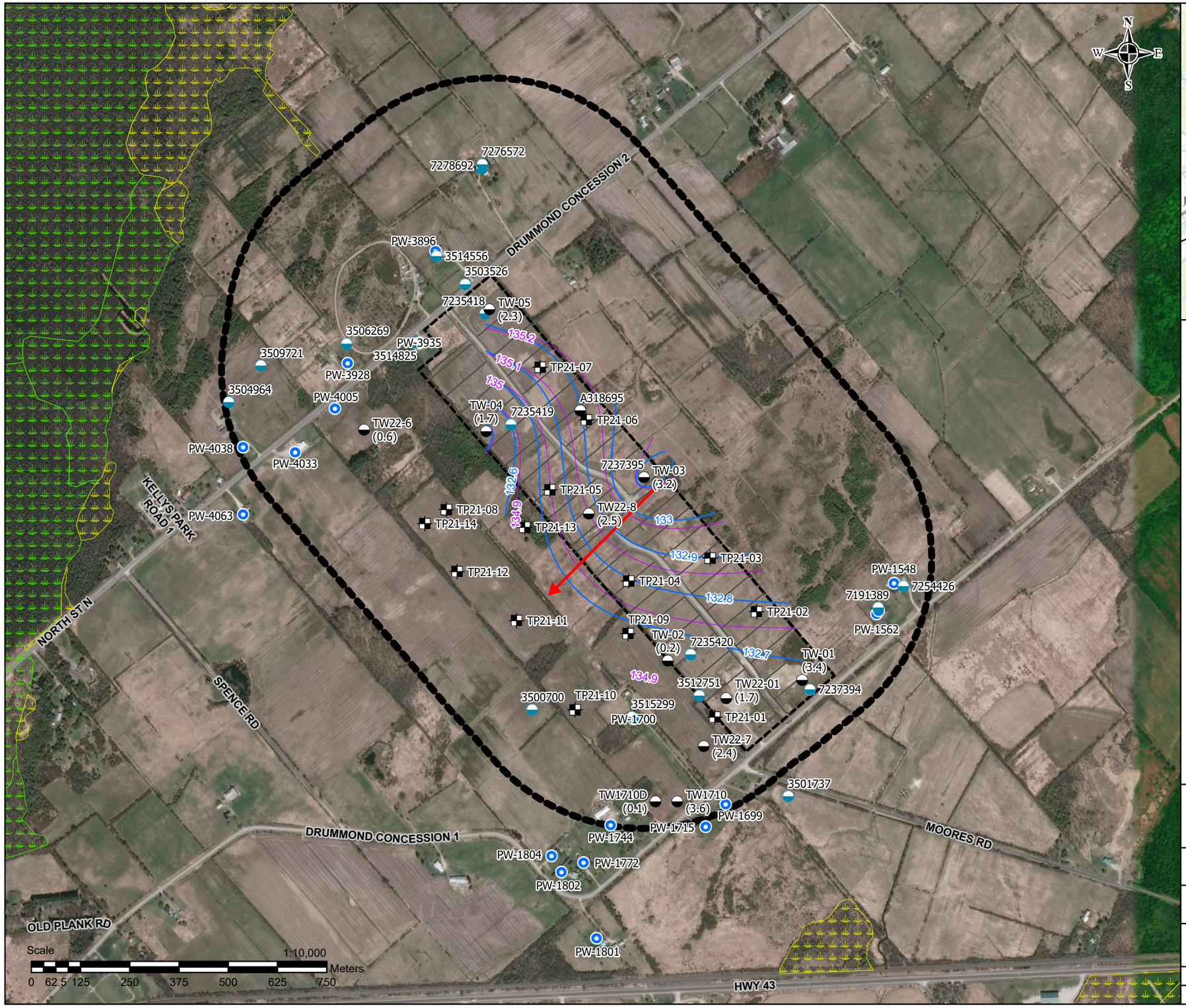
Title: CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

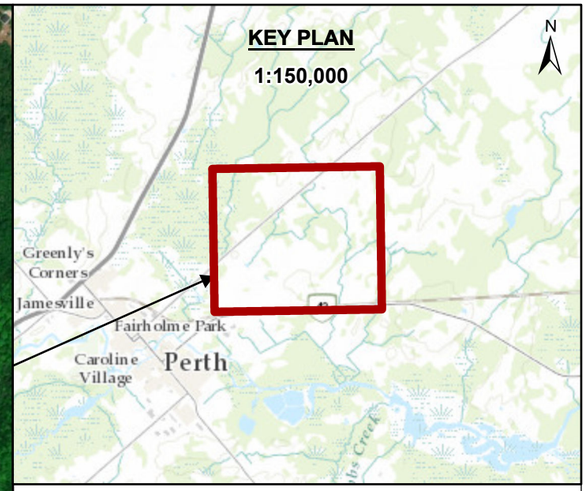
Drwn By	Chkd By	Client
S.L.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 6





LEGEND

TP/ TW/ PW # ⟸ TEST PIT/ TEST WELL/ PRIVATE WELL ID

- TEST PIT
- TEST WELL APPROXIMATE LOCATION
- PRIVATE WELL APPROXIMATE LOCATION
- MECP WELL LOCATION
- 500m BUFFER FROM LIMIT OF SUBDIVISION
- LIMIT OF SITE
- LOT BOUNDARY
- GROUNDWATER CONTOURS, IN METRES (JULY 15, 2022)
- GROUNDWATER CONTOURS, IN METRES (MARCH 18, 2022)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

WETLANDS

- NOT EVALUATED
- EVALUATED - PROVINCIAL

References:

Ontario Ministry of Natural Resources and Forestry, 2019. Wetlands. Available: https://geohub.lio.gov.on.ca/datasets/mnrf::wetlands. Obtained: September 21, 2020.

Ministry of the Environment, Conservation and Parks (MECP), 2018. Water Well Information System (WWIS). Available: https://data.ontario.ca/dataset/well-records. Obtained: June 12, 2020

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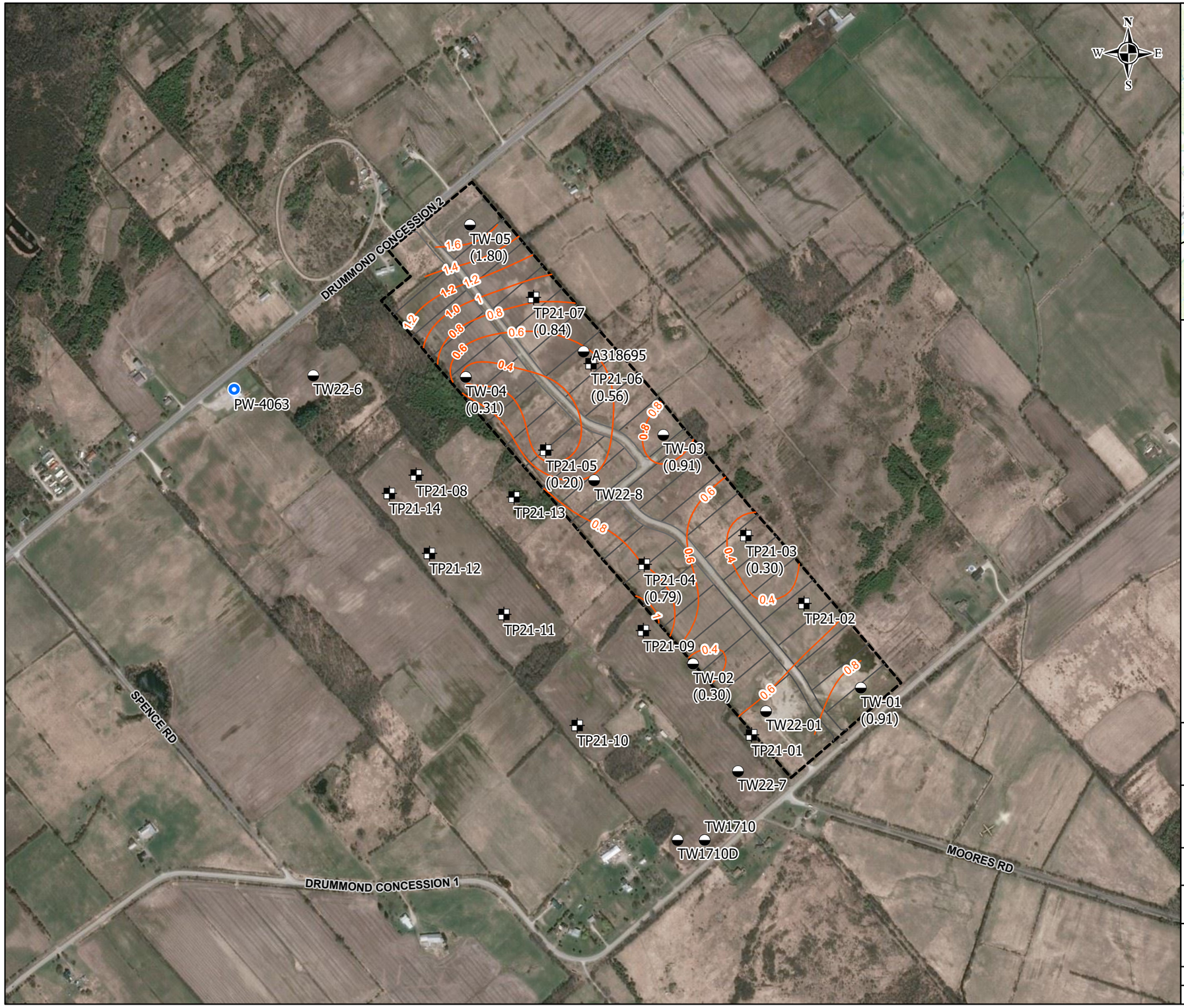
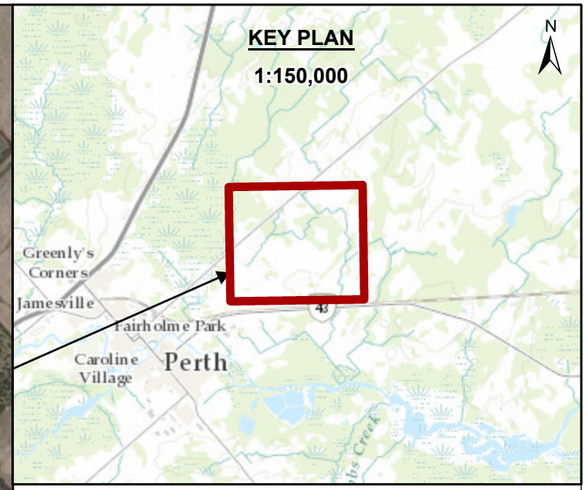
Drawing: **WETLANDS AND WATER WELL RECORDS**		Project: 100227.008
Title: **CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS PROPOSED RESIDENTIAL SUBDIVISION PHASE 1 PART OF LOT 6 AND LOT 7, CONCESSION 1 DRUMMOND TOWNSHIP, ONTARIO**		
Drwn By: S.L.	Chkd By: A.P.	Client: **Wilbert Crain**
Date: September 2023	Rev. 00	**FIGURE: 7**





LEGEND

TP/ TW/ PW # (XX.XX) — TEST PIT/ TEST WELL/ PRIVATE WELL ID; OVERBURDEN THICNESS

- TEST PIT
- TEST WELL APPROXIMATE LOCATION
- PRIVATE WELL APPROXIMATE LOCATION
- 1 — OVERBURDEN THICKNESS CONTOUR, IN METRES
- LIMIT OF SITE
- LOT BOUNDARY

References:

Service Layer Credits: World Topographic Map: County of Frontenac, Leeds and Grenville, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, AAFC, NRCan
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Scale 1:8,000

0 62.5 125 250 375 500 625 Meters

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Drawing	Project
OVERBURDEN THICKNESS	100227.008

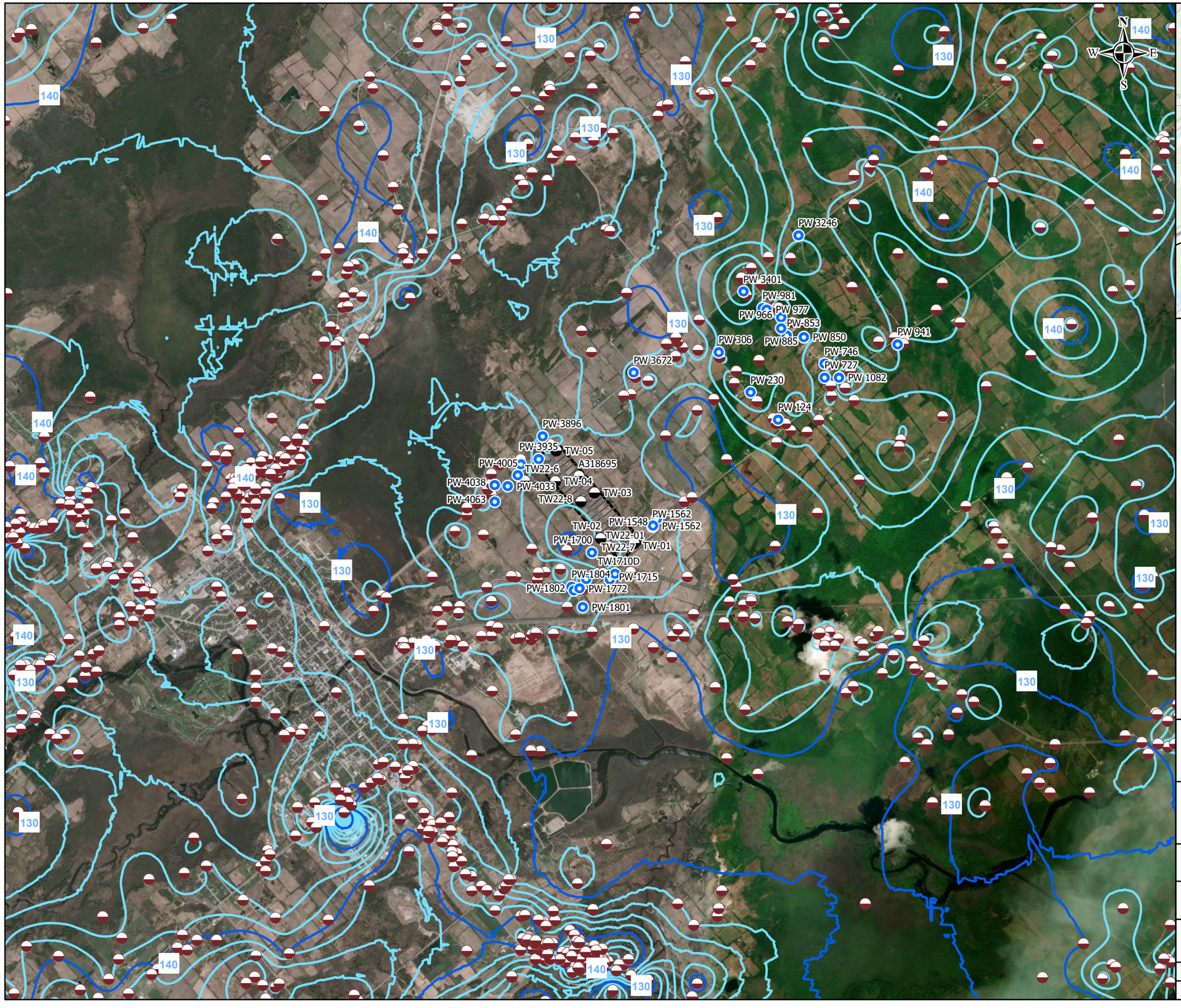
Title: CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

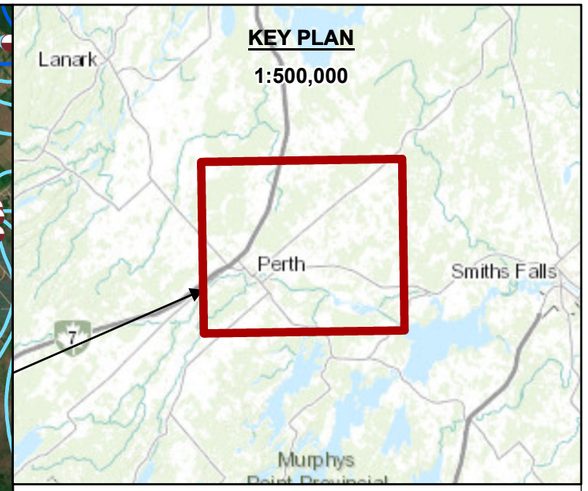
Drwn By	Chkd By	Client
S.L.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 8





LEGEND

TW/ PW # ⇦ TEST WELL/ PRIVATE WELL ID

- TEST WELL APPROXIMATE LOCATION
- PRIVATE WELL APPROXIMATE LOCATION
- MECP WELL LOCATION
- LIMIT OF SITE
- MAJOR GROUNDWATER ELEVATION CONTOUR
- MAJOR GROUNDWATER ELEVATION CONTOUR

References:

Ontario Ministry of Natural Resources and Forestry, 2019. Wetlands. Available: https://geohub.lio.gov.on.ca/datasets/mnrf::wetlands. Obtained: September 21, 2020.

Ministry of the Environment, Conservation and Parks (MECP), 2018. Water Well Information System (WWIS). Available: https://data.ontario.ca/dataset/well-records. Obtained: June 12, 2020

Scale

1:40,000

0 250 500 1,000 1,500 2,000 2,500 3,000 Meters

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Drawing	Project
REGIONAL GROUNDWATER FLOW ASSESSMENT	100227.008

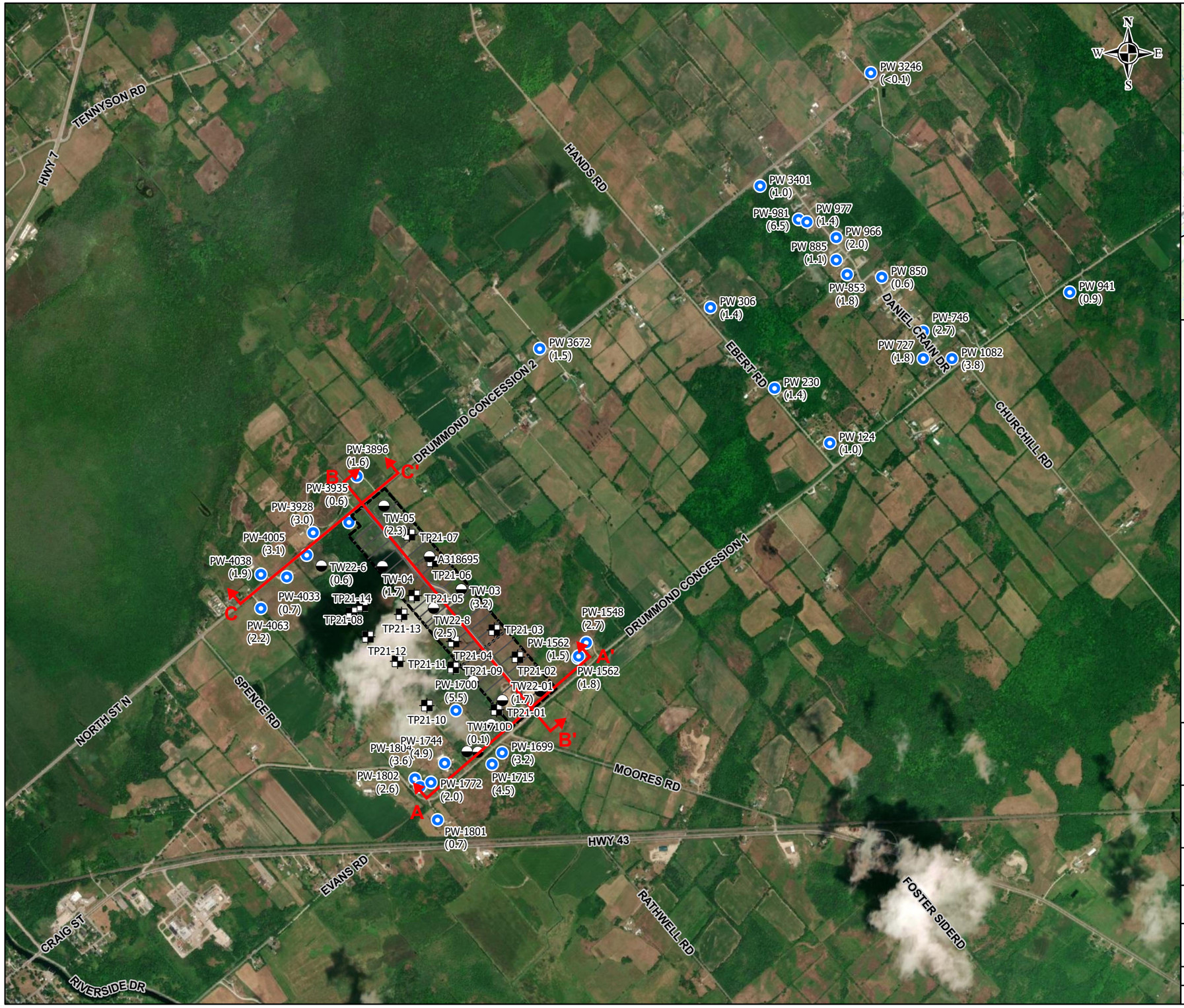
Title: CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

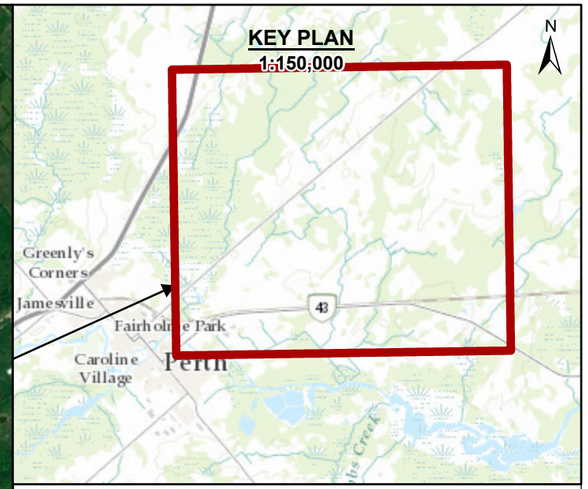
Drwn By	Chkd By	Client
S.L.	A.P.	Wilbert Crain

Date: September 2023

Rev. 00

FIGURE: 9





LEGEND

- PW # (X.X) ⟸ PRIVATE WELL ID / NITRATE CONCENTRATION (mg/L)
- PRIVATE WELL APPROXIMATE LOCATION
- LIMIT OF SITE
- LOT BOUNDARY
- A A' CROSS SECTION LOCATION

References:

Service Layer Credits: World Imagery: UCLG, Earthstar Geographics
World Topographic Map: County of Frontenac, Leeds and Grenville, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, AAFC, NRCan

Scale
1:20,000
0 150 300 600 900 1,200 1,500 Meters

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Drawing	Project
EXTENDED PRIVATE WELL SAMPLING PROGRAM	100227.008

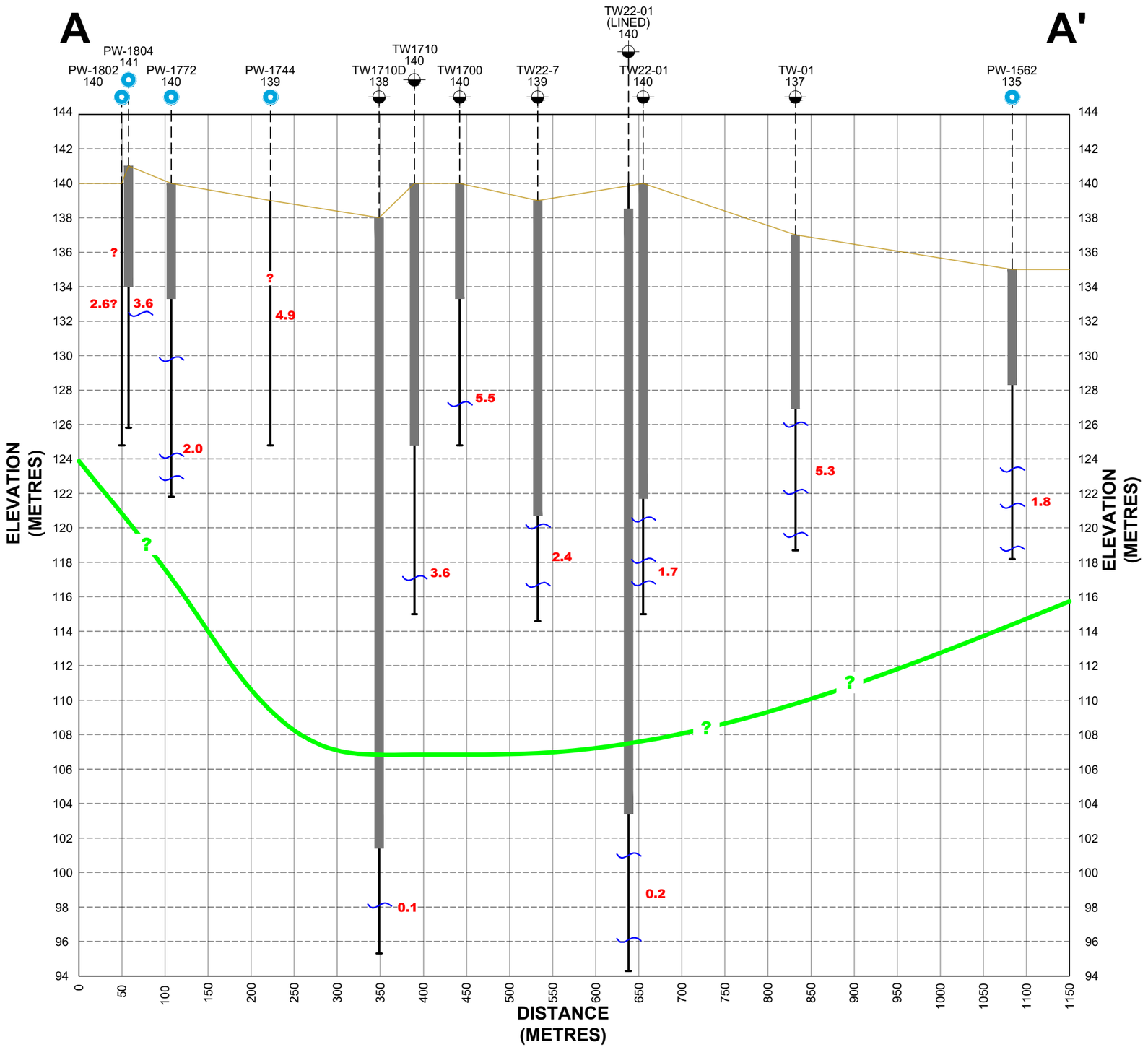
Title: **CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS PROPOSED RESIDENTIAL SUBDIVISION PHASE 1 PART OF LOT 6 AND LOT 7, CONCESSION 1 DRUMMOND TOWNSHIP, ONTARIO**

Drwn By	Chkd By	Client
S.L.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 10



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LEGEND

- TW/ PW # — TEST PIT/ TEST WELL/ PRIVATE WELL ID
- XXX — GROUND SURFACE ELEVATION, IN METRES EXTRACTED FROM DEM
- TEST WELL APPROXIMATE LOCATION
- PRIVATE WELL APPROXIMATE LOCATION
- GROUND SURFACE ELEVATION (BASED ON WELL ELEVATIONS)
- BOREHOLE
- BOREHOLE CASING
- WATER FOUND
- X.X — NITRATE (mg/L)
- 1.0 mg/L < NITRATE < 2.5 mg/L

NOTE(S):

- Elevation extracted from DEM at well locations licensed under the Open Government Licence – Ontario.

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM18.

HORIZONTAL SCALE
1:5000
0 100 200 300m

VERTICAL SCALE
1:250
0 5 10 15m

DRAWING
CROSS SECTION **A - A'**

CLIENT
WILBURT CRAIN

PROJECT
CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

DRAWN BY	CHECKED BY
S.L.	A.P.
PROJECT NO.	REVISION NO.
100227.001	00
DATE	FIGURE NO.
SEPTEMBER 2023	FIGURE 11

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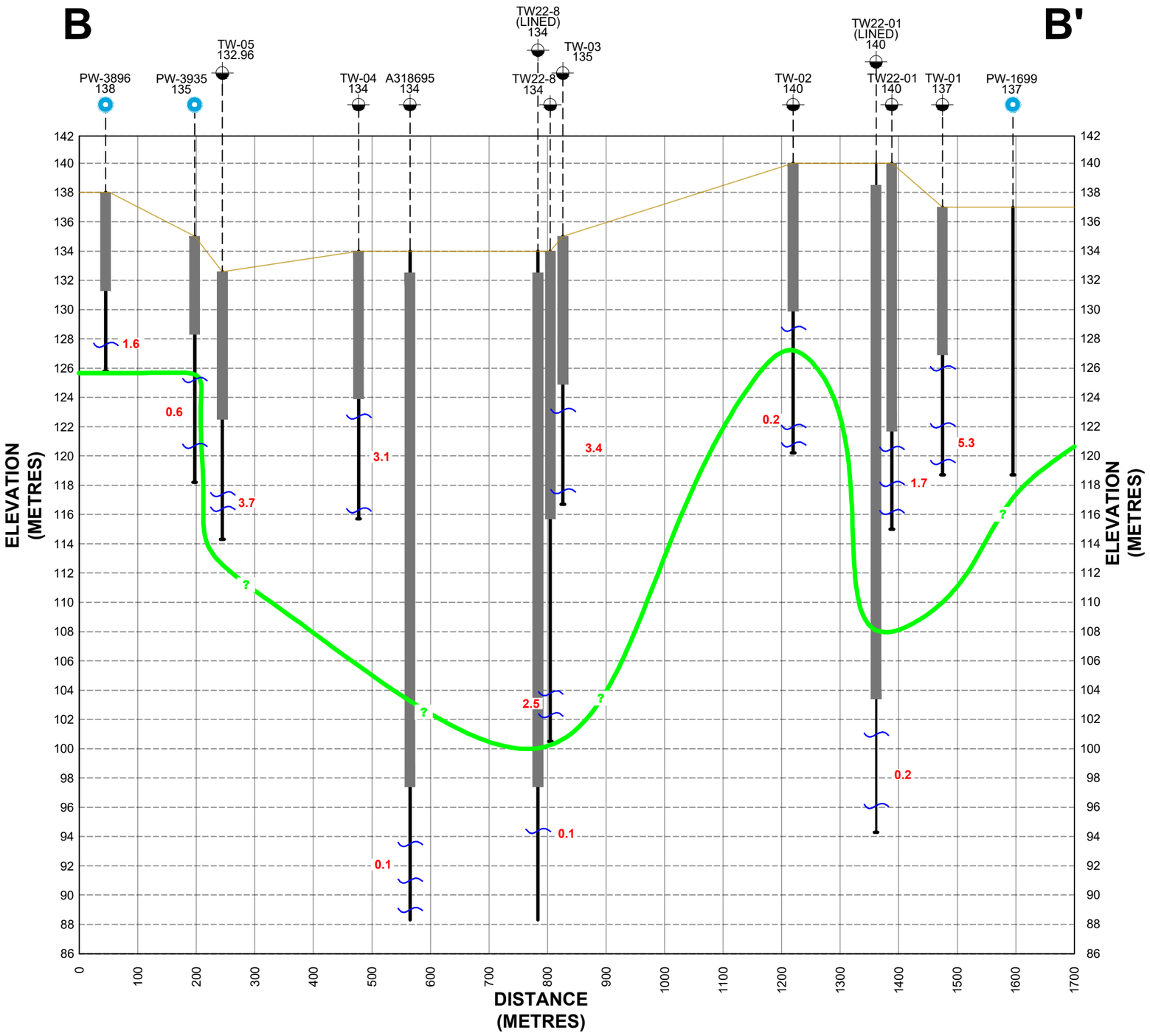

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LEGEND

TW/ PW # ← TEST PIT/ TEST WELL/ PRIVATE WELL ID

XXX ← GROUND SURFACE ELEVATION, IN METRES EXTRACTED FROM DEM

TEST WELL APPROXIMATE LOCATION

PRIVATE WELL APPROXIMATE LOCATION

GROUND SURFACE ELEVATION (BASED ON WELL ELEVATIONS)

BOREHOLE

BOREHOLE CASING

WATER FOUND

X.X NITRATE (mg/L)

1.0 mg/L < NITRATE < 2.5 mg/L

NOTE(S):

- Elevation extracted from DEM at well locations licensed under the Open Government Licence – Ontario.

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM18.

HORIZONTAL SCALE

1:7500

0 150 300 450m

VERTICAL SCALE

1:300

0 10 20m

DRAWING

CROSS SECTION **B - B'**

CLIENT

WILBURT CRAIN

PROJECT

CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

DRAWN BY	CHECKED BY
S.L.	A.P.
PROJECT NO.	REVISION NO.
100227.001	00
DATE	FIGURE NO.
SEPTEMBER 2023	FIGURE 12

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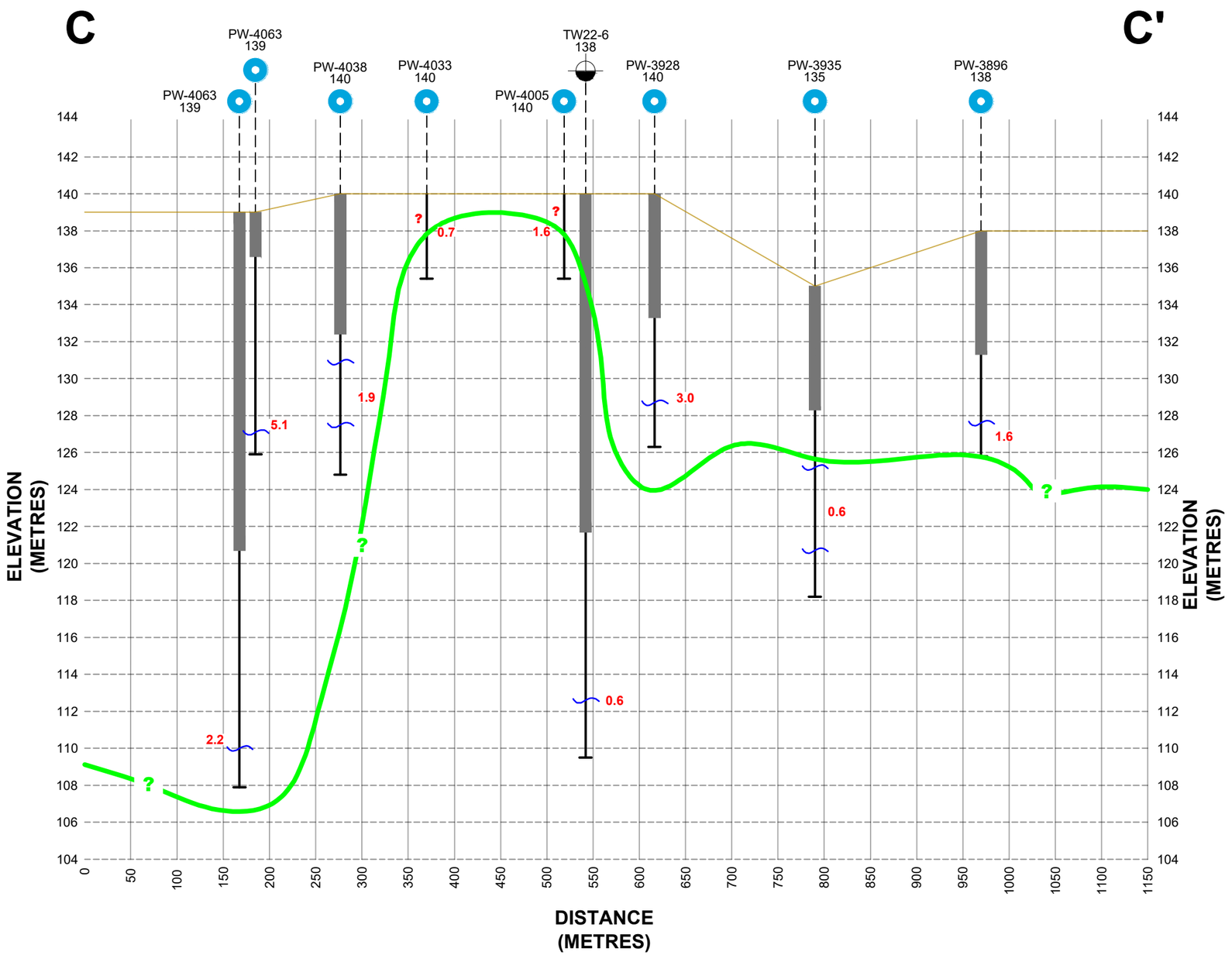

LEGEND

- TW/ PW # — TEST PIT/ TEST WELL/ PRIVATE WELL ID
- XXX — GROUND SURFACE ELEVATION, IN METRES EXTRACTED FROM DEM
- TEST WELL APPROXIMATE LOCATION
- PRIVATE WELL APPROXIMATE LOCATION
- GROUND SURFACE ELEVATION (BASED ON WELL ELEVATIONS)
- BOREHOLE
- BOREHOLE CASING
- WATER FOUND
- X.X — NITRATE (mg/L)
- 1.0 mg/L < NITRATE < 2.5 mg/L

NOTE(S):

- Elevation extracted from DEM at well locations licensed under the Open Government Licence – Ontario.

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM18.

HORIZONTAL SCALE

1:5000

0 100 200 300m

VERTICAL SCALE

1:250

0 5 10 15m

DRAWING

CROSS SECTION **C - C'**

CLIENT

WILBURT CRAIN

PROJECT

CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO

DRAWN BY	CHECKED BY
S.L.	A.P.
PROJECT NO.	REVISION NO.
100227.001	00
DATE	FIGURE NO.
SEPTEMBER 2023	FIGURE 13

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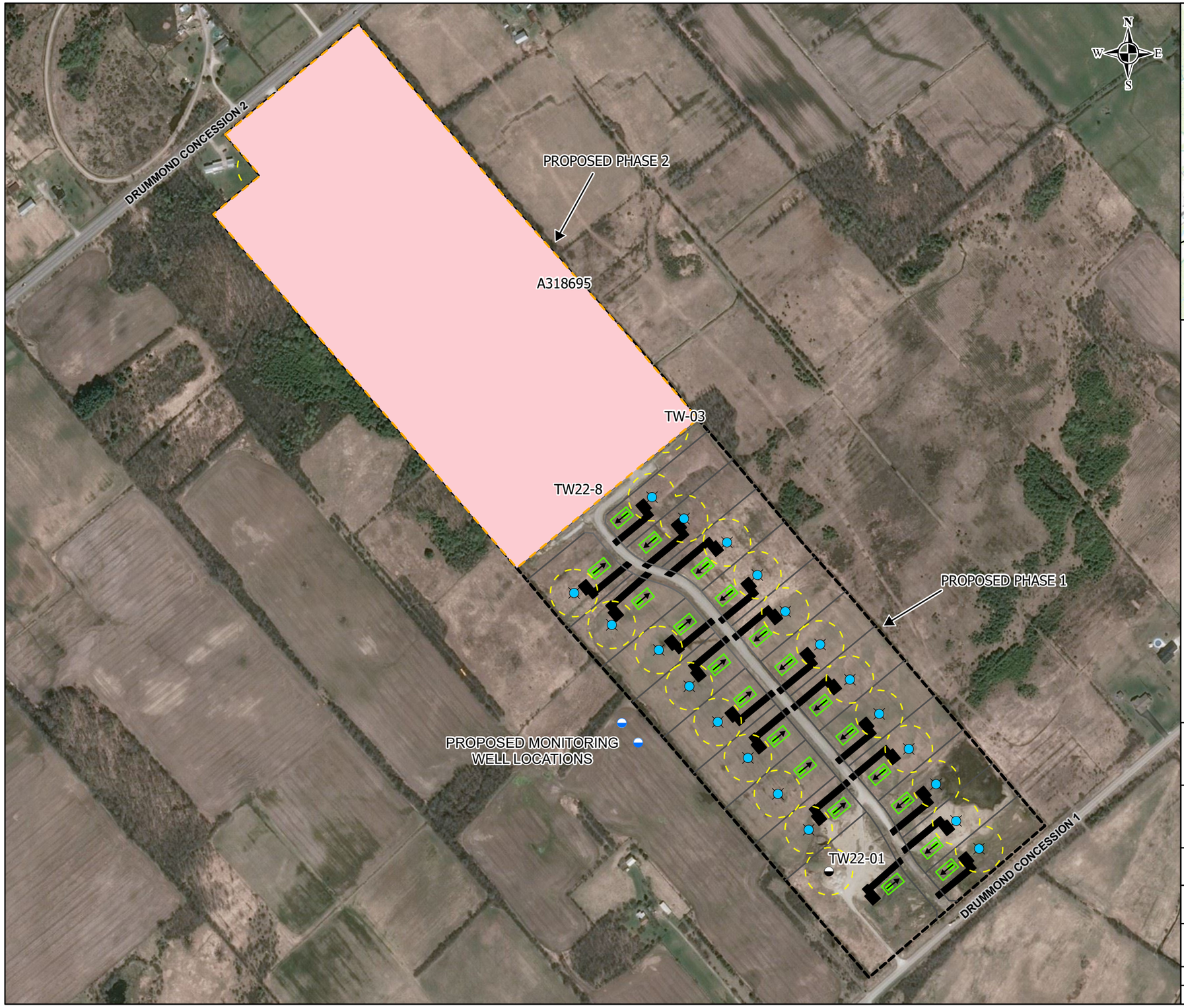

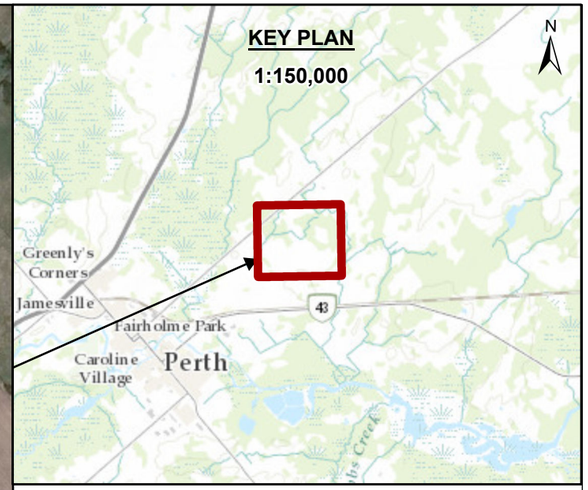

LEGEND

TP/ TW/ PW # ⟸ TEST PIT/ TEST WELL/ PRIVATE WELL ID

EXISTING TEST WELL APPROXIMATE LOCATION

PROPOSED PRIVATE WELL LOCATION

CONCEPTUAL DWELLING FOOTPRINT
(Approximately 260 square metres)

30 m WELL SETBACK

CONCEPTUAL SEPTIC SYSTEM LOCATION
(14 m x 26 m)

SEPTIC FLOW DIRECTION

References:

Service Layer Credits: World Topographic Map: County of Frontenac, Leeds and Grenville, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, AAFC, NRCan
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Scale
1:5,000
0 30 60 120 180 240 300 Meters

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Drawing	Project
CONCEPTUAL LOT DEVELOPMENT PLAN	100227.008

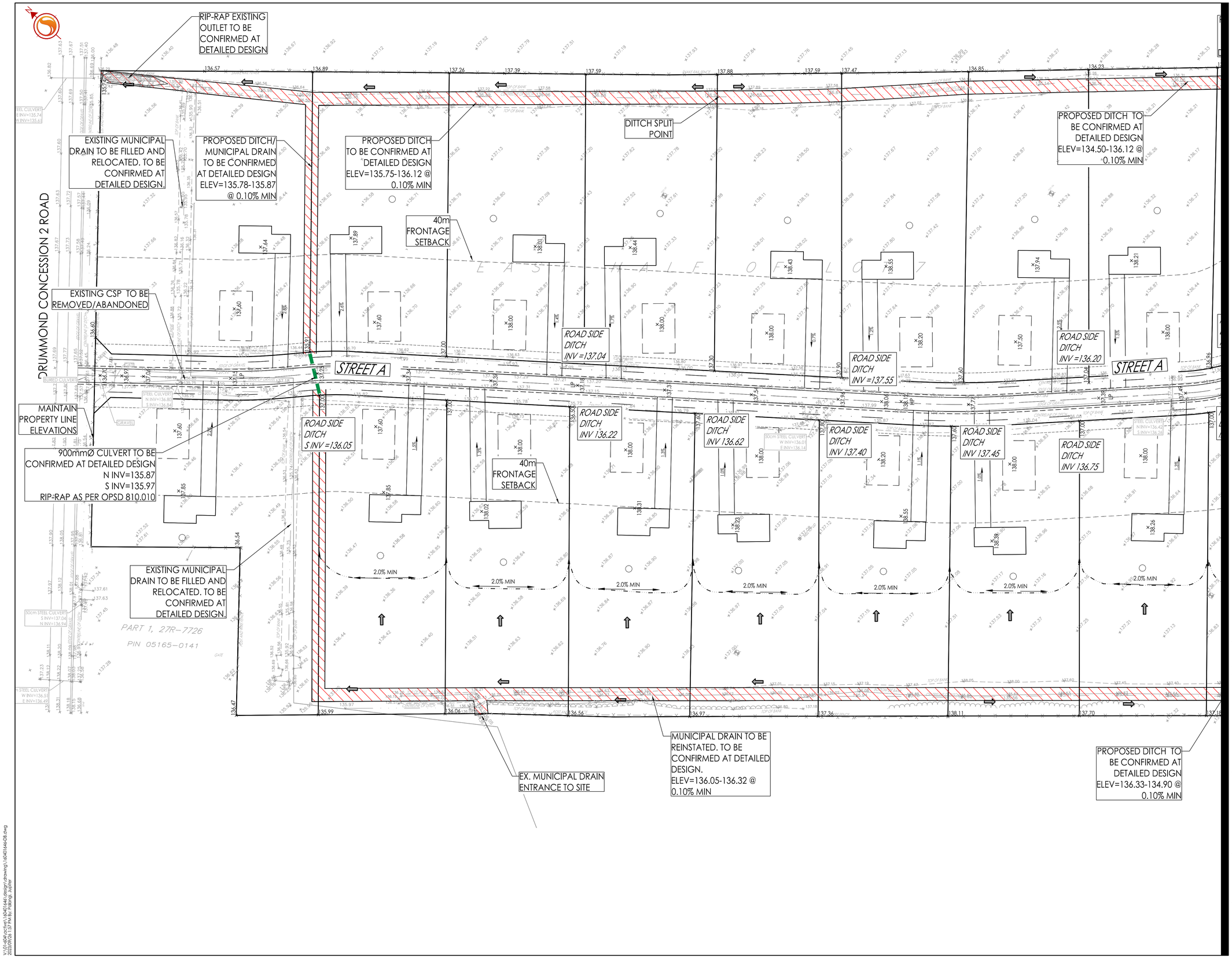
Title: **CONSOLIDATED HYDROGEOLOGICAL & TERRAIN ANALYSIS
PROPOSED RESIDENTIAL SUBDIVISION PHASE 1
PART OF LOT 6 AND LOT 7, CONCESSION 1
DRUMMOND TOWNSHIP, ONTARIO**

Drwn By	Chkd By	Client
C.Z.	A.P.	**Wilbert Crain**

Date: September 2023

Rev. 00

FIGURE: 14



Stantec

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400 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

Legend

99.99	ORIGINAL GROUND ELEVATION
99.99	PROPOSED ELEVATION
99.99(S)	PROPOSED DITCH ELEVATION
99.99 / 99.88	PROPOSED LOT CORNER ELEVATION EXISTING ELEVATION AT LOT CORNER
2.0%	FLOW DIRECTION AND GRADE
2.0% (S)	PROPOSED DITCH SLOPE
	PROPOSED DITCH
	PROPOSED CULVERT

NOTES:

1. ALL DITCHES SHALL BE CONFIRMED AT DETAILED DESIGN
2. UNDERSIDE OF FOOTING (USF) ELEVATIONS SHALL BE 0.30M (MIN) ABOVE THE C/L DITCH ELEVATION TO KEEP UNIT ABOVE EXPECTED GROUNDWATER ELEVATION AND PREVENT EXCESSIVE PUMPING OF FOUNDATION DRAIN.
3. ALL UNITS TO BE EQUIPPED WITH BACKWATER VALVES AND SUMP PUMPS TO DISCHARGE FOUNDATION DRAIN.
4. MIN. USF ELEVATIONS TO BE ADJUSTED IN CONJUNCTION WITH ANY UPDATES TO HYDROGEOLOGY AND TERRAIN ANALYSIS, AS WELL AS UPDATED HOUSE SITINGS.
5. ROOF DOWNSPOUTS TO BE DIRECTED TO FRONT YARDS
6. ALL RETAINING WALLS GREATER THAN 1.0m IN HEIGHT ARE TO BE DESIGNED, APPROVED, AND STAMPED BY STRUCTURAL ENGINEER.
7. FENCES OR RAILINGS ARE REQUIRED FOR RETAINING WALLS GREATER THAN 0.60m IN HEIGHT.
8. REFER TO SWM REPORT FOR PROPOSED DITCH ELEVATIONS

1	ISSUED FOR REVIEW	JP	KK	23.01.31
	Revision	By	Appd.	YY.MM.DD
File Name: 160401646-D8.dwg		JP	KK	JP 23.10.07
	Permit-Seal	Dwn.	Chkd.	Dsgn. YY.MM.DD

Client/Project
CRAINS' CONSTRUCTION LTD.

BURN'S FARM SUBDIVISION

LANARK, ON

Title
DRAFT SERVICING & GRADING PLAN
PHASE I

Project No.	Scale	Revision
160401646	1:750 (0, 7.5, 22.5, 37.5m)	
Drawing No.	Sheet	
SSGP-1	1 of 6	1

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2023/09/26 1:37 PM Br, Pradeep Jupiter

ORIGINAL SHEET - ARCH D

RIP-RAP EXISTING OUTLET TO BE CONFIRMED AT DETAILED DESIGN

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=134.50-134.87 @ 0.10% MIN

MAINTAIN PROPERTY LINE ELEVATIONS

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=134.50-136.12 @ 0.10% MIN

PROPOSED 900mmØ CULVERT TO BE CONFIRMED AT DETAILED DESIGN
W INV=134.82
E INV=134.91
RIP-RAP AS PER OPSD 810.010

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=134.91-136.40 @ 0.10% MIN

EXISTING 500mmØ CULVERT TO BE REPLACED WITH 600mmØ CULVERT. TO BE CONFIRMED AT DETAILED DESIGN.
N INV=134.90
S INV=134.97
RIPRAP PER OPSD 810.010

40m FRONTAGE SETBACK

ROAD SIDE DITCH INV =136.40

ROAD SIDE DITCH INV =136.55

ROAD SIDE DITCH INV =136.20

ROAD SIDE DITCH INV 136.34

ROAD SIDE DITCH INV 136.48

ROAD SIDE DITCH INV 136.65

ROAD SIDE DITCH INV 136.75

ROAD SIDE DITCH INV 136.31

ROAD SIDE DITCH INV 136.76

ROAD SIDE DITCH INV 137.94

ROAD SIDE DITCH INV 137.80

ROAD SIDE DITCH INV 138.10

ROAD SIDE DITCH INV 138.17

ROAD SIDE DITCH INV 137.90

ROAD SIDE DITCH INV 138.02

ROAD SIDE DITCH INV 135.58

STREET A

STREET B

STREET C

PROPOSED 900mmØ CULVERT TO BE CONFIRMED AT DETAILED DESIGN
S INV=135.40
N INV =135.33
RIP-RAP AS PER OPSD 810.010

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=135.40-139.33 @ 0.10% MIN

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=136.33-134.90 @ 0.10% MIN

SEE SWM REPORT FOR EXTERNAL DRAINAGE PROPOSED ELEVATIONS

2.0% MIN

Stantec

Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

Legend

99.99	ORIGINAL GROUND ELEVATION
99.99	PROPOSED ELEVATION
99.99(S)	PROPOSED DITCH ELEVATION
99.99 / 98.88	PROPOSED LOT CORNER ELEVATION / EXISTING ELEVATION AT LOT CORNER
2.0%	FLOW DIRECTION AND GRADE
2.0% (S)	PROPOSED DITCH SLOPE
	PROPOSED DITCH
	PROPOSED CULVERT

NOTES:

1. ALL DITCHES SHALL BE CONFIRMED AT DETAILED DESIGN
2. UNDERSIDE OF FOOTING (USF) ELEVATIONS SHALL BE 0.30M (MIN) ABOVE THE C/L DITCH ELEVATION TO KEEP UNIT ABOVE EXPECTED GROUNDWATER ELEVATION AND PREVENT EXCESSIVE PUMPING OF FOUNDATION DRAIN.
3. ALL UNITS TO BE EQUIPPED WITH BACKWATER VALVES AND SUMP PUMPS TO DISCHARGE FOUNDATION DRAIN.
4. MIN. USF ELEVATIONS TO BE ADJUSTED IN CONJUNCTION WITH ANY UPDATES TO HYDROGEOLOGY AND TERRAIN ANALYSIS, AS WELL AS UPDATED HOUSE SITINGS.
5. ROOF DOWNSPOUTS TO BE DIRECTED TO FRONT YARDS
6. ALL RETAINING WALLS GREATER THAN 1.0m IN HEIGHT ARE TO BE DESIGNED, APPROVED, AND STAMPED BY STRUCTURAL ENGINEER.
7. FENCES OR RAILINGS ARE REQUIRED FOR RETAINING WALLS GREATER THAN 0.60m IN HEIGHT.
8. REFER TO SWM REPORT FOR PROPOSED DITCH ELEVATIONS

1	ISSUED FOR REVIEW	JP	KK	23.01.31
	Revision	By	Appd.	YY.MM.DD

File Name: 160401646-DB.dwg		JP	KK	JP	21.10.07
	Permit-Seal	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Client/Project
CRAINS' CONSTRUCTION LTD.

BURN'S FARM SUBDIVISION

LANARK, ON

Title
DRAFT SERVICING & GRADING PLAN
PHASE II

Project No.
160401646

Scale
1:750
0 7.5 22.5 37.5m

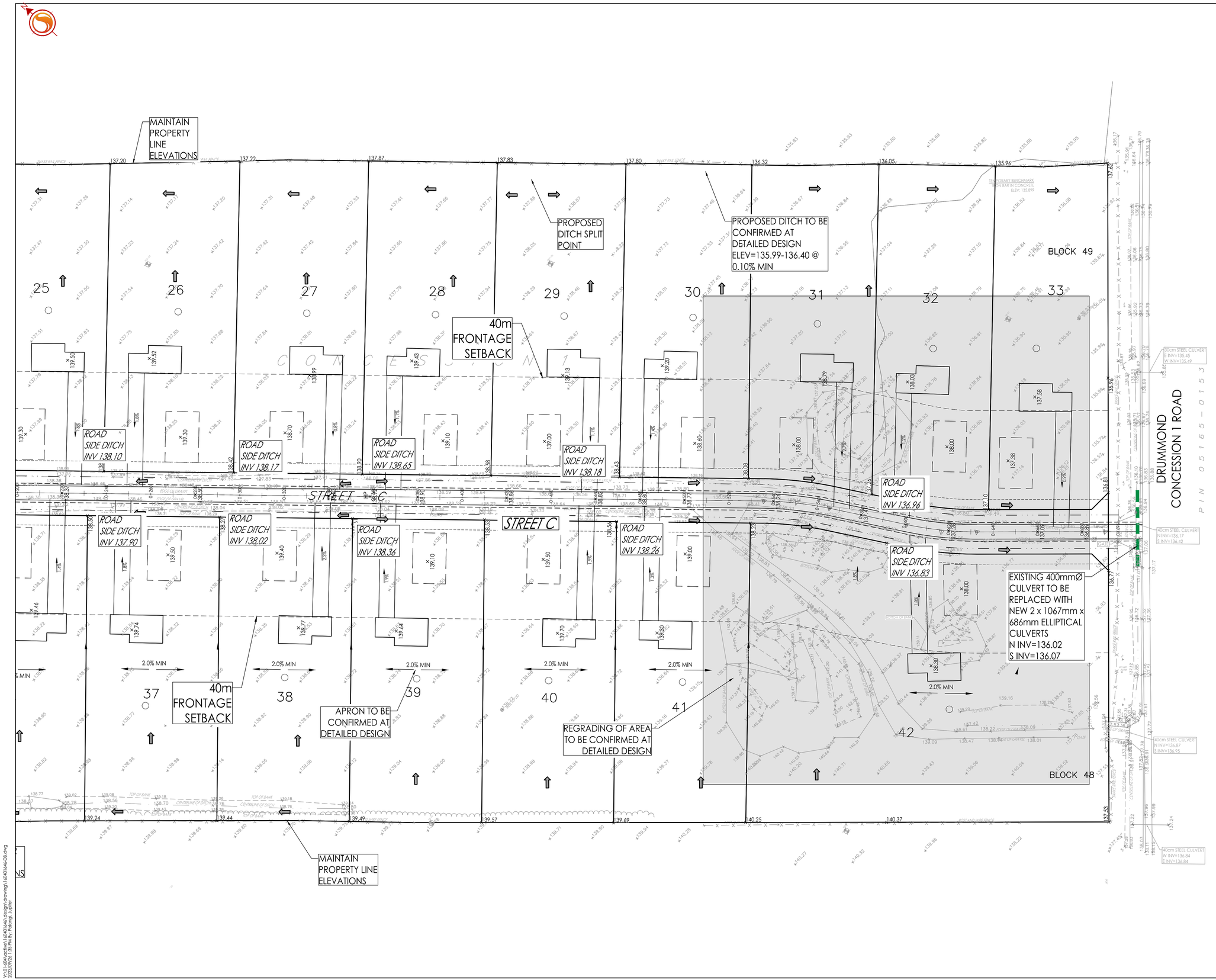
Drawing No.
SSGP-2

Sheet
2 of 6

Revision
1

V:\01-Ott-Active\160401646\design\drawings\160401646-DB.dwg
2023/09/26 1:33 PM By: Fraser.Jupiter

ORIGINAL SHEET - ARCH D



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99.99	ORIGINAL GROUND ELEVATION
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99.99(S)	PROPOSED DITCH ELEVATION
99.99 / 98.88	PROPOSED LOT CORNER ELEVATION / EXISTING ELEVATION AT LOT CORNER
2.0%	FLOW DIRECTION AND GRADE
2.0% (S)	PROPOSED DITCH SLOPE
	PROPOSED DITCH
	PROPOSED CULVERT

NOTES:

1. ALL DITCHES SHALL BE CONFIRMED AT DETAILED DESIGN
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8. REFER TO SWM REPORT FOR PROPOSED DITCH ELEVATIONS

1	ISSUED FOR REVIEW	JP	23.01.31
Revision		By	YY.MM.DD

File Name: 160401646-D8.dwg	JP	KK	JP	21.10.07
Permit-Seal	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Client/Project
CRAINS' CONSTRUCTION LTD.

BURN'S FARM SUBDIVISION

LANARK, ON

Title
DRAFT SERVICING & GRADING PLAN
PHASE II

Project No.	Scale	Drawing No.	Sheet	Revision
160401646	1:750 (0, 7.5, 22.5, 37.5m)	SSGP-3	3 of 6	1

ORIGINAL SHEET - ARCH D

APPENDIX B

Peer Review

Memorandum

Hydrogeological Technical Review

GRI Inc.
911 County Rd 18
Oxford Mills, ON K0G 1S0
C – (647) 502-5224
jennifer.gorrell@gri-inc.ca

From: Jennifer Gorrell

To: Julie Stewart, Lanark County

cc: Sarah McLeod-Neilson, Russell Chown

Date: March 9, 2023

Re: **Proposed Burns Farm Subdivision**
Part Lot 7, Con I, Geo. Twp. Drummond-North Elmsley
(Geographic Twp of Drummond), File # 21-DNE-PIN-0007

This is a discussion document to summarize my opinion and understanding of the status of the review of the subdivision application.

1 KEY ISSUES

The approval of the severances does not provide the information required to satisfy D-5-4 and D-5-5 as they apply to the subdivision. This was clearly stated in the review, and was also discussed with the consultants. Note, the lot addition that was part of the severances approval was to expand the subdivion. That would be premature.

The consultant's report for the subdivision includes Parts of Lot 6 and Lot 7 – the study does not provide any information about the hydrogeological conditions on Lot 7, which is the lot addition.

The issues still to be addressed for the original parcel are;

- Effects of the proposal resulting from the hydrogeological sensitivity of site and extensive surrounding area have not been determined.
- Long term safe water supply
- Sustainable lot size
- Subdivision approval on tertiary treatment sewage systems

Objectives

i. New wells will need to provide a water supply that will not deteriorate in the future, such as what appears to be occurring in Fellingers Mills.
ii. New wells cannot provide additional pathways for continued downward migration into the aquifer
iii. Sources should be identified. Some of this is beyond the scope of this application but should be done. Perhaps communal or municipal services are appropriate.

2 DISCUSSION

The concentration of nitrate in the upper levels of the bedrock aquifer does not exceed the drinking water objective. However, because the source(s) are not quantified, the long term water quality is not assured, based on the provided information.

2.1 Groundwater Quantity

There is evidence to show there is more than sufficient available groundwater to service the development. The quantity of groundwater is not an issue.

2.2 Groundwater Quality

GEMTEC's study showed that elevated nitrates are present down to around 30 m below the ground or around elevation +/- 100 mASL. These concentrations may be consistent through the area, but they are not natural, in my opinion. There is no information to indicate the contamination is stable or will not continue to increase in concentration or mechanisms to assure the contamination will not migrate further down into the bedrock aquifer in the long term. Therefore, the requirement to ensure a safe, long term water supply had not been shown. *These mechanisms may be the responsibility of the municipality.*

The original test wells on the site were constructed with slightly extended casing – 10.1 m – to accommodate the hydrogeological sensitivity of the site, based on Fellingers Mills Subdivision, a nearby comparable development that was developed previously. Those test wells were constructed in 2005.

The test wells on the site were constructed in 2015 for another consultant. GEMTEC took over the application around 2020. The study went through an exercise of constructing wells with increasingly longer casing in an attempt to secure a water supply beneath the nitrate contamination. RVCA expressed concern about the study method, since wells largely off-site with gradually increased casing were being constructed, creating potential downward pathways into non-impacted zones of the aquifer. A data-based rationale to select a construction methed was recommended. GEMTEC analysed the data and a conservative casing length of 36.8 m of casing was tested and was successful.

The source of the nitrates has not been established. There are likely local sources, and this has been argued - pathways for migration of sewage effluent through old wells with poor or deteriorated construction, local point sources at surface (e.g. tile beds). This simply illustrates there are issues that need to be attended to before more high density development is approved.

The argument that the site was used for agriculture was not reasonable, given the review of historic photos shows very little on the site and adjacent sites. D-5-5 says the agriculture argument can only be used with evidence, and none was provided. I would argue evidence would include a history of what crops were grown, what nutrients were applied, etc. There is more intense and continuous agriculture to south, but this is downgradient.

The current water quality from Fellingers Mills was used to indicate the ambient nitrate concentration was locally representative. However, a review of the original hydrogeology report found the test wells had originally had a range of much lower nitrate concentration, including below detection in some. Therefore, over the 10 to 15 year period since the subdivision was constructed, on average nitrates in groundwater increased significantly.

My theory is, the source to bedrock is the Perth Long Swamp Provincially Significant Wetland. The wetland is surrounded by crop agriculture. Hydrogeologically, the wetland is the discharge point for surface and shallow aquifer drainage. The analysis of water well records (WWR) suggests it is also a significant recharge zone to the bedrock aquifer. I have seen this hydrogeological pattern at other

significant wetlands I have worked near. However, additional details, such as measurements of gradients and quality would be required to confirm this, something that is likely beyond the scope of GEMTEC's investigation.

It would be valuable at a watershed scale to examine this further, to see if any other large significant wetlands are the same. Perhaps it could be done as part of sourcewater planning and protection. If so, it would provide important guidance for future development.

2.3 Terrain Analysis and Private Sewage Disposal Suitability

Many contaminants enter a septic system. Procedure D-5-4 uses nitrate concentration as the representative contaminant of sewage effluent. It is a parameter that is easy (and safe) to measure. However, it is not the only contaminant that is produced by septic systems. Other parameters of concern include pathogens, viruses, phosphorous and salt. Salt-laden backwash from water treatment will either be discharged to the septic system or to a greywater system at surface. Either way, this discharge will also be absorbed into the aquifer.

2.3.1 Use of Tertiary Sewage Treatment Systems

Near the beginning of the study, the suggestion was made to use tertiary treatment systems instead of conventional tile beds. It is true that the approved systems reduce the nitrate in the effluent very well but do not necessarily treat other parameters, including pathogens. I've spoken with regional MECP staff about the systems and they express the same concerns.

These concerns are the reasons D-5-4 recommends analysing for the conservative case: to make sure that there is a sufficient area on the lot for a properly designed conventional septic system (i.e. with fill that has correct composition to be compatible with the natural conditions). A spare bed area is also recommended. While the OBC allows tertiary treatment, the regulation provides design specifications, and does not provide advice on whether the use is appropriate.

In addition, the technology valid, but the oversight and management post-installation are flawed. The OBC simply assigns responsibility for resolution of any post-installation issues to the Chief Building Official. The municipality would have to decide whether they want to take on the responsibility for the oversight of tertiary systems. If there are no other alternatives, MECP can (and I was told, *will*) require the municipality to provide communal services.

3 PROVINCIAL POLICY STATEMENT SECTIONS 1.6.6.1, 1.6.6.2 AND 1.6.6.4

1.6.6.1 Planning for sewage and water services shall:

…

b) ensure that these systems are provided in a manner that:

1. can be sustained by the water resources upon which such services rely;

2. prepares for the impacts of a changing climate;

3. is feasible and financially viable over their lifecycle; and

4. protects human health and safety, and the natural environment;

1.6.6.2 … Municipal sewage services and municipal water services are the preferred form of servicing for settlement areas to **support protection of the environment** and **minimize potential risks to human health and safety**.

1.6.6.4 … At the time of the official plan review or update, planning authorities should assess the **long-term impacts of individual on-site sewage services and individual on-site water services on the environmental health** and the character of rural settlement areas.

- Although this last section refers to OP review, it is just as relevant to interim planning, I would think (but I am not a planner).

4 SUMMARY OF ADVICE

If the subdivision will be constructed on private services, it has to be at an appropriate density and with construction standards that will not aggravate the existing condition locally.

- A communal sewage system would resolve most of the issues and would allow for a higher density development. The feasibility of such a solution does not appear to have been considered. The bedrock is most likely an impediment.
- The testing for the severances found that nitrate contamination is present down to around 30 m below the ground or around elevation +/- 100 mASL.
- The site is hydrogeologically sensitive. D-5-4 states in this case approval on the basis of lot size (i.e. one hectare) does not apply and more support than the nitrate dilution calculation is necessary in support. From the beginning of the project, RVCA has emphasized that hydrogeological evidence is required to support lot sizes. So far, this has not been provided. This site requires a comprehensive assessment of the hydrogeological characteristics and conditions that include horizontal and vertical gradients and a real assessment of how contaminants from the septic systems will expand and disperse in the aquifer; i.e. contaminant plume assessment, cumulative impact and using the Reasonable Use policy/method to assess boundary concentrations.
- In addition, the lots need to be sized to support a conventional septic system with tile bed, and should include a full replacement area. The lot development plan should show the services to scale and respecting OBC separation distances and report recommendations. Fully raised beds require additional distances.
- The separation requirements from contaminant sources apply to the well, and should be contained within the individual lots. The separation also applies to the road.
- Nitrate reducing systems are not a recommended solution. These were not intended for widespread use, such as in a subdivision. Speak to a CBO about the issues that arise with maintenance, repair and issues with manufacturers who disappear, leaving homeowners with no options for said maintenance.
- While nitrate-reducing systems reduce nitrogen in the sewage effluent, they do not treat other parameters of concern such as pathogens, virus, phosphorus or salt.

Analysis provided by GEMTEC showed how wells may be constructed below the contamination zone. There is no long term monitoring of the water quality to show the use will not change the condition, or broad assessment of the ambient groundwater quality from this level to show it meets ODWS and D-5-5.

- The provided information for the subdivision does not address the requirements of D-5-5.
- The work to date has been a process to arrive at the recommended well construction (e.g. wells cased and grouted to 36.8 m). The report can and should include the discussion of ranges of water quality parameters etc. as background, but the purpose of the report is to present the proposed design. The history of the investigation process with the data should be included as an appendix or even a separate report to avoid confusion.
- D-5-5 requires the test wells be distributed across the site. There is currently *one* test well, located off site, that meets the construction requirements. New test wells drilled in the manner of the recommended construction need to be constructed and tested to the guidelines of D-5-5 (i.e. a well testing program needs to be repeated - this was discussed previously with GEMTEC).
- If development proceeds, it should be phased and a monitoring program should be implemented to show that the assumptions are validated before the next stage is approved.
- Any previous test wells that do not meet the recommended construction need to be abandoned. It is also recommended that wells off site for the study on private property either be monitored in the long term or abandoned and replaced with a well that is constructed to the specifications found to be suitable for the subdivision.

Any of the above recommendations are provided without prejudice.

5 ADDITIONAL RECOMMENDATIONS

The hydrogeological conditions in the area need to be better characterized to understand the source(s) of the ambient nitrates - areal extent and depth in the March Formation. There appears to be a broader source (e.g. the wetland) aggravated with many small point sources (e.g. sewage systems). Poorly constructed and/or wells with deteriorated construction due to age contribute to downward transmission. New point sources may be created by individual septic systems constructed in areas of thin to no soil. Perhaps this is a project that could fall under the direction of the source water protection agency or the MECP.

A summary of the reports and timeline to date, and some of the key data are provided in an Excel spreadsheet. They are also printed and attached to this “summary”.

Thank you for the opportunity to provide this service. If you have any commends or questions, please do not hesitate to contact the undersigned.

Respectfully,

jennifer gorell

Jennifer B. Gorrell M.Sc. P.Eng. P.Geo.
Senior Geoscientist

Disclaimer

GRI Inc. is retained by Lanark County to prepare a hydrogeological technical peer review of the referenced report in the context of specific Provincial development guidelines and policies. GRI Inc. has not conducted an independent site investigation to confirm the validity of the data, analyses, interpretations and recommendations presented in GEMTEC reports listed at the end of the review. GRI

Inc. has accepted the findings as conveyed and the professional opinions of the qualified professional who has conducted and signed the subject report. The comments and recommendations within the above memorandum are based on the provided information.

Summary of Available Data

(found in “Timeline and Summary of RVCA Reviews.xlsx”

	Previous Documents	Review Status
June 30/21	Terms of Reference provided by **GEMTEC** to **RVCA** - Subdivision	
	RVCA, Technical Review Memorandum to P. Mosher from C. Milloy, Hydrogeological Assessment / **Terms of Reference**, GEMTEC, June 30, 2021, **2021-08-11**.	
	Hydrogeological Investigation & Terrain Analysis, **Proposed Residential Subdivision**, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario, **GEMTEC**, **2021-10-28**	
	Meeting with **GEMTEC** and **RVCA**, 2021-12-01.	
	Re: Proposed Drummond Concession 1 Residential **Severances**, Scoped Hydrogeological Evaluation, Part Lot 7, Concession 1, Township of Drummond, Ontario, **GEMTEC**, **2022-01-04**	
	RVCA Technical Review Memorandum, to P. Mosher from J. Gorrell, 21-DNE-PER-0007, **Burns Farm Subdivision**, Township of Drummond/North Elmsley, **2022-01-19**	
	Meeting with Lanark Cty, Twp of DNE, RVCA, **GEMTEC**, Crain Construction, LGDHU, ZanderPlan, 2022-01-26	
	RVCA, **Technical Review** Memorandum to P. Mosher from J. Gorrell, 21_DNE_SEV_0022_0023_0024, Burns Farm **Severances, 2022-02-08**	
	Hydrogeological Investigation & Terrain Analysis, **Proposed Residential Subdivision**, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario, **GEMTEC**, **2022-03-31**	
	Re: Proposed Drummond Concession 1 **Residential Severances**, Scoped Hydrogeological Evaluation, Part Lot 7, Concession 1, Township of Drummond, Ontario, **GEMTEC**, **2022-04-07**	
	RVCA Technical Review Memorandum, to P. Mosher from J. Gorrell, 21-DNE-PER-0007, **Burns Farm Subdivision**, Township of Drummond/North Elmsley, **2022-05-10**	not accepted
Focussed on resolving severance application with intention to apply the data to subdivision application		
	RVCA, **Technical Review** Memorandum to P. Mosher from J. Gorrell, 21_DNE_SEV_0022_0023_0024, Burns Farm **Severances, 2022-06-24**	
	Scoped Hydrogeological Evaluation - Final Report, Proposed **Residential Severances**, Part Lot 7, Concession 1, B21/064, B21/065, B21/066, Perth, Ontaroi, **GEMTEC**, **2022-12-09**	
	RVCA Technical Review Memorandum, to P. Mosher from J. Gorrell, 21_DNE_SEV_0022_0023_0024, Burns Farm **Severances**, Township of Drummond North Elmsley, **2022-12-23**	Accepted for Severances

TO DO: is to resolve issues related to the subdivision

Date	Application	Document	Key Comments/Notes
2021-08-11	Subdivision	Technical Review Memorandum, Claire Milloy to Phil Mosher - Hydrogeological Assessment / Terms of Reference, GEMTEC, June 30, 2021	Initial concerns identified: - Existing and potential nitrate impacts ("the potential for nitrate impacts should be further investigated…") - Potential pathogenic impacts (chlorine residual in samples) - Concerns about development on advanced septic systems - need HU input - Need multiple lines of evidence to show site is not hydrogeologically sensitive (include groundwater gradients (recharging or discharging), existing chemistry (indicators of impacts), groundwater temperature and chemistry changes following groundwater recharge events etc.) - Nitrate dilution calculations are not applicable - Clay seals may be a best practice but they are not to be used to justify new development in vulnerable/ sensitive terrain. - Clay seals may be a best practice but they are not to be used to justify new development in vulnerable/ sensitive terrain.
2022-01-19	Subdivision	Technical Review Memorandum, Jennifer Gorrell to Phil Mosher - Hydrogeological Investigation & Terrain Analysis, Proposed Residential Subdivision, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario, GEMTEC, 2021-10-28	-same and comparable concerns previously expressed. -data presented to support previous argument of agricultural impact was insufficient. Result was finding that water quality at the Fellingers Mills subdivision had deteriorated since the original test well chemistry, adding support to the concern about hydrogeological sensitivity/development impacts.
2022-02-08	Severances	Technical Review Memorandum, J. Gorrell to Phil Mosher Re: Proposed Drummond Concession 1 Residential Severances, Scoped Hydrogeological Evaluation, Part Lot 7, Concession 1, Township of Drummond, Ontario, GEMTEC, 2022-01-04	-no issue with lot addition, but impact of third residential lot also needs to be considered.
2022-06-24	Severances	RE: Potential process for finalizing Crain/Kenny severance applications; e-mail with attachments (listed below) to Phil Mosher, GEMTEC, 2022-06-09	- issues partially resolved -feedback on additional infomation - nitrate concentrations above background are present to at least 30 m -no further wells should be drilled with the 60' casing
2022-08-18	Severances	Re: Proposed Drummond Concession 1 Residential Severances Scoped Hydrogeological Evaluation Part Lot 7, Concession 1 Township of Drummond, Ontario	

Date	Application	Document	Key Comments/Notes
2022-12-23	Severances	Re: Proposed Drummond Concession 1 Residential Severances, Scoped Hydrogeological Evaluation, Part Lot 7, Concession 1, Township of Drummond, Ontario, GEMTEC, 2022-12-09	between August and Dec, there were communications between RVCA and GEMTEC to try and optimize use of time and resources. Focus was on analysing the available data to try and find a well construction method that would assure that the test wells would not continue to provide pathways for downward migration. Area well records were plotted according to approximate elevation. -wells cased and grouted to 36.6 m seem to produce water without nitrate contamination. The water quality also met the ODWS or limits considered reasonably treatable by D-5-5. Mn is very high, and it is recommended a warning about the potential impacts identified by Health Canada be considered. -10 test wells were constructed and discussion was related to results from all wells. The review considered the data from the well that was constructed to the recommended design. -test wells that dont meet the recommended design should be abandoned, except for the wells on private property that are in service. Test wells on private property that are not being used should also be abandoned.

Technical Review Memorandum

Rideau Valley Conservation Authority
3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504
F 613-692-0831 | www.rvca.ca

To	Phil Mosher, RPP, MCIP, Department of Science and Planning
From	Jennifer Gorrell M.Sc. P.Eng. P.Geo. on behalf of Department of Engineering and Regulation
Date	May 10, 2022
File	**21-DNE-PER-0007, Burns Farm Subdivision,** Township of Drummond/North Elmsley
Type	Subdivision
Subject	**Private Servicing**
Submission	Hydrogeological Investigation & Terrain Analysis, Proposed Residential Subdivision, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario, GEMTEC, 2022-03-31

Previous subject memorandum dates • Jennifer Gorrell, Technical Review Memorandum of 2021-10-28 draft report by GEMTEC, dated 2022-01-19.

Status

The report provided additional significant effort that was invested to resolve the issues that were previously raised. We appreciate the effort and it has clarified many of the previous questions and concerns. There are some new, more specific issues that were introduced by the revised nitrate impact assessment and the lot development plan (LDP).

RVCA is not satisfied the subdivision can proceed as proposed primarily because in our opinion, the report information indicates there is an undefined issue with elevated nitrate in the local groundwater aquifer. We are hesitant to recommend approval because we do not understand what appears to be a regional issue of elevated nitrates. Therefore, we recommend the issue in the area be further investigated.

If approved, the new development could aggravate existing nitrate levels in existing, surrounding development, or conversely in the long term, the well water quality could be affected by it.

With respect to the project specifically, there are details regarding the proposed development that are provided in the new information that must be addressed before the requirements of Procedure D-5-4 and D-5-5 are satisfied.

If the wells are constructed as recommended in the report, the water quality may meet the drinking water standards initially, but based on the provided information there is no assurance that it will remain so in the future. Presented data show there are elevated nitrates in the target water bearing zones and the wells at Fellingers Mills Estates show the water quality has deteriorated over the past 15 years. Without knowing the source or whether it can be controlled

in the future, it cannot be assumed that the nitrate concentration will not continue to increase or to move down through the aquifer. Information has not been presented demonstrating the absence of nitrate issues at deeper water bearing zones.

Key Issues

A satisfactory deeper target water bearing zone may be found that will not be affected. The well construction and quality has to be confirmed. The recommended construction with 10.8 m casing (vs the minimum 6.7 m), the same as was used at Fellinger Mills Estates, does not address the concern. The report recommends a casing length of 10.8 m or more, but a more concrete specification is needed. For a revised recommendation to be approved, a test well program that conforms to Procedure D-5-5 would be required; that is new test wells would have to be installed and fully tested. The applicant might also consider alternative servicing options, such as a communal sewage treatment system.

We agree a phased approach to the development is appropriate. RVCA recommends post-development well monitoring of a representative number of wells in Phase 1 be conducted so the effect of the development and other off site activities on the water supply can be evaluated before additional development is approved. A minimum of five to ten years of monitoring is recommended.

RVCA is not satisfied with the nitrate dilution calculation that determined 30 lots could be developed over the proposed Phase 1 area. The water surplus that was used in the calculation is higher than that measured at the nearby Drummond Centre climate station. This would mean the dilution is less than the calculation has assumed.

RVCA has questions about the presented lot development plan and the sewage system design recommendations. These are discussed in the details below.

RVCA discussed 5 main issues in the January 19 review. These are summarized in the attached table, along with a summary of whether the issue has been addressed by the current report. In addition, the table discusses the current report recommendations and RVCA's assessment. Details are provided below.

Review Scope

RVCA is retained by Lanark County to complete a technical peer review of hydrogeological studies, among other duties. The scope of the reviews are to compare the information presented in the studies to the standards provided by the province in the form of Procedures

D-5-4 and D-5-5 that have been guiding development on private services since 1996, and to respond to other questions or issues that may be provided by the County. In addition, RVCA was asked to provide an opinion on applicant-provided conclusions and recommendations using the presented information and other available information sources.

Project History

October 28, 2021	GEMTEC Hydrogeological Investigation Report
January 19, 2022	RVCA Review Comments
January 26, 2022	Meeting to discuss review comments, site concerns
March 31, 2022	Revised Hydrogeological Report, GEMTEC

Revised Development Proposal

To address concerns previously expressed by RVCA, the applicant provided a revised proposal to develop a phase of a proposed larger residential development. This will consist of developing 30 lots on approximately 27.5 ha of the total 40 ha parcel with a minimum lot area of 0.8 ha and an average size of 0.92 ha. This is a larger average lot size than proposed in the previous report draft. The residential lots will each be serviced by a private well and septic system. The report concluded that most of the site is hydrogeologically sensitive.

Originally, the potential water supply was assessed by initially pumping and sampling five test wells and sampling five nearby private wells. The site wells were re-sampled in March, 2022. Originally, three wells were sampled from a developed subdivision that is comparable in density, design, and setting to show the development impacts. This report provided details on 13 new neighbouring residences that were sampled for nitrates. The report concludes the site is suitable for development as proposed, but recommends the bedrock aquifer be protected from future contamination by incorporating a clay liner into the sewage dispersion area design and use of tertiary sewage treatment systems.

Detailed Discussion

The remainder of the memo provides additional detail about the report and key findings. The headings refer to headings in the GEMTEC report.

The fundamental issue that the County needs to consider is the elevated nitrates that RVCA believes should be better understood prior to any new residential development in the area.

Throughout, the report still emphasizes the need for mitigation to provide protection to the water supply aquifer. For example, in the discussion on the conceptual hydrogeological model, page 11, second paragraph from the bottom of the page, reads "*Measures should be implemented in the design of septic systems to add additional protection above the bedrock.*"

Sewage System Assessment

While the specific design of septic systems is regulated by Section 8 of the Ontario Building Code, the assessment and approval of a new development through the planning process is guided by MECP documents D-5, D-5-4 and D-5-5 that describe the requirements to assess the site suitability. Generally, the Health Unit deals with the OBC.

If, as stated in Section 5.1.1, the assessment does not consider isolation or separation distances required by the OBC, the concept reviewers will not be able to assess whether the recommended systems will fit on the proposed lots. The purpose is to protect future purchasers from ending up with a property that cannot be developed.

There are some issues with the provided lot development plan. While it is true the concept plan should not provide specific design, basic information is still required to show the concept can succeed. The LDP has not provided enough information to assess whether the site servicing can meet Procedure D-5-4. The report states in [Section 5.2.4] that the intention is to construct nitrate-reducing septic systems, and this may be the reason there is some information missing from the LDP. However, if the site approval will be effectively given on nitrate-reducing systems, the County or municipality will have to figure out how to enforce that these systems are used in perpetuity, and that includes making sure each owner adheres to the requirements for maintenance and correct use.

Issues noted were:

- The report states that Appendix B Figure 2 shows a leaching bed only, but on a flat site, a mantle would be required in multiple directions. For a fully raised bed, this would add 18 m in possibly all directions around the leaching bed to the sewage system. These could not be placed in the front part of the lot as shown. Some beds nearly touch the house.
- The use of 3,500 L/day as design flow should be explained. D-5-4 requires 3,000 L/day and most new average homes would have smaller requirements. A description of the

development concept including the design parameters for the referenced single-family dwellings should be included.

- It is understood that the Leeds, Grenville Lanark District Health Unit requires an area for a replacement tile bed that must be shown on a lot development plan. The life expectancy of a septic system is around 20 years.

Conceptual Hydrogeological Model

The provided conceptual hydrogeological model (Appendix A, Figure 6) was useful in showing information on how the property fits into the regional groundwater setting. One small comment, the inset map suggests the regional model does not include Perth, but the UTMs show that it extends south west of the town. When compared to the RVCA interactive map, the model shows that Blueberry Marsh, Perth Long Swamp and Grant Creek Wetland provide the significant area groundwater recharge. The figure suggests that regional discharge occurs at the Rideau River.

There are also smaller areas of recharge to the north-east. These appear to coincide with higher elevations, other wetlands and/or areas of exposed bedrock. The proposed site does not appear to be located in an area of significant regional recharge or discharge.

Section 3.2.5 discusses the site groundwater conditions. The report refers to Figure 5 (should this be Figure 4?), which illustrates the site groundwater setting.

Photographs (Appendix I) were provided as evidence that there is no direct connection between the surface and groundwater (Section 3.2.5) with the argument that the standing water in a ditch excavated into bedrock was perched. We agree the photos show water standing in a ditch, but not necessarily that they prove there is no connection between the surface and groundwater.

We agree there is both bedding on the wall of the ditch as well as vertical fractures. However, the water would drain down to the drainage point through horizontal fractures, and the ditch is not dry. The photo isn't clear enough for us to be able to ascertain bedding conditions.

Spring 2021 was abnormally dry; recharge occurred in late winter before the ground was thawed and then there was no significant recharge until later in the summer. The water surplus in 2021 was less than half the 5-year average. What this also means is that the 2 metre difference in groundwater elevation between July and March may also not represent typical conditions. The weather/climate behaviour has to be considered as part of the overall hydrogeological cycle.

The presence of a hydraulic connection doesn't preclude an artesian pressure from lower in the bedrock aquifer. From Table 3.3, and from the stratigraphy plotted in cross-section, it can be seen that the groundwater elevation in TW-03 was only 0.27 m below the bedrock surface. This, along with the elevation calculated for TW-05, which is 0.48 m above the bedrock surface does indicate the hydrogeological conditions at the site are complex and have not yet been completely defined.

For the spring 2022 sampling, the number of well volumes removed before the samples were taken, or alternatively the pre sampling pumping rate and duration should be provided to illustrate the sample represented the groundwater (Sec 6.3).

Nitrate Impact Assessment

Normal climate data, or the average over the past 30 years, is usually used to represent the water budget. A reference for the water surplus was not provided. In this case, our information shows the Carleton Place or the Appleton climate stations have not been recording long enough or continually enough to calculate climate Normals.

We agree it is important to use a nearby climate station because there is a surprisingly high variability in weather patterns on the local scale. However, it is also important to have a sufficiently long and accurate record on which to base the analysis. The report referenced the water surplus data (Table 5.1, Note 2 refers to Appendix E) but the referenced location contains laboratory reports.

The Drummond Centre climate station is situated approximately 13.5 km north of the site, and about midway between Appleton/Carleton Place and the property. The water surplus based on the climate Normal data (1981-2010) from Drummond Centre is 290.2 mm, or 76% of the water surplus used in the nitrate dilution calculation. If this value is used in the calculation, the proposed development would not be within with the 10 mg/L maximum nitrate concentration.

Background Nitrate Concentration

The previous draft report recommended a background nitrate concentration of 5.0. The current report recommended a lower nitrate concentration of 3.4 based on additional sampling and a reduced development area.

In our opinion, the local background nitrate presence may be more than a concern about one property. A wider assessment of the source, the relative contributions of agriculture, residential development on private sewage systems or other factors may be needed but is beyond the scope of this subdivision application.

The assumption of past agriculture for the elevated background nitrate concentration is still a concern. A review of the available historic imagery shows that the approximately north two-thirds of the lot proposed for development was actively cultivated, however the elevated concentration of nitrates is stated to be in the south part of the property. The development of the conceptual digital groundwater surface model for the area (Appendix A, Figure 6) shows that locally, major groundwater recharge occurs in the wetland located north-west of the site and that the groundwater flows towards the Rideau River, south to south-east of the site, so we still do not have sufficient information to be convinced the site is the source. Details on historic crops, areas cultivated, products applied with a dilution model illustrating how they would reach the water supply zone would be needed to address the issue.

The report also mentions that elevated nitrates were measured in the test wells in 2015 likely after application of fertilizer, which is attributed as the source. First, this implies a very close and immediate connection between the water supply aquifer and the surface. The topography, surface drainage suggests a shallow drainage divide at the watercourse that transects the property that could likely also influence how the excess fertilizer would reach the wells in the south was not considered.

We also do not agree that the decrease in concentration between July 2021 and March 2022 means the nitrate concentration is stable or decreasing. There has not been enough sampling or study of seasonal variations for this conclusion.

Secondly, it implies that an excess of fertilizer is applied to the crops, sufficiently high that an excess rapidly leaches into the underlying water supply zone, which is not a practice we know farmers normally engage in, since farming can be a marginally profitable endeavour. The explanation provided is not convincing.

Fifteen samples were taken from nearby residences near the site. Two sites were sampled previously in April 2021. The nitrate concentration from the March samples were slightly higher than the previous year, but close enough that the results would be considered comparable.

One conclusion was that the high background nitrate at 4063 Drummond Conc 2, was a result of a shallow well casing. The well record shows the well matched to the site was drilled in 1954, but the home appears to have more recent construction. Also, the driller's map shows the well is on the north side of the road. For these reasons, this may not be the explanation based on just this information.

The sampling results showed a range of nitrate concentration along both Concession 1 and Concession 2. There were 5 sites, 7 samples from Concession 1 (two duplicates) and 10 sites, and 10 samples from Concession 2. The report concluded the nitrate concentration was higher

along Concession 1, and this was the reason Phase 1 was situated in the north 2/3 of the property. However, if the concentrations are compared by frequency, the range of concentration is comparable. There are simply more samples from Concession 2 at the south end of the site, it appears. Also, when the results were examined in plan view, the highest concentrations are nearest the site. There appears to be more variability in plan view along the north.

The report concludes the source of nitrate in the wells on and around the site does not originate from sewage systems because of the low density of development and the presence of the wetlands. This does not change the fact that nitrates are present and there is an undefined source.

The report found that the nitrate concentration at Fellingers Mills Subdivision has increased from an average concentration of 0.4 mg/L in 2005 to an average of 3.67 mg/L in 2021. The report is correct that the concentrations remain within the ODWS, but the concern is that they have increased by an average of 9.2 times in 15 years.

Were this rate of increase to continue, the average concentration would be 10 mg/L in about 2052. The issue is: the cause or causes of the contamination and the way they are entering the groundwater and water supply aquifer is unknown. Therefore, the fact that the nitrate concentration currently meets the ODWS does not address the potential future impacts.

Aquifer Vulnerability

The final sentence of the last paragraph on page 16 is likely is an editorial error. it says, “nitrate concentrations are expected to be less than the limit of 10 milligrams per litre at the site boundaries as established by the MECP when septic systems with tertiary treatment are used.”

The nitrate dilution calculation does not mean the proposed septic systems will not negatively impact the groundwater aquifer, as stated in the report. The nitrate dilution calculation is based on the MECP’s “Reasonable Use” policy, Policy B-7 which allows impact to groundwater within limits and even allows a proportion to migrate off site. The nitrate dilution analysis assumes an impact occurs and calculates the “acceptable” loading within this framework.

The recommended use of clay liners as additional protection as well as the use of tertiary treatment systems, as recommended in the report are both permitted measures under the OBC. The County or township will need to determine how they will make sure tertiary systems are maintained and operated properly through their operating life and multiple property owners.

The report notes that if clay liners are used, infiltration will be limited beneath the septic beds and that site grading will be used to direct the flow of effluent (hopefully treated) through shallow

soils towards the front of the lots. The thickness of soil required to prevent breaking out of the treated effluent (because of the tile bed mounding) in periods when the soil is saturated during wet periods should be considered. Please provide a conservative representative analysis to show whether the distribution tile will need to be raised higher than minimum to prevent breaking out, and if the mantle areas will require above minimum thicknesses to accommodate the sewage flows, or references in support of the mitigation measure. This requirement for directional lot grading should be included in the recommendations. A recommendation on the minimum fill thickness to prevent breakout of the effluent above the clay liner should be provided.

Groundwater Quality

The field readings (Appendix D) show the water quality stabilized over the pumping tests in July 2021 before the water samples were taken. However, there are noticeable differences in pH and conductivity between the dates – i.e. April 2021, July, 2021 and March 2022. While not mandatory, an explanation for the variable water quality could be considered.

Overall, the water quality on the site met most objectives and standards. The provided bacteriological analysis showed there is a safe drinking water supply. Water treatment may be required to reduce hardness and also iron based on comments from sampled neighbours. The iron concentration measured in the test wells was also variable. TW 2 recorded an iron concentration above the ODWS aesthetic objective but was within the concentration considered cost-effectively treatable by Procedure D-5-5.

Closure

In the April 4, 2022 e-mail from Jean-Philippe Gobeil to Phil Mosher, the author provided several additional considerations or discussion points:

1. *Given that water well records indicate multiple water bearing zones below 9.1 m bgs, the developer considers installing wells with 15 m casing depth instead of 11 m depth, providing additional protection by sealing the uppermost, more vulnerable water bearing fractures.*

   RVCA agrees with the approach as a possible solution, but test wells and the associated testing requirements of Procedure D-5-5 will be required.

2. *Although calculations were performed for conventional systems and approval is requested under those parameters, the plan remains to use tertiary treatment system with guaranteed maintenance by the manufacturer as an additional measure*.

Tertiary treatment is a viable solution, and the results may mean additional future phases of the development are possible. However, as noted, the approval of future phases of the development should not be based on the use of tertiary systems.

3. *In some of the RVCA comments on the report and/or proposed severances, the RVCA mentions the presence of a well developed network of vertical fractures at the site. Although we agree that the site is sensitive and that some degree of connection exists with the surface, hence the requirement for a septic impact assessment and recommended increased casing depth, we do not feel like the data necessarily supports that statement:*

    - *The water found depth in all well records is invariably greater that 9.1 m bgs. Given the presence of multiple horizontal fractures in this type of bedrock, a well developed vertical fracture network would likely generate an interconnected network of fractures and shallower water bearing fractures would also be expected*

    In our experience, the well driller's purpose is to provide a water supply that meets the regulatory requirements in a timely and cost-effective manner. The well driller's rig is also not well equipped to identifying fine fissures. This means that smaller water bearing zones are very small or that will not contribute to the final water supply (i.e. within the cased and grouted zone) may be missed or ignored. It does not mean they are not there.

    If the qualified professional (hydrogeologist) was present on the site when test wells are constructed, we would feel assured that these were not present, but based on the information provided, that does not appear to have been the case. We therefore cannot accept that groundwater was not encountered in the upper 9 m of the bedrock.

    - *Rapid downward migration of groundwater through vertical fractures reaching the water supply aquifer would probably result in the presence of bacteria, elevated turbidity, elevated dissolved organic carbon and elevated concentrations of potential other indicators such as tannin and lignin, organic nitrogen and chloride. Those parameters have not been identified at the site or in surrounding private wells to date.*

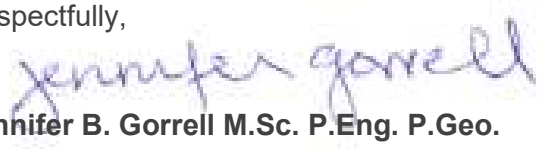
    Similarly, low concentrations of these parameters that originate at surface water features at some distance could be diluted or naturally treated within the aquifer by the time the zone recorded for the test wells was reached. There is not sufficient data to draw this conclusion, in our opinion. The report shows that area recharge occurs at the wetlands.

Recommended Monitoring – Additional Information For Future Development Phases

In the Key Issues, we noted that RVCA recommends post-development well monitoring of a representative number of wells in Phase 1 be conducted. Several years (e.g. 5 to 10) monitoring record will be required before the effects can be adequately characterized, in our opinion.

The monitoring proposal should be reviewed to the County before implementation.

Respectfully,



Jennifer B. Gorrell M.Sc. P.Eng. P.Geo.

Senior Geoscientist

Disclaimer

The Rideau Valley Conservation Authority (RVCA) has not conducted an independent site investigation to confirm the validity of the data, analyses, interpretations and recommendations presented in GEMTEC, 2022-03-31, Hydrogeological Investigation & Terrain Analysis, Proposed Residential
Subdivision, Part of Lot 6 and Lot 7, Concession 1, Drummond Township,
Ontario report. RVCA has accepted the findings as conveyed and the professional opinions of the qualified professional who has conducted and signed the subject report, within the context of the above memorandum.

Summary of RVCA 01.19.22 Review Concerns with Review and Comment on GEMTEC 03.31.22 Report Conclusions, with RVCA Recommended Status

			RVCA Comments	RVCA Recommendation
	Issues (Jan 19 RVCA Review)	**Additional Information (March 31, GEMTEC)**		
1	the site could not satisfy the requirement of Procedures D-5-4 as it was proposed	# of lots reduced and subdivision will be phased. Phase 1 has 30 lots with average size 0.8 ha. Using conventional sewage treatment, the result of the nitrate dilution calculation will be 9.88 mg/L	The concern is the water surplus that was used. The Drummond Centre climate station with climate Normals (1981-2010) is nearest the site, and using these data, the water surplus is 0.2902 m, which is significantly lower than the value of 0.381 m used in the calculation.	Not accepted The water surplus data should be reviewed and revised recommendations should be provided.
2	The site can satisfy the requirements of Procedure D-5-5, but additional detail in support is required	Additional sampling for bacteria and nitrates provided for site, additional samples were taken from 15 neighbouring wells that included two sites that were previously sampled. The requested additional information was provided on the field methods to aid in interpretation.	The additional samples reinforced the issue that unknown sources in the area have resulted in nitrate contamination.	Not accepted The data does not show that nitrates will not continue to increase over time.
3	The application as proposed cannot succeed without mitigation. D-5-4, which requires the development be sustainable on conventional sewage systems. The provided dilution calculation shows the site cannot support the proposed density of 56 lots.	Planned development was revised to increase the lot size and reduce the number of lots to be constructed in the initial phase to 30.	The water surplus data should be reviewed and the number of lots should be revised as required. We agree the site may be developed on conventional sewage systems but additional information is required on the minimum soil thickness that will be accepted by the LGLDHU and whether this is present in the areas of the recommended sewage distribution areas (including mantle)	Not accepted Revised recommendations should be provided.
4	The study presents doubtful results for the bacteriological water quality and the background nitrogen concentrations. To prove the results are not representative, a statistically relevant number of samples and additional data must be provided.	Additional bacteriological and nitrate sampling results were provided from the area with satisfactory field measurements and explanation of field methods.	Additional bacteriological results were provided with satisfactory field measurements and explanation of field methods. The additional samples reinforced the issue of nitrate presence in the area groundwater.	Not accepted
5	There was elevated nitrate in the bedrock aquifer	The elevated nitrate was examined in more detail.	The background nitrate concentration used in the assessment was decreased from the previous report draft. The rationale for the reduction was provided.	Partially accepted RVCA reviewed the provided data and we accept the use of the reduced background concentration. The issue of elevated background nitrate and the effect on the site development is not resolved.

			RVCA Comments	RVCA Recommendation
			There is insufficient information on the sources of the nitrate or whether they will continue to increase over time. If the nitrate concentration continues to increase at the rate it has over the past 15 years, the ODWS will be reached by about 2050.	
6	the hydrogeological model was very simple and unsubstantiated. The data from the site left unanswered questions.	A more comprehensive understanding of the hydrogeological model was provided.	RVCA disagrees with some of the interpretations in the model as described in the memorandum. While we may disagree, if there is a vertical connection to the lower water bearing zones in the broader area around the site, it might help provide an explanation of the contaminant sources.	Accepted
7	The presented analysis of the water supply aquifer did not include all the components required in Procedure D-5-5	Additional details were provided. An analysis of potential well interference was given.	While the additional details do address the proposal, they would not satisfy the requirements if a deeper casing in the site wells is proposed.	see item 25
8	D-5-5 does require that the pumping test analyses include an assessment of well quantity interference between wells internally within the development and also as a whole with wells on neighbouring properties. This was because the observation wells used in the pumping tests had wider separations than the new subdivision wells and some of the existing adjacent wells.	Additional details were provided. An analysis of potential well interference was given.		see item 25
9	There were irregularities with chlorine residual concentrations in the private off-site wells, that were not addressed in the report.	The issues with the residual chlorine were explained.	Agree	Accept
10	A lot development plan was not provided.	A lot development plan for the first phase was provided	RVCA agrees the concept plan should not provide specific design, however basic information is still required to show the concept can succeed. The LDP has not provided enough information to assess whether the site servicing can meet Procedure D-5-4.	Not Accepted

		RVCA Comments	RVCA Recommendation
	GEMTEC March 31 Report Conclusions		
11	The site geology generally consists of thinly veneered unconsolidated quaternary sediments, consisting of silty clay, sandy silt and silty sand and/or glacial till. The subject site overburden thickness ranges from approximately 0.2 to 2.6 metres. The site is considered to be hydrogeologically sensitive and protective measures are recommended to minimize potential impacts to the water supply aquifer.	Agree	Accept
12	Some areas of thin overburden will require augmentation of native soils to meet the minimum overburden thickness required for onsite septic systems. The proposed lot sizes are considered to be acceptable based on the proposed conceptual lot development plan as well as the nitrate dilution calculations.	Disagree The thin overburden areas will require augmentation. The sufficient minimum thickness of native soils required by (Leeds, Grenville and Lanark District Health Unit (LGLDHU) within the sewage distribution area needs to be confirmed as is the requirement for a replacement tile bed area.	Not accepted See also Item 18
13	The water quality available from drilled wells on the subject site is safe for consumption based on the absence of health-related exceedances, with the exception of total coliforms in TW-04 in the 6-hour sample; however, no other bacterial parameters exceedances were noted at other locations or during other sampling events in TW-04. Groundwater treatment for aesthetic parameters will likely be required.	Agree	Accept
14	The quality of the groundwater meets the Ministry of the Environment, Conservation and Parks Regulations, Standards, Guidelines and Objectives with the exception of hardness, manganese, colour, and iron.	Agree	Accepted
15	The levels of hardness, manganese and iron are considered to be reasonably treatable using a	Agree	Accepted

		RVCA Comments	RVCA Recommendation
	conventional water softener and/or manganese greensand filter.		
16	The levels of colour reported exceed the ODWS aesthetic objective of 5 TCU and the maximum acceptable reasonably treatable limit of 7 TCU; however, the colour is considered to be iron-related and can be treated using manganese greensand filters.	Agree	Accepted
17	The water quality from nearby private wells are similar to the water quality found in the proposed subdivision. No significant impacts from septic systems or surrounding land use have been identified based on the water quality results.	RVCA agrees the water quality is similar. The provided analyses show the wells also meet the ODWS. We disagree with the conclusion that there are no significant impacts from septic systems or surrounding land uses. We believe there is insufficient information. Elevated nitrates from unidentified source or sources were found in some of the sampled neighbouring wells as well as on the proposed development.	Not accepted
18	Based on the nitrate dilution calculations the site can support the proposed 56 lots if advanced septic treatment is implemented. No negative impacts to the bedrock aquifer are anticipated based on nitrate dilution calculations which demonstrate that offsite nitrate impacts are less than 10 mg/L if septic systems featuring tertiary treatment are used. If conventional septic systems are considered for the development, the number of lots would have to be reduced to 29 lots in order for each lot to be large enough to provide sufficient nitrate dilution.	Disagree The information provided is suitable for the approval of a phase of lots. The proposed number of lots within the area are 30. However, the water surplus used in the nitrate dilution calculation is not representative of the site. The climate Normal data from the nearby Drummond Centre climate station is available, and it shows the water surplus is about 76% of the quantity used in the calculation.	Not accepted

		RVCA Comments	RVCA Recommendation
		The approval for the development will not comply with Procedure D-5-4 if advanced septic treatment is used as the basis for approval. The County or municipality should devise a procedure to ensure that original and future owners are aware of the responsibilities of operating and maintaining an advanced septic treatment system, and that there may be associated costs.	
19	The water quality obtained from the nearby subdivision along Daniel Crain Drive suggests that low nitrate impacts related to septic systems are anticipated in the future. The low increase of nitrate concentrations over a 15-year period suggest that nitrate dilution calculations performed as part of this assessment are conservative and mitigation measures based on the results should be protective of future groundwater quality.	Disagree The nitrate concentration in the samples wells shows that on average, the nitrate concentration has increased 9.2 times. There is no information provided to show this increase will not continue. If it does, the nitrated concentration would reach 10.0 mg/L by about 2052.	Not accepted
20	The surface water assessment demonstrates that no surface water bodies will be negatively impacted by the proposed development.	Disagree. A description of how effluent from a septic system underlain by a clay liner might integrate with the subdivision ditch and merge with subsequent downstream water features was provided. There was no information on what concentration of potential contaminants (e.g. nitrate, phosphorous, chloride and potassium or sodium from water treatment systems) might be. Contamination of the subdivision ditches should be considered a negative impact.	Not accepted
21	The water quality determined in the course of this investigation is representative of long term water quality from which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.	Disagree Without knowledge of the source of contaminants or how they are entering the groundwater system, there can be no assurance that degradation will no occur in	Not accepted

		RVCA Comments	RVCA Recommendation
		the future. The wells that have the recommended construction on the site and on the nearby Fellinger Mills subdivision show that the intercepted groundwater does show an impact, although the concentrations meet the ODWS now. They do not show that the long term water quality is protected.	
22	The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term.	Agree	Agree
23	Interference between drinking water wells is expected to be negligible under typical usage for residential developments.	Agree The report provides calculations that show there will be minimal impact to wells within the subdivision and also to existing wells.	Accepted
24	The test well construction is typical of wells which will be used in the development in the future.	Disagree RVCA recommends that new wells be constructed below the level of the currently-identified contamination if the development is going to proceed. This will require representative test wells.	Not accepted
25	The well yields determined in the course of the investigation are representative of the yields which residents of the development are likely to obtain from their wells in the long term.	Agree, if the proposed well construction with minimum 10.8 m casing are used. However, if the well design for the development are to be revised, this conclusion will have to be confirmed.	Not accepted

APPENDIX C

Test pit Logs, Grain Size Analyses and MECP Water Well Records

Report to: Wilburt Crain
Project: 100227.008

C1: TEST PIT LOGS

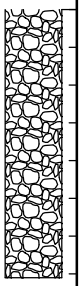
RECORD OF TEST PIT 21-1

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		Dark brown, sandy topsoil. Organic matter present, rootlets etc.									
	Excavator	Dark brown, sandy, topsoil like material. No organic material: appears to be filler/non-native material.		0.20							
		END OF TESTPIT, BEDROCK.		0.71							
1											
2											
3											
4											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90



Tespit backfilled with excavated material.

No groundwater seepage observed upon completion of excavation.

GEMTEC
Consulting Engineers and Scientists

LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-2

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0		Ground Surface						
	Excavator	Dark brown, sandy topsoil. Organic matter present, rootlets.						
		Light brown sand, minor silt. Moisture in layer but no visible groundwater.		0.25				
		END OF TESTPIT, BEDROCK.		0.43				
1								
2								
3								
4								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA
+ NATURAL ⊕ REMOULDED
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Testpit backfilled with excavated material.

No groundwater seepage observed upon completion of excavation.

GEMTEC
Consulting Engineers and Scientists

LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-3

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0		Ground Surface						
	Excavator	Dark brown topsoil, organic material.						
		END OF TESTPIT, BEDROCK.		0.30				
1								
2								
3								
4								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Testpit backfilled with excavated material.

No groundwater seepage observed upon completion of excavating.

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-4

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L); 10 20 30 40 50 60 70 80 90	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator	Ground Surface									
		Dark brown topsoil, organic material									
		Light brown silty sand.		0.18							Tespit backfilled with excavated material.
1		END OF TESTPIT, BEDROCK.		0.79							
2											Groundwater seepage observed ontop of bedrock surface at 0.79 m.
3											
4											

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Consulting Engineers and Scientists

LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-5

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
	Excavator	Dark brown topsoil, organic material									Testpit backfilled withe excavated material.
		END OF TESTPIT, BEDROCK.		0.20							
1											No groundwater seepage observed upon completion of excavating.
2											
3											
4											

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-6

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
	Excavator	Dark brown topsoil, organic material.									Test pit backfilled with excavated material.
		Light brown silty sand.		0.25							
		Grey sandy silt, minor clay.		0.48							
		END OF TESTPIT, BEDROCK.		0.56							Groundwater seepage observed ontop of bedrock surface at 0.56 m.
1											
2											
3											
4											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-7

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator	Ground Surface Dark brown topsoil, organic material.									
		Light brown silty sand.		0.25							Testpit backfilled with excavated material.
		Groundwater observed ontop of bedrock surface.		0.84							No groundwater seepage observed upon completion of excavating.
1		END OF TESTPIT, BEDROCK.									
2											
3											
4											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-8

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown topsoil, organic material.									
		Light brown, silty-sand.		0.25							
1	Excavator										Testpit backfilled with excavated material.
2		GW observed.									
		Till Formation - Grey silt, clay, gravel, and cobbles.		2.20							
		END OF TESTPIT, BEDROCK.		2.60							Groundwater seepage observed at 2.2 meters.
3											
4											

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-9

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator	Ground Surface Dark brown topsoil, organic material.									
		Light brown silty clay- high clay content.		0.25							
1		GW observed.		1.24							
		END OF TESPIT, BEDROCK.									
2											
3											
4											

Tespit backfilled with excavated material.

Groundwater seepage observed just above bedrock surface at 1.24 m.

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-10

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Solid Stem Auger (210mm OD)	Ground Surface									
		Dark brown topsoil, organic material.									Tespit backfilled with excavated material.
		Light brown, clayey sand, moisture presence.		0.25							
1		END OF TESTPIT, BEDROCK.		0.48							No groundwarter seepage observed upon completion of the excavation.
2											
3											
4											

10 20 30 40 50 60 70 80 90

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-11

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator	Ground Surface									
		Dark brown topsoil, organic material.									
		Dark brown silty clay.		0.25							
		Grey silty clay.		0.56							
		END OF TESPIT, BEDROCK.		0.74							
1											
2											
3											
4											

10 20 30 40 50 60 70 80 90

Testpit backfilled with excavated material.

No groundwater seepage observed upon completion of excavation.

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-12

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
	Excavator	Dark brown topsoil, organic material.									Testpit backfilled with excavated material.
		Dark brown silty clay.		0.25							
		Grey silty clay.		0.51							
1		END OF TESTPIT, BEDROCK.		0.69							
2											No groundwater seepage observed upon completion of testpit.
3											
4											

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LOGGED: BR
CHECKED:

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

RECORD OF TEST PIT 21-13

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator	Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown topsoil, organic material.									
		Dark to light brown silty sand, moisture present.		0.20							Testpit backfilled with excavated material
1		Till formation -grey sandy-silt, minor clay content, gravel, cobbles.		0.89							
		END OF TESTPIT, BEDROCK.		1.27							
2											No groundwater seepage oberved upon completion of excavation.
3											
4											

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LOGGED: BR
CHECKED:

RECORD OF TEST PIT 21-14

CLIENT: Wib Crain
PROJECT: Hydrogeological Investigation-Burns Farm, 3929-3875 Drummond Concession Rd. 2, Perth, ON
JOB#: 100227.008
LOCATION: see Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown topsoil, organic material.									
		Light brown silty sand.		0.20							
1	Excavator	Till formation - grey sandy-silt, clay, gravel.		0.76							Testpit backfilled with excavated material.
		END OF TESPIT, BEDROCK.		1.65							
2											
											No groundwater seepage observed upon completion of excavation.
3											
4											

GEO - BOREHOLE LOG 100496.001_GINT_V01_2021_04_06.GPJ GEMTEC 2018.GDT 30/4/21

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LOGGED: BR
CHECKED:

C2: GRAIN SIZE

GEMTEC
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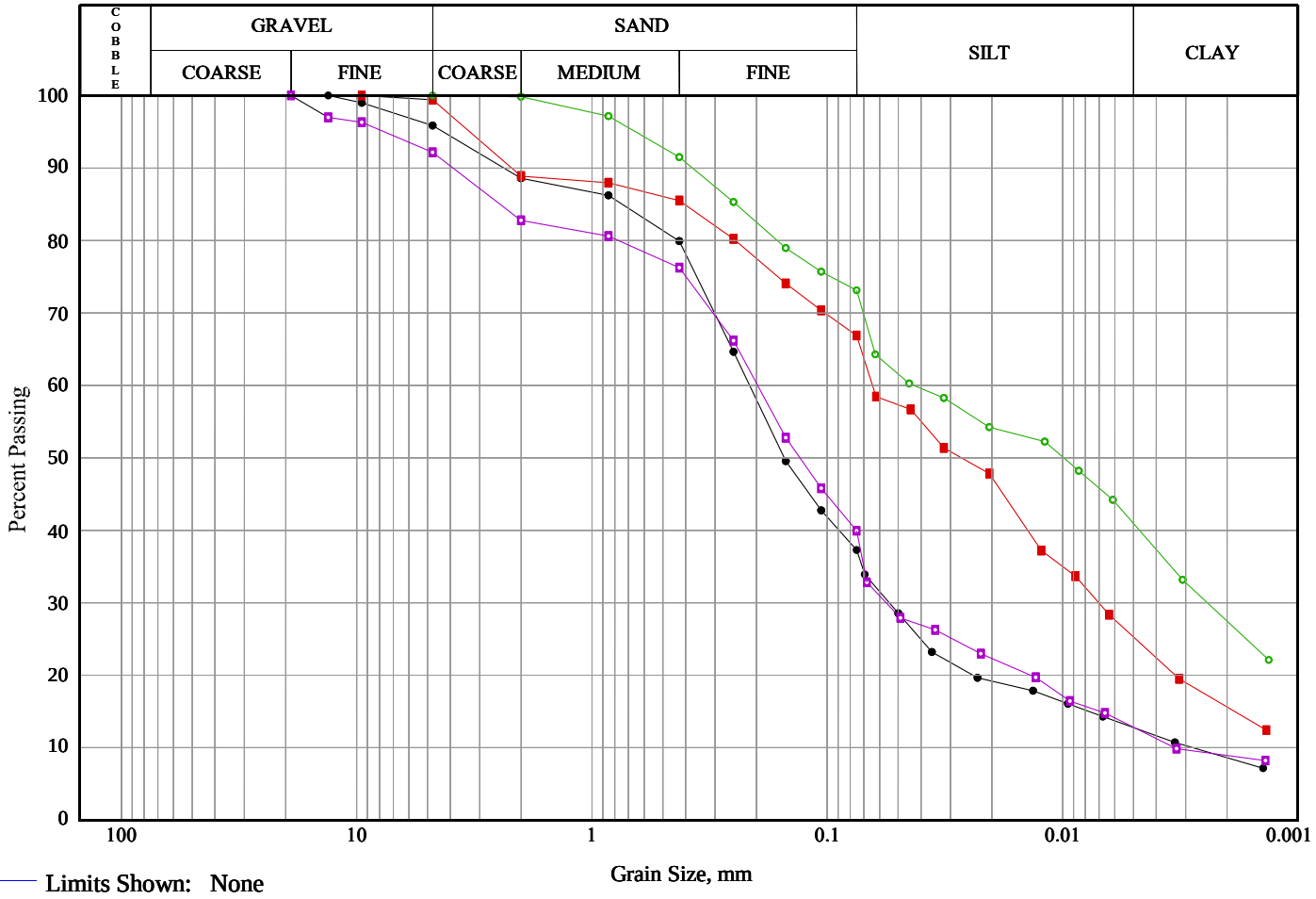
Client:	ZanderPlan Inc.
Project:	(Client: Crains Construction c/o Zander) EIS and Hydrog
Project #:	100227008

Soils Grading Chart



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
		21-02	1	0.25-0.43	4.2	58.6	24.5	12.8
		21-06	1	0.25-0.48	0.6	32.5	41.6	25.3
		21-09	1	0.25-1.24	0.0	26.9	32.2	40.9
		21-13	1	0.89-1.27	7.9	52.2	27.1	12.8

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
	Silty sand , some clay , trace gravel	N/A	0.00	0.01	0.05	0.15	0.21	0.74	24.5
	Sandy clayey silt , trace gravel	N/A	---	0.00	0.01	0.03	0.06	0.40	41.6
	Sandy silty clay	N/A	---	---	0.00	0.01	0.04	0.24	32.2
	Silty sand , some clay , trace gravel	N/A	0.00	0.01	0.06	0.13	0.20	2.46	27.1

C3: WELL RECORD SUMMARY

MECP Water Well Record Compilation
(Burns Farm- 500 m Radius)

Well ID	Date Completed	Depth (m)	Depth to Bedock (m)	Casing Depth (m)	Water Found (m)	Static Water Level (m)	Water Detail	Well Use
3500700	1966-01-11	15.2	0.6	7.9	12.2	7.3	FR	DO
7235419	2014-12-16	18.3	-	10.1	11.3, 17.7	-	UT	TH
3512751	1999-09-02	15.2	1.5	6.7	12.8	9.1	UK	DO
3515299	2006-04-11	-	-	-	-	-	-	-
3503526	1973-07-03	13.7	1.2	6.7	9.1, 11.0	4.0	FR	DO
3509721	1990-06-15	25.9	0.9	14.0	24.1	3.7	FR	DO
7278692	2016-12-13	-	-	-	-	-	-	-
3514556	2004-06-09	12.2	1.8	6.7	10.4	4.0	-	DO
7191389	2012-10-15	16.8	0.6	6.7	11.6, 13.8, 16.2	-	-	-
7237395	2015-01-19	18.3	-	10.1	11.9, 17.4	-	UT	TH
3514825	2005-02-17	16.8	1.8	6.7	9.8, 14.3	2.4	FR	DO
7237394	2015-01-19	18.3	-	6.7	11.0, 14.9, 17.4	-	UT	TH
7235418	2014-12-16	18.3	-	10.1	15.2, 16.2	-	UT	TH
3501737	1947-06-09	8.5	-	1.8	-	1.8	FR	PS
7254426	-	15.2	-	6.7	10.1, 13.7	-	-	-
3506269	1981-05-08	13.7	1.2	6.7	11.3	3.7	FR	DO
7276572	2016-11-22	18.3	-	6.7	13.7, 16.8, 17.7	-	-	-
7235420	2014-12-16	19.8	-	10.1	11.3, 18.0, 19.2	-	UT	TH
3504964	1977-01-01	12.2	-	6.7	10.1	3.7	FR	ST

https://www.ontario.ca/page/map-well-records

"Well Use"

DO	Domestic
ST	Livestock
IR	Irrigation
IN	Industrial
CO	Commercial
MN	Municipal
PS	Public
AC	Cooling and A/C
NU	Not Used
OT	Other
TH	Test Hole
DE	Dewatering
MO	Monitoring
MT	Monitoring Test

Parameter	10th Percentile	90th Percentile	Average	Geometric Mean
Depth Water Found[1] (m)	10.1	17.7	14.0	13.6
Static Water Level (m)	2.3	7.7	4.4	3.9
Depth to Bedrock (m)	0.6	1.8	1.2	1.1
Total Well Depth (m)	12.2	18.9	16.3	15.8

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C4: SECONDARY WELLS

Ontario — Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Below): Tag#: A174613 / A174613

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☐ Metric ☑ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Crain's Construction		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1800 Maberly - Elphin Road, RR1	Maberly	ON.	K0H2B0	6132652308

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1st Line of Drummond	Drummond	7	1 East.

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	K7H3C3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404606	4973943	—	—

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	Depth (m/ft) To
	Clay / gravel			0'	3'
grey	sandstone			3'	22'
grey/brown	sandstone			22'	60'
			Test Well #1		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0'	33'	2 Bags cement	0.044
		2 Bags quick grout	0.044
		Heavy drive shoe	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6"	Steel	.48cm	0'	22

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth	Kind of Water	
36' (m/ft)	☐ Fresh ☑ Untested	☐ Gas ☐ Other, specify
49' (m/ft)	☐ Fresh ☑ Untested	☐ Gas ☐ Other, specify
57' (m/ft)	☐ Fresh ☑ Untested	☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	22'	25.4cm

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☑ Other, specify: Cloudy

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 50'

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 7.62'

If flowing give rate (l/min / GPM): ∅

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min / GPM): 20 gpm

Well production (l/min / GPM): 60 gpm

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	7.70'		1	7.62'
2	7.70'		2	7.62'
3	7.70'		3	7.62'
4	7.70'		4	7.62'
5	7.70'		5	7.62'
10	7.70'		10	7.62'
15	7.70'		15	7.62'
20	7.70'		20	7.62'
25	7.70'		25	7.62'
30	7.7'		30	7.62'
40	7.7'		40	7.62'
50	7.7'		50	7.62'
60	7.7'		60	7.62'

Map of Well Location

Please provide a map below following instructions on the back.

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilf Hall & Sons Well Drilling	2558

Business Address (Street Number/Name)	Municipality
256 Hall Shore Rd. RR1	McDonald's Corners

Province	Postal Code	Business E-mail Address
ON	K0G1M0	wilfhall1td@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6132782933	Hall Mark

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T2228	Mark Hall	2015/01/19

Well owner's information package delivered: ☑ Yes ☐ No

Date Package Delivered: 2015/01/19

Date Work Completed: 2015/01/19

Ministry Use Only

Audit No. Z199127

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Ontario — Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Below): Tag#: A174613 / A174613

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☐ Metric ☑ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Crain's Construction		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1800 Maberly - Elphin Road, RR1	Maberly	ON.	K0H2B0	6132652308

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1st Line of Drummond	Drummond	7	1 East.

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	K7H3C3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404606	4973943	—	—

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	Depth (m/ft) To
	Clay / gravel			0'	3'
grey	sandstone			3'	22'
grey/brown	sandstone			22'	60'
			Test Well #1		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0'	33'	2 Bags cement	0.044
		2 Bags quick grout	0.044
		Heavy drive shoe	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6"	Steel	.48cm	0'	22

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth	Kind of Water	
36' (m/ft)	☐ Fresh ☑ Untested	☐ Gas ☐ Other, specify
49' (m/ft)	☐ Fresh ☑ Untested	☐ Gas ☐ Other, specify
57' (m/ft)	☐ Fresh ☑ Untested	☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	22'	25.4cm

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☑ Other, specify: Cloudy

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 50'

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 7.62'

If flowing give rate (l/min / GPM): ∅

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min / GPM): 20 gpm

Well production (l/min / GPM): 60 gpm

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	7.70'		1	7.62'
2	7.70'		2	7.62'
3	7.70'		3	7.62'
4	7.70'		4	7.62'
5	7.70'		5	7.62'
10	7.70'		10	7.62'
15	7.70'		15	7.62'
20	7.70'		20	7.62'
25	7.70'		25	7.62'
30	7.7'		30	7.62'
40	7.7'		40	7.62'
50	7.7'		50	7.62'
60	7.7'		60	7.62'

Map of Well Location

Please provide a map below following instructions on the back.

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilf Hall & Sons Well Drilling	2558

Business Address (Street Number/Name)	Municipality
256 Hall Shore Rd. RR1	McDonald's Corners

Province	Postal Code	Business E-mail Address
ON	K0G1M0	wilfhall1td@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6132782933	Hall Mark

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T2228	Mark Hall	2015/01/19

Well owner's information package delivered: ☑ Yes ☐ No

Date Package Delivered: 2015/01/19

Date Work Completed: 2015/01/19

Ministry Use Only

Audit No. Z199127

Received FEB 11 2015

Ministry's Copy

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag #: A174607
A174607

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Crain's	Construction	—	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1800 Maberly-Elphin Rd. RR1	Maberly	ON	K0H 2B0	613 268 2305

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1st Line Drummond	Drummond	7	1 East.

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	K7H 3C3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404303	4974032	1600 Drummond	—

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	Depth (m/ft) To
	earth			0'	1'
Grey	sandstone			1'	28'
brown	sandstone			28'	30'
grey	sandstone			30'	37'
grey/brown	sandstone			37'	59'
grey	sandstone			59'	65'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0'	33'	2 Bags cement	0.044
		2 Bags quick grout	0.044
		Heavy drive shoe	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

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"	Steel	.48cm	0'	33'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, specify
37'	☐	☐	☑	
59'	☐	☐	☑	
63'	☐	☐	☑	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	33'	25.4cm

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☑ Other, specify Cloudy

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 50'

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 15.58'

If flowing give rate (l/min / GPM): 0

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min / GPM): 20 gpm

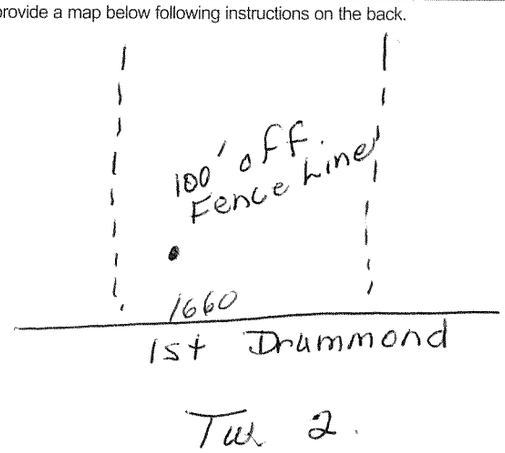
Well production (l/min / GPM): 60 gpm

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	15.9'	1	15.63'	
2	15.91'	2	15.61'	
3	15.92'	3	15.6'	
4	15.92'	4	15.6'	
5	15.92'	5	15.9'	
10	15.92'	10	15.8'	
15	15.92'	15	15.8'	
20	15.93'	20	15.8'	
25	15.93'	25	15.8'	
30	15.94'	30	15.8'	
40	15.94'	40	15.8'	
50	15.94'	50	15.8'	
60	15.94'	60	15.8'	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Hall & Sons Well Drilling	2558

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
256 Hall Shore Rd. RR1	McDonalds Corners	ON	K0G 1M0	wilfhall1td@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
613 278 2933	Hall Mark	T22 28	Mark Hall	2014/12/16

Well owner's information package delivered: ☑ Yes ☐ No

Date Package Delivered: 2014/12/16

Date Work Completed: 2014/12/16

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Well Tag No. (Place Sticker and/or Print Below): Tag#: A174614 / A174614

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Crain's	Construction		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1800 Maberly-Elphin Rd. RR1	Maberly	ON	K0H2B0	613 268 2308

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2nd Con.	Drummond	7	1 East.

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	K7H3C3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404184	4974482	—	—

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	Depth (m/ft) To
		Test Well #3			
	Clay/gravel			0'	3'
grey	sandstone			3'	37'
grey/brown	sandstone			37'	60'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0'	33'	2 Bags cement 2 Bags quickgrout Ready shoe	0.044

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6"	Steel	.148cm	0'	33'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth	Kind of Water	
39' (m/ft) ☐ Gas	☐ Fresh ☒ Untested	☐ Other, specify
57' (m/ft) ☐ Gas	☐ Fresh ☒ Untested	☐ Other, specify
(m/ft) ☐ Gas	☐ Fresh ☐ Untested	☐ Other, specify

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0'	33'	254cm

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☒ Other, specify: Cloudy

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 50'

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 8.23'

If flowing give rate (l/min / GPM): 0

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min / GPM): 20 gpm

Well production (l/min / GPM): 60 gpm

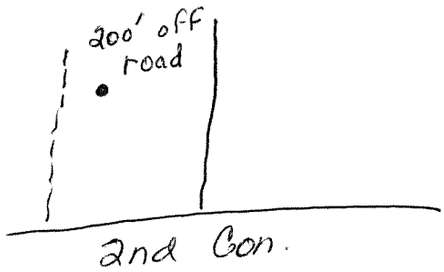
Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	8.32'		1	8.23'
2	8.32'		2	8.23'
3	8.32'		3	8.23'
4	8.32'		4	8.23'
5	8.32'		5	8.23'
10	8.32'		10	8.23'
15	8.32'		15	8.23'
20	8.32'		20	8.23'
25	8.32'		25	8.23'
30	8.32'		30	8.23'
40	8.32'		40	8.23'
50	8.32'		50	8.23'
60	8.32'		60	8.23'

Map of Well Location

Please provide a map below following instructions on the back.

Test Well #3



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilf Hall & Sons Well Drilling	2558

Business Address (Street Number/Name)	Municipality
256 Hall Shore Rd. RR1	McDonald's Corners

Province	Postal Code	Business E-mail Address
ON	K0G1M0	wilfhallltd@bellnet.ca.

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6132782933	Hall Mark

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T2228	Mark Hall	2015/01/19

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2015/01/19

Date Work Completed: 2015/01/19

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Audit No. Z 199128

Received FEB 11 2015

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Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. (Place Sticker and/or Print Below): **Tag#: A174609** A 174609

Well Record

Regulation 903 Ontario Water Resources Act

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Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Craigs	Construction		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1800 Maberly-Elphin Rd. RR1	Maberly	Ont	K0H2B0	6132682308

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1660 Drummond	Drummond	7	1 East

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	K7H3C3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	403847	4974616	1600 Drummond	

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	Depth (m/ft) To
	earth			0'	1 1/2'
grey	sandstone			1 1/2'	36'
brown	sandstone			36'	38'
grey/white	sandstone			38'	57'
grey	sandstone			57'	60'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0'	33'	2 Bags cement	0.044
		2 Bags quick grout	0.044
		Heavy drive shoe	

Method of Construction

☐ Cable Tool ☐ Diamond ☑ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

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	Depth (m/ft) To
6"	Steel	.148cm	0'	33'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth From	Hole Diameter Depth To	Hole Diameter (cm/in)
37' (m/ft) ☐ Gas	☐ Fresh ☑ Untested ☐ Other, specify			
58' (m/ft) ☐ Gas	☐ Fresh ☑ Untested ☐ Other, specify	0'	33'	25.4cm
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☑ Other, specify Cloudy

If pumping discontinued, give reason:

Pump intake set at (m/ft): 50'

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 10.2'

If flowing give rate (l/min / GPM): 0

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min / GPM): 20 gpm

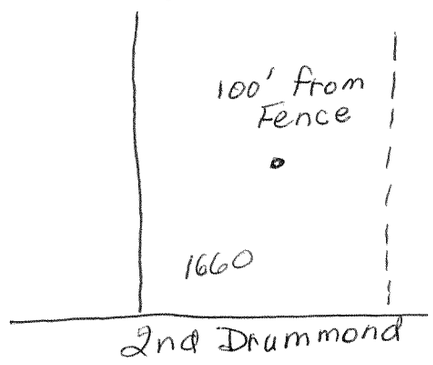
Well production (l/min / GPM): 60 gpm

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	10.33'	1	10.2'	
2	10.32'	2	10.2'	
3	10.31'	3	10.2'	
4	10.31'	4	10.2'	
5	10.31'	5	10.2'	
10	10.31'	10	10.2'	
15	10.31'	15	10.2'	
20	10.31'	20	10.2'	
25	10.31'	25	10.2'	
30	10.31'	30	10.2'	
40	10.32'	40	10.2'	
50	10.32'	50	10.2'	
60	10.32'	60	10.2'	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilf Hall & Sons Well Drilling	2158

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
256 Hall Shore Rd RR1	McDonald's Corners	Ont	K0G1M0	wilfhallltd@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6132782933	Hall Mark	1228	Mark Hall	2014/12/12

Well owner's information package delivered: ☑ Yes ☐ No

Date Package Delivered: 2014/12/16

Date Work Completed: 2014/12/16

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Ontario — Ministry of the Environment

Well Tag No. (Plate ow) **Tag#: A174608**

A174608

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☐ Metric ☑ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Crain's Construction		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1800 Moberly - Elphin Road RR1	Moberly	On	K0H 2B0	613 2682308

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2nd Drummond	Drummond		

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Reid	Ontario	K7H 3C3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	403781	4974897	1660 Drummond	

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	Depth (m/ft) To
	earth / clay / gravel			0'	6'
grey	sandstone			6'	28'
brown	sandstone			28'	30'
grey/white	sandstone			30'	50'
Grey/brown/green	sandstone			50'	60'

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0'	33'	2 Bags cement	0.044
		4 Bags quick grout	0.088
		Heavy drive shoe	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☑ 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	Depth (m/ft) To
6"	Steel	.46cm	0'	33'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
50'	☐ Fresh ☑ Untested	☐	
53'	☐ Fresh ☑ Untested	☐	
	☐ Fresh ☐ Untested	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0'	33'	25.4cm

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☑ Other, specify: Cloudy

If pumping discontinued, give reason:

Pump intake set at (m/ft): 50'

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 8.25'

If flowing give rate (l/min / GPM): 0

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min / GPM): 20 gpm

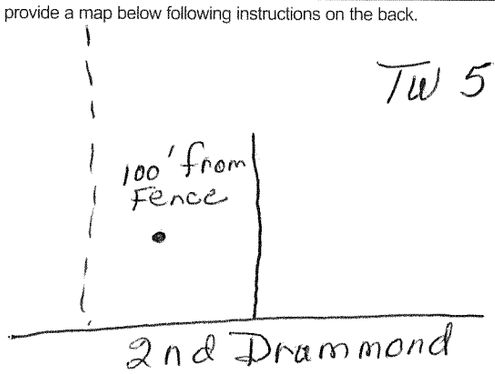
Well production (l/min / GPM): 60 gpm

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	8.42'		1	8.25'
2	8.42'		2	8.25'
3	8.42'		3	8.25'
4	8.42'		4	8.25'
5	8.42'		5	8.25'
10	8.42'		10	8.25'
15	8.42'		15	8.25'
20	8.42'		20	8.25'
25	8.43'		25	8.25'
30	8.43'		30	8.25'
40	8.43'		40	8.25'
50	8.43'		50	8.25'
60	8.43'		60	8.25'

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilf Hall & Sons Well Drilling	2558

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
256 Hall Shore Rd. RR1	McDonald's Corners	ON	K0G 1M0	wilfhallltd@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
613 278 2933	Hall Mark	1228	Mark Hall	2014 12 16

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2014 12 16	2014 12 16

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Tag#:A342215 (Print Below) A342215

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

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Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1660 Drummond Conc 1	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404419	4973879		

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	Depth (m/ft) To
Brown	Top Soil			0'	1'
Brown	Limestone			1'	18'
Grey & White	Sandstone			18'	84'
Grey & White	Sandstone			84'	72'
Grey & White	Sandstone			72'	76'
Grey & White	Sandstone			76'	82'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
80'	50'	Neat cement	12.48
50'	0'	Bentonite slurry	12.6

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6¼"	Steel	.188"	+2'	80'
6"	Open Hole		80'	82'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify
64	
72	
76	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	60'	9¾"
60'	82'	6"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify — Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 70

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 18.1'

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 70'

Recommended pump rate (l/min/GPM): 10

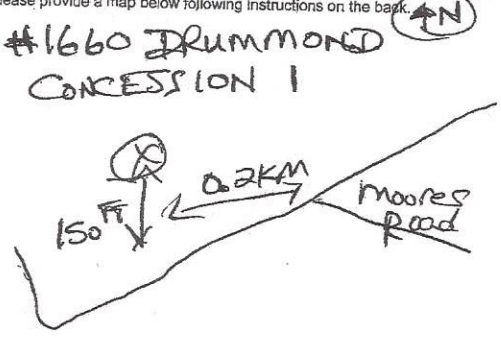
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	15'6"		18.1'
1	15.8	1	15.7
2	15.8	2	15.5
3	15.8	3	15.5
4	15.8	4	15.5
5	15.8	5	15.5
10	15.9	10	15.5
15	15.9	15	15.5
20	15.9	20	15.5
25	16	25	15.5
30	16	30	15.5
40	16	40	15.5
50	16	50	15.5
60	16.1'	60	15.5'

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6859 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6138382170	Hanna, Jeremy	T3632		2022 05 31

Comments: ½HP 10 GPM Set @ 70 FT

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2022 04 26	2022 04 25

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A342440

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Beside 4005 Drummond Concession 2	Drummon - North Elmsley	E1/2 7	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	403440	4974621		

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	Depth (m/ft) To
	Sand	& Clay		0	4
Brown	Sandstone	w/ Grey limestone Mix		4	70
White	Sandstone			70	90
White	Sandstone			90	100

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
60	0	Neat cement	62.4

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☒ Air percussion ☐ Other, specify

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	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	60'
6"	Open Hole		60'	100'

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	Depth (m/ft) To

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
90	☐	☐ Fresh ☒ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	60'	9 3/4"
60'	100'	6"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify **Not tested**

If pumping discontinued, give reason: ✓

Pump intake set at (m/ft): 80

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 19.8"

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 80'

Recommended pump rate (l/min/GPM): 10

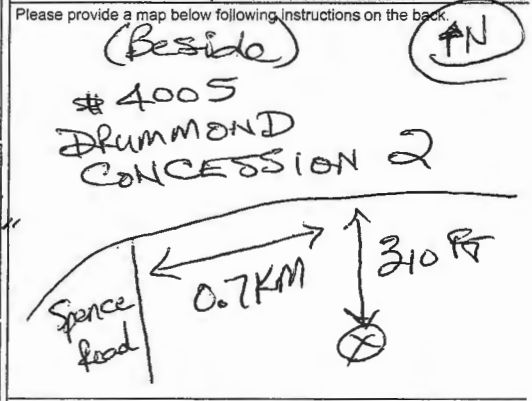
Well production (l/min/GPM): 20

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	18'1"		19.8'
1	19.3	1	18.1
2	19.6	2	18.1
3	19.6	3	18.1
4	19.7	4	18.1
5	19.7	5	18.1
10	19.7	10	18.1
15	19.8	15	18.1
20	19.8	20	18.1
25	19.8	25	18.1
30	19.8	30	18.1
40	19.8	40	18.1
50	19.8	50	18.1
60	19.8'	60	18.1'

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
13632		2022 07 31

Comments: 1/2HP-10GPM Set @ 80 FT

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☒ Yes ☐ No	2022 07 11	2022 07 05

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A342440

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Beside 4005 Drummond Concession 2	Drummon - North Elmsley	E1/2 7	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	403440	4974621		

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	Depth (m/ft) To
	Sand	& Clay		0	4
Brown	Sandstone	w/ Grey limestone Mix		4	70
White	Sandstone			70	90
White	Sandstone			90	100

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
60	0	Neat cement	62.4

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☒ Air percussion ☐ Other, specify

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	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	60'
6"	Open Hole		60'	100'

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	Depth (m/ft) To

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
90	☐	☐ Fresh ☒ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	60'	9 3/4"
60'	100'	6"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify **Not tested**

If pumping discontinued, give reason: ✓

Pump intake set at (m/ft): 80

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 19.8"

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 80'

Recommended pump rate (l/min/GPM): 10

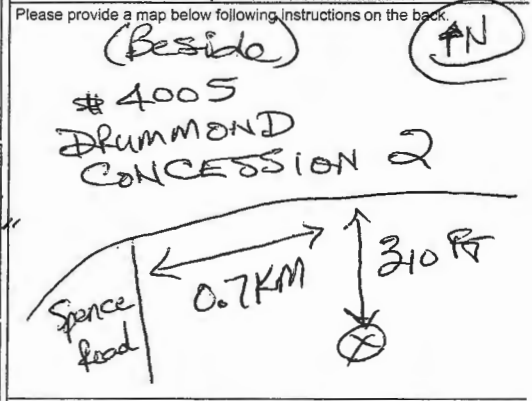
Well production (l/min/GPM): 20

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	18'1"		19.8'
1	19.3	1	18.1
2	19.6	2	18.1
3	19.6	3	18.1
4	19.7	4	18.1
5	19.7	5	18.1
10	19.7	10	18.1
15	19.8	15	18.1
20	19.8	20	18.1
25	19.8	25	18.1
30	19.8	30	18.1
40	19.8	40	18.1
50	19.8	50	18.1
60	19.8'	60	18.1'

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
13632		2022 07 31

Comments: 1/2HP-10GPM Set @ 80 FT

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☒ Yes ☐ No	2022 07 11	2022 07 05

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Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1690 Drummond Concession #1	Drummond - North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	404343	4973793		

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	Depth (m/ft) To
	Sand	& Clay		0	2
Grey	Limestone	W/ Brown Sandstone Mix		2	62
Grey	Limestone	W/ Brown Sandstone Mix		62	73
Grey	Limestone	W/ Brown Sandstone Mix		73	80

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/yd³)
60	0	Neat cement	43.68

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6 1/4"	Steel	.188"	+2	60
6"	Open Hole		60	80

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Water found at Depth (m/ft)	Kind of Water	Water found at Depth (m/ft)	Kind of Water
62	☐ Gas ☐ Fresh ☒ Untested ☐ Other, specify	73	☐ Gas ☐ Fresh ☒ Untested ☐ Other, specify		☐ Gas ☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	60	9 3/4"
60	80	6"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 70

Pumping rate (l/min/GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 24.5

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 60

Recommended pump rate (l/min/GPM): [redacted] 10 GPM

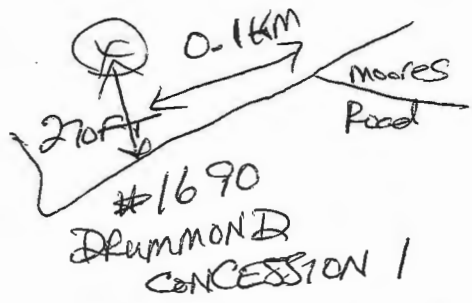
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	24.4		24.5
1	24.5	1	24.4
2	24.5	2	24.4
3	24.5	3	24.4
4	24.5	4	24.4
5	24.5	5	24.4
10	24.5	10	24.4
15	24.5	15	24.4
20	24.5	20	24.4
25	24.5	25	24.4
30	24.5	30	24.4
40	24.5	40	24.4
50	24.5	50	24.4
60	24.5	60	24.4

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6650 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
T3632		2022 07 31

Comments: 1/2HP-10GPM Set@60ft

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered (Y Y Y Y M M D D): 2022 07 11

Ministry Use Only

Audit No. Z379041

Received 2022 08 06

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Ministry's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

W Tag#: A342439 (Print Below)

A342439

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1690 Drummond Concession #1	Drummond - North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404343	4973793		

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	Depth (m/ft) To
	Sand	& Clay		0'	2'
Grey	Limestone	W/ Brown Sandstone Mix		2'	62'
Grey	Limestone	W/ Brown Sandstone Mix		62'	73'
Grey	Limestone	W/ Brown Sandstone Mix		73'	80'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/yd³)
60'	0'	Neat cement	43.68

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6¼"	Steel	.188"	+2'	60'
6"	Open Hole		60'	80'

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	Depth (m/ft) To

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
62	☐ Gas ☐ Other, specify ☐ Fresh ☒ Untested	0'	60'	9 3/4"
73	☐ Gas ☐ Other, specify ☐ Fresh ☒ Untested	60'	80'	6"
	☐ Gas ☐ Other, specify ☐ Fresh ☐ Untested			

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 70

Pumping rate (l/min/GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 24.5'

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 60'

Recommended pump rate (l/min/GPM): 10GPM

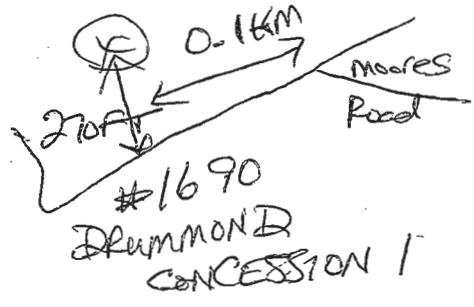
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	24'4"		24.5'
1	24.5	1	24.4
2	24.5	2	24.4
3	24.5	3	24.4
4	24.5	4	24.4
5	24.5	5	24.4
10	24.5	10	24.4
15	24.5	15	24.4
20	24.5	20	24.4
25	24.5	25	24.4
30	24.5	30	24.4
40	24.5	40	24.4
50	24.5	50	24.4
60	24.5'	60	24.4'

Map of Well Location

Please provide a map below following instructions on the back. 4N



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6659 Frankford Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
13632		2022 07 31

Comments: 1/2HP-10GPM Set@60ft

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Ministry Use Only
☒ Yes ☐ No	2022 07 11	Audit No. Z379041
		Received 2022 08 06

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

W Tag#:A342438 (Print Below)

A342438

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Beside 1690 Drummond Concession 1	Drummond - North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	403931	4974324		

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	Depth (m/ft) To
	Sand	& Clay		0	2
Grey	Limestone	W/Brown Sandstone Mix		2	65
White	Sandstone	[redacted]		65	99
White	Sandstone	[redacted]		99	104
White	Sandstone	[redacted]		104	110

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
60	0	Neat cement	56.16

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

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 1/4"	Steel	.188	+2	60
6"	Open Hole		60	110

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	To	Diameter (cm/in)
99	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify	0	60	9 3/4"
104	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify	60	110	6"
	☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 100

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 16.7"

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 80'

Recommended pump rate (l/min/GPM): 20

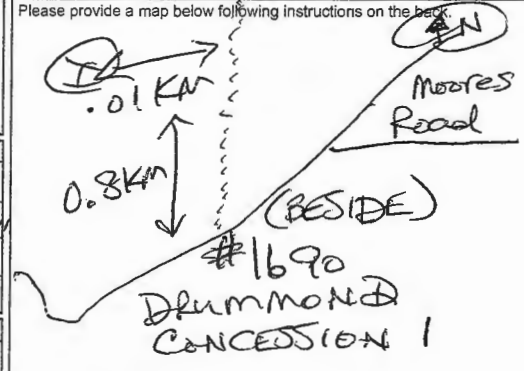
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	16'5"			16.7"
1	16.5		1	16.5
2	16.5		2	16.5
3	16.6		3	16.5
4	16.6		4	16.5
5	16.6		5	16.5
10	16.7		10	16.5
15	16.7		15	16.5
20	16.7		20	16.5
25	16.7		25	16.5
30	16.7		30	16.5
40	16.7		40	16.5
50	16.7		50	16.5
60	16.7"		60	16.5"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1/2HP-10GPM@80Ft

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
6138382170	Hanna, Jeremy	T3632		2022 07 31

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2022 07 11

Date Work Completed: 2022 07 06

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Audit No: Z379040

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Tag#: A342159 (Print Below) A342159

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corner	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1710 Drummond Concession 1	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Subiot Number	Other
NAD 83	18	404282	4973659		

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	Depth (m/ft) To
Grey & Black	Limestone			0'	48'
Grey & Red	Sandstone			48'	75'
Grey & Red	Sandstone			75'	82'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
50'	40'	Neat cement	12.48
40'	0'	Bentonite slurry	12.6

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify ____

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	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	50'
6 1/8"	Open Hole		50'	82'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
75	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	50'	6 1/4"
50'	82'	6 1/8"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6059 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted Y Y Y Y M M D D
6138382170	Hanna, Jeremy	13632		2022 03 31

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 70

Pumping rate (l/min/GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 15.5

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 60 FT

Recommended pump rate (l/min/GPM): 20

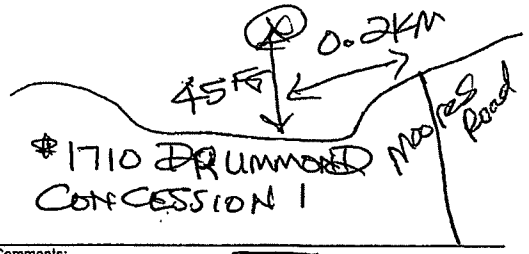
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	14'9"		15.5'
1	15.3	1	15
2	15.3	2	14.9
3	15.3	3	14.9
4	15.3	4	14.9
5	15.3	5	14.9
10	15.4	10	14.9
15	15.4	15	14.9
20	15.4	20	14.9
25	15.4	25	14.9
30	15.4	30	14.9
40	15.5	40	14.9
50	15.5	50	14.9
60	15.5'	60	14.9"

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
1 HP 20 GPM SET AT [redacted]
60 Feet

Well owner's information package delivered	Date Package Delivered Y Y M M D D	Ministry Use Only
☒ Yes ☐ No	2022 03 21	Audit No. Z379232 Received

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Ministry's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Tag#: A342159 (Print Below)

A342159

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corner	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1710 Drummond Concession 1	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404282	4973659		

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	Depth (m/ft) To
Grey & Black	Limestone			0'	48'
Grey & Red	Sandstone			48'	75'
Grey & Red	Sandstone			75'	82'

COPY

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
50'	40'	Neat cement	12.48
40'	0'	Bentonite slurry	12.6

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	50'
6 1/8"	Open Hole		50'	82'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh / Untested / Other, specify
75	☐	☒ Untested
	☐	☐ Fresh ☐ Untested
	☐	☐ Fresh ☐ Untested

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0'	50'	9 3/4"
50'	82'	6 1/8"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 70

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 15.5'

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 60 Ft

Recommended pump rate (l/min/GPM): 20

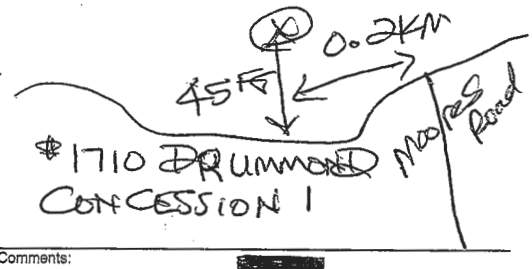
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		14'9"		15'5"
1	15.3		1	15
2	15.3		2	14.9
3	15.3		3	14.9
4	15.3		4	14.9
5	15.3		5	14.9
10	15.4		10	14.9
15	15.4		15	14.9
20	15.4		20	14.9
25	15.4		25	14.9
30	15.4		30	14.9
40	15.5		40	14.9
50	15.5		50	14.9
60	15.5'		60	14.9"

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
1 HP 20 GPM SET AT [redacted]
60 Feet

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6059 Frankford Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
T3632		2022 03 31

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2022 03 21

Ministry Use Only
Audit No: Z379232
Received

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Ministry's Copy

C5: PRIMARY WELLS

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

We Tag#:A361167 int Below)

A361167

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1710 Concession 2	Drummond / North Elmsley	E ½ 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404223	4973649		

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	Depth (m/ft) To
	Sand	Clay	& Stone	0'	7'
Grey & Yellow	Sandstone			7'	131'
Grey & Yellow	Sandstone			131'	140'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
120'	0'	Neat cement	74.88

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	120'
6"	Open Hole		120'	140'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth From	Hole Diameter Depth To	Diameter (cm/in)
131 (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☒ Other, specify			
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	0'	120'	9 3/4"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	120'	140'	6"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 120

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 28.8'

If flowing give rate (l/min/GPM): X

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min/GPM): 20

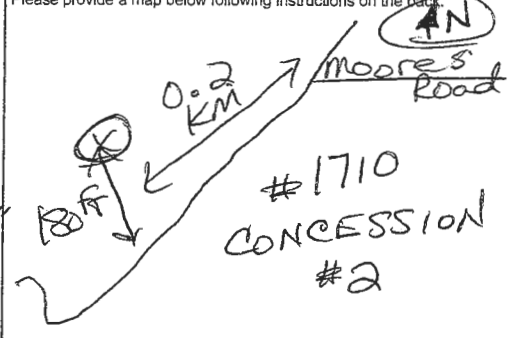
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	28.3'		28.8'
1	28.6	1	28.3
2	28.6	2	28.3
3	28.6	3	28.3
4	28.6	4	28.3
5	28.7	5	28.3
10	28.7	10	28.3
15	28.7	15	28.3
20	28.8	20	28.3
25	28.8	25	28.3
30	28.8	30	28.3
40	28.8	40	28.3
50	28.8	50	28.3
60	28.8'	60	28.3'

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6859 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138882170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3632		2022 10 31 (Y Y Y Y M M D D)

Comments: 1 HP 20GPM Set @ 100 FT

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2022 10 26	2022 10 03

Ministry Use Only

Audit No. Z394879

Received

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. (Place Sticker and/or Print Below): A342215

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name | Last Name/Organization: 1394706 Ontario Inc | Email Address | ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): 1698 2nd Concession N Sherbrooke | Municipality: McDonalds Corners | Province: ON | Postal Code: K0G 1M0 | Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name): 1660 Drummond Concession 1 | Township: Drummond/North Elmsley | Lot: E1/2 7 | Concession: 1

County/District/Municipality: Lanark | City/Town/Village: Perth | Province: Ontario | Postal Code

UTM Coordinates: Zone: 18 | Easting: 404419 | Northing: 4973879 | NAD 8 3

Municipal Plan and Sublot Number: | Other:

Overburden and Bedrock Materials/Abandonment Sealing Record

General Colour	Most Common Material	Other Materials	General Description	Depth (mbgl) From	To
	Existing 6" Drilled Well			0'	32'
	Grey to Black Limestone w/Minor Sandstone Mix			32'	150'

4" Liner Installed to 120 FT

Annular Space

Depth Set at: From	To	Type of Sealant Used (Neat Cement/Bentonite)	Volume Placed
25'	120'	Neat Cement Slurry	35 bags
0'	5'	Bentonite Slurry	5 bags

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Jetting ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Driving ☐ Digging ☐ Air Percussion ☐ Other

Well Use

☐ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public ☐ Not used ☐ Dewatering ☐ Monitoring ☐ Cooling & Air Conditioning ☐ Other

Construction Record – Casing

Inside Diameter	Material	Weight	From	To
4"	Plastic	Sch 80	0	120

Construction Record – Screen

Outside Diameter	Material	Slot No.	From	To

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

Water Details

Water Found at Depth	Kind of Water	Depth From	Depth To	Diameter (cm/in)
28 (m/ft)	☐ Fresh ☐ Unknown ☐ Gas ☐ Other, specify			
44 (m/ft)	☐ Fresh ☐ Unknown ☐ Gas ☐ Other, specify	82'	150'	6"
(m/ft)	☐ Fresh ☐ Unknown ☐ Gas ☐ Other, specify			

Contractor and Well Technician Information

Business Name of Well Contractor: Air Rock Drilling Co. Ltd. | Well Contractor's Licence No.: 7981

Business Address (Street Number/Name): 6569 Franktown Road | Municipality: Richmond

Province: ON | Postal Code: K0A 2Z0 | Business E-mail Address: air-rock@sympatico.ca

Business Telephone No. (inc. area code): 6136899170 | Name of Well Technician (Last Name, First Name): Hanna, Jeremy

Well Technician's Licence No.: 13632 | Signature of Technician and/or Contractor: | Date: 2023/08/30

Well Location

Please provide a map below following instructions on the back.

See attached
MOE WWR
A342215

Comments:

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: Y [redacted]

Date Work Completed: Y Y Y Y M M D D

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RADY

Ontario — Ministry of the Environment, Conservation and Parks

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): A342438

Page _____ of _____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Beside 1690 Drummond Concession 1	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	403931 [redacted]	4974324 [redacted]		

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	Depth (m/ft) To
	Existing	6" Drilled Well		0'	110'
Grey	limestone	w/ White Sandstone Mix		110'	150'
	4" liner	installed to 120 ft			

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
120'	100'	Neat Cement Slurry	12.48
100'	5'	Bentonite Slurry	12.60

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

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
4"	Plastic	.250	120'	5'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
130	☐	☐ Fresh ☒ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
110'	150'	6"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

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)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		[redacted]		
1				
2			2	
3				
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Completed By Others

Map of Well Location

Please provide a map below following instructions on the back.

See attached MOE WWR A342438 (July 6, 2022)

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6059 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
		2022 06 30

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	[redacted]	2023 05 11

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Audit No. Z407869
Received

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Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): A318695

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1660 Drummond Concession 1	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	404023	4974651		

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	Depth (m/ft) To
	Existing 6" Drilled Well			0'	100'
Grey & Black	Limestone w/ White	Sandstone Mix		100'	150'
	4" Liner Installed to 120 ft				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
120'	100'	Neat Cement Slurry	12.48
100'	5'	Bentonite Slurry	37.80

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

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	Depth (m/ft) To
4"	Plastic	.250	120'	5'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
100'	150'	6"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☒ Other, specify **Not tested**

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM) — Completed

Duration of pumping hrs + ____ min

Final water level end of pumping (m/ft) — By

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM) — Others

Well production (l/min/GPM)

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery 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	

Map of Well Location

Please provide a map below following instructions on the back.

See attached MOE WWR A318695 (Nov 12, 221)

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7881

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON.	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
6138382170				2023 06 30

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☐ Yes ☒ No	[redacted]	2023 09 11

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Audit No. Z407867

Received

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C6: ABANDONMENT RECORDS

Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. (Place Sticker and/or Print Below): N/A

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page _____ of _____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Drummond Concession 1 (No Civic)	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	4646	4973943		

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	Depth (m/ft) To
	6" Drilled well Abandonment			0'	60'

TW#1 - Drilled - Jan 19, 2015 - Audit 2199127
TAG # A174613 - Wilf Hall & Sons

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
60'	4'	3/8 Hole Plug	16 bags
4'	0'	Backfill	X

Method of Construction

☐ Cable Tool ☐ Diamond ☒ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☒ Air percussion ☒ Other, specify

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	Depth (m/ft) To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
New Construction Not Potable				

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify Not tested

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)

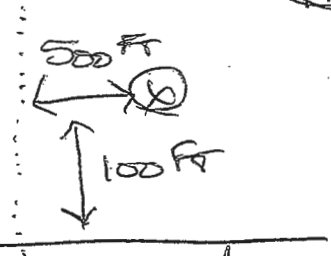
Well production (l/min/GPM)

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery 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	

Map of Well Location

Please provide a map below following instructions on the back.



(No Civic) Drummond Concession 1
TW#1

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7051

Business Address (Street Number/Name)	Municipality
6659 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K2S 1Z0	air.rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6133852170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
16052		2022 07 31

Well owner's information package delivered ☐ Yes ☒ No

Date Work Completed (Y Y Y Y M M D D) 2022 07 07

Ministry Use Only — Audit No. 379020

Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. (Place Sticker and/or Print Below): N/A

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
#1660 Drummond Concession 1	Drummond - North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404303	4974032		

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	Depth (m/ft) To
	6" Drilled Well Abandonment			0'	85'

#1660 DRUMMOND CONC #1
TW#2 Drilled - Dec 16, 2014 - Audit # 199120
TAG A174607 - Wilf Hall + Sons

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
85'	4'	3/8 Hole Plug	17 Bags
4'	0'	Backfill	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

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	Depth (m/ft) To

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	Depth (m/ft) To
	New Construction Not Potable			

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: ☐ Fresh ☐ Untested	Other, specify

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify Not tested

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)

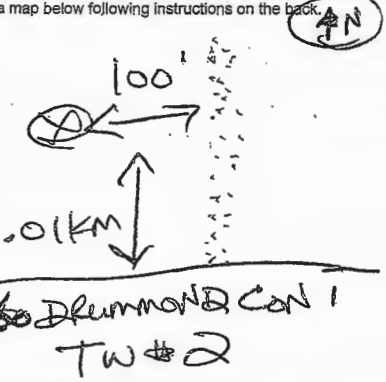
Well production (l/min/GPM)

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery 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	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6659 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
13632		2022 07 31

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☐ Yes ☒ No	[redacted]	2022 07 06

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Audit No. 379023

Received

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Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): N/A

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corner	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1660 Drummond Concession 2	Drummond - North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	403847	4974616		

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	Depth (m/ft) To
	6" Drilled Well Abandonment			0'	60'

*TW#4- Drilled Dec 16, 2014 - Audid 2199122

*TAG A174609 - Wilf Hall + Sons

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
60'	4'	3/8 Hole Plug	16 Bags
4'	0'	Backfill	X

Method of Construction

☐ Cable Tool ☐ Diamond ☒ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☒ Digging ☐ Air percussion ☐ Other, specify

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	Depth (m/ft) To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
	New Construction			
	NOT POTABLE			

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

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	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☒ Other, specify Not tested

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)

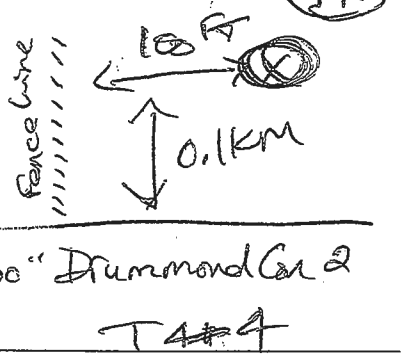
Well production (l/min/GPM)

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	[redacted]		
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	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7881

Business Address (Street Number/Name)	Municipality
6859 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138882170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
13632		2022 05 31

Well owner's information package delivered: ☐ Yes ☒ No

Date Package Delivered (Y Y Y Y M M D D): [redacted] 2022 06

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Receipt No:

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Ontario — Ministry of the Environment, Conservation and Parks

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag No. (Place Sticker and/or Print Below): N/A

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Drummond Concession 2 (No civic)	Drummond - North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	403781	4974897		

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	Depth (m/ft) To
	6" Drilled	Well Abandonment		0'	60'

*TW#5 Drilled Dec 16, 2014 - Audit 2199121

TAG A 174608 - Wilf Hall & Sons

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
60'	4'	3/8 Hole Plug	1 Bag
4'	0'	Backfill	X

Method of Construction

☐ Cable Tool ☒ Rotary (Conventional) ☐ Rotary (Reverse) ☒ Boring ☒ Air percussion ☒ Other, specify

☐ Diamond ☐ Jetting ☒ Driving ☒ Digging

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	Depth (m/ft) To

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	Depth (m/ft) To
New Construction				
Not Retrievable				

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	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify: Not tested

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)

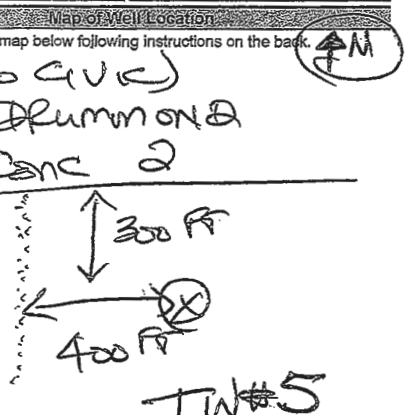
Well production (l/min/GPM)

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery 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	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6855A Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
1 [illegible]		2022 07 31 (Y Y Y Y M M D D)

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
Y/No X	[illegible]	Audit No 379021

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Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. (Place Sticker and/or Print Below): N/A

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1690 Drummond Concession 1	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404343	4973793		

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	Depth (m/ft) To
	6" Drilled	Well A border next		0	80

☒ MoE WWR Attached

☒ MoE Well Tag Attached — A342439

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
80	60	3/8 Hole Plug	10 Bags
60	4	Quick Grout	3 Bags
4	0	Backfill	X

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

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	Depth (m/ft) To

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	Depth (m/ft) To
	NOT POTABLE DOES NOT MEET WELL REQUIREMENTS			

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	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify Not tested

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)

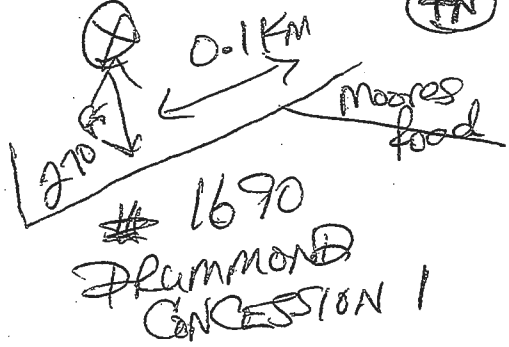
Well production (l/min/GPM)

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery 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	

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted Y Y Y Y M M D D
6138382170	Hanna, Jeremy	T3632		2023 05 31

Comments:

Well owner's information package delivered ☐ Yes ☒ No

Date Package Delivered: 2023 4 19

Ministry Use Only — Audit No: Z391585 — Received

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Well Record

Regulation 903 Ontario Water Resources Act

Well Tag No. (Place Sticker and/or Print Below): N/A

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	1394706 Ontario Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1098 2nd Concession N Sherbrooke	McDonalds Corners	ON	K0G 1M0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1710 Drummond Concession 1	Drummond/North Elmsley	E1/2 7	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404282	4973659		

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	Depth (m/ft) To
	6" Drilled well Abandonment			0	82

☒ MOE Work Attached (March 21/2022)

☒ TAG A342159

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
82	62	3/8 Hole Plug	10 Bags
62	4	Quick Grout	3 Bags
4	0	Backfill	X

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

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	Depth (m/ft) To

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	Depth (m/ft) To
NOT POTABLE DOES NOT MEET WELL REQUIREMENTS				

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify	Hole Diameter Depth (m/ft) From	To	Diameter (cm/in)
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			

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify Not tested

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)

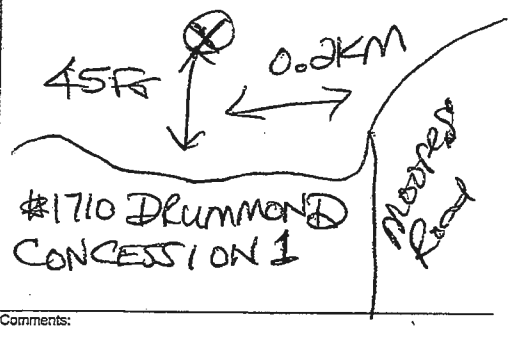
Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery 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	

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6628 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
6138382170	Hanna, Jeremy	T3632		2022 05 31

Comments:

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☐ Yes ☒ No	[redacted]	2022 04 19

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C7: NOTABLE PRIVATE WELLS

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☑ Imperial

We [redacted] below)

Tag#: A174552

A 174552

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1548 1st Con Drummond	Drummond	8	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Lanark	Perth	Ontario	K7H 2Z9

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	404843	4974205	Part 3 SW 1/2	

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	Depth (m/ft) To
	earth / stones			0'	2'
grey/brown	sandstone			2'	18'
grey/white	sandstone			18'	50'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0'	22'	2 Bags cement	0.044
		2 Bags quick grout	0.044
		Heavy drive shoe	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6"	Steel	.48cm	0'	22'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth	Kind of Water	
33' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify
45' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify
(m/ft) ☐ Gas	☐ Fresh ☐ Untested	☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	22'	25.4cm

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☑ Other, specify cloudy

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 30'

Pumping rate (l/min / GPM): 19 gpm

Duration of pumping: 1 hrs + ___ min

Final water level end of pumping (m/ft): 3.55'

If flowing give rate (l/min / GPM): 8

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min / GPM): 20 gpm

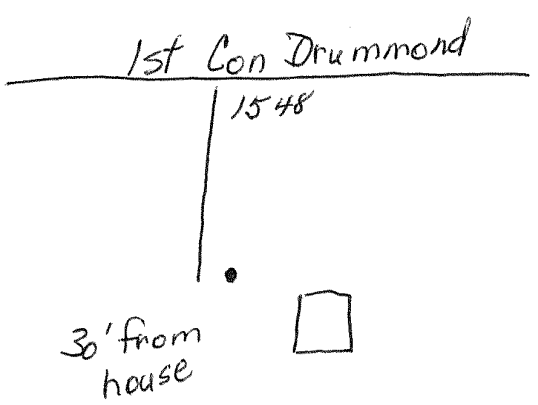
Well production (l/min / GPM): 30 gpm

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	3.9'		1	3.6'
2	3.9'		2	3.6'
3	3.9'		3	3.6'
4	3.9'		4	3.6'
5	3.9'		5	3.55'
10	3.9'		10	3.55'
15	3.9'		15	3.55'
20	3.9'		20	3.55'
25	3.9'		25	3.55'
30	3.9'		30	3.55'
40	3.9'		40	3.55'
50	3.9'		50	3.55'
60	3.9'		60	3.55'

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Hall Wall & Sons Well Drilling	2558

Business Address (Street Number/Name)	Municipality
256 Hall Shore Rd RR1	McDonald's Corners

Province	Postal Code	Business E-mail Address
On	K0G1M0	wilfhallltd@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6132787293 3	Hall Scott

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
27600	Scott Hall	2015/11/04

Well owner's information package delivered: ☑ Yes ☐ No

Date Package Delivered: 2015/11/04

Date Work Completed:

Ministry Use Only

Audit No Z217730

DEC 17 2015

Received

506E (2014/11)

Ministry's Copy

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A134631 — **Tag#: A134631**

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name): 562 Drummond Concession 1

Township: Drummond

Lot: 8

Concession: 1

County/District/Municipality: Lanark

City/Town/Village: Perth

Province: Ontario

Postal Code: K7H3C3

UTM Coordinates: NAD 83 Zone 18 Easting 404779 Northing 4974151

Municipal Plan and Sublot Number: 27 R9984 Pt2

Other:

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	Depth (m/ft) To
grey	clay & stones			0'	2'
grey/white	sandstone			2'	37'
grey/brown/white	sandstone			37'	55'

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0'	22'	2 bags of cement	0.044
		2 bags quick grout	0.044

Method of Construction

☐ Cable Tool ☑ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Other, specify

☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

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	Depth (m/ft) To
6"	steel	.48cm	0'	22'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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

Water Details

Water found at Depth	Kind of Water	
38' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify
45' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify
53' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0'	22'	25.4cm

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify cloudy

If pumping discontinued, give reason:

Pump intake set at (m/ft): 40'

Pumping rate (l/min / GPM): 20gpm

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 12.8'

If flowing give rate (l/min / GPM): 0

Recommended pump depth (m/ft): 45'

Recommended pump rate (l/min / GPM): 20gpm

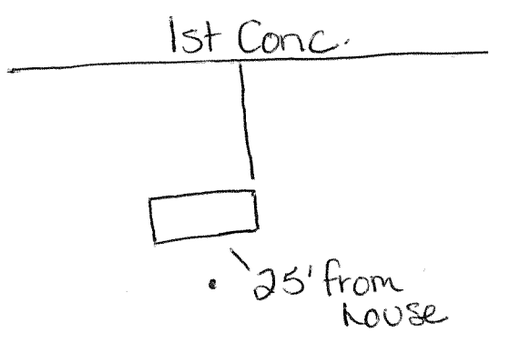
Well production (l/min / GPM): 50gpm

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	12.9	1	12.8	
2	12.9	2	12.8	
3	12.9	3	12.8	
4	12.9	4	12.8	
5	12.9	5	12.8	
10	12.9	10	12.8	
15	12.95	15	12.8	
20	12.95	20	12.8	
25	12.95	25	12.8	
30	12.95	30	12.8	
40	12.95	40	12.8	
50	12.95	50	12.8	
60	12.95	60	12.8	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Wilf Hall & Sons Well Drilling

Well Contractor's Licence No.: 2558

Business Address (Street Number/Name): 256 Hallshore Rd RR#1

Municipality: McDonalds Corners

Province: ON

Postal Code: K0G1M0

Business E-mail Address: wilfhallltd@bellnet.ca

Bus. Telephone No. (inc. area code): 6132782933

Name of Well Technician (Last Name, First Name): Mark Hall

Well Technician's Licence No.: T2228

Signature of Technician and/or Contractor: Mark Hall

Date Submitted: 2012/10/15

Well owner's information package delivered ☑ Yes ☐ No

Date Package Delivered: 2012/10/15

Date Work Completed: 2012/10/15

Ministry Use Only

Audit No.: Z154002

Received NOV 14 2012

Ministry's Copy

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 3512751 Municipality 35006 Con. CON Lot 01

County or District: Lanark
Township/Borough/City/Town/Village: Drummond
Con. block tract survey, etc.: 1
Lot: 7
Address: R.R.#1, Perth, On. K7H 3C3
Date completed: 02 day 09 month 99 year 99

21 UTM 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	earth			0	5
Grey	sandstone			5	50

31
32

41 WATER RECORD

Water found at - feet	Kind of water
42	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4"	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	22
6"	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		22	50
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

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 - feet From	Depth set - feet To	Material and type (Cement grout, bentonite, etc.)
0	22	cement grout

71 PUMPING TEST

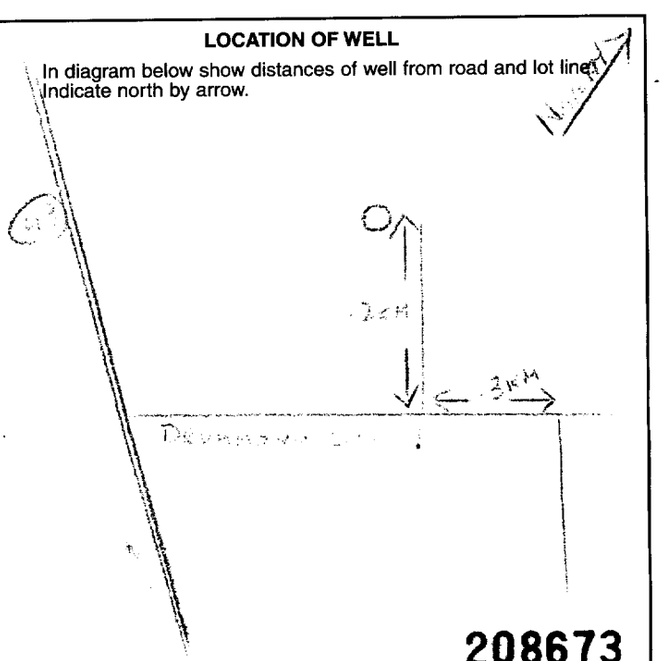
Pumping test method: 1 ☑ Pump 2 ☐ Bailer
Pumping rate: 10 GPM
Duration of pumping: 2 Hours ..... Mins

Static level	Water level end of pumping	Water levels during: 1 ☐ Pumping 2 ☑ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
30 feet	40 feet	30 feet	30 feet	30 feet	30 feet

If flowing give rate: GPM
Pump intake set at: 40 feet
Water at end of test: ☑ Clear ☐ Cloudy
Recommended pump type: ☐ Shallow ☑ Deep
Recommended pump setting: 40 feet
Recommended pump rate: 10 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot lines. Indicate north by arrow.



208673

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 .....

Name of Well Contractor	Well Contractor's Licence No.
J.R.Thompson	4905
Address: R.R.#1, Westport, On. K0G 1X0	
Name of Well Technician: Donald Smith	Well Technician's Licence No.: T0328
Signature of Technician/Contractor	Submission date: day 04 mo 09 yr 99

MINISTRY USE ONLY

Data source 58 | Contractor 4905 59-62 | Date received OCT 0 4 1999 63-68 80
Date of inspection | Inspector
Remarks: CSS.ES0

0506 (11/98) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. (A) Tag#:A290484

A290484

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1772 DRUMMOND CONC. 1	DRUMMOND	6	1

County/District/Municipality	City/Town/Village	Province	Postal Code
LANARK	PERTH	Ontario	K7H 3C3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	405649734 95			

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	Depth (m/ft) To
CLAY	STONES			0'	4'
GREY	WHITE BROWN	SANDSTONE		4'	60'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0'	22'	2 BAGS CEMENT	0.044
		2 BAGS QUICK GROUT	0.044
		HEAVY SHOE	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

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	Depth (m/ft) To
6"	STEEL	.48CM	0'	22'

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	Depth (m/ft) To

Water Details

Water found at Depth	Kind of Water	
33' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify
52' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify
56' (m/ft) ☐ Gas	☐ Fresh ☑ Untested	☐ Other, specify

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0'	22'	25.4CM

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☑ Other, specify CLOUDY

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 50'

Pumping rate (l/min / GPM): 20 GPM

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 23.7'

If flowing give rate (l/min / GPM): —

Recommended pump depth (m/ft): 50'

Recommended pump rate (l/min / GPM): 20gpm

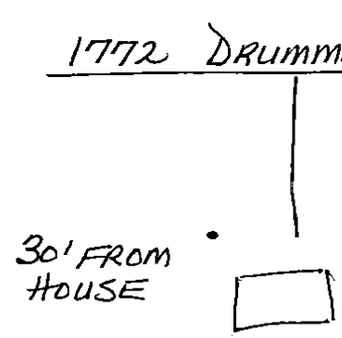
Well production (l/min / GPM): 40 gpm

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	23.2'		
1	23.65'	1	23.2'
2	23.65'	2	23.2'
3	23.65'	3	23.2'
4	23.7'	4	23.2'
5	23.7'	5	23.2'
10	23.7'	10	23.2'
15	23.7'	15	23.2'
20	23.7'	20	23.2'
25	23.7'	25	23.2'
30	23.7'	30	23.2'
40	23.7'	40	23.2'
50	23.7'	50	23.2'
60	23.7'	60	23.2'

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
WILFHALL & SONS WELL DRILLING	2558

Business Address (Street Number/Name)	Municipality
256 HALL SHORE RD.	MCDONALDS CORNERS

Province	Postal Code	Business E-mail Address
ON	K0G 1M0	WILFHALL1@BELLNET.COM

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6132780580	HALL, SCOTT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T2760	Scott Hall	2020 06 01

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2020 06 01	2020 06 01

Ministry Use Only

Audit No. Z325499

JUL 17 2020 Received

0506E (2018/12)

Ministry's Copy

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 — 3508221 — MUNICIP — CON.

COUNTY OR DISTRICT: [redacted]
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: DRUMMOND
CON., BLOCK, TRACT, SURVEY, ETC: 1
LOT: 6
[redacted] R#1 PERTH ON K7H 3C3
DATE COMPLETED: DAY 8 MO 12 YR 87
ELEVATION — 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
	SAND			0	4
	SANDSTONE			4	50

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
28	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	23
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		23	50
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

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	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

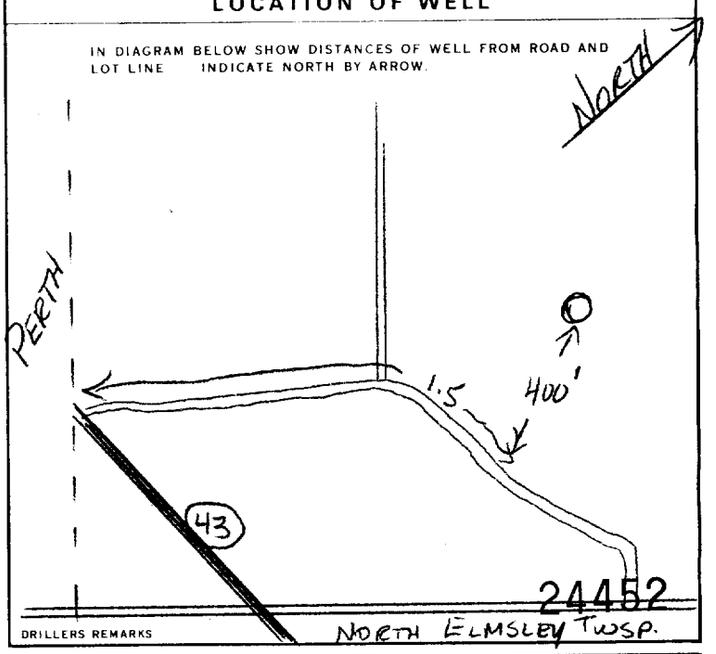
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 20 GPM
DURATION OF PUMPING: 1 HOURS 10 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
6 FEET	40 FEET	FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: 40 FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 40 FEET
RECOMMENDED PUMPING RATE: 20 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



24452
DRILLERS REMARKS: NORTH ELMSLEY TWSP.

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 ☐ UNFINISHED 9 ☐ DEWATERING

WATER USE

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 CONSTRUCTION

1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☒ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: J.R THOMPSON
WELL CONTRACTOR'S LICENCE NUMBER: 4905
ADDRESS: RR1 WESTPORT
NAME OF WELL TECHNICIAN: DONALD SMITH
WELL TECHNICIAN'S LICENCE NUMBER: T0328
SIGNATURE OF TECHNICIAN/CONTRACTOR: D R [illegible]
SUBMISSION DATE: DAY 21 MO 12 YR 87

OFFICE USE ONLY

DATA SOURCE — CONTRACTOR — DATE RECEIVED: FEB 24 1988
DATE OF INSPECTION — INSPECTOR
REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ontario Ministry of the Environment

Well Tag Number (Pl: A014413 / A014413

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN 3 5006 CON C ON LOT 07

Well Owner's Information and Location of Well Information

[redacted]

Lanark

RR#/Street Number/Name: Perth Rd

City/Town/Village: Drummond / Perth

Site/Compartment/Block/Tract etc.: 7 2

GPS Reading: NAD 83 Zone 18 Easting 403658 Northing 4975043

Unit Make/Model: Magellan

Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
	Clay fill			0	1.8
Grey+	white sandstone			1.8	12.2

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	12.2	15.07

Water Record

Water found at ___ Metres	Kind of Water		
10.4	☐ Fresh	☐ Sulphur	
	☐ Gas	☐ Salty	☐ Minerals
	☐ Other: Not tested		
___ m	☐ Fresh	☐ Sulphur	
	☐ Gas	☐ Salty	☐ Minerals
	☐ Other:		
___ m	☐ Fresh	☐ Sulphur	
	☐ Gas	☐ Salty	☐ Minerals
	☐ Other:		

After test of well yield, water was: ☒ Clear and sediment free ☐ Other, specify: Not tested

Chlorinated: ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	6.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		6.1	12.2

Test of Well Yield

Pumping test method: Submpump

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level	4.01		4.49
Pumping rate - (litres/min) 68.25	1	4.35	1	4.41
Duration of pumping 1 hrs + ___ min	2	4.38	2	4.36
Final water level end of pumping 4.5 metres	3	4.40	3	4.30
Recommended pump type: ☒ Shallow ☐ Deep	4	4.42	4	4.19
Recommended pump depth: 9.1 metres	5	4.45	5	4.01
Recommended pump rate. 68.25 (litres/min)	10	4.48	10	4.01
	15	4.48	15	4.01
If flowing give rate - (litres/min)	20	4.49	20	4.01
	25	4.49	25	4.01
If pumping discontinued, give reason. –	30	4.49	30	4.01
	40	4.49	40	4.01
	50	4.49	50	4.01
	60	4.49	60	4.01

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - From	Depth set at - To (Metres)	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
6.1	0	Cement Slurry	.2043

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☒ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: Air Rock Drilling Ltd — Well Contractor's Licence No.: 1119

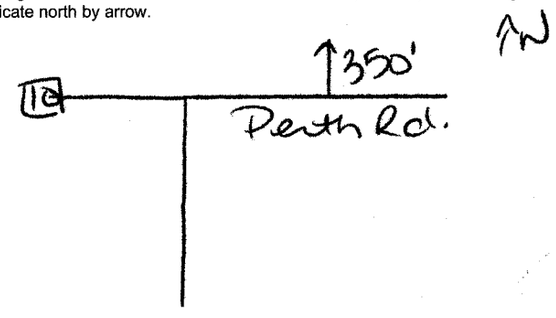
Business Address (street name, number, city etc.): RR#1 Richmond, Ont

Name of Well Technician (last name, first name): Logan Dan — Well Technician's Licence No.: T3058

Signature of Technician/Contractor: x [signature] — Date Submitted YYYY MM DD: 2004 06 28

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 14527

Date Well Completed YYYY MM DD: 2004 06 09

Was the well owner's information package delivered? ☒ Yes ☐ No

Date Delivered YYYY MM DD: 2004 06 09

Ministry Use Only

Data Source — Contractor: 1119

Date Received YYYY MM DD: JUL 08 2004 — Date of Inspection YYYY MM DD

Remarks — Well Record Number: 3514556

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☒ Well Owner's Copy ☐

Cette formule est disponible en français

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

31C 16E

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 — 3506269 — MUNICIP. 35006 — CON. CON — 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON.	BLOCK	TRACT	SURVEY	ETC.	LOT
[redacted]	DRUMMOND	2	II				007

[redacted] RR#1 PERTH ONT.

DATE COMPLETED: DA 08 MO 05 YR 81

UTM — ZONE — NORTHING 74599 — EASTING — RC 5 — ELEVATION 0450 — RC 5 — BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	SAND			0	4
	SANDSTONE			4	45

MOE VF-18

31 — 0004 28 — 0045 18

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0037	1 [x] FRESH 2 [ ] SALTY 3 [ ] SULPHUR 4 [ ] MINERAL
	1 [ ] FRESH 2 [ ] SALTY 3 [ ] SULPHUR 4 [ ] MINERAL
	1 [ ] FRESH 2 [ ] SALTY 3 [ ] SULPHUR 4 [ ] MINERAL
	1 [ ] FRESH 2 [ ] SALTY 3 [ ] SULPHUR 4 [ ] MINERAL
	1 [ ] FRESH 2 [ ] SALTY 3 [ ] SULPHUR 4 [ ] MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 [x] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [ ] OPEN HOLE	.188	0	0022
06	1 [ ] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [x] OPEN HOLE		22	0045
	1 [ ] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [ ] OPEN HOLE			

SCREEN

SIZE 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 [x] PUMP 2 [ ] BAILER

PUMPING RATE: 0020 GPM

DURATION OF PUMPING: ___ HOURS ___ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 [ ] PUMPING 2 [x] RECOVERY — 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
012 FEET	040 FEET	012 FEET	012 FEET	012 FEET	012 FEET

IF FLOWING GIVE RATE: ___ GPM

PUMP INTAKE SET AT: 40 FEET

WATER AT END OF TEST: 1 [x] CLEAR 2 [ ] CLOUDY

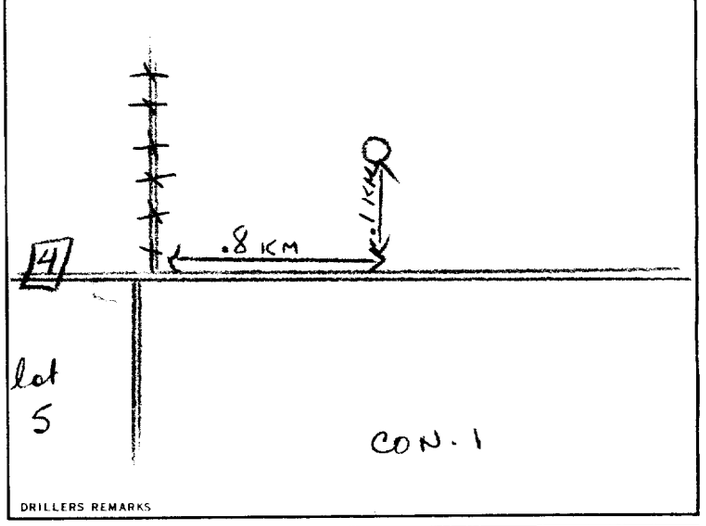
RECOMMENDED PUMP TYPE: [ ] SHALLOW [x] DEEP

RECOMMENDED PUMP SETTING: 040 FEET

RECOMMENDED PUMPING RATE: 0020 GPM

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 54: 1 [x] WATER SUPPLY; 2 [ ] OBSERVATION WELL; 3 [ ] TEST HOLE; 4 [ ] RECHARGE WELL; 5 [ ] ABANDONED, INSUFFICIENT SUPPLY; 6 [ ] ABANDONED, POOR QUALITY; 7 [ ] UNFINISHED

WATER USE 55-56: 01 — 1 [x] 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 57: 5 — 1 [ ] CABLE TOOL; 2 [ ] ROTARY (CONVENTIONAL); 3 [ ] ROTARY (REVERSE); 4 [ ] ROTARY (AIR); 5 [x] AIR PERCUSSION; 6 [ ] BORING; 7 [ ] DIAMOND; 8 [ ] JETTING; 9 [ ] DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: J.R THOMPSON — LICENCE NUMBER: 4905

ADDRESS: RR#1 WESTPORT

NAME OF DRILLER OR BORER: DONALD SMITH — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: J.R Thompson — SUBMISSION DATE: DAY 25 MO. 5 YR 81

OFFICE USE ONLY

DATA SOURCE 58: 1 — CONTRACTOR 59-62: 4905 — DATE RECEIVED 63-68: 230482

DATE OF INSPECTION — INSPECTOR

REMARKS: CSS 108/4m

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506--4--77 FORM 7

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A-011729 / A011729

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

[redacted]

Address of Well Location (County/District/Municipality): COUNTY ROAD 10 | Township: DRUMMOND | Lot: EAST 1/2-7 | Concession: 2

RR#/Street Number/Name | City/Town/Village | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone: 18 | Easting: 403607 | Northing: 4974823 | Unit Make/Model: MAGELLAN | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
BROWN	CLAY SOIL	STONES		0	6FT
GRAY	LIMESTONE			6FT	55FT

Hole Diameter

Depth From	Depth To	Diameter Centimetres
20FT	55FT	5 7/8

Water Record

Water found at Metres	Kind of Water
32FT	☒ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
47FT	☒ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was: ☒ Clear and sediment free ☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
6 1/4	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	188	0	22FT
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		

No Casing or Screen

☒ Open hole — 22FT 55FT

Test of Well Yield

Pumping test method: 10 GPM PUMP

Pump intake set at - (metres): 40FT

Pumping rate - (litres/min): 10 GPM

Duration of pumping: 2 hrs + ___ min

Final water level end of pumping: 12FT metres

Recommended pump type: ☒ Shallow ☐ Deep

Recommended pump depth: 40FT metres

Recommended pump rate: 10 GPM (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		8FT		
1	15 MIN	10FT		
2	30 MIN	12FT		
3	45 MIN	12 FT		
4	60 MIN	12 FT		
5	75 MIN	12 FT		
10	90 MIN	12 FT	15	
15	12 FT			
20	105 MIN	12FT	25	
25	12FT			
30	120 MIN	12 FT	40	
40	12 FT		50	
50			60	
60				

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	20FT	PORTLAND TYPE 30 HIGH EARLY CEMENT 9 BAGS	

Method of Construction

☒ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: BEN SKULL WELL DRILLING | Well Contractor's Licence No.: 7234

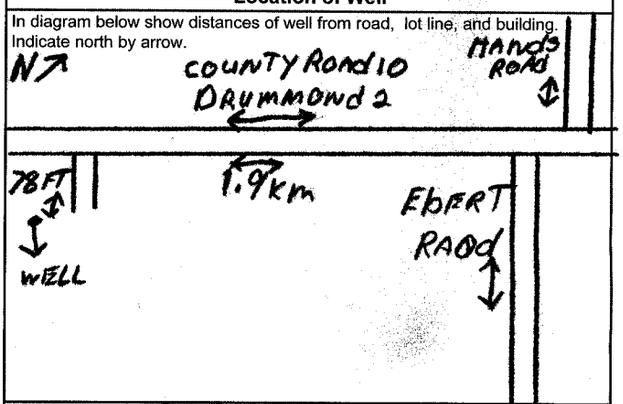
Business Address (street name, number, city etc.): RR#6 PERTH ONT K7H-3C8

Name of Well Technician (last name, first name): SKULL JAMES | Well Technician's Licence No.: 2277

Signature of Technician/Contractor: X James A. Skull | Date Submitted: YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No.: Z 11775 | Date Well Completed: YYYY 05 MM 02 DD 17

Was the well owner's information package delivered? ☒ Yes ☐ No | Date Delivered: YYYY 05 MM 02 DD 23

Ministry Use Only

Data Source | Contractor: 7234

Date Received: YYYY MAR MM 10 DD 2005 | Date of Inspection: YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☒

Cette formule est disponible en français

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

31 C/16E

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3503925 | MUNICIP. 35006 | CON. CON | 02

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
LANARK	DRUMMOND	# 2	006

[redacted]

.#1, PERTH, ONTARIO

DATE COMPLETED: DAY 16 MO 09 YR. 74

UTM: [illegible] | RC 5 | ELEVATION 0450 | RC 5 | BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	EARTH			0	5
GREY	SANDSTONE			5	50

31 0005602 0050218

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0030	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0041	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☒ STEEL			
6¼	2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0025
06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		25	0050
	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	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	0030 GPM.	01 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
019 FEET	040 FEET	1 ☐ PUMPING 2 ☒ RECOVERY	019 FEET	019 FEET	019 FEET	019 FEET

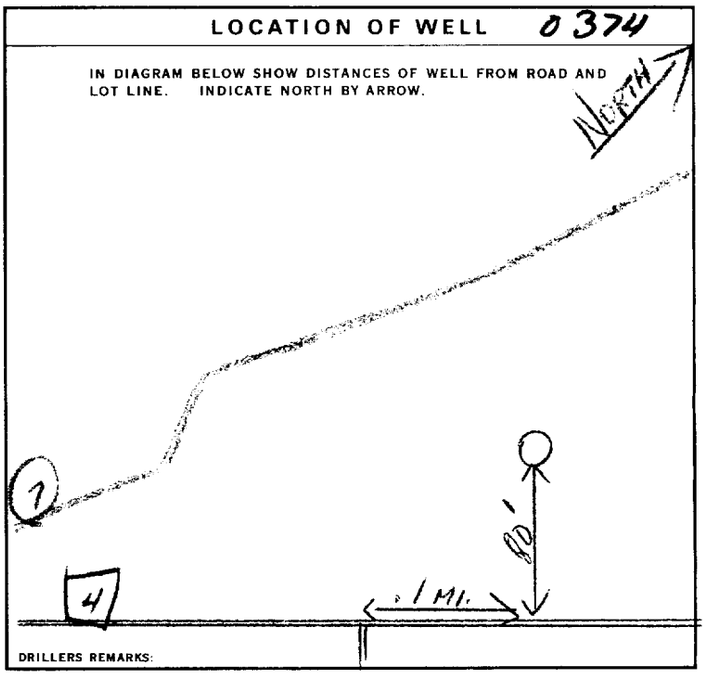
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	40 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	045 FEET	0025 GPM

GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 0374

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 54	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 55-56 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 57 5	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: J.R. THOMPSON | LICENCE NUMBER: 4905

ADDRESS: R.R.#1, WESTPORT, ONTARIO

NAME OF DRILLER OR BORER: DONALD SMITH | LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: J.R. Thompson | SUBMISSION DATE: DAY 22 MO 1 YR 75

OFFICE USE ONLY

DATA SOURCE 58: 1 | CONTRACTOR 59-62: 4905 | DATE RECEIVED 63-68: 040275

DATE OF INSPECTION | INSPECTOR

REMARKS:

P

WI

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 MOE 07-091

UTM 18Z 401311010E
9R 4974214 0N
Elev. 9R 01455
Basin 25

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

31 C/16 E

35 2 No 707

Water-Well Record

County or Territorial District ..... Lanark ..... Township, Village, Town or City ..... Drummond .....
[redacted] Village, Town or City) .....
Address ..... Perth ont .....

(day) 0 (month) (year)

Pipe and Casing Record

Casing diameter(s) ..... 6 4/4 .....
Length(s) ..... 8 ft .....
Type of screen .....
Length of screen .....

Pumping Test

Static level ..... 14 ft .....
Pumping rate ..... 30 gal per min .....
Pumping level ..... 28 ft .....
Duration of test ..... 30 min .....

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
clay loam	0	6			
Rockstone	6	43	39 ft	25 ft	Fresh

For what purpose(s) is the water to be used? House

Is water clear or cloudy? clear

Is well on upland, in valley, or on hillside? upland

Drilling firm ..... W. C. Mayhart .....
Address ..... Lanark .....

Name of Driller ..... James Crosbie .....
Address ..... Lanark .....

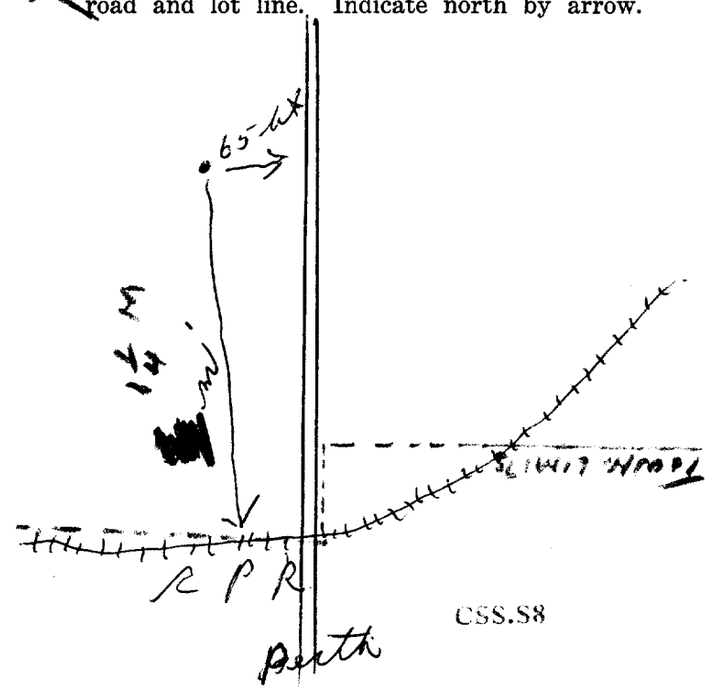
Licence Number .....

I certify that the foregoing statements of fact are true.

Date 31st July James Crosbie
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

Form 5

APPENDIX D

Summary of On-Site Water Quality

Report to: Wilburt Crain
Project: 100227.008

Appendix D – Table of Contents

Page #	Table Name
1	Test Well Water Quality Results Summary
3	Test Well Sampling - Field Parameters
4	Test Well Pumping Test Summary
6	Lab Results of Burn's Farm TW-01, TW-02, TW-03 (April 2021)
15	Lab Results of Burn's Farm TW-04, TW-05 (April 2021)
24	Lab Results of Burn's Farm TW-03 Pump Test (July 2021)
33	Lab Results of Burn's Farm TW-01, TW-02 Pump Test (July 2021)
42	Lab Results of Burn's Farm TW-04, TW-05 Pump Test (July 2021)
51	Lab Results of Burn's Farm TW-04, TW-05 (March 2022)
59	Lab Results of Burn's Farm TW-01, TW-02 (March 2022)
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75	Lab Results of Burn's Farm TW22-1, PW4063 Pump Test (May 2022)
86	Lab Results of Burn's Farm GW22SA-1 (October 2022)
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104	Lab Results of Burn's Farm TW22-1 Pump Test (April 2023)
113	Lab Results of Burn's Farm TW22-1 Revised Pump Test (April 2023)
122	Lab Results of Burn's Farm A318695, A342438 Pump Tests (May 2023)

Summary of On-Site Water Quality Results

Parameter	Units	TW-01						TW-02						TW-03					
		TW 1-1	TW 1-2	Initial Sampling	3 Hr Pump Test	6 Hr Pump Test	Spring 2022	TW 2-1	TW 2-2	Initial Sampling	3 Hr Pump Test	6 Hr Pump Test	Spring 2022	TW 3-1	TW 3-2	Initial Sampling	3 Hr Pump Test	6 Hr Pump Test	Spring 2022
		27-Jan-15	27-Jan-15	22-Apr-21	15-Jul-21	15-Jul-21	10-Mar-22	27-Jan-15	27-Jan-15	22-Apr-21	15-Jul-21	15-Jul-21	10-Mar-22	27-Jan-15	27-Jan-15	22-Apr-21	16-Jul-21	16-Jul-21	11-Mar-22
Microbiological Parameters																			
E. Coli	CFU/100 mL	ND (1)	ND (1)	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)
Fecal Coliforms	CFU/100 mL	ND (1)	ND (1)	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)
Total Coliforms	CFU/100 mL	ND (1)	ND (1)	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)
General Inorganics																			
Alkalinity, total	mg/L	285	280	301	267	267	N/A	291	288	307	293	296	N/A	236	238	321	253	254	N/A
Ammonia as N	mg/L	<0.02	<0.02	0.04	0.05	0.05	N/A	<0.02	<0.02	0.07	0.06	0.07	N/A	0.03	<0.02	0.06	0.05	0.05	N/A
Dissolved Organic Carbon	mg/L	1.3	1.6	2.5	1.9	1.8	N/A	2.4	2.4	1.8	2.7	1.8	N/A	2	1.9	1.2	1.4	1.2	N/A
Colour	TCU	ND (2)	ND (2)	3	ND (2)	ND (2)	N/A	ND (2)	ND (2)	5	10	16	N/A	ND (2)	ND (2)	ND (2)	2	ND (2)	N/A
Colour, apparent	ACU	N/A	N/A	**9**	ND (2)	ND (2)	N/A	N/A	N/A	**12**	**13**	**18**	N/A	N/A	N/A	4	3	2	N/A
Conductivity	uS/cm	578	609	660	636	631	N/A	597	602	627	632	636	N/A	528	530	762	585	590	N/A
Hardness	mg/L	**314**	**329**	**303**	**290**	**289**	N/A	**295**	**294**	**305**	**301**	**302**	N/A	**279**	**276**	**310**	**265**	**260**	N/A
pH	pH Units	7.93	7.97	8	7.9	7.9	N/A	7.81	7.88	8	8	8	N/A	8.13	8.05	8	8	8	N/A
Phenolics	mg/L	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A
Total Dissolved Solids	mg/L	376	396	336	366	366	N/A	388	391	328	340	350	N/A	343	344	400	314	310	N/A
Sulphide	mg/L	ND (0.01)	ND (0.01)	ND (0.02)	ND (0.02)	ND (0.02)	N/A	ND (0.01)	ND (0.01)	ND (0.02)	ND (0.02)	ND (0.02)	N/A	ND (0.01)	ND (0.01)	ND (0.02)	ND (0.02)	ND (0.02)	N/A
Tannin & Lignin	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Total Kjeldahl Nitrogen	mg/L	0.11	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A	0.19	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Total Organic Nitrogen[6]	mg/L	N/A	N/A	ND (0.1)	ND (0.1)	ND (0.1)	N/A	N/A	N/A	ND (0.1)	ND (0.1)	ND (0.1)	N/A	N/A	N/A	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Turbidity	NTU	1.7	0.3	2	0.6	0.3	N/A	**6.7**	4.5	1.5	2.8	3	N/A	**10.2**	0.7	0.2	0.9	0.4	N/A
Anions																			
Chloride	mg/L	16	21	23	17	17	N/A	9	13	11	12	11	N/A	9	9	43	16	16	N/A
Fluoride	mg/L	0.13	0.14	ND (0.1)	0.1	0.1	N/A	0.3	0.32	0.2	0.3	0.3	N/A	0.12	0.12	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Nitrate as N	mg/L	0.91	1.1	2.7	5.6	5.3	3.4	ND (0.1)	ND (0.1)	ND (0.1)	0.2	0.2	0.2	3.86	3.84	3.2	3.4	3.4	3.2
Nitrite as N	mg/L	ND (0.1)	ND (0.1)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.1)	ND (0.1)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.1)	ND (0.1)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Sulphate	mg/L	17	18	16	12	12	N/A	15	18	21	19	19	N/A	9	9	16	10	10	N/A
Metals																			
Mercury	mg/L	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A
Aluminum	mg/L	N/A	N/A	0.029	N/A	0.001	N/A	N/A	N/A	ND (0.001)	N/A	0.001	N/A	N/A	N/A	ND (0.001)	N/A	ND (0.001)	N/A
Antimony	mg/L	N/A	N/A	ND (0.0005)	N/A	ND (0.0005)	N/A	N/A	N/A	ND (0.0005)	N/A	ND (0.0005)	N/A	N/A	N/A	ND (0.0005)	N/A	ND (0.0005)	N/A
Arsenic	mg/L	<0.001	<0.001	ND (0.001)	N/A	ND (0.001)	N/A	0.001	0.002	0.002	N/A	0.002	N/A	<0.001	<0.001	ND (0.001)	N/A	ND (0.001)	N/A
Barium	mg/L	N/A	N/A	0.365	N/A	0.331	N/A	N/A	N/A	0.624	N/A	0.602	N/A	N/A	N/A	0.328	N/A	0.272	N/A
Boron	mg/L	N/A	N/A	0.02	N/A	0.02	N/A	N/A	N/A	0.03	N/A	0.03	N/A	N/A	N/A	0.01	N/A	0.02	N/A
Cadmium	mg/L	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A
Calcium	mg/L	88	92	82.5	80.5	79.7	N/A	82	83	82.3	81.3	82.3	N/A	82	81	84.9	73.8	72.9	N/A
Chromium	mg/L	N/A	N/A	ND (0.010)	N/A	ND (0.001)	N/A	N/A	N/A	ND (0.010)	N/A	ND (0.001)	N/A	N/A	N/A	ND (0.010)	N/A	ND (0.001)	N/A
Chromium (VI)	ug/L	N/A	N/A	ND (0.001)	N/A	ND (0.010)	N/A	N/A	N/A	ND (0.001)	N/A	ND (0.010)	N/A	N/A	N/A	ND (0.001)	N/A	ND (0.010)	N/A
Copper	mg/L	N/A	N/A	0.0016	N/A	0.0019	N/A	N/A	N/A	0.0006	N/A	0.0008	N/A	N/A	N/A	0.0006	N/A	ND (0.0005)	N/A
Iron	mg/L	0.07	<0.03	ND (0.1)	ND (0.1)	ND (0.1)	N/A	0.35	0.42	**0.4**	0.2	0.3	N/A	0.35	0.07	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Lead	mg/L	ND (0.001)	ND (0.001)	0.0002	N/A	ND (0.0001)	N/A	ND (0.001)	ND (0.001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.001)	ND (0.001)	ND (0.0001)	N/A	ND (0.0001)	N/A
Magnesium	mg/L	23	24	23.6	21.6	22	N/A	22	21	24.1	23.8	23.5	N/A	18	18	23.8	19.7	19	N/A
Manganese	mg/L	0.01	0.03	ND (0.005)	ND (0.005)	ND (0.005)	N/A	0.17	0.22	**0.201**	**0.197**	**0.21**	N/A	<0.01	<0.01	ND (0.005)	ND (0.005)	ND (0.005)	N/A
Potassium	mg/L	2	2	3.8	3.1	3.1	N/A	2	2	2.2	2.3	2	N/A	5	5	8.5	6.7	6.6	N/A
Selenium	mg/L	N/A	N/A	ND (0.001)	N/A	ND (0.001)	N/A	N/A	N/A	ND (0.001)	N/A	ND (0.001)	N/A	N/A	N/A	ND (0.001)	N/A	ND (0.001)	N/A
Sodium	mg/L	9	10	11.9	9.6	9.9	N/A	5	5	7.5	7.3	7.2	N/A	3	3	25.6	12.3	12.1	N/A
Strontium	mg/L	N/A	N/A	N/A	N/A	0.19	N/A	N/A	N/A	N/A	N/A	0.34	N/A	N/A	N/A	N/A	N/A	0.14	N/A
Uranium	mg/L	0.001	0.002	0.0011	N/A	0.0008	N/A	0.002	0.001	0.0016	N/A	0.0014	N/A	ND (0.001)	ND (0.001)	0.0007	N/A	0.0006	N/A
Zinc	mg/L	N/A	N/A	ND (0.005)	N/A	ND (0.005)	N/A	N/A	N/A	ND (0.005)	N/A	ND (0.005)	N/A	N/A	N/A	ND (0.005)	N/A	ND (0.005)	N/A

NOTES:

1. MAC = Maximum Acceptable Concentration;
2. OG = Operational Guideline
3. AO = Aesthetic Objective
4. The total of Nitrate and Nitrite should not exceed 10 mg/litre.
5. The aesthetic objective for sodium is 200 mg/litre. The local medical officer of health should be notified when the sodium concentration exceeds 20 mg/litre for persons on sodium restricted diets.
6. Organic Nitrogen = Total Kjeldahl Nitrogen - $N\text{-}NH_3$ and should not exceed 0.15 mg/litre.
7. '-' signifies no value provided in the Standards.
8. Values listed in Table 3 in MOE Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment, August 1996
9. Higher, iron-related colour may be removed by manganese greensand treatment; however, the nature of the constituents causing excessive colour must be determined.
10. 'ND' = No concentration detected above method detection limit
11. 'NA' = Parameter not analyzed

Summary of On-Site Water Quality Results

TW-04						TW-05						Ontario Drinking Water Standard	Type of Standard[1,2,3]
TW 4-1	TW 4-2	Initial Sampling	3 Hr Pump Test	6 Hr Pump Test	Spring 2022	TW 5-1	TW 5-2	Initial Sampling	3 Hr Pump Test	6 Hr Pump Test	Spring 2022		
27-Jan-15	27-Jan-15	23-Apr-21	19-Jul-21	19-Jul-21	8-Mar-22	27-Jan-15	27-Jan-15	23-Apr-21	19-Jul-21	19-Jul-21	8-Mar-22		
ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)	0	MAC
ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)	0	MAC
ND (1)	ND (1)	N/A	TNTC	103	ND (1)	ND (1)	ND (1)	N/A	ND (1)	ND (1)	ND (1)	-	-
252	241	268	238	237	N/A	245	249	285	274	277	N/A	30-500	OG
<0.02	<0.02	0.04	0.04	0.04	N/A	<0.02	<0.02	0.04	0.03	0.1	N/A	-	-
1.8	1.9	0.9	1.6	1.2	N/A	1.4	1.7	ND (0.5)	5.2	2	N/A	5	AO
ND (2)	ND (2)	ND (2)	2	2	N/A	ND (2)	ND (2)	4	3	ND (2)	N/A	-	-
N/A	N/A	**9**	2	2	N/A	N/A	N/A	**26**	3	**8**	N/A	5	AO
539	536	594	560	519	N/A	531	543	693	656	656	N/A	-	-
297	**297**	**261**	**245**	**249**	N/A	**275**	**284**	**307**	**294**	**293**	N/A	80-100	OG
7.99	8.09	8	7.7	7.6	N/A	7.98	7.95	8	7.6	7.7	N/A	6.5-8.5	OG
ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A	-	-
350	348	318	274	260	N/A	345	353	396	334	332	N/A	500	AO
ND (0.01)	ND (0.01)	ND (0.02)	ND (0.02)	ND (0.02)	N/A	ND (0.01)	ND (0.01)	ND (0.02)	ND (0.02)	ND (0.02)	N/A	0.05	AO
ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A	-	-
0.23	0.19	ND (0.1)	0.1	0.1	N/A	ND (0.1)	ND (0.1)	ND (0.1)	0.1	0.1	N/A	-	-
N/A	N/A	ND (0.1)	0.06	0.06	N/A	N/A	N/A	ND (0.1)	0.07	ND (0.1)	N/A	0.15	MAC
0.6	0.9	2.2	0.3	0.3	N/A	4.8	1.2	**5.3**	0.5	1.5	N/A	5	AO
10	9	19	7	7	N/A	9	10	40	24	23	N/A	250	AO
0.13	0.13	ND (0.1)	0.1	0.1	N/A	0.13	0.12	ND (0.1)	0.1	ND (0.1)	N/A	1.5	MAC
5.24	5.11	2.9	3	3.1	1.7	2.9	2.95	3.2	3.7	3.7	2.3	10[4]	MAC
ND (0.1)	ND (0.1)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.1)	ND (0.1)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	1.0[4]	MAC
8	9	12	9	8	N/A	13	13	11	13	13	N/A	500	AO
ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	0.001	MAC
N/A	N/A	0.007	N/A	0.001	N/A	N/A	N/A	0.009	N/A	0.025	N/A	0.1	OG
N/A	N/A	ND (0.0005)	N/A	ND (0.0005)	N/A	N/A	N/A	ND (0.0005)	N/A	ND (0.0005)	N/A	0.006	MAC
<0.001	<0.001	ND (0.001)	N/A	ND (0.001)	N/A	<0.001	<0.001	ND (0.001)	N/A	ND (0.001)	N/A	0.025	MAC
N/A	N/A	0.212	N/A	0.203	N/A	N/A	N/A	0.252	N/A	0.25	N/A	1	MAC
N/A	N/A	0.01	N/A	0.02	N/A	N/A	N/A	0.01	N/A	0.01	N/A	5	MAC
ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	ND (0.0001)	N/A	0.005	MAC
86	86	73.8	70.4	71.7	N/A	77	79	84.6	81.5	80.8	N/A	-	-
N/A	N/A	ND (0.010)	N/A	ND (0.001)	N/A	N/A	N/A	ND (0.010)	N/A	ND (0.001)	N/A	0.05	MAC
N/A	N/A	ND (0.001)	N/A	ND (0.010)	N/A	N/A	N/A	ND (0.001)	N/A	ND (0.010)	N/A	-	-
N/A	N/A	ND (0.0005)	N/A	ND (0.0005)	N/A	N/A	N/A	0.0005	N/A	ND (0.0005)	N/A	1	AO
0.07	<0.03	ND (0.1)	ND (0.1)	ND (0.1)	N/A	0.14	0.11	0.3	ND (0.1)	0.2	N/A	0.3	AO
ND (0.001)	ND (0.001)	ND (0.0001)	N/A	ND (0.0001)	N/A	ND (0.001)	ND (0.001)	ND (0.0001)	N/A	ND (0.0001)	N/A	0.01	MAC
20	20	18.6	16.7	17.1	N/A	20	21	23.4	22	22.3	N/A	-	-
<0.01	<0.01	ND (0.005)	ND (0.005)	ND (0.005)	N/A	<0.01	<0.01	0.007	ND (0.005)	ND (0.005)	N/A	0.05	AO
2	2	2	2.2	2.3	N/A	3	3	3.3	3.4	3.5	N/A	-	-
N/A	N/A	ND (0.001)	N/A	ND (0.001)	N/A	N/A	N/A	ND (0.001)	N/A	ND (0.001)	N/A	0.01	MAC
3	4	8.1	4.4	4.4	N/A	7	8	7.2	11.2	11.9	N/A	200 (20)[5]	AO
N/A	N/A	N/A	0.16	0.16	N/A	N/A	N/A	N/A	0.16	0.15	N/A	7	HC
ND (0.001)	ND (0.001)	0.0006	N/A	0.0006	N/A	ND (0.001)	ND (0.001)	0.0005	N/A	0.0005	N/A	0.02	MAC
N/A	N/A	ND (0.005)	N/A	ND (0.005)	N/A	N/A	N/A	ND (0.005)	N/A	ND (0.005)	N/A	5	AO

On-Site Field Sampling Water Quality Results

Test Well	Time Since Initiation of Pumping (Hours)	Date	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Colour (ACU[1])	Colour (TCU[2])	Turbidity (NTU)	Total Chlorine (mg/L)
TW-01	-	22-Apr-21	8.9	7.26	644	323	<1	<1	4.32	<0.02
TW-02	-	22-Apr-21	8.8	7.52	617	310	<1	<1	3.76	<0.02
TW-03	-	22-Apr-21	9.3	7.39	745	371	8	<1	0.68	0.06
TW-04	-	23-Apr-21	9.6	7.42	581	290	21	<1	3.60	0.05
TW-05	-	23-Apr-21	9.7	7.46	674	338	<1	<1	8.12	0.08
TW-01	1	15-Jul-21	10.1	7.03	582	274	-	-	3.41	-
	2	-	10.4	7.13	549	275	-	-	1.88	-
	3	-	10.5	7.14	551	273	0.4	<1	1.24	<0.02
	4	-	10.5	7.04	549	272	-	-	1.90	-
	5	-	10.6	7.11	545	273	-	-	1.76	-
	6		10.7	7.04	545	274	<1	<1	2.02	<0.02
TW-02	1	15-Jul-21	10.4	6.94	530	266	-	-	2.56	-
	2	-	10.3	6.99	528	265	-	-	1.92	-
	3	-	10.5	7.1	540	265	<1	<1	2.14	<0.02
	4	-	10.5	7.08	539	266	-	-	2.45	-
	5	-	-	-	-	-	-	-	-	-
	6	-	10.5	7.13	544	272	<1	<1	1.62	<0.02
TW-03	1	16-Jul-21	9.5	6.91	505	254	-	-	2.76	-
	2	-	9.6	7.04	508	254	-	-	2.25	-
	3	-	9.5	7.21	508	254	<1	<1	2.07	<0.02
	4	-	9.8	7.22	507	2.5	-	-	0.97	-
	5	-	-	-	-	-	-	-	-	-
	6	-	9.8	7.03	508	255	<1	<1	0.91	<0.02
TW-04	1	19-Jul-21	9.8	6.73	446	223	-	-	2.17	-
	2	-	10.3	6.83	446	224	-	-	2.24	-
	3	-	10.1	6.82	445	222	<1	<1	1.05	<0.02
	4	-	10.2	6.84	446	224	-	-	1.28	-
	5	-	-	-	-	-	-	-	-	-
	6	-	10.5	6.75	450	223	<1	<1	0.68	<0.02
TW-05	1	19-Jul-21	11.0	6.60	573	288	-	-	1.80	-
	2	-	10.7	6.62	565	284	-	-	1.48	-
	3	-	10.6	6.65	563	284	-	-	0.65	<0.02
	4	-	10.6	6.66	562	283	10	<1	0.79	-
	5	-	-	-	-	-	-	-	-	-
	6	-	10.4	6.65	558	279	5	<1	0.90	<0.02
TW-01		10-Mar-22	9.5	7.32	461	-	<1	<1	1.16	<0.02
TW-02		10-Mar-22	9.3	7.24	460	-	<1	<1	4.08	<0.02
TW-03		11-Mar-22	9.2	7.38	497	-	<1	<1	2.09	<0.02
TW-04		08-Mar-22	9.6	7.32	400	-	<1	<1	1.64	<0.02
TW-05		08-Mar-22	9.6	7.1	463	-	<1	<1	2.97	<0.02

Notes:

1. ACU: Actual Colour Units (unfiltered)
2. TCU: True Colour Units (field-filtered using 0.45-micron filter

On-Site Field Sampling Water Quality Results

Test Well	Time Since Initiation of Pumping (Hours)	Date	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Soilds (ppm)	Colour (ACU)	Colour (TCU)	Turbidity (NTU)	Total Chlorine (mg/L)
TW22-01	1	25-Apr-23	9.4	7.79	579	287	-	-	1.45	-
	2	-	9.1	7.79	580	290	-	-	0.80	-
	3	-	9.7	7.78	582	290	0	-	1.42	0.67
	4	-	-	-	-	-	-	-	-	-
	5	-	9.7	7.73	576	288	-	-	0.9	-
	6	-	10.5	7.69	573	285	0	-	0.67	0.7
A318695	1	16-May-23	10.5	7.83	587	291	-	-	291	-
	2	-	12.8	7.47	558	277	-	-	277	-
	3	-	12.0	7.55	554	278	0	-	278	0
	4	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-
	6	-	8.8	7.76	575	288	0	-	0.58	0
TW22-8	1	16-May-23	11.1	7.00	601	300	-	-	1.96	-
	2	-	10.5	7.25	615	308	-	-	0.97	-
	3	-	12.1	7.27	612	306	0	-	1.18	0
	4	-	11.4	7.27	604	303	-	-	1.01	-
	5	-	10.6	7.26	608	304	-	-	1.00	-
	6	-	11.5	7.36	620	311	0	-	0.80	0
PW-1710D	1	22-Nov-22	9.2	7.56	660	330	10	<1	0.55	<0.02

Notes:
1. EC: Electrical Conductivity
2. Turbidity is taken to be the average of three consecutive measurements.
3. TDS: Total Dissolved Solids (Calculated as 0.5 × EC)
4. ACU: Actual Colour Units (unfiltered)
5. TCU: True Colour Units (field-filtered using 0.45-micron filter)
6. '-': Not Measured

GEMTEC

Summary of On-Site Lined Wells

Parameter	Units	TW22-01		TW22-01 (LINER)				TW22-8		TW22-8 (LINER)			Ontario Drinking Water Standard	Type of Standard[1,2,3]
		3 Hr Pump Test	6 Hr Pump Test	3 Hr Pump Test	4.5 Hr Pump Test	6 Hr Pump Test	6 Hr Pump Test (Filtered)	1 Hr Sample	2 Hr Sample	3 Hr Pump Test	6 Hr Pump Test	6 Hr Pump Test (Filtered)		
		2022-05-24	2022-05-24	2023-04-25	2023-04-25	2023-04-25	2023-04-25	2022-07-11	2022-07-11	2023-05-16	2023-05-16	2023-05-16		
Microbiological Parameters														
E. Coli	CFU/100 mL	ND (1)	ND (1)							ND (1)	ND (1)		0	MAC
Fecal Coliforms	CFU/100 mL	ND (1)	ND (1)							ND (1)	ND (1)		0	MAC
Total Coliforms	CFU/100 mL	ND (1)	ND (1)							ND (1)	ND (1)		-	-
General Inorganics														
Alkalinity, total	mg/L	291	291	247		247				222	222		30-500	OG
Ammonia as N	mg/L	0.01	0.01	ND (0.01)		ND (0.01)				0.13	0.13		-	-
Dissolved Organic Carbon	mg/L	1.5	1.4	1.5		1.5				ND (0.5)	ND (0.5)		5	AO
Colour	TCU	ND (2)	ND (2)	3		2				ND (2)	ND (2)		-	-
Colour, apparent	ACU	**7**	**8**	**7**		**14**				37	41		5	AO
Conductivity	uS/cm	670	618	684		675				654	650		-	-
Hardness	mg/L	**292**	**289**	**322**		**327**				**327**	**327**		80-100	OG
pH	pH Units	7.7	7.7	7.9		7.9				7.8	7.9		6.5-8.5	OG
Phenolics	mg/L	ND (0.001)	ND (0.001)	ND (0.001)		ND (0.001)				ND (0.001)	ND (0.001)		-	-
Total Dissolved Solids	mg/L	380	360	400		410				364	384		500	AO
Sulphide	mg/L	ND (0.02)	ND (0.02)	ND (0.02)		ND (0.02)				ND (0.02)	ND (0.02)		0.05	AO
Tannin & Lignin	mg/L	ND (0.1)	ND (0.1)	ND (0.1)		ND (0.1)				ND (0.1)	ND (0.1)		-	-
Total Kjeldahl Nitrogen	mg/L	0.2	0.2	ND (0.1)		ND (0.1)				0.1	0.1		-	-
Total Organic Nitrogen[6]	mg/L	**0.2**	**0.2**	<0.1		<0.1				<0.1	<0.1		0.15	MAC
Turbidity	NTU	0.7	0.8	0.4		0.7				4.8	**6.2**		5	AO
Anions														
Chloride	mg/L	14	15	16		16				7	7		250	AO
Fluoride	mg/L	0.2	0.3	1.0		1.0				0.9	0.9		1.5	MAC
Nitrate as N	mg/L	1.7	1.7	0.2	0.2	0.2		2.3	2.5	ND (0.1)	ND (0.1)		10[4]	MAC
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)		ND (0.10)	ND (0.10)	ND (0.05)	ND (0.05)		1.0[4]	MAC
Sulphate	mg/L	25	26	80	-	81				111	112		500	AO
Metals		**Total**	**Total**	**Total**	**Total**	**Total**				**Total**	**Total**	**Dissolved**		
Mercury	mg/L		ND (0.0001)			ND (0.0001)	ND (0.0001)				ND (0.0001)	ND (0.0001)	0.001	MAC
Aluminum	mg/L		ND (0.001)			ND (0.001)	0.003				ND (0.001)	0.002	0.1	OG
Antimony	mg/L		ND (0.0005)			ND (0.0005)	ND (0.0005)				ND (0.0005)	ND (0.0005)	0.006	MAC
Arsenic	mg/L		ND (0.001)			ND (0.001)	ND (0.001)				ND (0.001)	ND (0.001)	0.025	MAC
Barium	mg/L		0.482			0.040	0.037				0.027	0.026	1	MAC
Beryllium			ND (0.0005)			ND (0.0005)	ND (0.0005)				ND (0.0005)	ND (0.0005)	-	-
Boron	mg/L		0.02			0.13	0.14				0.28	0.28	5	MAC
Cadmium	mg/L		ND (0.0001)			ND (0.0001)	0.0003				ND (0.0001)	ND (0.0001)	0.005	MAC
Calcium	mg/L	87.0	83.2	90.9		92.3	88.7			93.2	93.6	92.9	-	-
Chromium	mg/L		ND (0.001)			ND (0.001)	ND (0.001)				ND (0.001)	ND (0.001)	0.05	MAC
Cobalt			0.0005			0.0006	0.0005				ND (0.0005)	ND (0.0005)	-	-
Copper	mg/L		0.0008			0.0016	0.0018				ND (0.0005)	ND (0.0005)	1	AO
Iron	mg/L	ND (0.1)	ND (0.1)	ND (0.1)		ND (0.1)	ND (0.1)			**0.4**	**0.4**	**0.4**	0.3	AO
Lead	mg/L		ND (0.0001)			ND (0.0001)	ND (0.0001)				ND (0.0001)	ND (0.0001)	0.01	MAC
Magnesium	mg/L	18.2	16.8	23.1		23.4	25.9			22.8	22.6	22.7	-	-
Manganese	mg/L	**0.292**	**0.290**	**0.175**		**0.181**	**0.169**			0.012	0.012	0.011	0.05	AO
Molybdenum	mg/L		0.0006			0.0007	0.0007				0.0010	0.0010	-	-
Nickel	mg/L		ND (0.001)			ND (0.001)	ND (0.001)				ND (0.001)	ND (0.001)	-	-
Potassium	mg/L	1.9	1.9	3.5		3.5	3.6			4.0	4.0	4.0	-	-
Selenium	mg/L		ND (0.001)			ND (0.001)	ND (0.001)				ND (0.001)	ND (0.001)	0.05	MAC
Silver	mg/L		ND (0.0001)			ND (0.0001)	ND (0.0001)				ND (0.0001)	ND (0.0001)	-	-
Sodium	mg/L	8.6	7.6	13.7		13.7	13.9			19.1	19.4	19.6	200 (20)[5]	AO
Strontium	mg/L		0.35			1.66	1.56				2.55	2.59	7	HC
Thallium	mg/L		ND (0.001)			ND (0.001)	ND (0.001)				ND (0.001)	ND (0.001)	-	-
Uranium	mg/L		0.0040			0.0011	0.0010				0.0002	0.0002	0.02	MAC
Vanadium	mg/L		0.0006			0.0029	0.0026				ND (0.0005)	ND (0.0005)	-	-
Zinc	mg/L		ND (0.005)			ND (0.005)	ND (0.005)				ND (0.005)	ND (0.005)	5	AO

NOTES:

1. MAC = Maximum Acceptable Concentration;
2. OG = Operational Guideline
3. AO = Aesthetic Objective
4. The total of Nitrate and Nitrite should not exceed 10 mg/litre.
5. The aesthetic objective for sodium is 200 mg/litre. The local medical officer of health should be notified when the sodium concentration exceeds 20 mg/litre for persons on sodium restricted diets.
6. Organic Nitrogen = Total Kjeldahl Nitrogen - $N\text{-}NH_3$ and should not exceed 0.15 mg/litre.
7. '-' signifies no value provided in the Standards.
8. Values listed in Table 3 in MOE Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment, August 1996
9. Higher, iron-related colour may be removed by manganese greensand treatment; however, the nature of the constituents causing excessive colour must be determined.
10. 'ND' = No concentration detected above method detection limit
11. 'NA' = Parameter not analyzed

Summary of On-Site Lined Wells

Parameter	Units	TW-A318695 (LINER)			PW-1710D			Ontario Drinking Water Standard	Type of Standard[1,2,3]
		3 Hr Pump Test	6 Hr Pump Test	6 Hr Pump Test (Filtered)	7 Hr Sample	Resample	Resample		
		2023-05-16	2023-05-16	2023-05-16	2022-10-12	2022-11-07	2022-11-07		
Microbiological Parameters									
E. Coli	CFU/100 mL	ND (1)	ND (1)			ND (1)		0	MAC
Fecal Coliforms	CFU/100 mL	ND (1)	ND (1)			ND (1)		0	MAC
Total Coliforms	CFU/100 mL	ND (1)	ND (1)			ND (1)		-	-
General Inorganics									
Alkalinity, total	mg/L	233	235			256		30-500	OG
Ammonia as N	mg/L	0.06	0.05			0.05		-	-
Dissolved Organic Carbon	mg/L	0.6	0.5			2.2		5	AO
Colour	TCU	ND (2)	ND (2)			3		-	-
Colour, apparent	ACU	22	22			6		5	AO
Conductivity	uS/cm	653	654			690		-	-
Hardness	mg/L	**322**	**325**			**286**		80-100	OG
pH	pH Units	7.9	7.8			7.9		6.5-8.5	OG
Phenolics	mg/L	ND (0.001)	ND (0.001)			ND (0.001)		-	-
Total Dissolved Solids	mg/L	384	380			378		500	AO
Sulphide	mg/L	ND (0.02)	ND (0.02)			ND (0.02)		0.05	AO
Tannin & Lignin	mg/L	ND (0.1)	ND (0.1)			ND (0.1)		-	-
Total Kjeldahl Nitrogen	mg/L	ND (0.1)	ND (0.1)			0.1		-	-
Total Organic Nitrogen[6]	mg/L					<0.1		0.15	MAC
Turbidity	NTU	3.0	2.9			0.9		5	AO
Anions									
Chloride	mg/L	10	10			17		250	AO
Fluoride	mg/L	0.7	0.7			1		1.5	MAC
Nitrate as N	mg/L	ND (0.1)	ND (0.1)		0.1	ND (0.1)		10[4]	MAC
Nitrite as N	mg/L	ND (0.05)	ND (0.05)		ND (0.05)	ND (0.10)		1.0[4]	MAC
Sulphate	mg/L	96	96			67		500	AO
Metals		**Total**	**Total**	**Dissolved**		**Total**	**Dissolved**		
Mercury	mg/L		ND (0.0001)	ND (0.0001)		ND (0.0001)	ND (0.0001)	0.001	MAC
Aluminum	mg/L		ND (0.001)	0.001		ND (0.001)	ND (0.001)	0.1	OG
Antimony	mg/L		ND (0.0005)	ND (0.0005)		ND (0.0005)	ND (0.0005)	0.006	MAC
Arsenic	mg/L		ND (0.001)	ND (0.001)		ND (0.001)	ND (0.001)	0.025	MAC
Barium	mg/L		0.043	0.044		0.055	0.053	1	MAC
Beryllium			ND (0.0005)	ND (0.0005)		ND (0.0005)	ND (0.0005)	-	-
Boron	mg/L		0.18	0.18		0.21	0.21	5	MAC
Cadmium	mg/L		ND (0.0001)	ND (0.0001)		ND (0.0001)	ND (0.0001)	0.005	MAC
Calcium	mg/L	92.0	92.1	92.9		79.8	82.1	-	-
Chromium	mg/L		ND (0.001)	ND (0.001)		ND (0.001)	ND (0.001)	0.05	MAC
Cobalt			0.0005	ND (0.0005)		0.0006	0.0006	-	-
Copper	mg/L		ND (0.0005)	ND (0.0005)		0.0007	0.0009	1	AO
Iron	mg/L	0.3	0.3	0.3		ND (0.1)	ND (0.1)	0.3	AO
Lead	mg/L		ND (0.0001)	ND (0.0001)		ND (0.0001)	ND (0.0001)	0.01	MAC
Magnesium	mg/L	22.3	23.1	22.8		21.1	21.5	-	-
Manganese	mg/L	**0.098**	**0.096**	**0.097**		**0.282**	**0.287**	0.05	AO
Molybdenum	mg/L		0.0014	0.0013		0.001	0.001	-	-
Nickel	mg/L		ND (0.001)	ND (0.001)		ND (0.001)	ND (0.001)	-	-
Potassium	mg/L	2.9	3.0	2.9		3	3	-	-
Selenium	mg/L		ND (0.001)	ND (0.001)		ND (0.001)	ND (0.001)	0.05	MAC
Silver	mg/L		ND (0.0001)	ND (0.0001)		ND (0.0001)	ND (0.0001)	-	-
Sodium	mg/L	14.1	14.0	14.5		18	18.6	200 (20)[5]	AO
Strontium	mg/L		2.08	2.05		1.31	1.28	7	HC
Thallium	mg/L		ND (0.001)	ND (0.001)		ND (0.001)	ND (0.001)	-	-
Uranium	mg/L		0.0007	0.0007		0.0007	0.0007	0.02	MAC
Vanadium	mg/L		ND (0.0005)	ND (0.0005)		ND (0.0005)	ND (0.0005)	-	-
Zinc	mg/L		ND (0.005)	ND (0.005)		ND (0.005)	ND (0.005)	5	AO

NOTES:

1. MAC = Maximum Acceptable Concentration;
2. OG = Operational Guideline
3. AO = Aesthetic Objective
4. The total of Nitrate and Nitrite should not exceed 10 mg/litre.
5. The aesthetic objective for sodium is 200 mg/litre. The local medical officer of health should be notified when the sodium concentration exceeds 20 mg/litre for persons on sodium restricted diets.
6. Organic Nitrogen = Total Kjeldahl Nitrogen - $N\text{-}NH_3$ and should not exceed 0.15 mg/litre.
7. '-' signifies no value provided in the Standards.
8. Values listed in Table 3 in MOE Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment, August 1996
9. Higher, iron-related colour may be removed by manganese greensand treatment; however, the nature of the constituents causing excessive colour must be determined.
10. 'ND' = No concentration detected above method detection limit
11. 'NA' = Parameter not analyzed

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON0 K2K 2A9
Attn: Brent Redmond

Client PO:
Project: 100227.008
Custody: 13295

Report Date: 29-Apr-2021
Order Date: 22-Apr-2021

Order #: 2117594

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2117594-01	TW-01
2117594-02	TW-02
2117594-03	TW-03

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 22-Apr-2021

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	27-Apr-21	27-Apr-21
Ammonia, as N	EPA 351.2 - Auto Colour	28-Apr-21	28-Apr-21
Anions	EPA 300.1 - IC	27-Apr-21	27-Apr-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	26-Apr-21	26-Apr-21
Colour	SM2120 - Spectrophotometric	23-Apr-21	23-Apr-21
Colour, apparent	SM2120 - Spectrophotometric	23-Apr-21	23-Apr-21
Conductivity	EPA 9050A- probe @25 °C	27-Apr-21	27-Apr-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	23-Apr-21	23-Apr-21
E. coli	MOE E3407	23-Apr-21	23-Apr-21
Fecal Coliform	SM 9222D	23-Apr-21	23-Apr-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	27-Apr-21	28-Apr-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	23-Apr-21	23-Apr-21
pH	EPA 150.1 - pH probe @25 °C	27-Apr-21	27-Apr-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	28-Apr-21	28-Apr-21
Hardness	Hardness as CaCO3	23-Apr-21	23-Apr-21
Sulphide	SM 4500SE - Colourimetric	27-Apr-21	27-Apr-21
Tannin/Lignin	SM 5550B - Colourimetric	27-Apr-21	27-Apr-21
Total Coliform	MOE E3407	23-Apr-21	23-Apr-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	26-Apr-21	27-Apr-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	26-Apr-21	29-Apr-21
Turbidity	SM 2130B - Turbidity meter	23-Apr-21	23-Apr-21

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 22-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW-01	TW-02	TW-03	-
	Sample Date:	22-Apr-21 10:00	22-Apr-21 12:00	22-Apr-21 14:30	-
	Sample ID:	2117594-01	2117594-02	2117594-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	ND	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	ND	-
Total Coliforms	1 CFU/100 mL	ND	ND	ND	-
General Inorganics					
Alkalinity, total	5 mg/L	301	307	321	-
Ammonia as N	0.01 mg/L	0.04	0.07	0.06	-
Dissolved Organic Carbon	0.5 mg/L	2.5	1.8	1.2	-
Colour	2 TCU	3	5	<2	-
Colour, apparent	2 ACU	9	12	4	-
Conductivity	5 uS/cm	660	627	762	-
Hardness	mg/L	303	305	310	-
pH	0.1 pH Units	8.0	8.0	8.0	-
Phenolics	0.001 mg/L	<0.001	<0.001	<0.001	-
Total Dissolved Solids	10 mg/L	336	328	400	-
Sulphide	0.02 mg/L	<0.02	<0.02	<0.02	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	<0.1	-
Total Kjeldahl Nitrogen	0.1 mg/L	<0.1	<0.1	<0.1	-
Turbidity	0.1 NTU	2.0	1.5	0.2	-
Anions					
Chloride	1 mg/L	23	11	43	-
Fluoride	0.1 mg/L	<0.1	0.2	<0.1	-
Nitrate as N	0.1 mg/L	2.7	<0.1	3.2	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	-
Sulphate	1 mg/L	16	21	16	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	-
Aluminum	0.001 mg/L	0.029	<0.001	<0.001	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	<0.0005	-
Arsenic	0.001 mg/L	<0.001	0.002	<0.001	-
Barium	0.001 mg/L	0.365	0.624	0.328	-
Boron	0.01 mg/L	0.02	0.03	0.01	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	<0.0001	-
Calcium	0.1 mg/L	82.5	82.3	84.9	-
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	-
Chromium (VI)	0.010 mg/L	<0.010	<0.010	<0.010	-

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 22-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW-01	TW-02	TW-03	-
	Sample Date:	22-Apr-21 10:00	22-Apr-21 12:00	22-Apr-21 14:30	-
	Sample ID:	2117594-01	2117594-02	2117594-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Copper	0.0005 mg/L	0.0016	0.0006	0.0006	-
Iron	0.1 mg/L	<0.1	0.4	<0.1	-
Lead	0.0001 mg/L	0.0002	<0.0001	<0.0001	-
Magnesium	0.2 mg/L	23.6	24.1	23.8	-
Manganese	0.005 mg/L	<0.005	0.201	<0.005	-
Potassium	0.1 mg/L	3.8	2.2	8.5	-
Selenium	0.001 mg/L	<0.001	<0.001	<0.001	-
Sodium	0.2 mg/L	11.9	7.5	25.6	-
Uranium	0.0001 mg/L	0.0011	0.0016	0.0007	-
Zinc	0.005 mg/L	<0.005	<0.005	<0.005	-

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 22-Apr-2021

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium (VI)	ND	0.010	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	17.7	1	mg/L	17.7			0.3	10	
Fluoride	ND	0.1	mg/L	ND			NC	10	
Nitrate as N	1.50	0.1	mg/L	1.49			0.5	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	13.5	1	mg/L	13.6			0.3	10	
General Inorganics									
Alkalinity, total	264	5	mg/L	268			1.5	14	
Ammonia as N	ND	0.01	mg/L	0.032			NC	17.7	
Dissolved Organic Carbon	1.0	0.5	mg/L	1.0			1.2	37	
Colour	3	2	TCU	3			0.0	12	
Colour, apparent	4	2	ACU	4			0.0	12	
Conductivity	584	5	uS/cm	594			1.8	5	
pH	8.0	0.1	pH Units	8.0			0.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	312	10	mg/L	334			6.8	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	2.0	0.1	NTU	2.0			0.5	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.001	0.001	mg/L	ND			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.185	0.001	mg/L	0.181			2.0	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	138	0.1	mg/L	138			0.4	20	
Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	0.0042	0.0005	mg/L	0.0040			4.4	20	
Iron	4.1	0.1	mg/L	4.0			1.6	20	
Lead	0.0001	0.0001	mg/L	0.0001			7.2	20	
Magnesium	32.5	0.2	mg/L	31.5			3.1	20	
Manganese	0.161	0.005	mg/L	0.161			0.3	20	
Potassium	5.2	0.1	mg/L	5.3			0.8	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	236	0.2	mg/L	241			1.9	20	
Uranium	0.0001	0.0001	mg/L	0.0001			6.6	20	
Zinc	0.030	0.005	mg/L	0.029			1.6	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 22-Apr-2021

Client PO:

Project Description: 100227.008

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	27.7	1	mg/L	17.7	99.8	77-123			
Fluoride	0.88	0.1	mg/L	ND	87.9	79-121			
Nitrate as N	2.48	0.1	mg/L	1.49	98.5	79-120			
Nitrite as N	0.963	0.05	mg/L	ND	96.3	84-117			
Sulphate	22.8	1	mg/L	13.6	92.0	74-126			
General Inorganics									
Ammonia as N	0.234	0.01	mg/L	0.032	81.0	81-124			
Dissolved Organic Carbon	11.6	0.5	mg/L	1.0	106	60-133			
Phenolics	0.022	0.001	mg/L	ND	87.0	69-132			
Total Dissolved Solids	88.0	10	mg/L	ND	88.0	75-125			
Sulphide	0.54	0.02	mg/L	ND	108	79-115			
Tannin & Lignin	0.9	0.1	mg/L	ND	92.8	71-113			
Total Kjeldahl Nitrogen	1.95	0.1	mg/L	ND	97.4	81-126			
Metals									
Mercury	0.0032	0.0001	mg/L	ND	107	70-130			
Aluminum	46.9	0.001	mg/L	0.772	92.2	80-120			
Antimony	45.3	0.0005	mg/L	0.273	90.0	80-120			
Arsenic	53.3	0.001	mg/L	0.161	106	80-120			
Barium	216	0.001	mg/L	181	69.4	80-120			QM-07
Boron	48.4	0.01	mg/L	9.06	78.8	80-120			QM-07
Cadmium	42.8	0.0001	mg/L	0.0159	85.6	80-120			
Calcium	9820	0.1	mg/L	ND	98.2	80-120			
Chromium (VI)	0.197	0.010	mg/L	ND	98.5	70-130			
Chromium	57.1	0.001	mg/L	0.410	113	80-120			
Copper	50.7	0.0005	mg/L	4.00	93.3	80-120			
Iron	6380	0.1	mg/L	4030	94.0	80-120			
Lead	41.0	0.0001	mg/L	0.126	81.7	80-120			
Magnesium	41500	0.2	mg/L	31500	99.6	80-120			
Manganese	208	0.005	mg/L	161	93.8	80-120			
Potassium	16200	0.1	mg/L	5250	110	80-120			
Selenium	45.8	0.001	mg/L	0.075	91.5	80-120			
Sodium	9270	0.2	mg/L	ND	92.7	80-120			
Uranium	44.2	0.0001	mg/L	0.131	88.2	80-120			
Zinc	68.2	0.005	mg/L	29.3	77.8	80-120			QM-07

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD

Paracel ID: 2117594

Paracel Order Number	Chain Of Custody
2117594	Ontario Drinking Water Samples № 13295

Client Name:	GEMTEC	Project Ref:	100227.008	Waterworks Name:	Samples Taken By:
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name: Brent Redmond
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	brent.redmond@GEMTEC.ca		Page ____ of ____
Telephone:	343-571-9556	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☐ 4 day N/A

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other O Reg. 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☒ No ☐ N/A

Are these samples for human consumption?: ☐ Yes ☐ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subspecies Pachinge Bacteria	Heavy Metals (Cr6, Hg)	
1	Barnes Farm	TW-01	R	G	N		April 22/21	10:00	II							/	/	
2	"	TW-02	R	G	N		"	12:00	II							/	/	
3	"	TW-03	R	G	N		"	14:30	II							/	/	
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments: Colour in ACH & TCH

Method of Delivery: Drop Box

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Brent Redmond	Date/Time: Apr 22/21 1700	Date/Time: April 23, 2021 11:30	Date/Time: April 23, 2021 11:46
Date/Time: April 22, 21 / 17:00	Temperature: 12.5 °C	Temperature: 3.1 °C	pH Verified: ☑ By: KS

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON0 K2K 2A9
Attn: Brent Redmond

Client PO:
Project: 100227.008
Custody: 13296

Report Date: 29-Apr-2021
Order Date: 23-Apr-2021

Order #: 2117604

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2117604-01	TW-04
2117604-02	TW-05

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 23-Apr-2021

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	27-Apr-21	27-Apr-21
Ammonia, as N	EPA 351.2 - Auto Colour	28-Apr-21	28-Apr-21
Anions	EPA 300.1 - IC	27-Apr-21	27-Apr-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	26-Apr-21	26-Apr-21
Colour	SM2120 - Spectrophotometric	27-Apr-21	27-Apr-21
Colour, apparent	SM2120 - Spectrophotometric	23-Apr-21	23-Apr-21
Conductivity	EPA 9050A- probe @25 °C	27-Apr-21	27-Apr-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	27-Apr-21	27-Apr-21
E. coli	MOE E3407	23-Apr-21	23-Apr-21
Fecal Coliform	SM 9222D	23-Apr-21	23-Apr-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	27-Apr-21	28-Apr-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	28-Apr-21	28-Apr-21
pH	EPA 150.1 - pH probe @25 °C	27-Apr-21	27-Apr-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	28-Apr-21	28-Apr-21
Hardness	Hardness as CaCO3	28-Apr-21	28-Apr-21
Sulphide	SM 4500SE - Colourimetric	27-Apr-21	27-Apr-21
Tannin/Lignin	SM 5550B - Colourimetric	27-Apr-21	27-Apr-21
Total Coliform	MOE E3407	23-Apr-21	23-Apr-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	26-Apr-21	27-Apr-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	26-Apr-21	29-Apr-21
Turbidity	SM 2130B - Turbidity meter	23-Apr-21	23-Apr-21

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 23-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW-04	TW-05	-	-
	Sample Date:	23-Apr-21 08:30	23-Apr-21 10:30	-	-
	Sample ID:	2117604-01	2117604-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	-	-
Total Coliforms	1 CFU/100 mL	ND	ND	-	-
General Inorganics					
Alkalinity, total	5 mg/L	268	285	-	-
Ammonia as N	0.01 mg/L	0.04	0.04	-	-
Dissolved Organic Carbon	0.5 mg/L	0.9	<0.5	-	-
Colour	2 TCU	<2 [1]	4 [1]	-	-
Colour, apparent	2 ACU	9	26	-	-
Conductivity	5 uS/cm	594	693	-	-
Hardness	mg/L	261	307	-	-
pH	0.1 pH Units	8.0	8.0	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	318	396	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	<0.1	<0.1	-	-
Turbidity	0.1 NTU	2.2	5.3	-	-
Anions					
Chloride	1 mg/L	19	40	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-
Nitrate as N	0.1 mg/L	2.9	3.2	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	12	11	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Aluminum	0.001 mg/L	0.007	0.009	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-
Barium	0.001 mg/L	0.212	0.252	-	-
Boron	0.01 mg/L	0.01	0.01	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Calcium	0.1 mg/L	73.8	84.6	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-
Chromium (VI)	0.010 mg/L	<0.010	<0.010	-	-

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 23-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW-04	TW-05	-	-
	Sample Date:	23-Apr-21 08:30	23-Apr-21 10:30	-	-
	Sample ID:	2117604-01	2117604-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Copper	0.0005 mg/L	<0.0005	0.0005	-	-
Iron	0.1 mg/L	<0.1	0.3	-	-
Lead	0.0001 mg/L	<0.0001	<0.0001	-	-
Magnesium	0.2 mg/L	18.6	23.4	-	-
Manganese	0.005 mg/L	<0.005	0.007	-	-
Potassium	0.1 mg/L	2.0	3.3	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-
Sodium	0.2 mg/L	8.1	7.2	-	-
Uranium	0.0001 mg/L	0.0006	0.0005	-	-
Zinc	0.005 mg/L	<0.005	<0.005	-	-

Certificate of Analysis

Report Date: 29-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 23-Apr-2021

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium (VI)	ND	0.010	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	17.7	1	mg/L	17.7			0.3	10	
Fluoride	ND	0.1	mg/L	ND			NC	10	
Nitrate as N	1.50	0.1	mg/L	1.49			0.5	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	13.5	1	mg/L	13.6			0.3	10	
General Inorganics									
Alkalinity, total	264	5	mg/L	268			1.5	14	
Ammonia as N	ND	0.01	mg/L	0.032			NC	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	0.9			5.6	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	4	2	ACU	4			0.0	12	
Conductivity	584	5	uS/cm	594			1.8	5	
pH	8.0	0.1	pH Units	8.0			0.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	312	10	mg/L	334			6.8	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	2.3	0.1	NTU	2.2			5.3	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.006	0.001	mg/L	0.007			2.8	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.213	0.001	mg/L	0.212			0.5	20	
Boron	0.01	0.01	mg/L	0.01			0.3	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	73.6	0.1	mg/L	73.8			0.3	20	
Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	ND	0.0005	mg/L	ND			NC	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	18.3	0.2	mg/L	18.6			1.9	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	2.0	0.1	mg/L	2.0			2.0	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	8.1	0.2	mg/L	8.1			0.5	20	
Uranium	0.0006	0.0001	mg/L	0.0006			1.5	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	27.7	1	mg/L	17.7	99.8	77-123			
Fluoride	0.88	0.1	mg/L	ND	87.9	79-121			
Nitrate as N	2.48	0.1	mg/L	1.49	98.5	79-120			
Nitrite as N	0.963	0.05	mg/L	ND	96.3	84-117			
Sulphate	22.8	1	mg/L	13.6	92.0	74-126			
General Inorganics									
Ammonia as N	0.234	0.01	mg/L	0.032	81.0	81-124			
Dissolved Organic Carbon	11.6	0.5	mg/L	0.9	106	60-133			
Phenolics	0.022	0.001	mg/L	ND	87.0	69-132			
Total Dissolved Solids	88.0	10	mg/L	ND	88.0	75-125			
Sulphide	0.54	0.02	mg/L	ND	108	79-115			
Tannin & Lignin	0.9	0.1	mg/L	ND	92.8	71-113			
Total Kjeldahl Nitrogen	1.95	0.1	mg/L	ND	97.4	81-126			
Metals									
Mercury	0.0032	0.0001	mg/L	ND	107	70-130			
Aluminum	48.1	0.001	mg/L	6.57	83.0	80-120			
Antimony	45.9	0.0005	mg/L	0.317	91.3	80-120			
Arsenic	51.4	0.001	mg/L	0.141	102	80-120			
Barium	260	0.001	mg/L	212	96.4	80-120			
Boron	55.4	0.01	mg/L	14.2	82.4	80-120			
Cadmium	48.3	0.0001	mg/L	0.0158	96.5	80-120			
Calcium	80300	0.1	mg/L	73800	64.3	80-120			QM-07
Chromium (VI)	0.197	0.010	mg/L	ND	98.5	70-130			
Chromium	52.3	0.001	mg/L	0.498	104	80-120			
Copper	47.2	0.0005	mg/L	0.385	93.6	80-120			
Iron	2450	0.1	mg/L	85.8	94.6	80-120			
Lead	43.9	0.0001	mg/L	0.0626	87.7	80-120			
Magnesium	27200	0.2	mg/L	18600	85.5	80-120			
Manganese	52.2	0.005	mg/L	1.69	101	80-120			
Potassium	11800	0.1	mg/L	2040	98.0	80-120			
Selenium	49.0	0.001	mg/L	0.289	97.3	80-120			
Sodium	16600	0.2	mg/L	8090	85.5	80-120			
Uranium	44.2	0.0001	mg/L	0.613	87.1	80-120			
Zinc	45.6	0.005	mg/L	0.503	90.3	80-120			

Qualifier Notes:

Sample Qualifiers :

1 : This analysis was conducted after the accepted holding time had been exceeded.

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

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Paracel ID: 2117604

Chain Of Custody
Ontario Drinking Water Samples
№ 13296

Client Name:	GEMTEC	Project Ref:	100227.008	Waterworks Name:	Samples Taken By:
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name: Brent Redmond
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	brent.redmond@GEMTEC.ca		Page ____ of ____ Regular
Telephone:	343-571-9556	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

Samples Submitted Under: (Indicate ONLY one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other O. Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☐ N/A

Are these samples for human consumption?: ☐ Yes ☐ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Sulphides, Bacteria	Bacteria	Heavy metals (Cr6+, Hg)
1	Barnes Farm	TW-04	R	G	N		April 23, 21	08:30	11							/	/	/
2	11	TW-05	R	G	N		11	10:30	11							/	/	/
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments: Colour in TC4 & AC4

Method of Delivery: Drop Box

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Synergy Rohrmann	Verified By:
Relinquished By (Print): Brent Redmond	Date/Time: Apr 23/21	Date/Time: APR 23, 2021 03:29	Date/Time: Apr 23/21 3:30p
Date/Time: April 23, 21 : 11:40	Temperature: 7.5 °C	Temperature: 8.1 °C	pH Verified: ☐ By: SC

11:48

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON0 K2K 2A9
Attn: Brent Redmond

Client PO:
Project: 100227.008
Custody: 14467

Report Date: 21-Jul-2021
Order Date: 16-Jul-2021

Order #: 2129683

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2129683-01	TW3 3hr
2129683-02	TW3 6hr

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 21-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 16-Jul-2021

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	20-Jul-21	20-Jul-21
Ammonia, as N	EPA 351.2 - Auto Colour	21-Jul-21	21-Jul-21
Anions	EPA 300.1 - IC	19-Jul-21	19-Jul-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	19-Jul-21	19-Jul-21
Colour	SM2120 - Spectrophotometric	16-Jul-21	16-Jul-21
Colour, apparent	SM2120 - Spectrophotometric	16-Jul-21	16-Jul-21
Conductivity	EPA 9050A- probe @25 °C	20-Jul-21	20-Jul-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	19-Jul-21	19-Jul-21
E. coli	MOE E3407	16-Jul-21	17-Jul-21
Fecal Coliform	SM 9222D	16-Jul-21	17-Jul-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	19-Jul-21	21-Jul-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	19-Jul-21	19-Jul-21
pH	EPA 150.1 - pH probe @25 °C	20-Jul-21	20-Jul-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	20-Jul-21	21-Jul-21
Hardness	Hardness as CaCO3	19-Jul-21	19-Jul-21
Sulphide	SM 4500SE - Colourimetric	19-Jul-21	19-Jul-21
Tannin/Lignin	SM 5550B - Colourimetric	19-Jul-21	19-Jul-21
Total Coliform	MOE E3407	16-Jul-21	17-Jul-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	19-Jul-21	20-Jul-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	19-Jul-21	20-Jul-21
Turbidity	SM 2130B - Turbidity meter	16-Jul-21	16-Jul-21

Certificate of Analysis

Report Date: 21-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 16-Jul-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW3 3hr	TW3 6hr	-	-
	Sample Date:	16-Jul-21 10:00	16-Jul-21 13:00	-	-
	Sample ID:	2129683-01	2129683-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	-	-
Total Coliforms	1 CFU/100 mL	ND	ND	-	-
General Inorganics					
Alkalinity, total	5 mg/L	253	254	-	-
Ammonia as N	0.01 mg/L	0.05	0.05	-	-
Dissolved Organic Carbon	0.5 mg/L	1.4	1.2	-	-
Colour	2 TCU	2	<2	-	-
Colour, apparent	2 ACU	3	2	-	-
Conductivity	5 uS/cm	585	590	-	-
Hardness	mg/L	265	260	-	-
pH	0.1 pH Units	8.0	8.0	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	314	310	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	<0.1	<0.1	-	-
Turbidity	0.1 NTU	0.9	0.4	-	-
Anions					
Chloride	1 mg/L	16	16	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-
Nitrate as N	0.1 mg/L	3.4	3.4	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	10	10	-	-
Metals					
Mercury	0.0001 mg/L	-	<0.0001	-	-
Aluminum	0.001 mg/L	-	<0.001	-	-
Antimony	0.0005 mg/L	-	<0.0005	-	-
Arsenic	0.001 mg/L	-	<0.001	-	-
Barium	0.001 mg/L	-	0.272	-	-
Boron	0.01 mg/L	-	0.02	-	-
Cadmium	0.0001 mg/L	-	<0.0001	-	-
Calcium	0.1 mg/L	73.8	72.9	-	-
Chromium	0.001 mg/L	-	<0.001	-	-
Chromium (VI)	0.010 mg/L	-	<0.010	-	-

Certificate of Analysis

Report Date: 21-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 16-Jul-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW3 3hr	TW3 6hr	-	-
	Sample Date:	16-Jul-21 10:00	16-Jul-21 13:00	-	-
	Sample ID:	2129683-01	2129683-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Copper	0.0005 mg/L	-	<0.0005	-	-
Iron	0.1 mg/L	<0.1	<0.1	-	-
Lead	0.0001 mg/L	-	<0.0001	-	-
Magnesium	0.2 mg/L	19.7	19.0	-	-
Manganese	0.005 mg/L	<0.005	<0.005	-	-
Potassium	0.1 mg/L	6.7	6.6	-	-
Selenium	0.001 mg/L	-	<0.001	-	-
Sodium	0.2 mg/L	12.3	12.1	-	-
Strontium	0.01 mg/L	-	0.14	-	-
Uranium	0.0001 mg/L	-	0.0006	-	-
Zinc	0.005 mg/L	-	<0.005	-	-

Certificate of Analysis

Report Date: 21-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 16-Jul-2021

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium (VI)	ND	0.010	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.0	1	mg/L	15.9			0.1	10	
Fluoride	ND	0.1	mg/L	ND			NC	10	
Nitrate as N	3.43	0.1	mg/L	3.43			0.1	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	9.86	1	mg/L	9.82			0.4	10	
General Inorganics									
Alkalinity, total	250	5	mg/L	253			1.3	14	
Ammonia as N	0.306	0.01	mg/L	0.299			2.4	17.7	
Dissolved Organic Carbon	3.8	0.5	mg/L	4.3			12.2	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	3	2	ACU	3			0.0	12	
Conductivity	580	5	uS/cm	585			0.9	5	
pH	8.0	0.1	pH Units	8.0			0.4	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	316	10	mg/L	314			0.6	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	0.2	0.1	NTU	0.2			0.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	0.0007	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.280	0.001	mg/L	0.274			2.1	20	
Boron	0.02	0.01	mg/L	0.02			0.0	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	72.5	0.1	mg/L	73.8			1.8	20	
Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	0.0005	0.0005	mg/L	0.0005			2.8	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	18.8	0.2	mg/L	19.7			4.4	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	6.5	0.1	mg/L	6.7			2.0	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	11.7	0.2	mg/L	12.3			4.3	20	
Uranium	0.0006	0.0001	mg/L	0.0006			0.4	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	25.2	1	mg/L	15.9	92.9	77-123			
Fluoride	1.05	0.1	mg/L	ND	105	79-121			
Nitrate as N	4.32	0.1	mg/L	3.43	89.0	79-120			
Nitrite as N	0.912	0.05	mg/L	ND	91.2	84-117			
Sulphate	19.3	1	mg/L	9.82	94.9	74-126			
General Inorganics									
Ammonia as N	0.541	0.01	mg/L	0.299	96.8	81-124			
Dissolved Organic Carbon	14.2	0.5	mg/L	4.3	98.7	60-133			
Phenolics	0.026	0.001	mg/L	ND	105	69-132			
Total Dissolved Solids	110	10	mg/L	ND	110	75-125			
Sulphide	0.55	0.02	mg/L	ND	109	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	103	71-113			
Total Kjeldahl Nitrogen	1.99	0.1	mg/L	ND	99.5	81-126			
Metals									
Mercury	0.0036	0.0001	mg/L	ND	120	70-130			
Aluminum	48.5	0.001	mg/L	0.768	95.4	80-120			
Antimony	47.9	0.0005	mg/L	0.0668	95.7	80-120			
Arsenic	55.7	0.001	mg/L	0.093	111	80-120			
Barium	301	0.001	mg/L	274	53.0	80-120			QM-07
Boron	59.1	0.01	mg/L	16.6	85.0	80-120			
Cadmium	50.3	0.0001	mg/L	0.0015	101	80-120			
Calcium	78900	0.1	mg/L	73800	51.6	80-120			QM-07
Chromium (VI)	0.185	0.010	mg/L	ND	92.5	70-130			
Chromium	55.2	0.001	mg/L	0.372	110	80-120			
Copper	50.5	0.0005	mg/L	0.525	100	80-120			
Iron	2590	0.1	mg/L	26.6	103	80-120			
Lead	44.6	0.0001	mg/L	0.0267	89.2	80-120			
Magnesium	27700	0.2	mg/L	19700	80.2	80-120			
Manganese	53.8	0.005	mg/L	0.264	107	80-120			
Potassium	16500	0.1	mg/L	6680	97.9	80-120			
Selenium	52.2	0.001	mg/L	0.413	104	80-120			
Sodium	21300	0.2	mg/L	12300	90.0	80-120			
Uranium	47.9	0.0001	mg/L	0.577	94.6	80-120			
Zinc	49.0	0.005	mg/L	1.37	95.3	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARA LABORATORI

Paracel ID: 2129683

St. Laurent Blvd.
ntario K1G 4J8
49-1947
@paracellabs.com
cellabs.com

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 14467
2129683	

Client Name:	GEMTEC	Project Ref:	100227.008	Waterworks Name:	Samples Taken By:
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name: Brent Redmond
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	Brent.Redmond@GEMTEC.ca		Page ____ of ____
Telephone:	343-571-9556	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other Oreg 164/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☐ N/A

Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Required Analyses: Subdivision + Bacteria	Heavy Metals (Cr6, Hg)	Strontium
1		TW3 3hr	R	G	N	N	July 16,21	10:00	8							x		
2		TW3 6hr	R	G	N	N	"	13:00	11							x	x	x
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments: Colour in Acu / TCH

Method of Delivery: Drop Box

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Brent Redmond	Date/Time:	Date/Time: July 16,2021 14:45	Date/Time: Jul 16 21 15:03
Date/Time: July 16,21 14:24	Temperature: °C	Temperature: 14.2 °C	pH Verified: ☐ By:

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO:
Project: 100227.008
Custody: 14468

Report Date: 22-Jul-2021
Order Date: 16-Jul-2021

Order #: 2129701

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2129701-01	TW1 3hr
2129701-02	TW1 6hr
2129701-03	TW2 3hr
2129701-04	TW2 6hr

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 22-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 16-Jul-2021

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	20-Jul-21	20-Jul-21
Ammonia, as N	EPA 351.2 - Auto Colour	21-Jul-21	21-Jul-21
Anions	EPA 300.1 - IC	19-Jul-21	19-Jul-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	19-Jul-21	19-Jul-21
Colour	SM2120 - Spectrophotometric	17-Jul-21	17-Jul-21
Colour, apparent	SM2120 - Spectrophotometric	17-Jul-21	17-Jul-21
Conductivity	EPA 9050A- probe @25 °C	20-Jul-21	20-Jul-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	19-Jul-21	19-Jul-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	19-Jul-21	21-Jul-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	19-Jul-21	19-Jul-21
pH	EPA 150.1 - pH probe @25 °C	20-Jul-21	20-Jul-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	20-Jul-21	21-Jul-21
Hardness	Hardness as CaCO3	19-Jul-21	19-Jul-21
Sulphide	SM 4500SE - Colourimetric	19-Jul-21	19-Jul-21
Tannin/Lignin	SM 5550B - Colourimetric	19-Jul-21	19-Jul-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	19-Jul-21	20-Jul-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	19-Jul-21	20-Jul-21
Turbidity	SM 2130B - Turbidity meter	17-Jul-21	17-Jul-21

Certificate of Analysis

Report Date: 22-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 16-Jul-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW1 3hr	TW1 6hr	TW2 3hr	TW2 6hr
	Sample Date:	15-Jul-21 10:00	15-Jul-21 13:00	15-Jul-21 16:30	15-Jul-21 19:30
	Sample ID:	2129701-01	2129701-02	2129701-03	2129701-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
General Inorganics					
Alkalinity, total	5 mg/L	267	267	293	296
Ammonia as N	0.01 mg/L	0.05	0.05	0.06	0.07
Dissolved Organic Carbon	0.5 mg/L	1.9	1.8	2.7	1.8
Colour	2 TCU	<2	<2	10	16
Colour, apparent	2 ACU	<2	<2	13	18
Conductivity	5 uS/cm	636	631	632	636
Hardness	mg/L	290	289	301	302
pH	0.1 pH Units	7.9	7.9	8.0	8.0
Phenolics	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	10 mg/L	366	366	340	350
Sulphide	0.02 mg/L	<0.02	<0.02	<0.02	<0.02
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Total Kjeldahl Nitrogen	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Turbidity	0.1 NTU	0.6	0.3	2.8	3.0
Anions					
Chloride	1 mg/L	17	17	12	11
Fluoride	0.1 mg/L	0.1	0.1	0.3	0.3
Nitrate as N	0.1 mg/L	5.6	5.3	0.2	0.2
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	<0.05
Sulphate	1 mg/L	12	12	19	19
Metals					
Mercury	0.0001 mg/L	-	<0.0001	-	<0.0001
Aluminum	0.001 mg/L	-	0.001	-	0.001
Antimony	0.0005 mg/L	-	<0.0005	-	<0.0005
Arsenic	0.001 mg/L	-	<0.001	-	0.002
Barium	0.001 mg/L	-	0.331	-	0.602
Boron	0.01 mg/L	-	0.02	-	0.03
Cadmium	0.0001 mg/L	-	<0.0001	-	<0.0001
Calcium	0.1 mg/L	80.5	79.7	81.3	82.3
Chromium	0.001 mg/L	-	<0.001	-	<0.001
Chromium (VI)	0.010 mg/L	-	<0.010	-	<0.010
Copper	0.0005 mg/L	-	0.0019	-	0.0008
Iron	0.1 mg/L	<0.1	<0.1	0.2	0.3
Lead	0.0001 mg/L	-	<0.0001	-	<0.0001
Magnesium	0.2 mg/L	21.6	22.0	23.8	23.5

Certificate of Analysis

Report Date: 22-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 16-Jul-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW1 3hr	TW1 6hr	TW2 3hr	TW2 6hr
	Sample Date:	15-Jul-21 10:00	15-Jul-21 13:00	15-Jul-21 16:30	15-Jul-21 19:30
	Sample ID:	2129701-01	2129701-02	2129701-03	2129701-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Manganese	0.005 mg/L	<0.005	<0.005	0.197	0.210
Potassium	0.1 mg/L	3.1	3.1	2.3	2.0
Selenium	0.001 mg/L	-	<0.001	-	<0.001
Sodium	0.2 mg/L	9.6	9.9	7.3	7.2
Strontium	0.01 mg/L	-	0.19	-	0.34
Uranium	0.0001 mg/L	-	0.0008	-	0.0014
Zinc	0.005 mg/L	-	<0.005	-	<0.005

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium (VI)	ND	0.010	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.0	1	mg/L	15.9			0.1	10	
Fluoride	ND	0.1	mg/L	ND			NC	10	
Nitrate as N	3.43	0.1	mg/L	3.43			0.1	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	9.86	1	mg/L	9.82			0.4	10	
General Inorganics									
Alkalinity, total	250	5	mg/L	253			1.3	14	
Ammonia as N	0.306	0.01	mg/L	0.299			2.4	17.7	
Dissolved Organic Carbon	3.8	0.5	mg/L	4.3			12.2	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	ND	2	ACU	ND			NC	12	
Conductivity	580	5	uS/cm	585			0.9	5	
pH	8.0	0.1	pH Units	8.0			0.4	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	316	10	mg/L	314			0.6	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	0.6	0.1	NTU	0.6			8.1	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	0.0007	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.280	0.001	mg/L	0.274			2.1	20	
Boron	0.02	0.01	mg/L	0.02			0.0	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	72.5	0.1	mg/L	73.8			1.8	20	
Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	0.0005	0.0005	mg/L	0.0005			2.8	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	18.8	0.2	mg/L	19.7			4.4	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	6.5	0.1	mg/L	6.7			2.0	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	11.7	0.2	mg/L	12.3			4.3	20	
Uranium	0.0006	0.0001	mg/L	0.0006			0.4	20	
Zinc	ND	0.005	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	25.2	1	mg/L	15.9	92.9	77-123			
Fluoride	1.05	0.1	mg/L	ND	105	79-121			
Nitrate as N	4.32	0.1	mg/L	3.43	89.0	79-120			
Nitrite as N	0.912	0.05	mg/L	ND	91.2	84-117			
Sulphate	19.3	1	mg/L	9.82	94.9	74-126			
General Inorganics									
Ammonia as N	0.541	0.01	mg/L	0.299	96.8	81-124			
Dissolved Organic Carbon	14.2	0.5	mg/L	4.3	98.7	60-133			
Phenolics	0.026	0.001	mg/L	ND	105	69-132			
Total Dissolved Solids	110	10	mg/L	ND	110	75-125			
Sulphide	0.55	0.02	mg/L	ND	109	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	103	71-113			
Total Kjeldahl Nitrogen	1.99	0.1	mg/L	ND	99.5	81-126			
Metals									
Mercury	0.0036	0.0001	mg/L	ND	120	70-130			
Aluminum	48.5	0.001	mg/L	0.768	95.4	80-120			
Antimony	47.9	0.0005	mg/L	0.0668	95.7	80-120			
Arsenic	55.7	0.001	mg/L	0.093	111	80-120			
Barium	301	0.001	mg/L	274	53.0	80-120			QM-07
Boron	59.1	0.01	mg/L	16.6	85.0	80-120			
Cadmium	50.3	0.0001	mg/L	0.0015	101	80-120			
Calcium	78900	0.1	mg/L	73800	51.6	80-120			QM-07
Chromium (VI)	0.185	0.010	mg/L	ND	92.5	70-130			
Chromium	55.2	0.001	mg/L	0.372	110	80-120			
Copper	50.5	0.0005	mg/L	0.525	100	80-120			
Iron	2590	0.1	mg/L	26.6	103	80-120			
Lead	44.6	0.0001	mg/L	0.0267	89.2	80-120			
Magnesium	27700	0.2	mg/L	19700	80.2	80-120			
Manganese	53.8	0.005	mg/L	0.264	107	80-120			
Potassium	16500	0.1	mg/L	6680	97.9	80-120			
Selenium	52.2	0.001	mg/L	0.413	104	80-120			
Sodium	21300	0.2	mg/L	12300	90.0	80-120			
Uranium	47.9	0.0001	mg/L	0.577	94.6	80-120			
Zinc	49.0	0.005	mg/L	1.37	95.3	80-120			

Qualifier Notes:

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD.

Paracel ID: 2129701

Paracel Order Number: 2129701

Chain Of Custody

Ontario Drinking Water Samples

№ 14468

Client Name: GEMTEC	Project Ref: 100227.008		Waterworks Name:	Samples Taken By:	
Contact Name: Jean-Philippe Gobeil	Quote #:		Waterworks Number:	Name:	Brent R.
Address:	PO #:		Address:	Signature:	[signature]
After Hours Contact:	E-mail: jean-philippe.gobeil@gemtec.ca			Page ___ of ___	
Telephone: 418-820-7157	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 5 day	

Samples Submitted Under: (Indicate **ONLY** one)
❑ ON REG 170/03 ❑ ON REG 319/08 ❑ Private Well
❑ ON REG 243/07 ☑ Other O.reg 169/03

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☑ N/A

Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G/S	Reportable: Y/N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S/F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subdivision + bacteria	heavy metals (Cr, Hg)	Strontium	
1		TW1 3hr	R	G	N	N	July 15, 21	10:00	8							X			
2	TW1	~~[illegible]~~ 6hr	R	G	N	N	"	13:00	11							X	X		
3		TW2 3hr	R	G	N	N	"	16:30	8							X			
4		TW2 6hr	R	G	N	N	"	19:30	11							X	X		
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Colour in ACU / TCU

Method of Delivery: Walk-in

Relinquished By (Sign): Mohit.	Received By Driver/Depot: [signature]	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): MOHIT BHARGAV	Date/Time: 07/16/21 3:21pm	Date/Time: 4:55 July 16th 2021	Date/Time: July 16, 2021 17:50
Date/Time: July 16, 2021 (15:15)	Temperature: 9.5 °C	Temperature: 5.3 °C	pH Verified: ☑ By: RS

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON0 K2K 2A9
Attn: Brent Redmond

Client PO:
Project: 100227.008
Custody: 14495

Report Date: 23-Jul-2021
Order Date: 20-Jul-2021

Order #: 2130215

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2130215-01	TW4 3hr
2130215-02	TW4 6hr
2130215-03	TW5 3hr
2130215-04	TW5 6hr

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 23-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 20-Jul-2021

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	22-Jul-21	22-Jul-21
Ammonia, as N	EPA 351.2 - Auto Colour	21-Jul-21	21-Jul-21
Anions	EPA 300.1 - IC	21-Jul-21	21-Jul-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	21-Jul-21	21-Jul-21
Colour	SM2120 - Spectrophotometric	21-Jul-21	21-Jul-21
Colour, apparent	SM2120 - Spectrophotometric	21-Jul-21	21-Jul-21
Conductivity	EPA 9050A- probe @25 °C	22-Jul-21	22-Jul-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	22-Jul-21	22-Jul-21
E. coli	MOE E3407	21-Jul-21	22-Jul-21
Fecal Coliform	SM 9222D	21-Jul-21	22-Jul-21
Heterotrophic Plate Count	SM 9215C	20-Jul-21	22-Jul-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	21-Jul-21	22-Jul-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	21-Jul-21	21-Jul-21
pH	EPA 150.1 - pH probe @25 °C	22-Jul-21	22-Jul-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	21-Jul-21	21-Jul-21
Hardness	Hardness as CaCO3	21-Jul-21	21-Jul-21
Sulphide	SM 4500SE - Colourimetric	21-Jul-21	21-Jul-21
Tannin/Lignin	SM 5550B - Colourimetric	22-Jul-21	22-Jul-21
Total Coliform	MOE E3407	21-Jul-21	22-Jul-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	22-Jul-21	22-Jul-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	21-Jul-21	22-Jul-21
Turbidity	SM 2130B - Turbidity meter	21-Jul-21	21-Jul-21

Certificate of Analysis

Report Date: 23-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 20-Jul-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW4 3hr	TW4 6hr	TW5 3hr	TW5 6hr
	Sample Date:	19-Jul-21 10:00	19-Jul-21 10:00	19-Jul-21 16:30	19-Jul-21 19:30
	Sample ID:	2130215-01	2130215-02	2130215-03	2130215-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND [2]	ND	ND	ND
Fecal Coliforms	1 CFU/100 mL	ND	ND	ND	ND
Total Coliforms	1 CFU/100 mL	TNTC [1]	103	ND	ND
Heterotrophic Plate Count	10 CFU/mL	20	<10	<10	<10
General Inorganics					
Alkalinity, total	5 mg/L	238	237	274	277
Ammonia as N	0.01 mg/L	0.04	0.04	0.03	0.10
Dissolved Organic Carbon	0.5 mg/L	1.6	1.2	5.2	2.0
Colour	2 TCU	2	2	3	<2
Colour, apparent	2 ACU	2	2	3	8
Conductivity	5 uS/cm	560	519	656	656
Hardness	mg/L	245	249	294	293
pH	0.1 pH Units	7.7	7.6	7.6	7.7
Phenolics	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	10 mg/L	274	260	334	332
Sulphide	0.02 mg/L	<0.02	<0.02	<0.02	<0.02
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	0.1	0.1	0.1
Turbidity	0.1 NTU	0.3	0.3	0.5	1.5
Anions					
Chloride	1 mg/L	7	7	24	23
Fluoride	0.1 mg/L	0.1	0.1	0.1	<0.1
Nitrate as N	0.1 mg/L	3.0	3.1	3.7	3.7
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	<0.05
Sulphate	1 mg/L	9	8	13	13
Metals					
Mercury	0.0001 mg/L	-	<0.0001	-	<0.0001
Aluminum	0.001 mg/L	-	0.001	-	0.025
Antimony	0.0005 mg/L	-	<0.0005	-	<0.0005
Arsenic	0.001 mg/L	-	<0.001	-	<0.001
Barium	0.001 mg/L	-	0.203	-	0.250
Boron	0.01 mg/L	-	0.02	-	0.01
Cadmium	0.0001 mg/L	-	<0.0001	-	<0.0001
Calcium	0.1 mg/L	70.4	71.7	81.5	80.8
Chromium	0.001 mg/L	-	<0.001	-	<0.001

Certificate of Analysis

Report Date: 23-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 20-Jul-2021

Client PO:

Project Description: 100227.008

	Client ID:	TW4 3hr	TW4 6hr	TW5 3hr	TW5 6hr
	Sample Date:	19-Jul-21 10:00	19-Jul-21 10:00	19-Jul-21 16:30	19-Jul-21 19:30
	Sample ID:	2130215-01	2130215-02	2130215-03	2130215-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Chromium (VI)	0.010 mg/L	-	<0.010	-	<0.010
Copper	0.0005 mg/L	-	<0.0005	-	<0.0005
Iron	0.1 mg/L	<0.1	<0.1	<0.1	0.2
Lead	0.0001 mg/L	-	<0.0001	-	<0.0001
Magnesium	0.2 mg/L	16.7	17.1	22.0	22.3
Manganese	0.005 mg/L	<0.005	<0.005	<0.005	<0.005
Potassium	0.1 mg/L	2.2	2.3	3.4	3.5
Selenium	0.001 mg/L	-	<0.001	-	<0.001
Sodium	0.2 mg/L	4.4	4.4	11.2	11.9
Strontium	0.01 mg/L	0.16	0.16	0.16	0.15
Uranium	0.0001 mg/L	-	0.0006	-	0.0005
Zinc	0.005 mg/L	-	<0.005	-	<0.005

Certificate of Analysis

Report Date: 23-Jul-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 20-Jul-2021

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium (VI)	ND	0.010	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	129	1	mg/L	129			0.2	10	
Fluoride	0.74	0.1	mg/L	0.74			1.1	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	48.8	1	mg/L	49.0			0.3	10	
General Inorganics									
Alkalinity, total	270	5	mg/L	274			1.4	14	
Ammonia as N	0.306	0.01	mg/L	0.299			2.4	17.7	
Dissolved Organic Carbon	2.0	0.5	mg/L	2.2			7.8	37	
Colour	25	2	TCU	25			0.0	12	
Colour, apparent	2	2	ACU	2			0.0	12	
Conductivity	1540	5	uS/cm	1560			1.8	5	
pH	7.6	0.1	pH Units	7.7			0.1	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	174	10	mg/L	176			1.1	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.38	0.1	mg/L	0.40			5.4	16	
Turbidity	8.2	0.1	NTU	7.9			3.6	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.034	0.001	mg/L	0.034			0.0	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.014	0.001	mg/L	0.015			4.2	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	9.0	0.1	mg/L	9.1			0.8	20	
Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	0.0061	0.0005	mg/L	0.0062			0.9	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	2.0	0.2	mg/L	2.0			0.9	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	0.7	0.1	mg/L	0.7			2.3	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	16.9	0.2	mg/L	17.4			2.8	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Zinc	0.009	0.005	mg/L	0.009			0.4	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	BAC14
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	TNTC	1	CFU/100 mL	TNTC			NC	30	BAC08i
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	139	1	mg/L	129	95.5	77-123			
Fluoride	1.63	0.1	mg/L	0.74	88.2	79-121			
Nitrate as N	1.02	0.1	mg/L	ND	102	79-120			
Nitrite as N	1.01	0.05	mg/L	ND	101	84-117			
Sulphate	58.0	1	mg/L	49.0	89.9	74-126			
General Inorganics									
Ammonia as N	0.541	0.01	mg/L	0.299	96.8	81-124			
Dissolved Organic Carbon	11.9	0.5	mg/L	2.2	96.6	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	69-132			
Total Dissolved Solids	102	10	mg/L	ND	102	75-125			
Sulphide	0.50	0.02	mg/L	ND	101	79-115			
Tannin & Lignin	1.1	0.1	mg/L	ND	105	71-113			
Total Kjeldahl Nitrogen	2.39	0.1	mg/L	0.40	99.1	81-126			
Metals									
Mercury	0.0035	0.0001	mg/L	ND	115	70-130			
Aluminum	81.6	0.001	mg/L	33.9	95.3	80-120			
Antimony	44.4	0.0005	mg/L	ND	88.8	80-120			
Arsenic	53.5	0.001	mg/L	0.368	106	80-120			
Barium	65.9	0.001	mg/L	14.9	102	80-120			
Boron	53.9	0.01	mg/L	5.61	96.6	80-120			
Cadmium	51.1	0.0001	mg/L	0.0078	102	80-120			
Calcium	18700	0.1	mg/L	9100	96.3	80-120			
Chromium (VI)	0.198	0.010	mg/L	ND	99.0	70-130			
Chromium	52.6	0.001	mg/L	0.241	105	80-120			
Copper	57.0	0.0005	mg/L	6.17	102	80-120			
Iron	2560	0.1	mg/L	17.9	102	80-120			
Lead	49.7	0.0001	mg/L	0.0345	99.4	80-120			
Magnesium	11400	0.2	mg/L	2050	93.4	80-120			
Manganese	53.6	0.005	mg/L	2.37	102	80-120			
Potassium	10600	0.1	mg/L	740	98.2	80-120			
Selenium	50.1	0.001	mg/L	0.053	100	80-120			
Sodium	25100	0.2	mg/L	17100	80.3	80-120			
Uranium	49.7	0.0001	mg/L	0.0102	99.5	80-120			
Zinc	59.8	0.005	mg/L	9.40	101	80-120			

Qualifier Notes:

Sample Qualifiers :

1 : TNTC - Too Numerous To Count - significantly greater than 150 colonies

2 : A2C - Background counts greater than 200

QC Qualifiers :

BAC08i : TNTC - Too Numerous To Count - significantly greater than 150 colonies

BAC14 : A2C - Background counts greater than 200

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD.

Paracel ID: 2130215

Paracel Order Number	Chain Of Custody
2130220-PW 2130215-TW	Ontario Drinking Water Samples № 14495

Client Name:	GEMTEC	Project Ref:	see comments	Waterworks Name:	Samples Taken By:
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name: [signature]
Address:		PO #:		Address:	Signature: Brent Redmond
After Hours Contact:		E-mail:	brent.redmond@GEMTEC.ca		Page ___ of ___
Telephone:	343-571-9554	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

Samples Submitted Under: (Indicate **ONLY** one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other O.reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☑ N/A

Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G/S	Reportable: Y/N	Resample	DATE	TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S/F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subdivision bacteria + E.Coli	Heavy metals (ICP + Hg)	Chloride + Sodium	Subdivision bacteria
1		TW4 3hr	R	G	N	N	July 19, 21	10:00	8							X			
2		TW4 6hr	R	G	N	N	"	13:00	11							X	X		
3		TW5 3hr	R	G	N	N	"	16:30	8							X			
4		TW5 6hr	R	G	N	N	"	19:30	11							X	X		
5		PW-761	R	G	N	N	July 20, 21	11:00	8										X
6		PW-756	R	G	N	N	"	09:30	2									X	
7		PW-759	R	G	N	N	"	11:30	8										X
8		PW-757	R	G	N	N	"	12:00	8										X
9																			
10																			

Comments: → Colour in ACu + TCu (TW5) → All Test wells: Project #: 100227,002
→ All Private wells (PW) Project #: 100443.001

Relinquished By (Sign): [signature]	Received By Driver/Depot: [signature]	Received at Lab: Dvneepam Dohmai	Method of Delivery: Walk-in
Relinquished By (Print): Brent Redmond	Date/Time: 07/20/21 1:12pm	Date/Time: Jul 20, 2021 03.20	Verified By: BSim
Date/Time: July 20 21 - 13:00	Temperature: 15.3 °C	Temperature: 8.1 °C	Date/Time: July 20, 2021 15:40
			pH Verified: ☑ By: BS

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO:
Project: 100227.008
Custody: 15611

Report Date: 11-Mar-2022
Order Date: 8-Mar-2022

Order #: 2211299

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2211299-01	TW5
2211299-02	TW4

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 11-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 8-Mar-2022

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	9-Mar-22	10-Mar-22
E. coli	MOE E3407	9-Mar-22	9-Mar-22
Fecal Coliform	SM 9222D	9-Mar-22	9-Mar-22
Heterotrophic Plate Count	SM 9215C	9-Mar-22	9-Mar-22
Total Coliform	MOE E3407	9-Mar-22	9-Mar-22

Certificate of Analysis

Report Date: 11-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 8-Mar-2022

Client PO:

Project Description: 100227.008

	Client ID:	TW5	TW4	-	-
	Sample Date:	08-Mar-22 10:30	08-Mar-22 14:00	-	-
	Sample ID:	2211299-01	2211299-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-
Anions					
Nitrate as N	0.1 mg/L	2.3	1.7	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 11-Mar-2022

Order Date: 8-Mar-2022

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 11-Mar-2022

Order Date: 8-Mar-2022

Project Description: 100227.008

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	0.33	0.1	mg/L	0.32			2.1	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Certificate of Analysis

Report Date: 11-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 8-Mar-2022

Client PO:

Project Description: 100227.008

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.30	0.1	mg/L	0.32	98.2	79-120			
Nitrite as N	0.987	0.05	mg/L	ND	98.7	84-117			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD.

Paracel ID: 2211299

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 15611
2211299	

Client Name:	GEMTEC	Project Ref:	100227.008	Waterworks Name:	Samples Taken By:
Contact Name:	Jean-Philippe Gobeil	Quote #:		Waterworks Number:	Name: Brent Redmond
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	Jean-Phillippe.Gobeil@GEMTEC.ca		Page ____ of ____
Telephone:	418-820-7157	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day

Samples Submitted Under: (Indicate **ONLY** one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☒ Other Oreg. 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☒ N/A

Are these samples for human consumption?: ☐ Yes ☒ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Required Analyses: Nitrate+Nitrite as N	Required Analyses: Total Coliform, E. Coli, Fecal Coliform # TNTC	Required Analyses: Total Coliform # TNTC
1		TW5	R	G	N	/	Mar. 8, 22	10:30	3							X	X	X
2		TW4	R	G	N	/	11	14:00	3							X	X	X
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: Walk-in

Relinquished By (Sign): Brent Redmond	Received By Driver/Depot:	Received at Lab: Summerside Dartmouth	Verified By: BF Cm
Relinquished By (Print):	Date/Time: 03/08/22 4:36pm	Date/Time: MAR 09 2022 12.48	Date/Time: March 9, 22 13:17
Date/Time: 16:30, Mar. 8, 22	Temperature: 10.7 °C	Temperature: 5.1 °C	pH Verified: ☐ By:

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO:
Project: 100227.008
Custody: 15612

Report Date: 14-Mar-2022
Order Date: 10-Mar-2022

Order #: 2211496

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2211496-01	TW02
2211496-02	TW01

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 14-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 10-Mar-2022

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	11-Mar-22	11-Mar-22
E. coli	MOE E3407	11-Mar-22	11-Mar-22
Fecal Coliform	SM 9222D	11-Mar-22	11-Mar-22
Total Coliform	MOE E3407	11-Mar-22	11-Mar-22

Certificate of Analysis

Report Date: 14-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 10-Mar-2022

Client PO:

Project Description: 100227.008

	Client ID:	TW02	TW01	-	-
	Sample Date:	10-Mar-22 13:30	10-Mar-22 15:25	-	-
	Sample ID:	2211496-01	2211496-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-
Anions					
Nitrate as N	0.1 mg/L	0.2	3.4	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-

Certificate of Analysis

Report Date: 14-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 10-Mar-2022

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 14-Mar-2022

Order Date: 10-Mar-2022

Project Description: 100227.008

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	0.18	0.1	mg/L	0.18			2.1	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 14-Mar-2022

Order Date: 10-Mar-2022

Project Description: 100227.008

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.21	0.1	mg/L	0.18	102	79-120			
Nitrite as N	0.865	0.05	mg/L	ND	86.5	84-117			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACE LABORATORIES L

Paracel ID: 2211496

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J8
.com

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 15612
2211496	

Client Name:	GENIEC	Project Ref:	100227-008	Waterworks Name:	Samples Taken By:
Contact Name:	Jean-Philippe Gobeil	Quote #:		Waterworks Number:	Name: Samuel Desrosiers
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	Jean-philippe.Gobeil@Genitec.Ca		Page ___ of ___
Telephone:	418-820-7157	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other Oreg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☒ N/A

Are these samples for human consumption?: ☐ Yes ☒ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Required Analyses: Total Coliform/E. Coli / Fecal	HPC	Lead	THM	Nitrate/Nitrite	Coli/Ecrm, HPC		
1		TW02	R	G	N	✓	Mar 10, 22	~~10:~~ 13:30	3			X				X	X		
2		TW01	R	G	N	✓	Mar 10, 22	15:25	3			X				X	X		
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Walk in

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Dhmara Winnipeg	Verified By:
Relinquished By (Print):	Date/Time: 03/10/22 4:42pm	Date/Time: Mar 11, 2022 11:45	Date/Time: March 11 2022 11:50
Date/Time:	Temperature: 11.7 °C	Temperature: 8.3 °C	pH Verified: ☐ By:

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO:
Project: 100227.008
Custody: 16850

Report Date: 14-Mar-2022
Order Date: 11-Mar-2022

Order #: 2211561

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2211561-01	TW3

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 14-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-Mar-2022

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	11-Mar-22	11-Mar-22
E. coli	MOE E3407	11-Mar-22	11-Mar-22
Fecal Coliform	SM 9222D	11-Mar-22	11-Mar-22
Total Coliform	MOE E3407	11-Mar-22	11-Mar-22

Certificate of Analysis

Report Date: 14-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-Mar-2022

Client PO:

Project Description: 100227.008

	Client ID:	TW3	-	-	-
	Sample Date:	11-Mar-22 09:50	-	-	-
	Sample ID:	2211561-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-
Anions					
Nitrate as N	0.1 mg/L	3.2	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-

Certificate of Analysis

Report Date: 14-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-Mar-2022

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 14-Mar-2022

Order Date: 11-Mar-2022

Project Description: 100227.008

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	0.18	0.1	mg/L	0.18			2.1	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	

Certificate of Analysis

Report Date: 14-Mar-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-Mar-2022

Client PO:

Project Description: 100227.008

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.21	0.1	mg/L	0.18	102	79-120			
Nitrite as N	0.865	0.05	mg/L	ND	86.5	84-117			

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - ID on bottles read: "TW03", COC reads: "TW3".

Applies to samples: TW3

Sample Qualifiers :

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LT

Paracel ID: 2211561

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 16850
2211561	

Client Name:	Gemtec	Project Ref:	100227.008	Waterworks Name:	Samples Taken By:
Contact Name:	Jean-phillipe Gobeil	Quote #:		Waterworks Number:	Name: Samuel Esenwa
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	Jean-phillipe.Gobeil@Gemtec.ca		Page ____ of ____
Telephone:	418-820-7157	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☒ Other O.Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☒ N/A

Are these samples for human consumption?: ☐ Yes ☒ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Required Analyses: Total Coliform/E. Coli, Ecoli	HPC	Lead	THM	Nitrate, Nitrite, Coliform			
1		TW3	R	G	N	/	Mar 11,22	9:50am	3			X				X	X		
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Hand/Courier

Relinquished By (Sign): Samuel Esenwa	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Samuel Esenwa	Date/Time:	Date/Time: March 11 2022 11:40	Date/Time: March 11 2022 1608
Date/Time: 11:30, ~~FRI~~ March 11, 2022	Temperature: °C	Temperature: 3.9 °C	pH Verified: ☐ By:

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO: Burns Farms
Project: 100227.008
Custody: 16198

Report Date: 31-May-2022
Order Date: 25-May-2022

Order #: 2222100

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2222100-01	TW22-1 3hr
2222100-02	TW22-1 6hr
2222100-03	TW22-1 6hr (Filtered)
2222100-04	PW4063 3hr
2222100-05	PW4063 6hr
2222100-06	PW4063 6hr (Filtered)

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 31-May-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 25-May-2022

Client PO: Burns Farms

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	26-May-22	26-May-22
Ammonia, as N	EPA 351.2 - Auto Colour	27-May-22	27-May-22
Anions	EPA 300.1 - IC	27-May-22	27-May-22
Colour	SM2120 - Spectrophotometric	26-May-22	26-May-22
Colour, apparent	SM2120 - Spectrophotometric	26-May-22	26-May-22
Conductivity	EPA 9050A- probe @25 °C	26-May-22	26-May-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	27-May-22	27-May-22
E. coli	MOE E3407	26-May-22	26-May-22
Fecal Coliform	SM 9222D	26-May-22	26-May-22
Heterotrophic Plate Count	SM 9215C	26-May-22	26-May-22
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	31-May-22	31-May-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	30-May-22	31-May-22
pH	EPA 150.1 - pH probe @25 °C	26-May-22	26-May-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	25-May-22	26-May-22
Hardness	Hardness as CaCO3	30-May-22	31-May-22
Sulphide	SM 4500SE - Colourimetric	26-May-22	26-May-22
Tannin/Lignin	SM 5550B - Colourimetric	26-May-22	26-May-22
Total Coliform	MOE E3407	26-May-22	26-May-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	26-May-22	26-May-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	27-May-22	27-May-22
Turbidity	SM 2130B - Turbidity meter	26-May-22	26-May-22

Certificate of Analysis

Report Date: 31-May-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 25-May-2022

Client PO: Burns Farms

Project Description: 100227.008

	Client ID:	TW22-1 3hr	TW22-1 6hr	TW22-1 6hr (Filtered)	PW4063 3hr
	Sample Date:	24-May-22 11:06	24-May-22 15:30	24-May-22 15:30	24-May-22 12:20
	Sample ID:	2222100-01	2222100-02	2222100-03	2222100-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND	-	ND
Fecal Coliforms	1 CFU/100mL	ND	ND	-	ND
Total Coliforms	1 CFU/100mL	ND	ND	-	ND
Heterotrophic Plate Count	10 CFU/mL	10	<10	-	20
General Inorganics					
Alkalinity, total	5 mg/L	291	291	-	254
Ammonia as N	0.01 mg/L	0.01	0.01	-	<0.01
Dissolved Organic Carbon	0.5 mg/L	1.5	1.4	-	0.7
Colour	2 TCU	<2	<2	-	<2
Colour, apparent	2 ACU	7	8	-	3
Conductivity	5 uS/cm	670	618	-	553
Hardness	mg/L	292	289	-	263
pH	0.1 pH Units	7.7	7.7	-	7.7
Phenolics	0.001 mg/L	<0.001	<0.001	-	<0.001
Total Dissolved Solids	10 mg/L	380	360	-	324
Sulphide	0.02 mg/L	<0.02	<0.02	-	<0.02
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	<0.1
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	0.2	-	0.2
Turbidity	0.1 NTU	0.7	0.8	-	0.3
Anions					
Chloride	1 mg/L	14	15	-	9
Fluoride	0.1 mg/L	0.2	0.3	-	0.4
Nitrate as N	0.1 mg/L	1.7	1.7	-	1.8
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	<0.05
Sulphate	1 mg/L	25	26	-	30
Metals					
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-
Aluminum	0.001 mg/L	-	<0.001	<0.001	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-
Barium	0.001 mg/L	-	0.454	0.482	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-
Boron	0.01 mg/L	-	0.02	0.02	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-

Certificate of Analysis

Report Date: 31-May-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 25-May-2022

Client PO: Burns Farms

Project Description: 100227.008

	Client ID:	TW22-1 3hr	TW22-1 6hr	TW22-1 6hr (Filtered)	PW4063 3hr
	Sample Date:	24-May-22 11:06	24-May-22 15:30	24-May-22 15:30	24-May-22 12:20
	Sample ID:	2222100-01	2222100-02	2222100-03	2222100-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Calcium	0.1 mg/L	87.0	86.8	83.2	70.8
Chromium	0.001 mg/L	-	<0.001	<0.001	-
Cobalt	0.0005 mg/L	-	0.0005	0.0005	-
Copper	0.0005 mg/L	-	0.0008	0.0008	-
Iron	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-
Magnesium	0.2 mg/L	18.2	17.6	16.8	21.0
Manganese	0.005 mg/L	0.292	0.286	0.290	0.115
Molybdenum	0.0005 mg/L	-	0.0005	0.0006	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-
Potassium	0.1 mg/L	1.9	1.9	1.9	1.4
Selenium	0.001 mg/L	-	<0.001	<0.001	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-
Sodium	0.2 mg/L	8.6	8.5	7.6	5.8
Strontium	0.01 mg/L	-	0.35	0.35	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-
Uranium	0.0001 mg/L	-	0.0038	0.0040	-
Vanadium	0.0005 mg/L	-	0.0006	0.0006	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-

Certificate of Analysis

Report Date: 31-May-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 25-May-2022

Client PO: Burns Farms

Project Description: 100227.008

	Client ID:	PW4063 6hr	PW4063 6hr (Filtered)	-	-
	Sample Date:	24-May-22 15:20	24-May-22 15:20	-	-
	Sample ID:	2222100-05	2222100-06	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	253	-	-	-
Ammonia as N	0.01 mg/L	<0.01	-	-	-
Dissolved Organic Carbon	0.5 mg/L	0.8	-	-	-
Colour	2 TCU	<2	-	-	-
Colour, apparent	2 ACU	2	-	-	-
Conductivity	5 uS/cm	553	-	-	-
Hardness	mg/L	264	-	-	-
pH	0.1 pH Units	7.7	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	334	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	-	-	-
Turbidity	0.1 NTU	0.3	-	-	-
Anions					
Chloride	1 mg/L	9	-	-	-
Fluoride	0.1 mg/L	0.4	-	-	-
Nitrate as N	0.1 mg/L	2.0	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	29	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Aluminum	0.001 mg/L	<0.001	<0.001	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-
Barium	0.001 mg/L	0.212	0.230	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-
Boron	0.01 mg/L	0.03	0.03	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-

Certificate of Analysis

Report Date: 31-May-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 25-May-2022

Client PO: Burns Farms

Project Description: 100227.008

	Client ID:	PW4063 6hr	PW4063 6hr (Filtered)	-	-
	Sample Date:	24-May-22 15:20	24-May-22 15:20	-	-
	Sample ID:	2222100-05	2222100-06	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Calcium	0.1 mg/L	70.6	69.0	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-
Cobalt	0.0005 mg/L	<0.0005	<0.0005	-	-
Copper	0.0005 mg/L	0.0018	0.0018	-	-
Iron	0.1 mg/L	<0.1	<0.1	-	-
Lead	0.0001 mg/L	<0.0001	<0.0001	-	-
Magnesium	0.2 mg/L	21.2	20.4	-	-
Manganese	0.005 mg/L	0.114	0.115	-	-
Molybdenum	0.0005 mg/L	0.0006	0.0006	-	-
Nickel	0.001 mg/L	<0.001	<0.001	-	-
Potassium	0.1 mg/L	1.4	1.4	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-
Sodium	0.2 mg/L	5.9	5.5	-	-
Strontium	0.01 mg/L	0.43	0.43	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-
Uranium	0.0001 mg/L	0.0011	0.0011	-	-
Vanadium	0.0005 mg/L	0.0007	0.0008	-	-
Zinc	0.005 mg/L	<0.005	<0.005	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	1.35	1	mg/L	1.38			2.3	10	
Fluoride	0.29	0.1	mg/L	0.28			3.7	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	32.7	1	mg/L	32.3			1.4	10	
General Inorganics									
Alkalinity, total	89.1	5	mg/L	89.9			0.9	14	
Ammonia as N	0.035	0.01	mg/L	0.030			16.2	17.7	
Dissolved Organic Carbon	4.0	0.5	mg/L	3.8			4.6	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	6	2	ACU	7			NC	12	
Conductivity	972	5	uS/cm	994			2.2	5	
pH	7.7	0.1	pH Units	7.5			2.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	292	10	mg/L	286			2.1	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.13	0.1	mg/L	0.13			2.1	16	
Turbidity	0.7	0.1	NTU	0.7			7.1	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	0.0007	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.448	0.001	mg/L	0.454			1.2	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.02	0.01	mg/L	0.02			1.1	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	88.6	0.1	mg/L	87.0			1.8	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	0.0005	0.0005	mg/L	0.0005			1.9	20	
Copper	0.0008	0.0005	mg/L	0.0008			1.4	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	18.1	0.2	mg/L	18.2			0.4	20	
Manganese	0.294	0.005	mg/L	0.292			0.6	20	
Molybdenum	0.0006	0.0005	mg/L	0.0005			6.2	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	2.0	0.1	mg/L	1.9			2.7	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	8.5	0.2	mg/L	8.6			1.7	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0041	0.0001	mg/L	0.0039			5.6	20	
Vanadium	0.0006	0.0005	mg/L	0.0006			0.8	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	10			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	12.6	1	mg/L	1.38	112	77-123			
Fluoride	1.27	0.1	mg/L	0.28	99.4	79-121			
Nitrate as N	1.06	0.1	mg/L	ND	106	79-120			
Nitrite as N	1.07	0.05	mg/L	ND	107	84-117			
Sulphate	42.9	1	mg/L	32.3	107	74-126			
General Inorganics									
Ammonia as N	0.281	0.01	mg/L	0.030	100	81-124			
Dissolved Organic Carbon	14.8	0.5	mg/L	3.8	109	60-133			
Phenolics	0.027	0.001	mg/L	ND	108	67-133			
Total Dissolved Solids	108	10	mg/L	ND	108	75-125			
Sulphide	0.48	0.02	mg/L	ND	95.2	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	2.05	0.1	mg/L	0.13	96.1	81-126			
Metals									
Mercury	0.0031	0.0001	mg/L	ND	102	70-130			
Aluminum	45.0	0.001	mg/L	ND	90.0	80-120			
Antimony	43.3	0.0005	mg/L	0.172	86.3	80-120			
Arsenic	51.8	0.001	mg/L	0.198	103	80-120			
Barium	495	0.001	mg/L	454	83.4	80-120			
Beryllium	50.0	0.0005	mg/L	0.0243	99.9	80-120			
Boron	66.7	0.01	mg/L	20.0	93.4	80-120			
Cadmium	46.0	0.0001	mg/L	0.0038	92.1	80-120			
Calcium	92500	0.1	mg/L	87000	54.8	80-120			QM-07
Chromium	54.8	0.001	mg/L	0.157	109	80-120			
Cobalt	50.7	0.0005	mg/L	0.530	100	80-120			
Copper	47.4	0.0005	mg/L	0.792	93.3	80-120			
Iron	2380	0.1	mg/L	48.4	93.4	80-120			
Lead	41.7	0.0001	mg/L	0.0357	83.3	80-120			
Magnesium	26000	0.2	mg/L	18200	77.6	80-120			QM-07
Manganese	334	0.005	mg/L	292	84.3	80-120			
Molybdenum	49.3	0.0005	mg/L	0.550	97.4	80-120			
Nickel	49.7	0.001	mg/L	0.943	97.4	80-120			
Potassium	11700	0.1	mg/L	1920	97.4	80-120			
Selenium	48.7	0.001	mg/L	0.266	96.8	80-120			
Silver	46.5	0.0001	mg/L	0.0017	93.0	80-120			
Sodium	17500	0.2	mg/L	8630	88.4	80-120			
Thallium	45.6	0.001	mg/L	0.034	91.1	80-120			
Uranium	49.1	0.0001	mg/L	3.85	90.5	80-120			
Vanadium	56.4	0.0005	mg/L	0.599	112	80-120			
Zinc	46.2	0.005	mg/L	1.79	88.9	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD.

Paracel ID: 2222100

Paracel Order Number: 2222100

Chain Of Custody
Ontario Drinking Water Samples
№ 16198

Client Name:	Gemtec	Project Ref:	100227.008/ Burns farms	Waterworks Name:	
Contact Name:	Jean-phillipe Gobeil	Quote #:		Waterworks Number:	
Address:		PO #:		Address:	
After Hours Contact:		E-mail:	Jean-phillipe.Gobeil@gemtec.ca		
Telephone:	613-836-1422	Fax:		Public Health Unit:	

Samples Taken By:
Name: Samuel Essenus
Signature: [signature]
Page ___ of ___
Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

Samples Submitted Under: (Indicate **ONLY** one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☒ Other O.Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☒ N/A

Are these samples for human consumption?: ☐ Yes ☒ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G/S	Reportable: Y/N	Resample	DATE	TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S/F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subdivision package	Bacteria	Trace metals (filtered/unpreserved)	
1		TW22-1 3hr	R	G	N	/	24-05-22	11:06	8							X	X		
2		TW22-1 6hr	R	G	N	/	"	15:30	11							X	X	X	
3		PW4063 3hr	R	G	N	/	"	12:20	8							X	X		
4		PW4063 6hr	R	G	N	/	"	15:20	11							X	X	X	
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Color in ACU & TCU, trace metals, (1,5+) emailed to Jonathan

Method of Delivery: ~~Courier~~ Walk-in

Relinquished By (Sign): [signature]	Received By Driver/Depot:	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): Samuel Essenus	Date/Time:	Date/Time: May 25, 22 9:30	Date/Time: May 25, 22 10:09
Date/Time: 25-05-2022 / 9:40	Temperature: °C	Temperature: 6.4 °C	pH Verified: ☑ By: [initials]

Chain of Custody (Drinking Water).xlsx

Revision 5.0

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO:
Project: 100227.008
Custody:

Report Date: 17-Oct-2022
Order Date: 12-Oct-2022

Order #: 2242382

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2242382-01	GW22SA-1

Approved By:

Milan Ralitsch, PhD
Senior Technical Manager

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	14-Oct-22	14-Oct-22

Summary of Criteria Exceedances

(If this page is blank then there are no exceedances)

Only those criteria that a sample exceeds will be highlighted in red

Regulatory Comparison:

Paracel Laboratories has provided regulatory guidelines on this report for informational purposes only and makes no representations or warranties that the data is accurate or reflects the current regulatory values. The user is advised to consult with the appropriate official regulations to evaluate compliance. Sample results that are highlighted have exceeded the selected regulatory limit. Calculated uncertainty estimations have not been applied for determining regulatory exceedances.

Sample	Analyte	MDL / Units	Result	-	-

	Client ID:	GW22SA-1	-	-	-		
	Sample Date:	12-Oct-22 14:40	-	-	-	-	-
	Sample ID:	2242382-01	-	-	-		
	Matrix:	Water	-	-	-		
	MDL/Units						
Anions							
Nitrate as N	0.1 mg/L	0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.03	0.1	mg/L	ND	103	79-120			
Nitrite as N	1.13	0.05	mg/L	ND	113	84-117			

Certificate of Analysis

Report Date: 17-Oct-2022

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 12-Oct-2022

Client PO:

Project Description: 100227.008

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Paracel ID: 2242382

Chain Of Custody
(Lab Use Only)

Client Name: GEMTEC	Project Ref: 100227.008	Page 1 of 1
Contact Name: Jean-Philippe Gobeil	Quote #:	Turnaround Time
Address: 32 Steacie Dr, Kanata	PO #:	☒ 1 day ☒ 3 day
	E-mail: Jean-philippe.gobeil@gemtec.ca	☐ 2 day ☐ Regular
Telephone: 418-820-7157		Date Required:

☐ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

Other Regulation
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	Nitrates	Nitrites			
1	GW22SA-1	GW		2	Oct12/22	2:40pm								X	X			
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments: water was being purged from 7:30am

Method of Delivery: Walk in

Relinquished By (Sign):	Received By Driver/Depot: C—Ply	Received at Lab:	Verified By: C—Ply
Relinquished By (Print): Adrian Williams	Date/Time: Oct 14/22 9:51	Date/Time: 2022.10.12 4:30pm	Date/Time: Oct 14/22 10:24
Date/Time: Oct12/22 4:20pm	Temperature: 9.3 °C	Temperature: 10.9 C	pH Verified: ☐ By:

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Brent Redmond

Client PO:
Project: 100227.008
Custody: 17549

Report Date: 15-Nov-2022
Order Date: 7-Nov-2022

Order #: 2246211

This Certificate of Analysis contains analytical data applicable to the following samples as submitted :

Paracel ID	Client ID
2246211-01	A361167
2246211-02	A361167 (Filtered)

GEMTEC ID: PW-1710D

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 15-Nov-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 7-Nov-2022

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	10-Nov-22	10-Nov-22
Ammonia, as N	EPA 351.2 - Auto Colour	9-Nov-22	9-Nov-22
Anions	EPA 300.1 - IC	11-Nov-22	11-Nov-22
Colour	SM2120 - Spectrophotometric	9-Nov-22	9-Nov-22
Colour, apparent	SM2120 - Spectrophotometric	9-Nov-22	9-Nov-22
Conductivity	EPA 9050A- probe @25 °C	10-Nov-22	10-Nov-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	10-Nov-22	15-Nov-22
E. coli	MOE E3407	9-Nov-22	9-Nov-22
Fecal Coliform	SM 9222D	9-Nov-22	9-Nov-22
Heterotrophic Plate Count	SM 9215C	9-Nov-22	9-Nov-22
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	10-Nov-22	10-Nov-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	10-Nov-22	10-Nov-22
pH	EPA 150.1 - pH probe @25 °C	10-Nov-22	10-Nov-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	10-Nov-22	11-Nov-22
Hardness	Hardness as CaCO3	10-Nov-22	10-Nov-22
Sulphide	SM 4500SE - Colourimetric	11-Nov-22	11-Nov-22
Tannin/Lignin	SM 5550B - Colourimetric	11-Nov-22	11-Nov-22
Total Coliform	MOE E3407	9-Nov-22	9-Nov-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	9-Nov-22	10-Nov-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	9-Nov-22	10-Nov-22
Turbidity	SM 2130B - Turbidity meter	9-Nov-22	9-Nov-22

Certificate of Analysis

Report Date: 15-Nov-2022

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 7-Nov-2022

Client PO:

Project Description: 100227.008

	Client ID:	A361167	A361167 (Filtered)	-	-
	Sample Date:	07-Nov-22 12:30	07-Nov-22 12:30	-	-
	Sample ID:	2246211-01	2246211-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	50	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	256	-	-	-
Ammonia as N	0.01 mg/L	0.05	-	-	-
Dissolved Organic Carbon	0.5 mg/L	2.2	-	-	-
Colour	2 TCU	3	-	-	-
Colour, apparent	2 ACU	6	-	-	-
Conductivity	5 uS/cm	690	-	-	-
Hardness	mg/L	286	-	-	-
pH	0.1 pH Units	7.9	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	378	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	-	-	-
Turbidity	0.1 NTU	0.9	-	-	-
Anions					
Chloride	1 mg/L	17 [4]	-	-	-
Fluoride	0.1 mg/L	1.0 [4]	-	-	-
Nitrate as N	0.1 mg/L	<0.1 [4]	-	-	-
Nitrite as N	0.10 mg/L	<0.10 [4]	-	-	-
Sulphate	1 mg/L	67 [4]	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Aluminum	0.001 mg/L	<0.001	<0.001	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-
Barium	0.001 mg/L	0.055	0.053	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-
Boron	0.01 mg/L	0.21	0.21	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Calcium	0.1 mg/L	79.8	82.1	-	-

Certificate of Analysis

Report Date: 15-Nov-2022

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 7-Nov-2022

Client PO:

Project Description: 100227.008

	Client ID:	A361167	A361167 (Filtered)	-	-
	Sample Date:	07-Nov-22 12:30	07-Nov-22 12:30	-	-
	Sample ID:	2246211-01	2246211-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-
Cobalt	0.0005 mg/L	0.0006	0.0006	-	-
Copper	0.0005 mg/L	0.0007	0.0009	-	-
Iron	0.1 mg/L	<0.1	<0.1	-	-
Lead	0.0001 mg/L	<0.0001	<0.0001	-	-
Magnesium	0.2 mg/L	21.1	21.5	-	-
Manganese	0.005 mg/L	0.282	0.287	-	-
Molybdenum	0.0005 mg/L	0.0010	0.0010	-	-
Nickel	0.001 mg/L	<0.001	<0.001	-	-
Potassium	0.1 mg/L	3.0	3.0	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-
Sodium	0.2 mg/L	18.0	18.6	-	-
Strontium	0.01 mg/L	1.31	1.28	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-
Uranium	0.0001 mg/L	0.0007	0.0007	-	-
Vanadium	0.0005 mg/L	<0.0005	<0.0005	-	-
Zinc	0.005 mg/L	<0.005	<0.005	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Alkalinity, total	256	5	mg/L	256			0.1	14	
Ammonia as N	0.050	0.01	mg/L	0.050			1.4	17.7	
Colour	3	2	TCU	3			0.0	12	
Colour, apparent	6	2	ACU	6			0.0	12	
Conductivity	709	5	uS/cm	690			2.6	5	
pH	8.0	0.1	pH Units	7.9			0.9	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	32.0	10	mg/L	32.0			0.0	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	0.10			NC	16	
Turbidity	ND	0.1	NTU	ND			NC	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.033	0.001	mg/L	0.033			0.0	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.011	0.001	mg/L	0.011			4.7	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	7.2	0.1	mg/L	7.2			0.1	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0629	0.0005	mg/L	0.0626			0.5	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0001	0.0001	mg/L	ND			NC	20	
Magnesium	1.9	0.2	mg/L	1.9			2.5	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	ND	0.0005	mg/L	ND			NC	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	0.7	0.1	mg/L	0.7			0.6	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	15.0	0.2	mg/L	15.2			1.1	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	20	10	CFU/mL	50			86.0	30	BAC04

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Ammonia as N	0.286	0.01	mg/L	0.050	94.7	81-124			
Dissolved Organic Carbon	8.4	0.5	mg/L	ND	83.8	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	67-133			
Total Dissolved Solids	96.0	10	mg/L	ND	96.0	75-125			
Sulphide	0.48	0.02	mg/L	ND	96.2	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	95.7	71-113			
Total Kjeldahl Nitrogen	2.00	0.1	mg/L	0.10	94.6	81-126			
Metals									
Mercury	0.0025	0.0001	mg/L	ND	82.0	70-130			
Aluminum	77.4	0.001	mg/L	33.1	88.7	80-120			
Arsenic	48.5	0.001	mg/L	0.358	96.3	80-120			
Barium	50.2	0.001	mg/L	11.1	78.3	80-120			QM-07
Beryllium	49.3	0.0005	mg/L	0.0170	98.7	80-120			
Boron	50.6	0.01	mg/L	6.06	89.1	80-120			
Cadmium	40.1	0.0001	mg/L	0.0067	80.2	80-120			
Calcium	15400	0.1	mg/L	7240	82.0	80-120			
Chromium	46.2	0.001	mg/L	0.171	92.0	80-120			
Cobalt	46.9	0.0005	mg/L	0.0349	93.7	80-120			
Copper	47.6	0.0005	mg/L	0.744	93.7	80-120			
Iron	2180	0.1	mg/L	3.4	87.0	80-120			
Magnesium	10800	0.2	mg/L	1940	88.1	80-120			
Manganese	46.7	0.005	mg/L	0.814	91.8	80-120			
Molybdenum	44.3	0.0005	mg/L	0.240	88.1	80-120			
Nickel	46.8	0.001	mg/L	0.273	93.1	80-120			
Potassium	9870	0.1	mg/L	671	92.0	80-120			
Selenium	45.3	0.001	mg/L	0.094	90.5	80-120			
Silver	41.9	0.0001	mg/L	0.0185	83.8	80-120			
Sodium	22400	0.2	mg/L	15200	72.2	80-120			QM-07
Thallium	40.6	0.001	mg/L	0.012	81.2	80-120			
Uranium	41.6	0.0001	mg/L	0.0085	83.3	80-120			
Vanadium	47.5	0.0005	mg/L	0.171	94.6	80-120			
Zinc	46.6	0.005	mg/L	2.31	88.6	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - Sample dated as Nov. 07 2022, chain of custody reads Nov. 11, 2022.
Applies to samples: A361167, A361167 (Filtered)

Sample Qualifiers :

4 : Subcontracted analysis - Eurofins Environment Testing

QC Qualifiers :

BAC04 Duplicate QC data falls within method prescribed 95% confidence limits.
QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES

Paracel ID: 2246211

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Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 17549
2246211	

Client Name:	GEMTEC	Project Ref:	100227.008	Waterworks Name:		Samples Taken By:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:		Name:	Brent Redmond
Address:		PO #:		Address:		Signature:	
After Hours Contact:		E-mail:	brent.redmond@GEMTEC.ca			Page ____ of ____	
Telephone:	343 - 571-9556	Fax:		Public Health Unit:		Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day	

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other: OReg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☑ N/A

Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subdivision Backgrounds	Trace (E. coli, 4 units)		
1		A361167	R	G	N	/	Nov. 11, 22	12:30	11							X	X		
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: → colour in ACs & TCs

Method of Delivery: Walked

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Junee/Sam Blumel	Verified By:
Relinquished By (Print): Brent Redmond 15:40	Date/Time: Nov 7/22 3:45 pm	Date/Time: NOV 08, 2022 01:24	Date/Time: Nov 8/2022 1617
Date/Time: Nov. 11, 22	Temperature: 11.6 °C	Temperature: 7.8 °C	pH Verified: ☐ By:

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO: Burn Farm
Project: 100227.008
Custody: 17494

Report Date: 1-May-2023
Order Date: 25-Apr-2023

Order #: 2317295

This Certificate of Analysis contains analytical data applicable to the following samples as submitted :

Paracel ID	Client ID
2317295-01	TW22-1 3hr
2317295-02	TW22-1 4.5hr
2317295-03	TW22-1 6hr

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burn Farm**

Report Date: 01-May-2023

Order Date: 25-Apr-2023

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	28-Apr-23	28-Apr-23
Ammonia, as N	EPA 351.2 - Auto Colour	28-Apr-23	28-Apr-23
Anions	EPA 300.1 - IC	26-Apr-23	27-Apr-23
Colour	SM2120 - Spectrophotometric	26-Apr-23	27-Apr-23
Colour, apparent	SM2120 - Spectrophotometric	26-Apr-23	27-Apr-23
Conductivity	EPA 9050A- probe @25 °C	28-Apr-23	28-Apr-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	26-Apr-23	27-Apr-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	27-Apr-23	27-Apr-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	27-Apr-23	27-Apr-23
pH	EPA 150.1 - pH probe @25 °C	28-Apr-23	28-Apr-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	27-Apr-23	27-Apr-23
Hardness	Hardness as CaCO3	27-Apr-23	27-Apr-23
Sulphide	SM 4500SE - Colourimetric	27-Apr-23	28-Apr-23
Tannin/Lignin	SM 5550B - Colourimetric	1-May-23	1-May-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	28-Apr-23	28-Apr-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	27-Apr-23	28-Apr-23
Turbidity	SM 2130B - Turbidity meter	27-Apr-23	27-Apr-23

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burn Farm**

Report Date: 01-May-2023

Order Date: 25-Apr-2023

Project Description: 100227.008

	Client ID:	TW22-1 3hr	TW22-1 4.5hr	TW22-1 6hr	-
	Sample Date:	25-Apr-23 11:40	25-Apr-23 13:10	25-Apr-23 14:40	-
	Sample ID:	2317295-01	2317295-02	2317295-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
General Inorganics					
Alkalinity, total	5 mg/L	247	-	247	-
Ammonia as N	0.01 mg/L	<0.01	-	<0.01	-
Dissolved Organic Carbon	0.5 mg/L	1.5	-	1.5	-
Colour	2 TCU	3	-	2	-
Colour, apparent	2 ACU	7	-	14	-
Conductivity	5 uS/cm	684	-	675	-
Hardness	mg/L	322	-	327	-
pH	0.1 pH Units	7.9	-	7.9	-
Phenolics	0.001 mg/L	<0.001	-	<0.001	-
Total Dissolved Solids	10 mg/L	400	-	410	-
Sulphide	0.02 mg/L	<0.02	-	<0.02	-
Tannin & Lignin	0.1 mg/L	<0.1	-	<0.1	-
Total Kjeldahl Nitrogen	0.1 mg/L	<0.1	-	<0.1	-
Turbidity	0.1 NTU	0.4	-	0.7	-
Anions					
Chloride	1 mg/L	16	-	16	-
Fluoride	0.1 mg/L	1.0	-	1.0	-
Nitrate as N	0.1 mg/L	0.2	0.2	0.2	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	-
Sulphate	1 mg/L	80	-	81	-
Metals					
Mercury	0.0001 mg/L	-	-	<0.0001	-
Aluminum	0.001 mg/L	-	-	<0.001	-
Antimony	0.0005 mg/L	-	-	<0.0005	-
Arsenic	0.001 mg/L	-	-	<0.001	-
Barium	0.001 mg/L	-	-	0.040	-
Beryllium	0.0005 mg/L	-	-	<0.0005	-
Boron	0.01 mg/L	-	-	0.13	-
Cadmium	0.0001 mg/L	-	-	<0.0001	-
Calcium	0.1 mg/L	90.9	-	92.3	-
Chromium	0.001 mg/L	-	-	<0.001	-
Cobalt	0.0005 mg/L	-	-	0.0006	-
Copper	0.0005 mg/L	-	-	0.0016	-
Iron	0.1 mg/L	<0.1	-	<0.1	-
Lead	0.0001 mg/L	-	-	<0.0001	-

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burn Farm**

Report Date: 01-May-2023

Order Date: 25-Apr-2023

Project Description: 100227.008

	Client ID:	TW22-1 3hr	TW22-1 4.5hr	TW22-1 6hr	-
	Sample Date:	25-Apr-23 11:40	25-Apr-23 13:10	25-Apr-23 14:40	-
	Sample ID:	2317295-01	2317295-02	2317295-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Magnesium	0.2 mg/L	23.1	-	23.4	-
Manganese	0.005 mg/L	0.175	-	0.181	-
Molybdenum	0.0005 mg/L	-	-	0.0007	-
Nickel	0.001 mg/L	-	-	<0.001	-
Potassium	0.1 mg/L	3.5	-	3.5	-
Selenium	0.001 mg/L	-	-	<0.001	-
Silver	0.0001 mg/L	-	-	<0.0001	-
Sodium	0.2 mg/L	13.7	-	13.7	-
Strontium	0.01 mg/L	-	-	1.66	-
Thallium	0.001 mg/L	-	-	<0.001	-
Uranium	0.0001 mg/L	-	-	0.0011	-
Vanadium	0.0005 mg/L	-	-	0.0029	-
Zinc	0.005 mg/L	-	-	<0.005	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.0	1	mg/L	16.1			0.6	20	
Fluoride	0.94	0.1	mg/L	0.97			2.6	20	
Nitrate as N	0.17	0.1	mg/L	0.17			0.6	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	81.6	1	mg/L	81.4			0.3	20	
General Inorganics									
Alkalinity, total	246	5	mg/L	247			0.2	14	
Ammonia as N	ND	0.01	mg/L	ND			NC	17.7	
Dissolved Organic Carbon	2.1	0.5	mg/L	1.5			33.3	37	
Colour	28	2	TCU	29			3.5	12	
Colour, apparent	38	2	ACU	38			0.0	12	
Conductivity	665	5	uS/cm	675			1.5	5	
pH	7.9	0.1	pH Units	7.9			0.1	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	402	10	mg/L	400			0.5	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	0.8	0.1	NTU	0.8			0.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.040	0.001	mg/L	0.040			0.3	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.13	0.01	mg/L	0.13			2.0	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	91.7	0.1	mg/L	92.3			0.6	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	0.0006	0.0005	mg/L	0.0006			7.0	20	
Copper	0.0017	0.0005	mg/L	0.0016			1.6	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	23.4	0.2	mg/L	23.4			0.2	20	
Manganese	0.182	0.005	mg/L	0.181			0.4	20	
Molybdenum	0.0008	0.0005	mg/L	0.0007			9.3	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	3.6	0.1	mg/L	3.5			2.0	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	13.4	0.2	mg/L	13.7			2.0	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0011	0.0001	mg/L	0.0011			0.4	20	
Vanadium	0.0029	0.0005	mg/L	0.0029			3.1	20	
Zinc	ND	0.005	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	25.6	1	mg/L	16.1	94.8	70-124			
Fluoride	2.14	0.1	mg/L	0.97	118	70-130			
Nitrate as N	1.21	0.1	mg/L	0.17	104	77-126			
Nitrite as N	0.938	0.05	mg/L	ND	93.8	82-115			
Sulphate	89.1	1	mg/L	81.4	77.3	70-130			
General Inorganics									
Ammonia as N	1.08	0.01	mg/L	ND	108	81-124			
Dissolved Organic Carbon	9.6	0.5	mg/L	ND	96.4	60-133			
Phenolics	0.016	0.001	mg/L	ND	62.8	67-133			QM-07
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.44	0.02	mg/L	ND	88.0	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	101	71-113			
Total Kjeldahl Nitrogen	1.05	0.1	mg/L	ND	105	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	93.5	70-130			
Aluminum	46.5	0.001	mg/L	0.395	92.2	80-120			
Arsenic	52.1	0.001	mg/L	0.177	104	80-120			
Barium	90.2	0.001	mg/L	39.7	101	80-120			
Beryllium	49.8	0.0005	mg/L	0.0330	99.5	80-120			
Boron	167	0.01	mg/L	132	70.9	80-120			QM-07
Cadmium	52.7	0.0001	mg/L	0.0281	105	80-120			
Calcium	10200	0.1	mg/L	ND	102	80-120			
Chromium	53.3	0.001	mg/L	0.280	106	80-120			
Cobalt	50.7	0.0005	mg/L	0.599	100	80-120			
Copper	47.9	0.0005	mg/L	1.63	92.6	80-120			
Iron	2140	0.1	mg/L	12.5	84.9	80-120			
Lead	44.6	0.0001	mg/L	0.0401	89.2	80-120			
Magnesium	30700	0.2	mg/L	23400	73.2	80-120			QM-07
Manganese	221	0.005	mg/L	181	79.3	80-120			QM-07
Molybdenum	48.4	0.0005	mg/L	0.732	95.4	80-120			
Nickel	49.8	0.001	mg/L	0.547	98.5	80-120			
Potassium	12800	0.1	mg/L	3500	93.3	80-120			
Selenium	50.5	0.001	mg/L	0.199	101	80-120			
Silver	51.2	0.0001	mg/L	0.0744	102	80-120			
Sodium	22100	0.2	mg/L	13700	83.7	80-120			
Thallium	48.8	0.001	mg/L	0.075	97.4	80-120			
Uranium	48.1	0.0001	mg/L	1.06	94.0	80-120			
Vanadium	55.7	0.0005	mg/L	2.86	106	80-120			
Zinc	46.6	0.005	mg/L	0.250	92.7	80-120			

Qualifier Notes:

QC Qualifiers :

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD.

Paracel ID: 2317295

Paracel Order Number: 2317295

Chain Of Custody
Ontario Drinking Water Samples

№ 17494

Client Name:	Gemtec	Project Ref:	100227.008 / Burn Farm	Waterworks Name:	
Contact Name:	Andrius Paznekas	Quote #:		Waterworks Number:	
Address:		PO #:		Address:	
After Hours Contact:		E-mail:	Andrius.paznekas@gemtec.ca		
Telephone:		Fax:		Public Health Unit:	

Samples Taken By:
Name: Samuel Esenwa
Signature: [signature]
See comments
Page ___ of ___
Turn Around Time Required: ☐ 1 day ☐ 2 day ☑ 3 day ☐ 4 day

Samples Submitted Under: (Indicate **ONLY** one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other: O. Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☑ N/A

Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	DATE	TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subd. package (no bacteria)	Trace metals (filtered & unfiltered)	Nitrate + Nitrite	
1	/	TW22-13hr	R	G	N	/	25-04-23	11:40	6							✓			
2	/	TW22-14.5hr	↓	↓	↓	/	↓	13:10	1									✓	
3	/	TW22-16hr				/		14:40	9							✓	✓		
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: All nitrate samples TAT: 1-day rush, Rest of samples 3-day rush, color in 1 ACU & TCU

Method of Delivery: Walk in

Relinquished By (Sign): [signature]	Received By Driver/Depot: [signature] 4:21	Received at Lab: Sandra Dominis	Verified By: [signature]
Relinquished By (Print): Samuel Esenwa	Date/Time: Apr 25/23 PM	Date/Time: April 26, 12:30	Date/Time: Apr 26/23 13:06
Date/Time: 25-04-2023; 16:18	Temperature: 10.0 °C	Temperature: 6.9 °C	pH Verified: ☐ By:

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO: Burns Farm
Project: 100227.008
Custody: 11811

Report Date: 23-May-2023
Order Date: 17-May-2023

Order #: 2320209

This Certificate of Analysis contains analytical data applicable to the following samples as submitted :

Paracel ID	Client ID
2320209-01	A318695 3hr
2320209-02	A318695
2320209-03	A318695 (Filtered)
2320209-04	A342438 3hr
2320209-05	A342438
2320209-06	A342438 (Filtered)

A342438 - GEMTEC Well ID: TW22-8 (LINER)

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burns Farm**

Report Date: 23-May-2023

Order Date: 17-May-2023

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	18-May-23	18-May-23
Ammonia, as N	EPA 351.2 - Auto Colour	18-May-23	18-May-23
Anions	EPA 300.1 - IC	17-May-23	17-May-23
Colour	SM2120 - Spectrophotometric	18-May-23	18-May-23
Colour, apparent	SM2120 - Spectrophotometric	18-May-23	18-May-23
Conductivity	EPA 9050A- probe @25 °C	18-May-23	18-May-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	17-May-23	18-May-23
E. coli	MOE E3407	17-May-23	17-May-23
Fecal Coliform	SM 9222D	17-May-23	17-May-23
Heterotrophic Plate Count	SM 9215C	17-May-23	17-May-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	18-May-23	18-May-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	18-May-23	19-May-23
pH	EPA 150.1 - pH probe @25 °C	18-May-23	18-May-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	18-May-23	18-May-23
Hardness	Hardness as CaCO3	18-May-23	19-May-23
Sulphide	SM 4500SE - Colourimetric	19-May-23	19-May-23
Tannin/Lignin	SM 5550B - Colourimetric	18-May-23	18-May-23
Total Coliform	MOE E3407	17-May-23	17-May-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	18-May-23	19-May-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	18-May-23	19-May-23
Turbidity	SM 2130B - Turbidity meter	18-May-23	18-May-23

PARACEL LABORATORIES LTD.

Order #: 2320209

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO: Burns Farm

Report Date: 23-May-2023

Order Date: 17-May-2023

Project Description: 100227.008

	Client ID:	A318695 3hr	A318695	A318695 (Filtered)	A342438 3hr
	Sample Date:	16-May-23 12:30	16-May-23 15:30	16-May-23 15:30	16-May-23 12:00
	Sample ID:	2320209-01	2320209-02	2320209-03	2320209-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND	-	ND
Total Coliforms	1 CFU/100mL	ND	ND	-	ND
Fecal Coliforms	1 CFU/100mL	ND	ND	-	ND
Heterotrophic Plate Count	10 CFU/mL	10	<10	-	<10
General Inorganics					
Alkalinity, total	5 mg/L	233	235	-	222
Ammonia as N	0.01 mg/L	0.06	0.05	-	0.13
Dissolved Organic Carbon	0.5 mg/L	0.6	0.5	-	<0.5
Colour	2 TCU	<2	<2	-	<2
Colour, apparent	2 ACU	22	22	-	37
Conductivity	5 uS/cm	653	654	-	654
Hardness	mg/L	322	325	-	327
pH	0.1 pH Units	7.9	7.8	-	7.8
Phenolics	0.001 mg/L	<0.001	<0.001	-	<0.001
Total Dissolved Solids	10 mg/L	384	380	-	364
Sulphide	0.02 mg/L	<0.02	<0.02	-	<0.02
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	<0.1
Total Kjeldahl Nitrogen	0.1 mg/L	<0.1	<0.1	-	0.1
Turbidity	0.1 NTU	3.0	2.9	-	4.8
Anions					
Chloride	1 mg/L	10	10	-	7
Fluoride	0.1 mg/L	0.7	0.7	-	0.9
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	<0.1
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	<0.05
Sulphate	1 mg/L	96	96	-	111
Metals					
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-
Aluminum	0.001 mg/L	-	<0.001	0.001	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-
Barium	0.001 mg/L	-	0.043	0.044	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-
Boron	0.01 mg/L	-	0.18	0.18	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-
Calcium	0.1 mg/L	92.0	92.1	92.9	93.2

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burns Farm**

Report Date: 23-May-2023

Order Date: 17-May-2023

Project Description: 100227.008

	Client ID:	A318695 3hr	A318695	A318695 (Filtered)	A342438 3hr
	Sample Date:	16-May-23 12:30	16-May-23 15:30	16-May-23 15:30	16-May-23 12:00
	Sample ID:	2320209-01	2320209-02	2320209-03	2320209-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Chromium	0.001 mg/L	-	<0.001	<0.001	-
Cobalt	0.0005 mg/L	-	0.0005	<0.0005	-
Copper	0.0005 mg/L	-	<0.0005	<0.0005	-
Iron	0.1 mg/L	0.3	0.3	0.3	0.4
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-
Magnesium	0.2 mg/L	22.3	23.1	22.8	22.8
Manganese	0.005 mg/L	0.098	0.096	0.097	0.012
Molybdenum	0.0005 mg/L	-	0.0014	0.0013	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-
Potassium	0.1 mg/L	2.9	3.0	2.9	4.0
Selenium	0.001 mg/L	-	<0.001	<0.001	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-
Sodium	0.2 mg/L	14.1	14.0	14.5	19.1
Strontium	0.01 mg/L	-	2.08	2.05	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-
Uranium	0.0001 mg/L	-	0.0007	0.0007	-
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burns Farm**

Report Date: 23-May-2023

Order Date: 17-May-2023

Project Description: 100227.008

	Client ID:	A342438	A342438 (Filtered)	-	-
	Sample Date:	16-May-23 15:00	16-May-23 15:00	-	-
	Sample ID:	2320209-05	2320209-06	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	10	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	222	-	-	-
Ammonia as N	0.01 mg/L	0.13	-	-	-
Dissolved Organic Carbon	0.5 mg/L	<0.5	-	-	-
Colour	2 TCU	<2	-	-	-
Colour, apparent	2 ACU	41	-	-	-
Conductivity	5 uS/cm	650	-	-	-
Hardness	mg/L	327	-	-	-
pH	0.1 pH Units	7.9	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	384	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	-	-	-
Turbidity	0.1 NTU	6.2	-	-	-
Anions					
Chloride	1 mg/L	7	-	-	-
Fluoride	0.1 mg/L	0.9	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	112	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Aluminum	0.001 mg/L	<0.001	0.002	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-
Barium	0.001 mg/L	0.027	0.026	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-
Boron	0.01 mg/L	0.28	0.28	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Calcium	0.1 mg/L	93.6	92.9	-	-

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burns Farm**

Report Date: 23-May-2023

Order Date: 17-May-2023

Project Description: 100227.008

	Client ID:	A342438	A342438 (Filtered)	-	-
	Sample Date:	16-May-23 15:00	16-May-23 15:00	-	-
	Sample ID:	2320209-05	2320209-06	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-
Cobalt	0.0005 mg/L	<0.0005	<0.0005	-	-
Copper	0.0005 mg/L	<0.0005	<0.0005	-	-
Iron	0.1 mg/L	0.4	0.4	-	-
Lead	0.0001 mg/L	<0.0001	<0.0001	-	-
Magnesium	0.2 mg/L	22.6	22.7	-	-
Manganese	0.005 mg/L	0.012	0.011	-	-
Molybdenum	0.0005 mg/L	0.0010	0.0010	-	-
Nickel	0.001 mg/L	<0.001	<0.001	-	-
Potassium	0.1 mg/L	4.0	4.0	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-
Sodium	0.2 mg/L	19.4	19.6	-	-
Strontium	0.01 mg/L	2.55	2.59	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-
Uranium	0.0001 mg/L	0.0002	0.0002	-	-
Vanadium	0.0005 mg/L	<0.0005	<0.0005	-	-
Zinc	0.005 mg/L	<0.005	<0.005	-	-

Certificate of Analysis

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Client PO: **Burns Farm**

Report Date: 23-May-2023

Order Date: 17-May-2023

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	6.78	1	mg/L	6.76			0.3	20	
Fluoride	ND	0.1	mg/L	ND			NC	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	8.82	1	mg/L	8.81			0.1	20	
General Inorganics									
Alkalinity, total	231	5	mg/L	233			1.0	14	
Ammonia as N	ND	0.01	mg/L	ND			NC	17.7	
Dissolved Organic Carbon	ND	0.5	mg/L	0.6			NC	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	22	2	ACU	22			0.0	12	
Conductivity	644	5	uS/cm	653			1.3	5	
pH	7.9	0.1	pH Units	7.9			0.6	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	84.0	10	mg/L	86.0			2.4	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.15	0.1	mg/L	0.16			8.3	16	
Turbidity	ND	0.1	NTU	ND			NC	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	0.001			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	0.002	0.001	mg/L	0.001			8.2	20	
Barium	0.323	0.001	mg/L	0.310			4.3	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.01	0.01	mg/L	0.01			2.2	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	42.2	0.1	mg/L	41.7			1.3	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0015	0.0005	mg/L	0.0016			1.0	20	
Iron	0.2	0.1	mg/L	0.2			9.7	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	21.6	0.2	mg/L	22.0			2.0	20	
Manganese	0.031	0.005	mg/L	0.031			0.3	20	
Molybdenum	0.0007	0.0005	mg/L	0.0007			9.6	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	3.3	0.1	mg/L	3.3			1.5	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	3.4	0.2	mg/L	3.5			3.3	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0009	0.0001	mg/L	0.0009			4.8	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	10			0.0	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.4	1	mg/L	6.76	96.6	70-124			
Fluoride	1.04	0.1	mg/L	ND	104	70-130			
Nitrate as N	1.03	0.1	mg/L	ND	103	77-126			
Nitrite as N	0.950	0.05	mg/L	ND	95.0	82-115			
Sulphate	18.7	1	mg/L	8.81	98.8	70-130			
General Inorganics									
Ammonia as N	1.00	0.01	mg/L	ND	100	81-124			
Dissolved Organic Carbon	11.3	0.5	mg/L	1.3	99.7	60-133			
Phenolics	0.025	0.001	mg/L	ND	99.0	67-133			
Total Dissolved Solids	96.0	10	mg/L	ND	96.0	75-125			
Sulphide	0.53	0.02	mg/L	ND	107	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.08	0.1	mg/L	0.16	92.3	81-126			
Metals									
Mercury	0.0024	0.0001	mg/L	ND	79.1	70-130			
Aluminum	51.3	0.001	mg/L	1.15	100	80-120			
Antimony	52.1	0.0005	mg/L	0.0566	104	80-120			
Arsenic	55.4	0.001	mg/L	1.49	108	80-120			
Barium	68.3	0.001	mg/L	15.1	106	80-120			
Beryllium	53.2	0.0005	mg/L	0.0166	106	80-120			
Boron	61.3	0.01	mg/L	12.9	96.8	80-120			
Cadmium	54.4	0.0001	mg/L	0.0073	109	80-120			
Calcium	16600	0.1	mg/L	7380	92.5	80-120			
Chromium	54.9	0.001	mg/L	0.221	109	80-120			
Cobalt	52.4	0.0005	mg/L	0.0447	105	80-120			
Copper	52.3	0.0005	mg/L	1.55	102	80-120			
Iron	2390	0.1	mg/L	173	88.6	80-120			
Lead	46.3	0.0001	mg/L	0.0214	92.5	80-120			
Magnesium	10100	0.2	mg/L	1790	83.6	80-120			
Manganese	83.5	0.005	mg/L	31.2	105	80-120			
Molybdenum	49.8	0.0005	mg/L	0.660	98.3	80-120			
Nickel	51.6	0.001	mg/L	0.296	103	80-120			
Potassium	11400	0.1	mg/L	3250	81.6	80-120			
Selenium	52.9	0.001	mg/L	0.059	106	80-120			
Silver	46.4	0.0001	mg/L	0.0099	92.8	80-120			
Sodium	8390	0.2	mg/L	ND	83.9	80-120			
Thallium	47.9	0.001	mg/L	0.011	95.8	80-120			
Uranium	50.1	0.0001	mg/L	0.888	98.3	80-120			
Vanadium	54.8	0.0005	mg/L	0.0439	110	80-120			
Zinc	53.3	0.005	mg/L	1.64	103	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - One bacteria bottle missing sample date and time.

Applies to samples: A318695 3hr

Metals sample was decanted from the generals container and preserved at the lab
Metals by ICP-MS.

Applies to samples: A342438

Sample Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD

Paracel ID: 2320209

Paracel Order Number: 2320209

Chain Of Custody

Ontario Drinking Water Samples

№ 11811

Client Name:	Gemtec	Project Ref:	100227.008/ Burns Farm	Waterworks Name:	
Contact Name:	Andrius Paznekas	Quote #:		Waterworks Number:	
Address:		PO #:		Address:	
After Hours Contact:		E-mail:	Andrius.Paznekas@gemtec		
Telephone:		Fax:		Public Health Unit:	

Samples Taken By:
Name: Sam & Bella
Signature: [signature]
Page ___ of ___
Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

Samples Submitted Under: (Indicate ONLY one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other O-Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☑ N/A
Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

Required Analyses

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	DATE	TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	SUSD - Drugs	Bacteria	Trace metals (filtered + unfiltered)
1		A318695 3hr	R	G	N	/	16-05-23	12:30	8									
2		A318695	↓	↓	↓	↓	↓	15:30	11									
3		A342438 3hr	↓	↓	↓	↓	↓	12:00	8									
4		A342438	↓	↓	↓	↓	↓	15:00	12									
5																		
6																		
7																		
8																		
9																		
10																		

Comments: Cook in ACU & TCU

Method of Delivery: Drop Box

Relinquished By (Sign): [signature]	Received By Driver/Depot: [signature]	Received at Lab: Sandra Damonins	Verified By: [signature]
Relinquished By (Print): Samua Esenua	Date/Time: May 17/23 830 AM	Date/Time: May 17, 11:40	Date/Time: May 17/23 1257
Date/Time: 16-05-23	Temperature: 5.0 °C	Temperature: 5.8 °C	pH Verified: ☐ By: [signature]

Chain of Custody (Drinking Water).xlsx

Revision 5.0

APPENDIX E

Off-Site Private Well Water Quality

Report to: Wilburt Crain
Project: 100227.008

Summary of Off-Site Water Quality Results

Parameter	Units	Homeowner Sampling - Vicinity of Burns Farm					Homeowner Sampling - Fellinger's Mills Estate Subdivision			Ontario Drinking Water Standard	Type of Standard
		PW-1562	PW-3896	PW-3928	PW-1802	PW-1744	PW-746	PW-853	PW-981		
		21-Apr-21	21-Apr-21	21-Apr-21	21-Apr-21	21-Apr-21	4-Aug-21	4-Aug-21	4-Aug-21		
Microbiological Parameters											
E. Coli	CFU/100 mL	N/A	N/A	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	0	MAC
Fecal Coliforms	CFU/100 mL	N/A	N/A	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	0	MAC
Total Coliforms	CFU/100 mL	N/A	N/A	N/A	N/A	N/A	ND (1)	ND (1)	ND (1)	-	-
General Inorganics											
Alkalinity, total	mg/L	292	204	238	295	293	289	243	243	30-500	OG
Ammonia as N	mg/L	0.03	0.17	0.17	0.29	0.07	0.02	0.03	0.05	-	-
Dissolved Organic Carbon	mg/L	1	1.5	1.8	1.6	2.2	1.5	4.2	3.6	5	AO
Colour	TCU	ND (2)	2	2	2	3	2	2	2	-	-
Colour, apparent	ACU	3	3	4	4	5	N/A	N/A	N/A	5	AO
Conductivity	uS/cm	620	411	496	751	674	692	544	681	-	-
Hardness	mg/L	**287**	**196**	**238**	**294**	**284**	**300**	**233**	**219**	80-100	OG
pH	pH Units	8	8	8	7.8	7.9	7.6	7.7	7.7	6.5-8.5	OG
Phenolics	mg/L	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	-	-
Total Dissolved Solids	mg/L	334	208	256	400	358	370	276	364	500	AO
Sulphide	mg/L	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.05	AO
Tannin & Lignin	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	-	-
Total Kjeldahl Nitrogen	mg/L	0.1	0.2	0.3	0.3	0.2	0.1	ND (0.1)	0.2	-	-
Total Organic Nitrogen[6]	mg/L	0.07	0.03	0.13	0.01	0.13	0.08	ND (0.1)	0.15	0.15	MAC
Turbidity	NTU	0.2	0.2	0.1	0.2	0.1	0.4	ND (0.1)	0.1	5	AO
Anions											
Chloride	mg/L	18	5	4	50	27	30	15	43	250	AO
Fluoride	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	0.1	ND (0.1)	ND (0.1)	1.5	MAC
Nitrate as N	mg/L	1.5	1.6	3	2.5	4.9	2.7	1.8	6.5	10[4]	MAC
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	1.0[4]	MAC
Sulphate	mg/L	14	3	13	21	18	16	7	7	500	AO
Metals											
Mercury	mg/L	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	N/A	N/A	0.001	MAC
Aluminum	mg/L	ND (0.001)	0.014	0.001	ND (0.001)	ND (0.001)	N/A	N/A	N/A	0.1	OG
Antimony	mg/L	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	N/A	N/A	N/A	0.006	MAC
Arsenic	mg/L	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A	N/A	N/A	0.025	MAC
Barium	mg/L	0.576	0.136	0.748	0.231	0.496	N/A	N/A	N/A	1	MAC
Boron	mg/L	0.01	0.01	0.02	ND (0.01)	0.01	N/A	N/A	N/A	5	MAC
Cadmium	mg/L	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	N/A	N/A	0.005	MAC
Calcium	mg/L	76.1	56.7	69.4	91	85.6	75.9	57.8	60.9	-	-
Chromium	mg/L	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)	N/A	N/A	N/A	0.05	MAC
Chromium (VI)	ug/L	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A	N/A	N/A	-	-
Copper	mg/L	0.0015	0.002	0.0028	0.0369	0.0135	N/A	N/A	N/A	1	AO
Iron	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	0.3	AO
Lead	mg/L	0.0002	0.0001	ND (0.0001)	ND (0.0001)	ND (0.0001)	N/A	N/A	N/A	0.01	MAC
Magnesium	mg/L	23.5	13.1	15.8	16.2	17	26.8	21.4	16.2	-	-
Manganese	mg/L	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.05	AO
Potassium	mg/L	2.1	0.9	1.3	1.3	5.9	2.3	1.4	4.9	-	-
Selenium	mg/L	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	N/A	N/A	N/A	0.01	MAC
Sodium	mg/L	10.2	2	2.4	34.1	20	15.7	7.2	35.2	200 (20)[5]	AO
Strontium		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Uranium	mg/L	0.0017	0.0003	0.0018	0.0003	0.0005	N/A	N/A	N/A	0.02	MAC
Zinc	mg/L	ND (0.005)	0.011	0.006	0.016	ND (0.005)	N/A	N/A	N/A	5	AO

March 2022 Additional Nitrate Sampling Results

Private Well	Sampling Date	Nitrate (N) (mg/L)
1804 Drummond 1	23-Mar-22	3.6
1802 Drummond 1	23-Mar-22	2.6
1801 Drummond 1	23-Mar-22	0.7
1772 Drummond 1	23-Mar-22	2
1715 Drummond 1	23-Mar-22	4.5
1700 Drummond 1	23-Mar-22	5.5
1699 Drummond 1	23-Mar-22	3.2
1660 Drummond 1	23-Mar-22	4.8
1562 Drummond 1	23-Mar-22	1.8
1548 Drummond 1	23-Mar-22	2.7
3935 Drummond 2	23-Mar-22	0.6
4005 Drummond 2	23-Mar-22	3.1
4033 Drummond 2	23-Mar-22	0.7
4038 Drummond 2	23-Mar-22	1.9
4063 Drummond 2	23-Mar-22	5.1

NOTES:

1. MAC = Maximum Acceptable Concentration;
2. OG = Operational Guideline
3. AO = Aesthetic Objective
4. The total of Nitrate and Nitrite should not exceed 10 mg/litre.
5. The aesthetic objective for sodium is 200 mg/litre. The local medical officer of health should be notified when the sodium concentration exceeds 20 mg/litre for persons on sodium restricted diets.
6. Organic Nitrogen = Total Kjeldahl Nitrogen - $N\text{-}NH_3$ and should not exceed 0.15 mg/litre.
7. '-' signifies no value provided in the Standards.
8. Values listed in Table 3 in MOE Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment, August 1996
9. Higher, iron-related colour may be removed by manganese greensand treatment; however, the nature of the constituents causing excessive colour must be determined.
10. 'ND' = No concentration detected above method detection limit
11. 'NA' = Parameter not analyzed

Regional Nitrate Sampling Results

Private Well	UTM N	UTM E	Nitrate (N) (mg/L)	Sampling Date
PW-1804 Drummond 1*	4973521	403950	3.6	23-Mar-22
PW-1802 Drummond 1*	4973480	403975	2.6	23-Mar-22
PW-1801 Drummond 1*	4973312	404064	0.7	23-Mar-22
PW-1772 Drummond 1*	4973503	404031	2	23-Mar-22
PW-1715 Drummond 1*	4973595	404341	4.5	23-Mar-22
PW-1700 Drummond 1*	4973868	404158	5.5	23-Mar-22
PW-1699 Drummond 1*	4973652	404392	3.2	23-Mar-22
PW-1562 Drummond 1*	4974135	404775	1.8	23-Mar-22
PW-1548 Drummond 1*	4974212	404819	2.7	23-Mar-22
PW-3935 Drummond 2*	4974823	403614	0.6	23-Mar-22
PW-4005 Drummond 2*	4974656	403400	3.1	23-Mar-22
PW-4033 Drummond 2*	4974545	403299	0.7	23-Mar-22
PW-4038 Drummond 2*	4974558	403167	1.9	23-Mar-22
PW-4063 Drummond 2	4974387	403167	2.2	6-Jul-22
TW-01	4973969	404586	3.4	10-Mar-22
TW-02	4974018	404245	0.2	10-Mar-22
TW-03	4974473	404177	3.2	11-Mar-22
TW-04	4974600	403784	1.7	8-Mar-22
TW-05	4974909	403792	2.3	8-Mar-22
PW-1562	4974135	404775	1.5	21-Apr-21
PW-1744	4973599	404100	4.9	21-Apr-21
PW-3896	4975055	403655	1.6	21-Apr-21
PW-3928	4974770	403432	3	21-Apr-21
TW-1710	4973660	404269	3.6	21-Mar-22
TW22-01	4973922	404393	1.7	24-May-22
TW22-6	4974603	403474	0.6	11-Jul-22
TW22-7	4973800	404336	2.4	12-Jul-22
TW22-8	4974390	404044	2.5	11-Jul-22
PW-746 Daniel Crain	4975792	406530	2.7	4-Aug-21
PW-853 Leslie Crain	4976080	406144	1.8	4-Aug-21
PW-981 Leslie Crain	4976361	405897	6.5	4-Aug-21
PW 977 Leslie Crain	4976346	405939	1.4	4-Apr-22
PW 966 Leslie Crain	4976268	406088	2	4-Apr-22
PW 885 Leslie Crain	4976153	406088	1.1	4-Apr-22
PW 727 Daniel Crain	4975653	406530	1.8	4-Apr-22
PW 850 Daniel Crain	4976066	406319	0.6	5-Apr-22
PW 3246 Drummond 2	4977104	406264	0.1	6-Apr-22
PW 3672 Drummond 2	4975703	404583	1.5	6-Apr-22
PW 1082 Drummond 1	4975653	406676	3.8	5-Apr-22
PW 124 Ebert Road	4975225	406056	1	5-Apr-22
PW 230 Ebert Road	4975502	405775	1.4	5-Apr-22
PW 306 Ebert Road	4975912	405450	1.4	5-Apr-22
PW 941 Drummond 1	4975990	407274	0.9	5-Apr-22
PW 3401 Drummond 2	4976529	405702	1	5-Apr-22

Note:

* Samples collected by client and analyzed for nitrate only. Other samples were collectd by GEMTEC staff, following typical private well sampling methodology including the disinfection of sampled taps, wearing nitrile gloves, letting the water run for 5 to 10 minutes, and monitoring field parameters and chlorine residual concentrations at locations where additional subdivision package parameters were analyzed.

Summary of Fellinger's Mills Estate Private Well Sampling Results

Parameter	Units	MDL	Regulation		PW-746	PW-853	PW-98	PW 977	PW 966	PW 885	PW 727	PW 850	PW 3246	PW 3672	PW 1082	PW 124	PW 230	PW 306	PW 941	PW 3401
			Ontario Drinking Water Standards - Maximum Allowable Concentration	Ontario Drinking Water Standards - Aesthetic Objectives	746 Daniel Crain	853 Leslie Crain	981 Leslie Crain	977 Leslie Crain	966 Leslie Crain	885 Leslie Crain	727 Daniel Crain	850 Daniel Crain	3246 Drummond Concession Rd 2	3672 Drummond Concession Rd 2	1082 Drummond Concession Rd 1	124 Ebert Road	230 Ebert Road	306 Ebert Road	941 Drummond Concession Rd 1	3401 Drummond Concession Rd 2
					08/04/2021	08/04/2021	08/04/2021	04/04/2022	04/04/2022	04/04/2022	04/04/2022	04/05/2022	04/06/2022	04/06/2022	04/05/2022	04/05/2022	04/05/2022	04/05/2022	04/05/2022	04/05/2022
Microbiological Parameters																				
E. Coli	CFU/100mL	1	0 CFU/100 mL (0 CFU/100mL)		ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	-	-	-	-	-	-	-	-
Fecal Coliforms	CFU/100mL	1			ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	-	-	-	-	-	-	-	-
Total Coliforms	CFU/100mL	1	0 CFU/100 mL (0 CFU/100mL)		ND (1)	ND (1)	ND (1)	1	ND (1)	ND (1)	ND (1)	1	-	-	-	-	-	-	-	-
Heterotrophic Plate Count	CFU/mL	10			30	>2000	10	ND (10)	40	ND (10)	10	10	-	-	-	-	-	-	-	-
General Inorganics																				
Alkalinity, total	mg/L	5		500 mg/L	289	243	243	250	264	262	214	232	-	-	-	-	-	-	-	-
Ammonia as N	mg/L	0.01			0.02	0.03	0.05	0.02	0.02	0.01	0.03	ND (0.01)	-	-	-	-	-	-	-	-
Dissolved Organic Carbon	mg/L	0.5		5 mg/L	1.5	4.2	3.6	2.7	1.9	2.3	1.9	2.2	-	-	-	-	-	-	-	-
Colour	TCU	2			2	2	2	3	ND (2)	ND (2)	2	4	-	-	-	-	-	-	-	-
Colour, apparent	ACU	2		5 TCU (5 ACU)	N/A	N/A	N/A	4	2	3	4	29	-	-	-	-	-	-	-	-
Conductivity	uS/cm	5			692	544	681	742	576	584	491	468	-	-	-	-	-	-	-	-
Hardness	mg/L				300	233	219	247	257	252	211	237	-	-	-	-	-	-	-	-
pH	pH Units	0.1			7.6	7.7	7.7	7.4	7.5	7.5	7.6	7.6	-	-	-	-	-	-	-	-
Phenolics	mg/L	0.001			ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	10		500 mg/L	370	276	364	378	308	302	246	264	-	-	-	-	-	-	-	-
Sulphide	mg/L	0.02		0.05 mg/L	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	-	-	-	-	-	-	-	-
Tannin & Lignin	mg/L	0.1			ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen	mg/L	0.1			0.1	ND (0.1)	0.2	0.3	0.2	0.2	0.2	0.2	-	-	-	-	-	-	-	-
Turbidity	NTU	0.1		5 NTU	0.4	ND (0.1)	0.1	0.2	ND (0.1)	0.2	0.3	4.4	-	-	-	-	-	-	-	-
Anions																				
Chloride	mg/L	1		250 mg/L	30	15	43	83	19	26	22	13	-	-	-	-	-	-	-	-
Fluoride	mg/L	0.1	1.5 mg/L		0.1	ND (0.1)	ND (0.1)	0.1	0.1	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	0.1	10 mg/L		2.7	1.8	6.5	1.4	2	1.1	1.8	0.6	ND (0.1)	1.5	3.8	1	1.4	1.4	0.9	1
Nitrite as N	mg/L	0.05	1 mg/L		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Sulphate	mg/L	1		500 mg/L	16	7	7	12	10	9	8	11	-	-	-	-	-	-	-	N/A
Metals																				
Calcium	mg/L	0.1			75.9	57.8	60.9	66	65.3	63.9	53	60.2	-	-	-	-	-	-	-	-
Iron	mg/L	0.1		0.3 mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	0.2	-	-	-	-	-	-	-	-
Magnesium	mg/L	0.2			26.8	21.4	16.2	19.9	22.8	22.5	19.2	21.1	-	-	-	-	-	-	-	-
Manganese	mg/L	0.005		0.05 mg/L	ND (0.005)	ND (0.005)	ND (0.005)	0.011	ND (0.005)	ND (0.005)	0.01	0.033	-	-	-	-	-	-	-	-
Potassium	mg/L	0.1			2.3	1.4	4.9	7.8	3.5	2.6	1.2	1.3	-	-	-	-	-	-	-	-
Sodium	mg/L	0.2	20 mg/L	200 mg/L	15.7	7.2	35.2	41	11.6	15	11.3	5.9	-	-	-	-	-	-	-	-

NOTES:

1. MAC = Maximum Acceptable Concentration;
2. OG = Operational Guideline
3. AO = Aesthetic Objective
4. The total of Nitrate and Nitrite should not exceed 10 mg/litre.
5. The aesthetic objective for sodium is 200 mg/litre. The local medical officer of health should be notified when the sodium concentration exceeds 20 mg/litre for persons on sodium restricted diets.
6. Organic Nitrogen = Total Kjeldahl Nitrogen - $N\text{-}NH_3$ and should not exceed 0.15 mg/litre.
7. '-' signifies no value provided in the Standards.
8. Values listed in Table 3 in MOE Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment, August 1996
9. Higher, iron-related colour may be removed by manganese greensand treatment; however, the nature of the constituents causing excessive colour must be determined.
10. 'ND' = No concentration detected above method detection limit
11. 'NA' = Parameter not analyzed

8. Values listed in Table 3 in MOE Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment, August 1996
9. Higher, iron-related colour may be removed by manganese greensand treatment; however, the nature of the constituents causing excessive colour must be determined.
10. 'ND' = No concentration detected above method detection limit
11. 'NA' = Parameter not analyzed

On-Site Nitrate A	**2.2**	**mg/L**
Off-Site Nitrate A	**1.4**	**mg/L**

Off-Site Field Sampling Water Quality Results

Well	Date	Temp (°C)	EC[1] (µS/cm)	pH (-)	Turbidity[2] (NTU)	TDS[3] (ppm)	Total Chlorine (mg/litre)	Colour (ACU[4])	Colour (TCU[5])
Homeowner Sampling - Vicinity of Burns Farm									
PW-3896	21-Apr-21	9	410	7.14	1.07	200	0.02	<1	<1
PW-3928	21-Apr-21	8.2	494	7.38	1.23	238	0.05	<1	<1
PW-1802	21-Apr-21	9.1	767	7.24	0.67	381	0.19	14	<1
PW-1744	21-Apr-21	8.2	690	7.28	1.56	347	0	4	<1
PW-1562	21-Apr-21	9.6	604	7.7	0.88	301	0.1	37	<1
Homeowner Sampling - Nearby Subdivision - Daniel Crain Dr.									
PW-746	4-Aug-21	11.4	658	-	0.41	327	0.12	<1	<1
PW-853	4-Aug-21	12.3	510	-	0.36	255	0.09	<1	<1
PW-981	4-Aug-21	10.9	639	-	0.34	319	0.11	<1	<1

Notes:

1. EC: Electrical Conductivity
2. Turbidity is taken to be the average of three consecutive measurements.
3. TDS: Total Dissolved Solids
4. ACU: Actual Colour Units (unfiltered)
5. TCU: True Colour Units (field-filtered using 0.45-micron filter

Results of Homeowner Interviews

Test Well ID	Water Quantity Comments	Water Quality Comments
Homeowner Sampling - Vicinity of Burns Farm		
PW-3896	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted no adverse occurrences or conditions during past year; noted use of conventional water softener
PW-3928	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted presence of iron in drinking water; noted use of iron treatment system
PW-1802	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted no adverse occurrences or conditions during past year
PW-1744	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted no adverse occurrences or conditions during past year
PW-1562	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted hard water and presence of iron; noted use of conventional water softener
Homeowner Sampling - Nearby Subdivision - Daniel Crain Dr.		
PW-746	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted no adverse occurrences or conditions during past year
PW-853	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted no adverse occurrences or conditions during past year
PW-981	• Respondent noted no adverse occurrences or conditions during past year	• Respondent noted hard water and presence of iron; noted use of conventional water softener

Off-Site Field Sampling Water Quality Results

Well	Date	Temp (°C)	EC[1] (µS/cm)	pH (-)	Turbidity[2] (NTU)	TDS[3] (ppm)	Total Chlorine (mg/litre)	Colour (ACU[4])	Colour (TCU[5])
Homeowner Sampling - Vicinity of Burns Farm									
PW-3896	21-Apr-21	9	410	7.14	1.07	200	<0.02	<5	<5
PW-3928	21-Apr-21	8.2	494	7.38	1.23	238	<0.02	<5	<5
PW-1802	21-Apr-21	9.1	767	7.24	0.67	381	<0.02	14	<5
PW-1744	21-Apr-21	8.2	690	7.28	1.56	347	<0.02	<5	<5
PW-1562	21-Apr-21	9.6	604	7.7	0.88	301	<0.02	37	<5
Homeowner Sampling - Fellinger Mills Estates Subdivision									
PW-746	4-Aug-21	11.4	658	-	0.41	327	<0.02	<5	<5
PW-853	4-Aug-21	12.3	510	-	0.36	255	<0.02	<5	<5
PW-981	4-Aug-21	10.9	639	-	0.34	319	<0.02	<5	<5
PW-124	8-Apr-22	13.6	480	7.69	-	230	-	-	-
PW-230	5-Apr-22	12.5	560	7.64	-	280	-	-	-
PW-306	5-Apr-22	16.3	600	7.51	-	300	-	-	-
PW-727	4-Apr-22	9.4	510	7.72	0.63	250	<0.02	<5	<5
PW-850	5-Apr-22	11.9	550	7.5	0.59	280	<0.02	<5	<5
PW-885	4-Apr-22	10.7	600	7.6	0.54	300	<0.02	<5	<5
PW-941	4-Apr-22	11.4	490	7.7	0.62	250	-	-	-
PW-966	4-Apr-22	9.9	600	7.74	0.76	300	<0.02	<5	<5
PW-1082	5-Apr-22	12.8	650	7.61	0.48	320	-	-	-
PW-3246	6-Apr-22	11.9	760	7.46	1.8	380	-	-	-
PW-3401	6-Apr-22	13.5	750	7.52	0.63	380	-	-	-
PW-3642	6-Apr-22	13.5	1000	7.37	0.45	500	-	-	-

Notes:

1. EC: Electrical Conductivity
2. Turbidity is taken to be the average of three consecutive measurements.
3. TDS: Total Dissolved Solids
4. ACU: Actual Colour Units (unfiltered)
5. TCU: True Colour Units (field-filtered using 0.45-micron filter

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON0 K2K 2A9
Attn: Brent Redmond

Client PO:
Project: 100227.008
Custody: 12982

Report Date: 28-Apr-2021
Order Date: 21-Apr-2021

Order #: 2117478

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2117478-01	PW-1562
2117478-02	PW-3896
2117478-03	PW-3928
2117478-04	PW-1802
2117478-05	PW-1744

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 28-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 21-Apr-2021

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	23-Apr-21	23-Apr-21
Ammonia, as N	EPA 351.2 - Auto Colour	28-Apr-21	28-Apr-21
Anions	EPA 300.1 - IC	27-Apr-21	27-Apr-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	22-Apr-21	22-Apr-21
Colour	SM2120 - Spectrophotometric	22-Apr-21	22-Apr-21
Colour, apparent	SM2120 - Spectrophotometric	22-Apr-21	22-Apr-21
Conductivity	EPA 9050A- probe @25 °C	23-Apr-21	23-Apr-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	23-Apr-21	23-Apr-21
E. coli	MOE E3407	22-Apr-21	22-Apr-21
Fecal Coliform	SM 9222D	22-Apr-21	22-Apr-21
Heterotrophic Plate Count	SM 9215C	22-Apr-21	22-Apr-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	22-Apr-21	28-Apr-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	23-Apr-21	23-Apr-21
pH	EPA 150.1 - pH probe @25 °C	23-Apr-21	23-Apr-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	28-Apr-21	28-Apr-21
Hardness	Hardness as CaCO3	23-Apr-21	23-Apr-21
Sulphide	SM 4500SE - Colourimetric	27-Apr-21	27-Apr-21
Tannin/Lignin	SM 5550B - Colourimetric	22-Apr-21	22-Apr-21
Total Coliform	MOE E3407	22-Apr-21	22-Apr-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	26-Apr-21	27-Apr-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	23-Apr-21	26-Apr-21
Turbidity	SM 2130B - Turbidity meter	22-Apr-21	22-Apr-21

Certificate of Analysis

Report Date: 28-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 21-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	PW-1562	PW-3896	PW-3928	PW-1802
	Sample Date:	21-Apr-21 14:00	21-Apr-21 10:15	21-Apr-21 11:15	21-Apr-21 12:15
	Sample ID:	2117478-01	2117478-02	2117478-03	2117478-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	ND	ND
Fecal Coliforms	1 CFU/100 mL	ND	ND	ND	ND
Total Coliforms	1 CFU/100 mL	ND	ND	ND	ND
Heterotrophic Plate Count	10 CFU/mL	<10	<10	<10	<10
General Inorganics					
Alkalinity, total	5 mg/L	292	204	238	295
Ammonia as N	0.01 mg/L	0.03	0.17	0.17	0.29
Dissolved Organic Carbon	0.5 mg/L	1.0	1.5	1.8	1.6
Colour	2 TCU	<2	2	2	2
Colour, apparent	2 ACU	3	3	4	4
Conductivity	5 uS/cm	620	411	496	751
Hardness	mg/L	287	196	238	294
pH	0.1 pH Units	8.0	8.0	8.0	7.8
Phenolics	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	10 mg/L	334	208	256	400
Sulphide	0.02 mg/L	<0.02	<0.02	<0.02	<0.02
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	0.2	0.3	0.3
Turbidity	0.1 NTU	0.2	0.2	0.1	0.2
Anions					
Chloride	1 mg/L	18	5	4	50
Fluoride	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Nitrate as N	0.1 mg/L	1.5	1.6	3.0	2.5
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	<0.05
Sulphate	1 mg/L	14	3	13	21
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum	0.001 mg/L	<0.001	0.014	0.001	<0.001
Antimony	0.0005 mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Barium	0.001 mg/L	0.576	0.136	0.748	0.231
Boron	0.01 mg/L	0.01	0.01	0.02	<0.01
Cadmium	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	0.1 mg/L	76.1	56.7	69.4	91.0
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001

Certificate of Analysis

Report Date: 28-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 21-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	PW-1562	PW-3896	PW-3928	PW-1802
	Sample Date:	21-Apr-21 14:00	21-Apr-21 10:15	21-Apr-21 11:15	21-Apr-21 12:15
	Sample ID:	2117478-01	2117478-02	2117478-03	2117478-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Drinking Water
Chromium (VI)	0.010 mg/L	<0.010	<0.010	<0.010	<0.010
Copper	0.0005 mg/L	0.0015	0.0020	0.0028	0.0369
Iron	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Lead	0.0001 mg/L	0.0002	0.0001	<0.0001	<0.0001
Magnesium	0.2 mg/L	23.5	13.1	15.8	16.2
Manganese	0.005 mg/L	<0.005	<0.005	<0.005	<0.005
Potassium	0.1 mg/L	2.1	0.9	1.3	1.3
Selenium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Sodium	0.2 mg/L	10.2	2.0	2.4	34.1
Uranium	0.0001 mg/L	0.0017	0.0003	0.0018	0.0003
Zinc	0.005 mg/L	<0.005	0.011	0.006	0.016

Certificate of Analysis

Report Date: 28-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 21-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	PW-1744	-	-	-
	Sample Date:	21-Apr-21 13:00	-	-	-
	Sample ID:	2117478-05	-	-	-
	MDL/Units	Drinking Water	-	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	-	-	-
Fecal Coliforms	1 CFU/100 mL	ND	-	-	-
Total Coliforms	1 CFU/100 mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	293	-	-	-
Ammonia as N	0.01 mg/L	0.07	-	-	-
Dissolved Organic Carbon	0.5 mg/L	2.2	-	-	-
Colour	2 TCU	3	-	-	-
Colour, apparent	2 ACU	5	-	-	-
Conductivity	5 uS/cm	674	-	-	-
Hardness	mg/L	284	-	-	-
pH	0.1 pH Units	7.9	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	358	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	-	-	-
Turbidity	0.1 NTU	0.1	-	-	-
Anions					
Chloride	1 mg/L	27	-	-	-
Fluoride	0.1 mg/L	<0.1	-	-	-
Nitrate as N	0.1 mg/L	4.9	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	18	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	-	-	-
Aluminum	0.001 mg/L	<0.001	-	-	-
Antimony	0.0005 mg/L	<0.0005	-	-	-
Arsenic	0.001 mg/L	<0.001	-	-	-
Barium	0.001 mg/L	0.496	-	-	-
Boron	0.01 mg/L	0.01	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-
Calcium	0.1 mg/L	85.6	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-

Certificate of Analysis

Report Date: 28-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 21-Apr-2021

Client PO:

Project Description: 100227.008

	Client ID:	PW-1744	-	-	-
	Sample Date:	21-Apr-21 13:00	-	-	-
	Sample ID:	2117478-05	-	-	-
	MDL/Units	Drinking Water	-	-	-
Chromium (VI)	0.010 mg/L	<0.010	-	-	-
Copper	0.0005 mg/L	0.0135	-	-	-
Iron	0.1 mg/L	<0.1	-	-	-
Lead	0.0001 mg/L	<0.0001	-	-	-
Magnesium	0.2 mg/L	17.0	-	-	-
Manganese	0.005 mg/L	<0.005	-	-	-
Potassium	0.1 mg/L	5.9	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-
Sodium	0.2 mg/L	20.0	-	-	-
Uranium	0.0001 mg/L	0.0005	-	-	-
Zinc	0.005 mg/L	<0.005	-	-	-

Certificate of Analysis

Report Date: 28-Apr-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 21-Apr-2021

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium (VI)	ND	0.010	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	17.7	1	mg/L	17.7			0.3	10	
Fluoride	ND	0.1	mg/L	ND			NC	10	
Nitrate as N	1.50	0.1	mg/L	1.49			0.5	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	13.5	1	mg/L	13.6			0.3	10	
General Inorganics									
Alkalinity, total	290	5	mg/L	292			0.7	14	
Ammonia as N	ND	0.01	mg/L	0.032			NC	17.7	
Dissolved Organic Carbon	1.0	0.5	mg/L	1.0			1.2	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	4	2	ACU	4			0.0	12	
Conductivity	614	5	uS/cm	620			1.0	5	
pH	8.0	0.1	pH Units	8.0			0.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	312	10	mg/L	334			6.8	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	0.1			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	0.11			NC	16	
Turbidity	0.1	0.1	NTU	0.1			0.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.001	0.001	mg/L	ND			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.185	0.001	mg/L	0.181			2.0	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	138	0.1	mg/L	138			0.4	20	
Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	0.0042	0.0005	mg/L	0.0040			4.4	20	
Iron	4.1	0.1	mg/L	4.0			1.6	20	
Lead	0.0001	0.0001	mg/L	0.0001			7.2	20	
Magnesium	32.5	0.2	mg/L	31.5			3.1	20	
Manganese	0.161	0.005	mg/L	0.161			0.3	20	
Potassium	5.2	0.1	mg/L	5.3			0.8	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	236	0.2	mg/L	241			1.9	20	
Uranium	0.0001	0.0001	mg/L	0.0001			6.6	20	
Zinc	0.030	0.005	mg/L	0.029			1.6	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	BAC14
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	BAC14
Heterotrophic Plate Count	ND	10	CFU/mL	10			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	27.7	1	mg/L	17.7	99.8	77-123			
Fluoride	0.88	0.1	mg/L	ND	87.9	79-121			
Nitrate as N	2.48	0.1	mg/L	1.49	98.5	79-120			
Nitrite as N	0.963	0.05	mg/L	ND	96.3	84-117			
Sulphate	22.8	1	mg/L	13.6	92.0	74-126			
General Inorganics									
Ammonia as N	0.234	0.01	mg/L	0.032	81.0	81-124			
Dissolved Organic Carbon	11.6	0.5	mg/L	1.0	106	60-133			
Phenolics	0.022	0.001	mg/L	ND	87.0	69-132			
Total Dissolved Solids	88.0	10	mg/L	ND	88.0	75-125			
Sulphide	0.54	0.02	mg/L	ND	108	79-115			
Tannin & Lignin	1.0	0.1	mg/L	0.1	87.7	71-113			
Total Kjeldahl Nitrogen	1.98	0.1	mg/L	0.11	93.3	81-126			
Metals									
Mercury	0.0034	0.0001	mg/L	ND	112	70-130			
Aluminum	46.9	0.001	mg/L	0.772	92.2	80-120			
Antimony	45.3	0.0005	mg/L	0.273	90.0	80-120			
Arsenic	53.3	0.001	mg/L	0.161	106	80-120			
Barium	216	0.001	mg/L	181	69.4	80-120			QM-07
Boron	48.4	0.01	mg/L	9.06	78.8	80-120			QM-07
Cadmium	42.8	0.0001	mg/L	0.0159	85.6	80-120			
Calcium	9820	0.1	mg/L	ND	98.2	80-120			
Chromium (VI)	0.192	0.010	mg/L	ND	96.0	70-130			
Chromium	57.1	0.001	mg/L	0.410	113	80-120			
Copper	50.7	0.0005	mg/L	4.00	93.3	80-120			
Iron	6380	0.1	mg/L	4030	94.0	80-120			
Lead	41.0	0.0001	mg/L	0.126	81.7	80-120			
Magnesium	41500	0.2	mg/L	31500	99.6	80-120			
Manganese	208	0.005	mg/L	161	93.8	80-120			
Potassium	16200	0.1	mg/L	5250	110	80-120			
Selenium	45.8	0.001	mg/L	0.075	91.5	80-120			
Sodium	9270	0.2	mg/L	ND	92.7	80-120			
Uranium	44.2	0.0001	mg/L	0.131	88.2	80-120			
Zinc	68.2	0.005	mg/L	29.3	77.8	80-120			QM-07

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

BAC14 : A2C - Background counts greater than 200

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACE LABORATORIES L

Paracel ID: 2117478

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Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 12982
2117478	

Client Name:	GEMTEC	Project Ref:	100227.008	Waterworks Name:		Samples Taken By:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:		Name:	Brent Redmond
Address:		PO #:		Address:		Signature:	
After Hours Contact:		E-mail:	brent.redmond@GEMTEC.ca			Page ___ of ___	N/A
Telephone:	343-571-9556	Fax:		Public Health Unit:		Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☐ 4 day	

Samples Submitted Under: (Indicate **ONLY** one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☑ Other O. Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☐ N/A

Are these samples for human consumption?: ☐ Yes ☒ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Escherichia coli / Bacteria	Heavy Metals	Cr(VI) & Hg
1	Barnes Farm	PW-1562	R	G			April 21, 21	14:00	11							/	/	/
2	"	PW-3896	R	G			"	10:15	"							/	/	/
3	"	PW-3928	R	G			"	11:15	"							/	/	/
4	"	PW-1802	R	G			"	12:15	"							/	/	/
5	"	PW-1744	R	G			"	13:00	"							/	/	/
6																		
7																		
8																		
9																		
10																		

Comments: Colour in TCH & ACL

Method of Delivery: Drop Box

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Sunnyvale Belmont	Verified By:
Relinquished By (Print): Brent Redmond	Date/Time: Apr 21/21 1653	Date/Time: APR 22, 2021 10.55	Date/Time: April 22, 2021 12:04
Date/Time: April 21, 2021	Temperature: 10.2 °C	Temperature: 5.3 °C	pH Verified: ☑ By:

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www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO:
Project: 100227.008
Custody: 15540

Report Date: 9-Aug-2021
Order Date: 4-Aug-2021

Order #: 2132329

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2132329-01	PW-746
2132329-02	PW-853
2132329-03	PW-981

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 09-Aug-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 4-Aug-2021

Client PO:

Project Description: 100227.008

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	5-Aug-21	5-Aug-21
Ammonia, as N	EPA 351.2 - Auto Colour	9-Aug-21	9-Aug-21
Anions	EPA 300.1 - IC	5-Aug-21	5-Aug-21
Colour	SM2120 - Spectrophotometric	5-Aug-21	5-Aug-21
Conductivity	EPA 9050A- probe @25 °C	5-Aug-21	5-Aug-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	6-Aug-21	6-Aug-21
E. coli	MOE E3407	5-Aug-21	5-Aug-21
Fecal Coliform	SM 9222D	5-Aug-21	5-Aug-21
Heterotrophic Plate Count	SM 9215C	5-Aug-21	5-Aug-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	6-Aug-21	6-Aug-21
pH	EPA 150.1 - pH probe @25 °C	5-Aug-21	5-Aug-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	5-Aug-21	5-Aug-21
Hardness	Hardness as CaCO3	6-Aug-21	6-Aug-21
Sulphide	SM 4500SE - Colourimetric	9-Aug-21	9-Aug-21
Tannin/Lignin	SM 5550B - Colourimetric	6-Aug-21	6-Aug-21
Total Coliform	MOE E3407	5-Aug-21	5-Aug-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	6-Aug-21	9-Aug-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	6-Aug-21	6-Aug-21
Turbidity	SM 2130B - Turbidity meter	6-Aug-21	6-Aug-21

Certificate of Analysis

Report Date: 09-Aug-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 4-Aug-2021

Client PO:

Project Description: 100227.008

	Client ID:	PW-746	PW-853	PW-981	-
	Sample Date:	04-Aug-21 11:30	04-Aug-21 12:15	04-Aug-21 13:00	-
	Sample ID:	2132329-01	2132329-02	2132329-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	ND	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	ND	-
Total Coliforms	1 CFU/100 mL	ND	ND	ND	-
Heterotrophic Plate Count	10 CFU/mL	30	>2000	10	-
General Inorganics					
Alkalinity, total	5 mg/L	289	243	243	-
Ammonia as N	0.01 mg/L	0.02	0.03	0.05	-
Dissolved Organic Carbon	0.5 mg/L	1.5	4.2	3.6	-
Colour	2 TCU	2	2	2	-
Conductivity	5 uS/cm	692	544	681	-
Hardness	mg/L	300	233	219	-
pH	0.1 pH Units	7.6	7.7	7.7	-
Phenolics	0.001 mg/L	<0.001	<0.001	<0.001	-
Total Dissolved Solids	10 mg/L	370	276	364	-
Sulphide	0.02 mg/L	<0.02	<0.02	<0.02	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	<0.1	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	<0.1	0.2	-
Turbidity	0.1 NTU	0.4	<0.1	0.1	-
Anions					
Chloride	1 mg/L	30	15	43	-
Fluoride	0.1 mg/L	0.1	<0.1	<0.1	-
Nitrate as N	0.1 mg/L	2.7	1.8	6.5	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	-
Sulphate	1 mg/L	16	7	7	-
Metals					
Calcium	0.1 mg/L	75.9	57.8	60.9	-
Iron	0.1 mg/L	<0.1	<0.1	<0.1	-
Magnesium	0.2 mg/L	26.8	21.4	16.2	-
Manganese	0.005 mg/L	<0.005	<0.005	<0.005	-
Potassium	0.1 mg/L	2.3	1.4	4.9	-
Sodium	0.2 mg/L	15.7	7.2	35.2	-

Certificate of Analysis

Report Date: 09-Aug-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 4-Aug-2021

Client PO:

Project Description: 100227.008

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Calcium	ND	0.1	mg/L						
Iron	ND	0.1	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Sodium	ND	0.2	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	3.99	1	mg/L	4.01			0.5	10	
Fluoride	0.24	0.1	mg/L	0.23			4.0	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	24.6	1	mg/L	24.6			0.1	10	
General Inorganics									
Alkalinity, total	229	5	mg/L	234			2.1	14	
Ammonia as N	0.136	0.01	mg/L	0.148			8.3	17.7	
Dissolved Organic Carbon	2.7	0.5	mg/L	2.1			28.8	37	
Colour	2	2	TCU	2			0.0	12	
Conductivity	489	5	uS/cm	490			0.1	5	
pH	9.3	0.1	pH Units	9.3			0.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	498	10	mg/L	488			2.0	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	0.3	0.1	mg/L	0.3			3.2	11	
Total Kjeldahl Nitrogen	0.18	0.1	mg/L	0.21			15.6	16	
Turbidity	0.4	0.1	NTU	0.4			2.6	10	
Metals									
Calcium	102	0.1	mg/L	104			1.6	20	
Iron	0.7	0.1	mg/L	0.8			2.2	20	
Magnesium	26.3	0.2	mg/L	26.8			1.9	20	
Manganese	0.166	0.005	mg/L	0.166			0.1	20	
Potassium	4.1	0.1	mg/L	4.2			2.0	20	
Sodium	16.9	0.2	mg/L	17.5			3.1	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	30			100.0	30	BAC04

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	13.2	1	mg/L	4.01	92.0	77-123			
Fluoride	1.06	0.1	mg/L	0.23	83.3	79-121			
Nitrate as N	0.93	0.1	mg/L	ND	93.1	79-120			
Nitrite as N	0.904	0.05	mg/L	ND	90.4	84-117			
Sulphate	34.3	1	mg/L	24.6	96.9	74-126			
General Inorganics									
Ammonia as N	0.420	0.01	mg/L	0.148	109	81-124			
Dissolved Organic Carbon	13.1	0.5	mg/L	2.1	110	60-133			
Phenolics	0.025	0.001	mg/L	ND	99.7	69-132			
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.54	0.02	mg/L	ND	107	79-115			
Tannin & Lignin	1.3	0.1	mg/L	0.3	91.9	71-113			
Total Kjeldahl Nitrogen	2.17	0.1	mg/L	0.21	97.9	81-126			
Metals									
Calcium	14400	0.1	mg/L	6020	83.7	80-120			
Iron	2970	0.1	mg/L	760	88.6	80-120			
Magnesium	9820	0.2	mg/L	1480	83.4	80-120			
Manganese	207	0.005	mg/L	166	81.4	80-120			
Potassium	13500	0.1	mg/L	4180	92.8	80-120			
Sodium	25500	0.2	mg/L	17500	80.5	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

BAC04 : Duplicate QC data falls within method prescribed 95% confidence limits.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD

Paracel ID: 2132329

Paracel Order Number	Chain Of Custody
2132329 - 100227.008	Ontario Drinking Water Samples
2132330 - 100227.032	№ 15540

Client Name:	GEMTEC	Project Ref:	100227.008 / 100227.032	Waterworks Name:	Samples Taken By:
Contact Name:	Jean-Philippe	Quote #:	Gobeil	Waterworks Number:	Name: Brent Redmond
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	Jean-Philippe.gobeil@GEMTEC.ca		Page ____ of ____
Telephone:	418-870-7157	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day

Samples Submitted Under: (Indicate **ONLY** one)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☒ Other Oreg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☒ N/A

Are these samples for human consumption?: ☐ Yes ☒ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subdivision Package	Distribution
1		PW-746	R	G	N	N	Aug. 4, 21	11:30	8							X	X
2		PW-853	R	G	N	N	"	12:15	8							X	X
3		PW-981	R	G	N	N	"	13:00	8							X	X
4		PW-1971	R	G	N	N	"	14:00	8							X	X
5																	
6																	
7																	
8																	
9																	
10																	

Comments: Colour in Acid TCH

- PW-746, 853 & 981: P#: 100227.008
- PW-1971 : P#: 100227.032

Method of Delivery: Walk-in

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Surrey Pam Dolmai	Verified By:
Relinquished By (Print): Brent Redmond	Date/Time: 08/04/21 3:50 pm	Date/Time: AUG 05, 2021 10.50	Date/Time: August 5, 2021 11:15
Date/Time: Aug 4, 21 - 15:47	Temperature: 13.9 °C	Temperature: 8.8 °C	pH Verified: ☑ By: BS

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G101660 **REPORT No. B22-07981**

Report To:

Crains Construction LTD
RR #1,
Maberly ON K0H 2B0 Canada
Attention: Wilburt Crain

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Mar-22
DATE REPORTED: 25-Mar-22
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Burns Farm Sub
P.O. NUMBER:
WATERWORKS NO.

	Parameter		Nitrite (N)	Nitrate (N)			
	Units		mg/L	mg/L			
	R.L.		0.1	0.1			
	Reference Method		SM4110C	SM4110C			
	Date Analyzed/Site		24-Mar-22/O	24-Mar-22/O			
Client I.D.	Sample I.D.	Date Collected					
1804 Drummond (1)	B22-07981-1	23-Mar-22	< 0.1	3.6			
1802 Drummond (1)	B22-07981-2	23-Mar-22	< 0.1	2.6			
1801 Drummond (1)	B22-07981-3	23-Mar-22	< 0.1	0.7			
1772 Drummond (1)	B22-07981-4	23-Mar-22	< 0.1	2.0			
1715 Drummond (1)	B22-07981-5	23-Mar-22	< 0.1	4.5			
1700 Drummond (1)	B22-07981-6	23-Mar-22	< 0.1	5.5			
1699 Drummond (1)	B22-07981-7	23-Mar-22	< 0.1	3.2			
1660 Drummond (1)	B22-07981-8	23-Mar-22	< 0.1	4.8			
1562 Drummond (1)	B22-07981-9	23-Mar-22	< 0.1	1.8			
1548 Drummond (1)	B22-07981-10	23-Mar-22	< 0.1	2.7			
3935 Drummond (2)	B22-07981-11	23-Mar-22	< 0.1	0.6			
4005 Drummond (2)	B22-07981-12	23-Mar-22	< 0.1	3.1			
4033 (2) Drummond (2)	B22-07981-13	23-Mar-22	< 0.1	0.7			
4038 (2) Drummond (2)	B22-07981-14	23-Mar-22	< 0.1	1.9			
4063 (2) Drummond (2)	B22-07981-15	23-Mar-22	< 0.1	5.1			

Michelle Dubien
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

APPENDIX F

Nitrate Dilution Calculations

Report to: Wilburt Crain
Project: 100227.008

Nitrate Dilution Calculation Worksheet - Conventional Systems

Nitrate Loading

Residential Septic Systems (assumes 1,000 L/day/lot)

Number of lots with untreated septic systems =	42	lots
Nitrate loading from untreated septic system =	40	grams/lot/day
Total annual nitrate loading from untreated systems =	613200	grams/year
Total Annual Nitrate Loading from all Systems =	**613200**	**grams/year**

Dilution Volumes

Infiltration Factors

Topography factor =	0.21
Soil factor =	0.30
Cover factor =	0.10
Combined infiltration factor =	0.61

Precipitation Infiltration

Annual water surplus =	0.39	metres/year
Annual infiltration (Water Surplus x Infiltration Factor) =	0.2379	metres/year

Infiltration Area and Infiltration Volumes

Area available for infiltration (Site Area) =	392684.3	square metres
Area available for infiltration (Site Area - Hard Surface Area) =	356742	square metres
Total Annual Volume of Infiltration (Infiltration x Area) =	84869	cubic metres/year
Annual Flow from Residential Lots (assuming 1000 L/day/lot) =	15330	cubic metres/year
Total Annual Volume Available for Dilution =	**100199**	**cubic metres/year**

Dilution Calculation

$$C_{Nitrate} = \frac{Mass}{Volume} = \frac{Annual\ Nitrate\ Loading(grams/year)}{Annual\ Dilution\ Volume(cubic\ metres/year)} = \frac{grams}{cubic\ metre} = \frac{mg}{L}$$

$$\mathbf{C_{Nitrate} = \frac{613200\ grams/year}{100199\ cubic\ metres/year} = 6.12\ mg/L}$$

$$\mathbf{C_{nitrate\_Background} = 3.40 + C_{Nitrate} = 9.52\ mg/L}$$

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

Drummond Centre WATER BUDGET MEANS FOR THE PERIOD 1985-2021 DC20492

LAT.... 45.03 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.49
LONG... 76.25 LOWER ZONE..... 45 MM A..... 1.076

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-9.2	69	19	24	1	1	0	42	58	74	303
28- 2	-8.0	55	15	29	1	1	0	43	68	75	358
31- 3	-2.0	61	33	76	8	8	0	101	21	75	418
30- 4	6.1	75	71	26	33	33	0	65	0	74	495
31- 5	13.2	75	75	0	81	81	0	10	0	57	570
30- 6	18.0	95	95	0	114	104	-10	11	0	37	666
31- 7	20.5	88	88	0	133	107	-27	2	0	17	755
31- 8	19.4	83	83	0	116	82	-34	2	0	15	838
30- 9	15.0	92	92	0	76	71	-5	5	0	31	930
31-10	8.3	88	87	1	37	37	0	18	0	64	88
30-11	1.5	75	60	10	10	10	0	49	5	74	163
31-12	-5.5	72	27	18	2	2	0	42	32	75	235
AVE	6.5	TTL	927	745	184	612	537	-76	390		

Drummond Centre STANDARD DEVIATIONS FOR THE PERIOD 1985-2021 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	3.1	27	24	23	1	1	0	39	32	5	53
28- 2	2.7	21	15	26	1	1	0	34	43	0	59
31- 3	2.4	29	22	31	5	5	0	35	43	0	68
30- 4	1.6	40	40	44	8	8	0	56	0	4	89
31- 5	1.6	30	30	0	10	10	0	17	0	23	98
30- 6	1.2	47	47	0	8	20	20	24	0	31	116
31- 7	1.4	35	35	0	9	30	33	9	0	23	128
31- 8	1.2	44	44	0	8	28	31	10	0	26	140
30- 9	1.4	40	40	0	8	13	12	17	0	27	134
31-10	1.5	34	35	4	7	7	2	26	0	18	34
30-11	1.9	29	27	10	4	4	0	33	10	3	46
31-12	3.1	26	20	14	2	2	0	25	29	0	47

DRUMMOND CENTRE WATER BUDGET MEANS FOR THE PERIOD 1985-2021 DC20492

LAT.... 45.03 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.49
LONG... 76.25 LOWER ZONE..... 45 MM A..... 1.076

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-9.2	69	19	24	1	1	0	42	58	74	303
28- 2	-8.0	55	15	29	1	1	0	43	68	75	358
31- 3	-2.0	61	33	76	8	8	0	101	21	75	418
30- 4	6.1	75	71	26	33	33	0	65	0	74	495
31- 5	13.2	75	75	0	81	81	0	10	0	57	570
30- 6	18.0	95	95	0	114	104	-10	11	0	37	666
31- 7	20.5	88	88	0	133	107	-27	2	0	17	755
31- 8	19.4	83	83	0	116	82	-34	2	0	15	838
30- 9	15.0	92	92	0	76	71	-5	5	0	31	930
31-10	8.3	88	87	1	37	37	0	18	0	64	88
30-11	1.5	75	60	10	10	10	0	49	5	74	163
31-12	-5.5	72	27	18	2	2	0	42	32	75	235
AVE	6.5 TTL	927	745	184	612	537	-76	390			

Drummond Centre STANDARD DEVIATIONS FOR THE PERIOD 1985-2021 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	3.1	27	24	23	1	1	0	39	32	5	53
28- 2	2.7	21	15	26	1	1	0	34	43	0	59
31- 3	2.4	29	22	31	5	5	0	35	43	0	68
30- 4	1.6	40	40	44	8	8	0	56	0	4	89
31- 5	1.6	30	30	0	10	10	0	17	0	23	98
30- 6	1.2	47	47	0	8	20	20	24	0	31	116
31- 7	1.4	35	35	0	9	30	33	9	0	23	128
31- 8	1.2	44	44	0	8	28	31	10	0	26	140
30- 9	1.4	40	40	0	8	13	12	17	0	27	134
31-10	1.5	34	35	4	7	7	2	26	0	18	34
30-11	1.9	29	27	10	4	4	0	33	10	3	46
31-12	3.1	26	20	14	2	2	0	25	29	0	47

Data provided by Environment Canada.

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

APPENDIX G

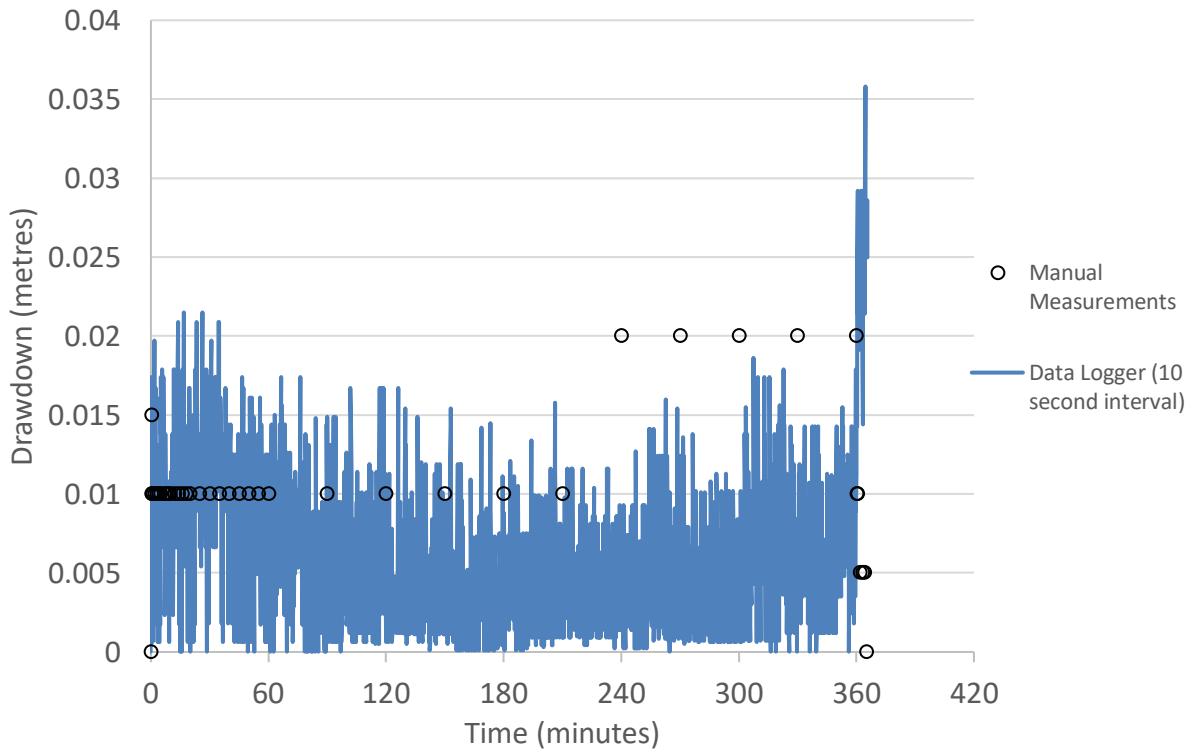
Pumping Test Drawdown and Recovery

Report to: Wilburt Crain
Project: 100227.008

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-01	P-Test Date: July 15, 2021
Analysis Performed by: JPG	Method: Constant rate	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 95 L/min	Duration: 360 minutes

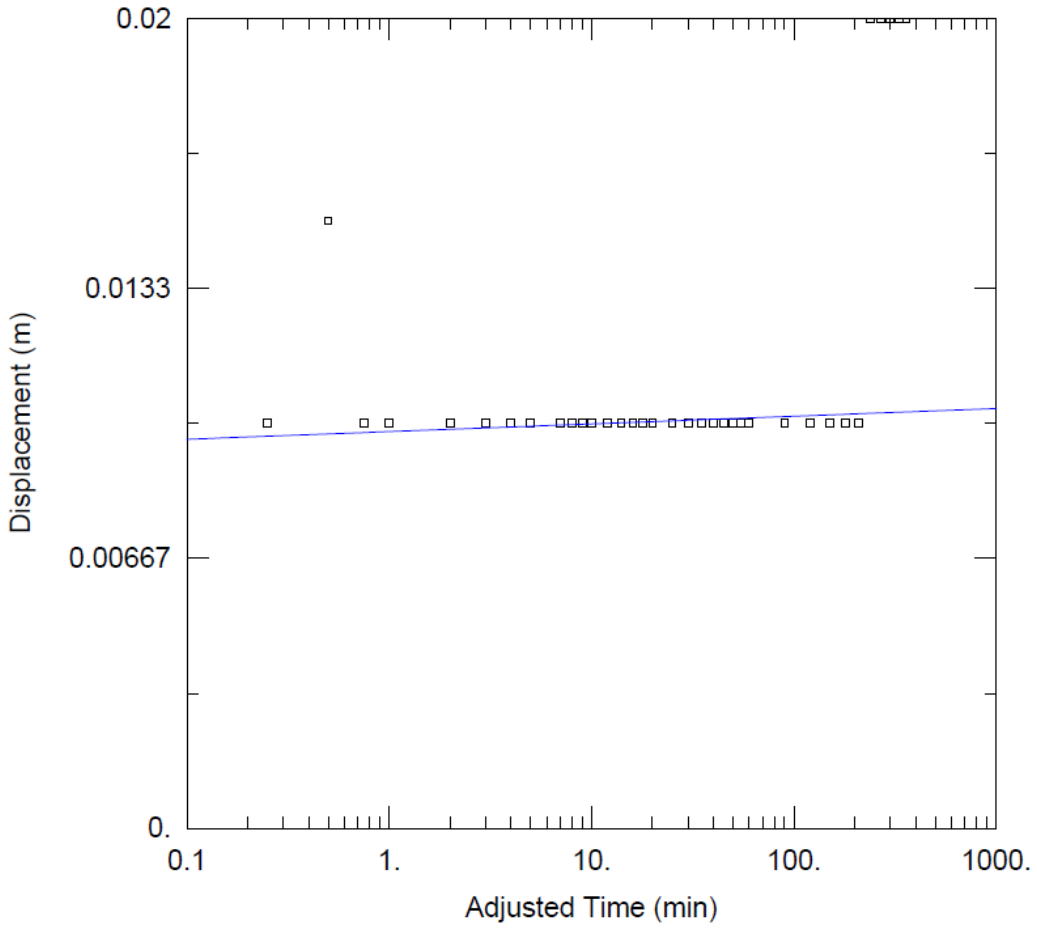
Pumping Test Data (TW-01): Drawdown and Recovery



Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 3.60 m
End of pump test (360 minutes): 3.61 m
Final water level following recovery (5-min): 3.60 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 100227.008	
	Client: Crains Construction	
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-01	P-Test Date: July 15, 2021
Analysis Performed by: JPG	Method: Cooper Jacob Analysis	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 95 L/min	Duration: 360 minutes

Pumping Test Analysis – Cooper-Jacob (TW-01)

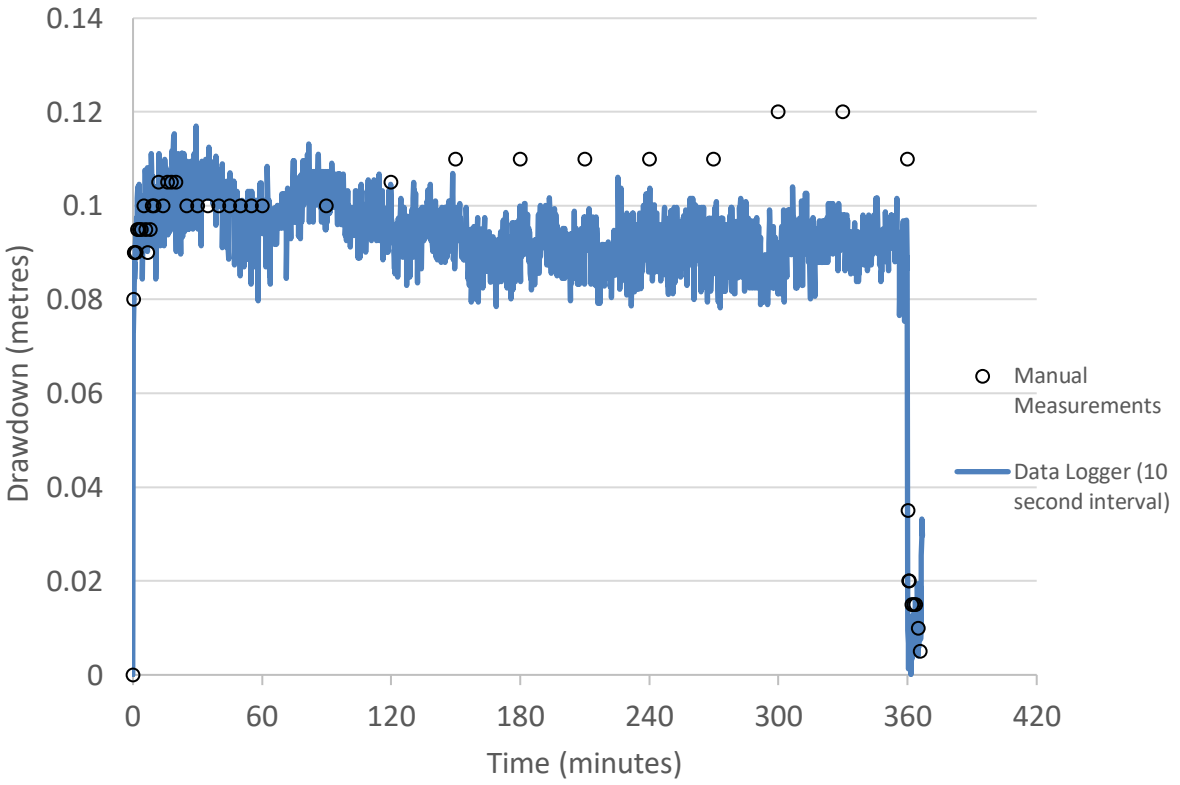


Aquifer Model: Confined
Estimated Transmissivity: 1.3E+5 m^2/day
Estimated Storativity: 9.6E-48
Kz/Kr: 1

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-02	P-Test Date: July 15, 2021
Analysis Performed by: JPG	Method: Constant rate	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

Pumping Test Data (TW-02): Drawdown and Recovery

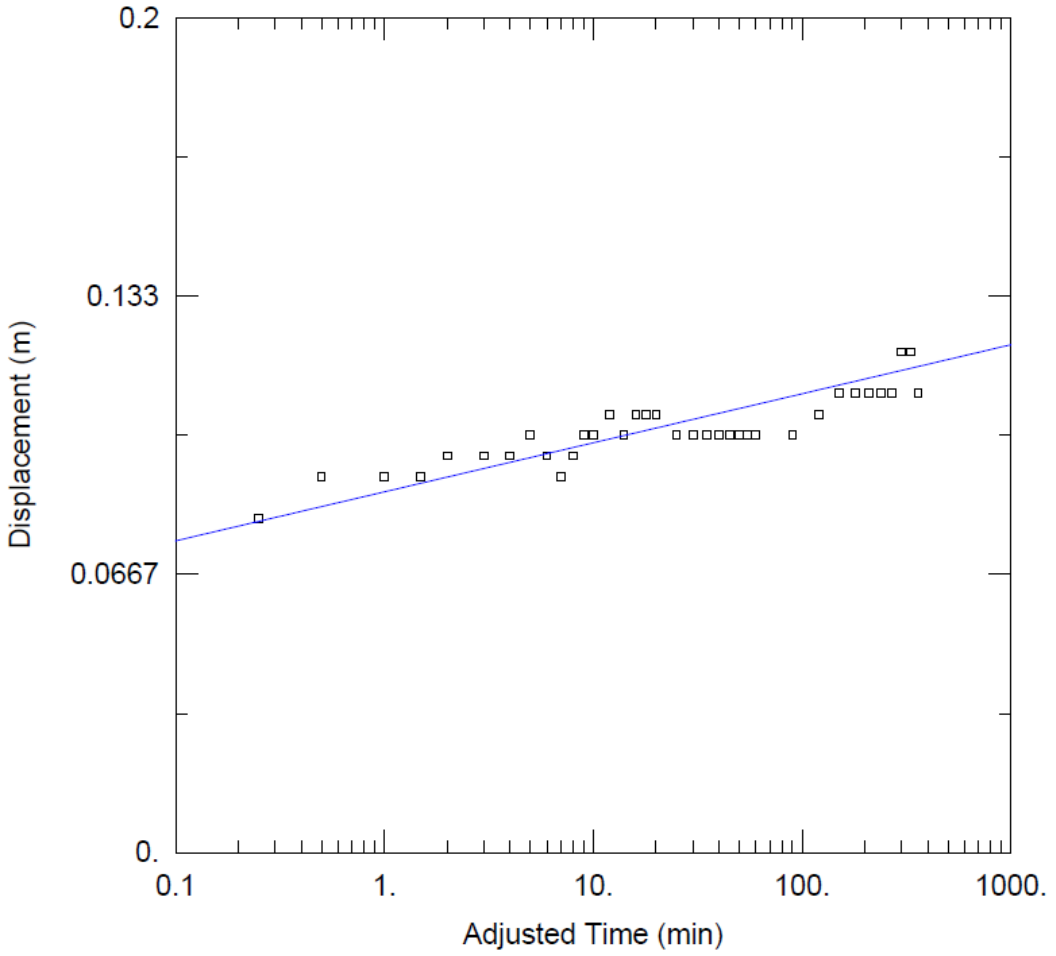


Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 6.14 m
End of pump test (360 minutes): 6.25 m
Final water level following recovery (6-min): 6.14 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-02	P-Test Date: July 15, 2021
Analysis Performed by: JPG	Method: Cooper Jacob Analysis	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

Pumping Test Analysis – Cooper-Jacob (TW-02)

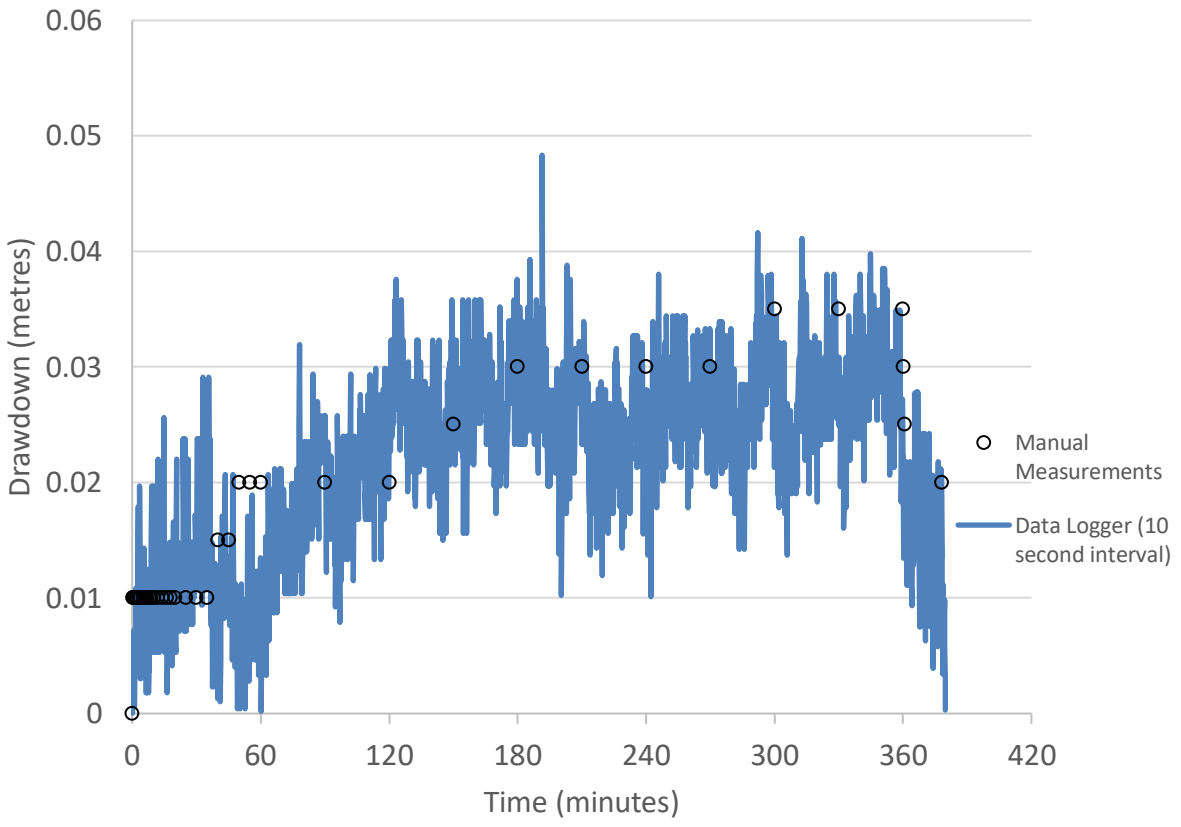


Aquifer Model: Confined
Estimated Transmissivity: 2.0E+3 m^2/day
Estimated Storativity: 2.5E-5
Kz/Kr: 1

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-03	P-Test Date: July 16, 2021
Analysis Performed by: JPG	Method: Constant rate	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

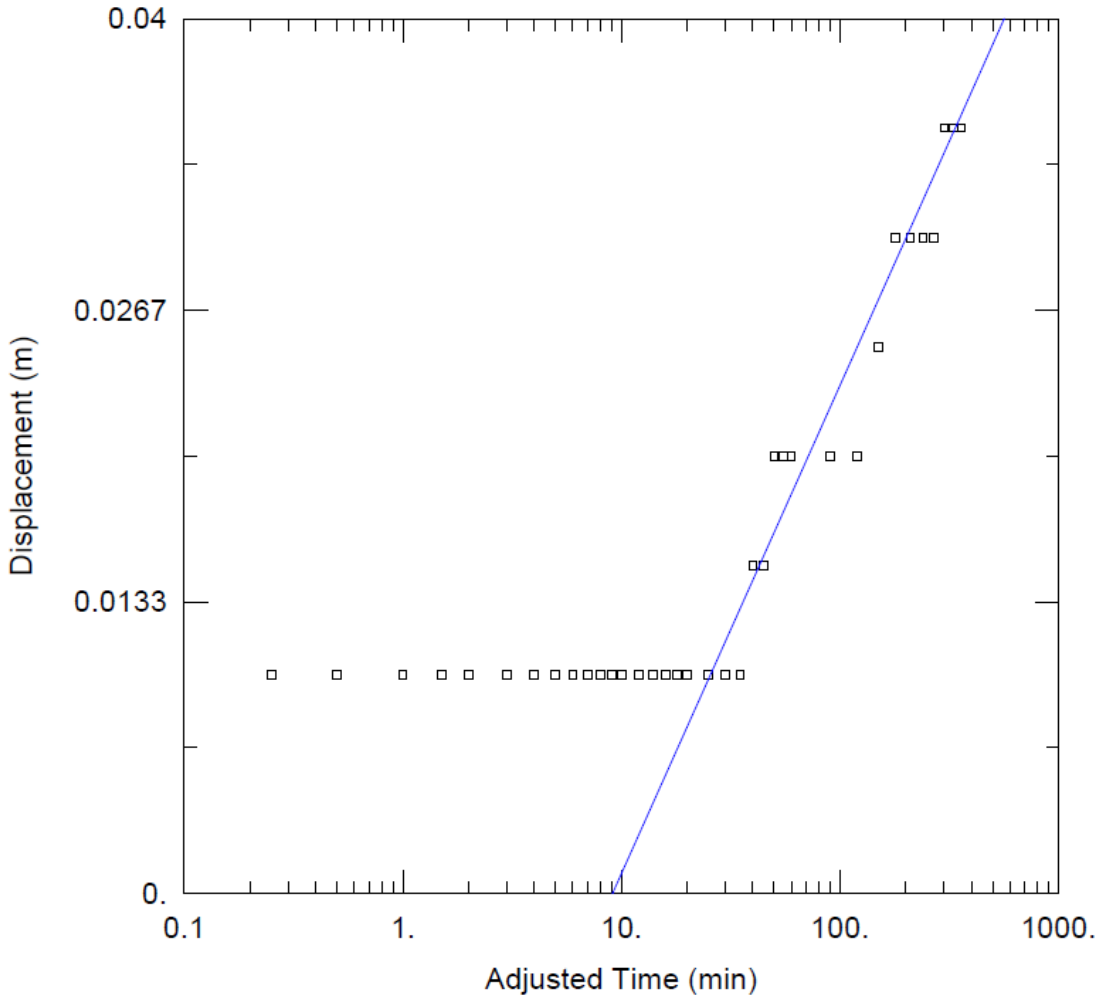
Pumping Test Data (TW-03): Drawdown and Recovery



Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 3.79 m
End of pump test (360 minutes): 3.83 m
Final water level following recovery (20-min): 3.79 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 100227.008	
	Client: Crains Construction	
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-03	P-Test Date: July 16, 2021
Analysis Performed by: JPG	Method: Cooper Jacob Analysis	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

Pumping Test Analysis – Cooper-Jacob (TW-03)

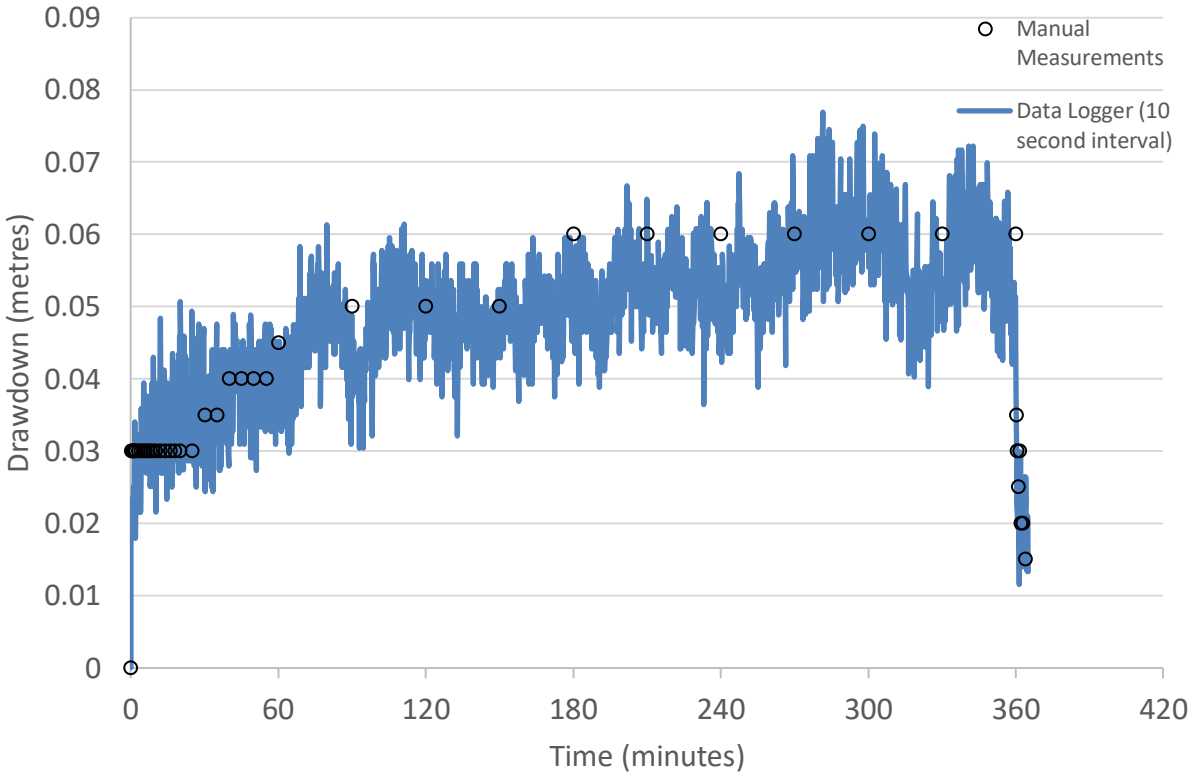


Aquifer Model: Confined
Estimated Transmissivity: 1.1E+3 m^2/day
Estimated Storativity: 2.7E+3
Kz/Kr: 1

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-04	P-Test Date: July 19, 2021
Analysis Performed by: JPG	Method: Constant rate	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

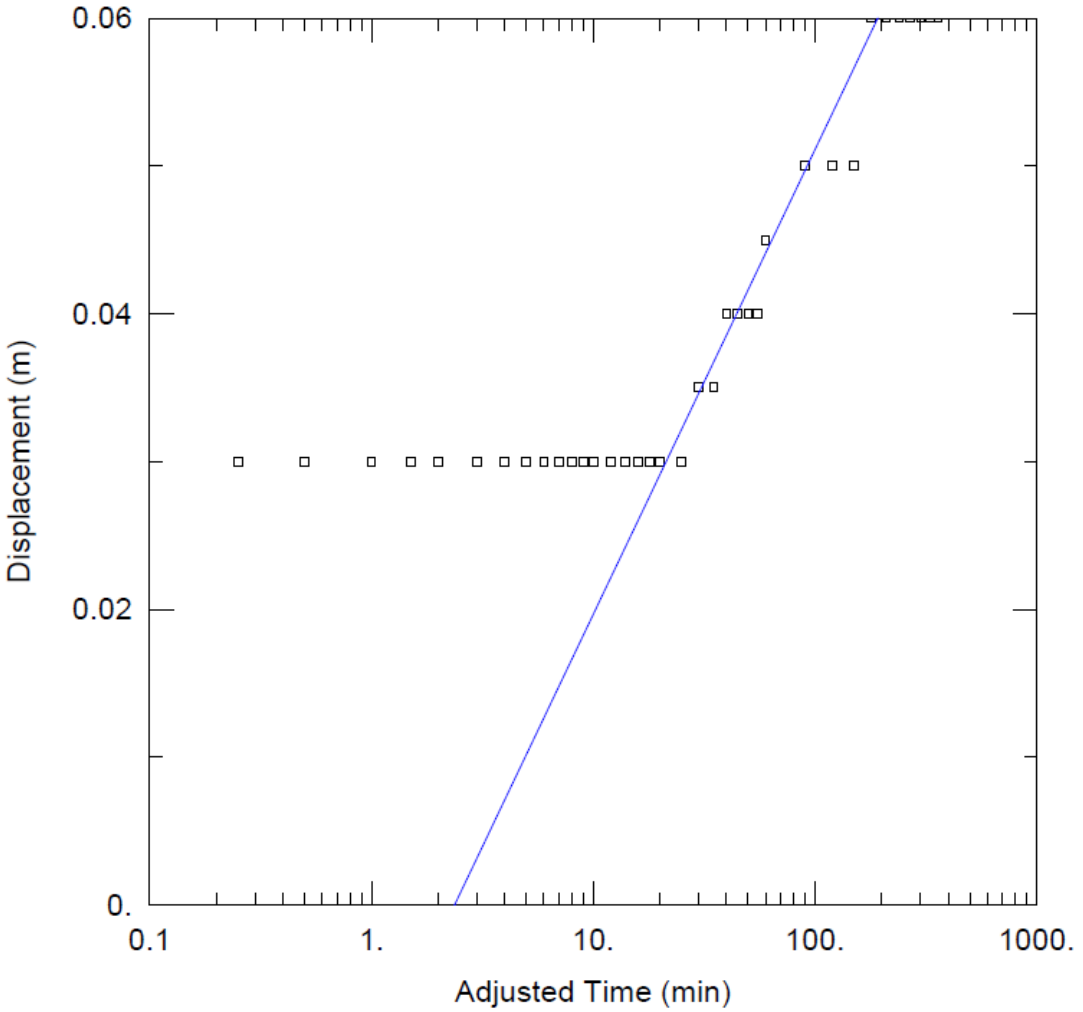
Pumping Test Data (TW-04): Drawdown and Recovery



Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 4.60 m
End of pump test (360 minutes): 4.66 m
Final water level following recovery (5-min): 4.61 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 100227.008	
	Client: Crains Construction	
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-04	P-Test Date: July 19, 2021
Analysis Performed by: JPG	Method: Cooper Jacob Analysis	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

Pumping Test Analysis – Cooper-Jacob (TW-04)

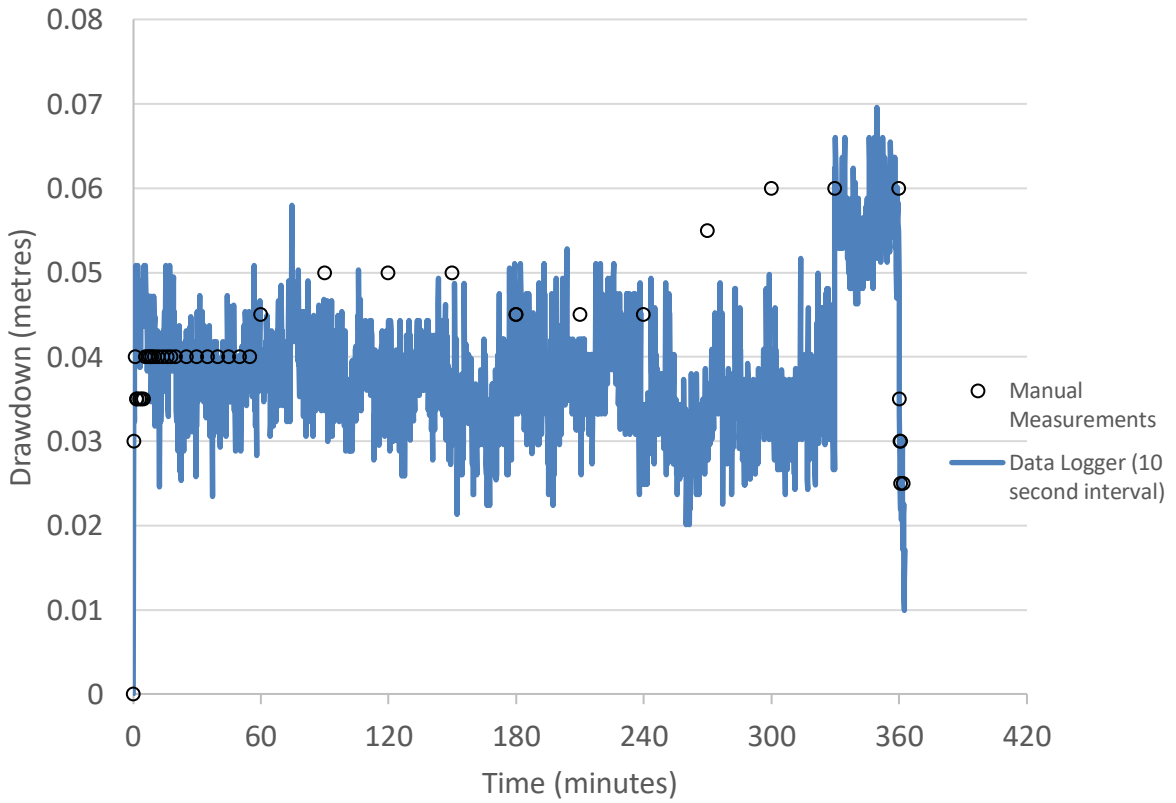


Aquifer Model: Confined
Estimated Transmissivity: 764 m^2/day
Estimated Storativity503
Kz/Kr: 1

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-05	P-Test Date: July 19, 2021
Analysis Performed by: JPG	Method: Constant rate	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

Pumping Test Data (TW-05): Drawdown and Recovery

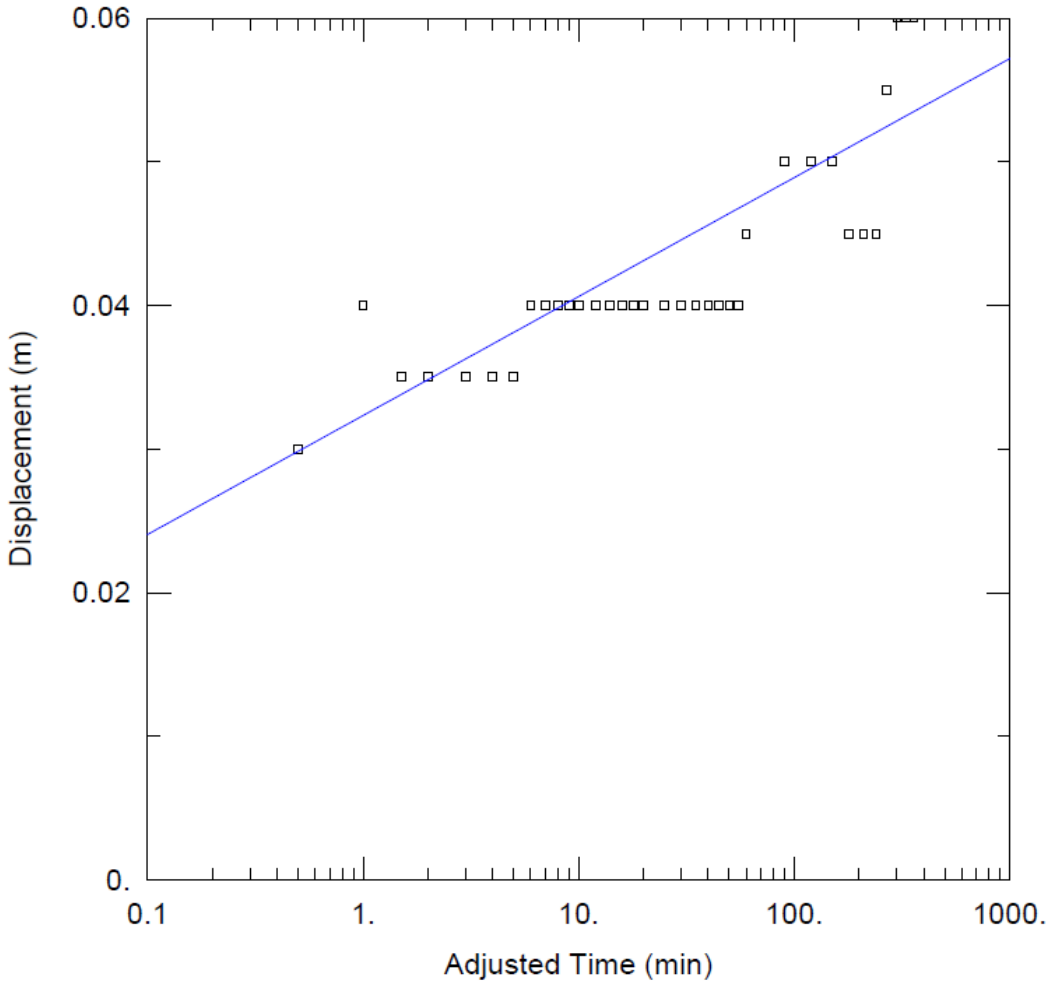


Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 4.03 m
End of pump test (360 minutes): 4.09 m
Final water level following recovery (3-min): 4.04 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW-05	P-Test Date: July 19, 2021
Analysis Performed by: JPG	Method: Cooper Jacob Analysis	Analysis Date: September, 2021
Aquifer Thickness: 11.6 m	Discharge: 91 L/min	Duration: 360 minutes

Pumping Test Analysis – Cooper-Jacob (TW-05)

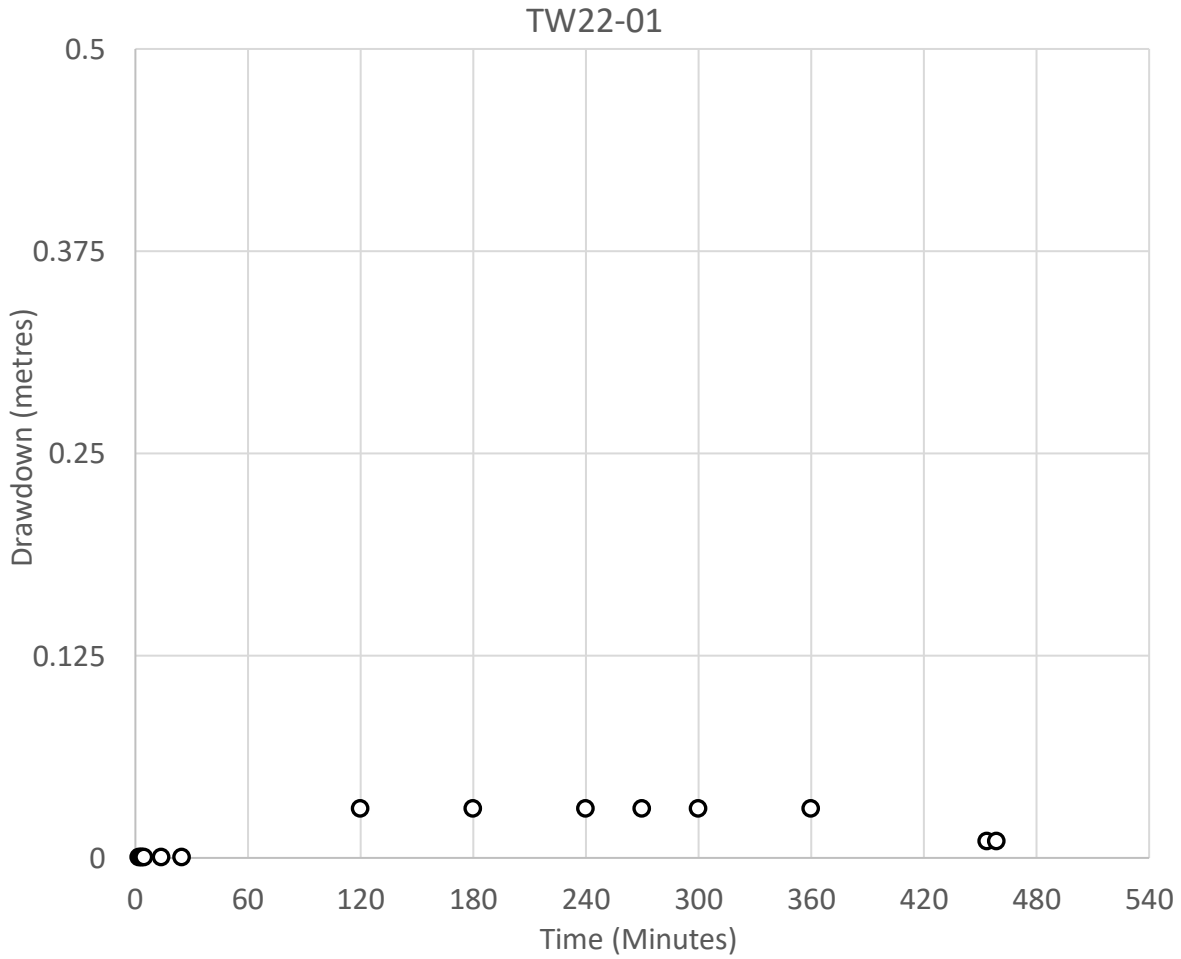


Aquifer Model: Confined
Estimated Transmissivity: 2.9E+03 m^2/day
Estimated Storativity: 0.1
Kz/Kr: 1

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: 4063, Drummond Concession 2, Drummond		
Test Conducted by: SE	Pumping Well: TW22-01	P-Test Date: May 24, 2022
Analysis Performed by: SE	Method: Constant rate	Analysis Date: June 2023
Aquifer Thickness: 40 m	Discharge: 91 L/min	Duration: 454 minutes

Pumping Test Data (TW22-01): Drawdown and Recovery

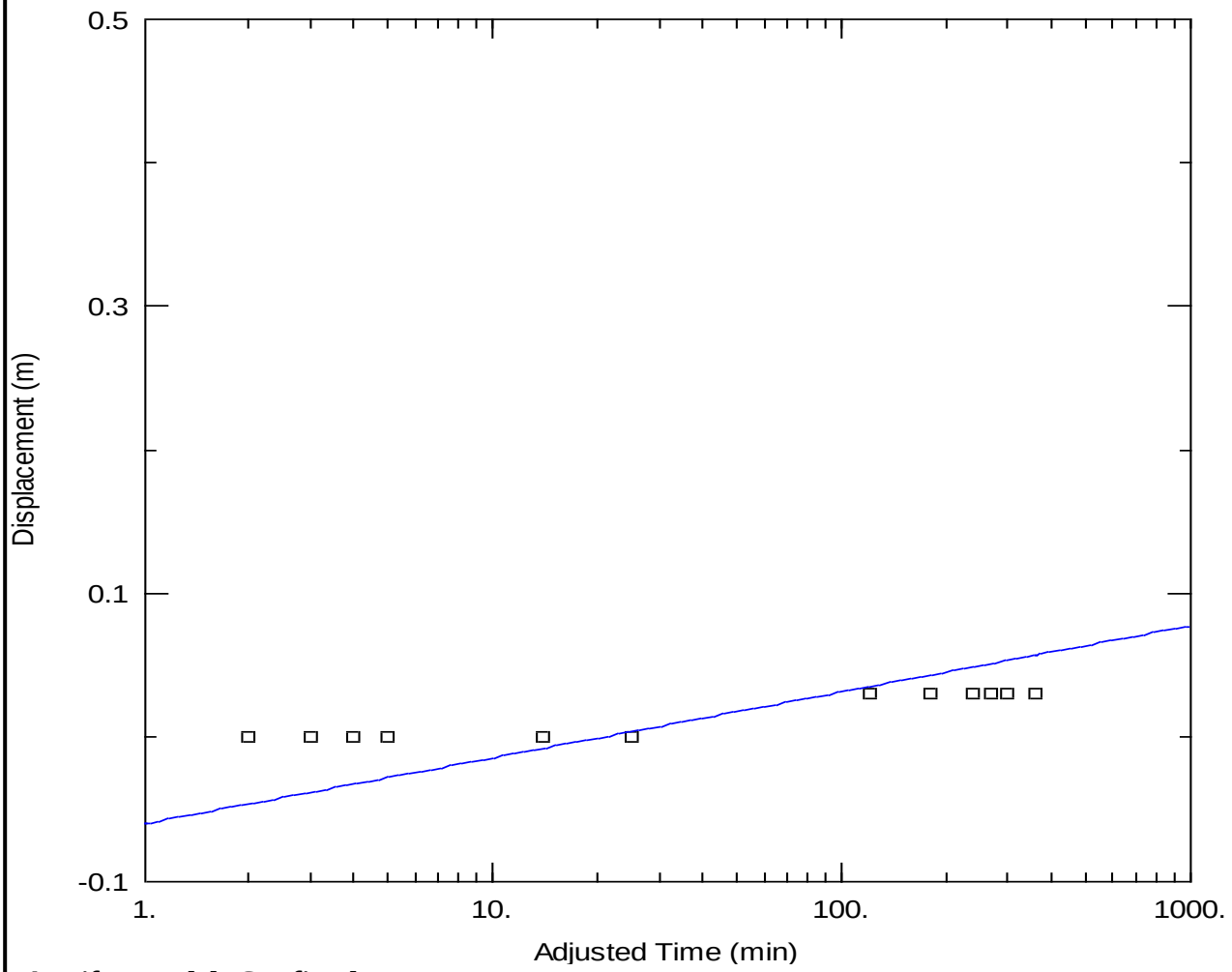


Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 5.02 m
End of pump test (360 minutes): 5.05 m
Final water level following recovery (5-min): 5.03 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100227.008		
Client: Crains Construction		
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: SE	Pumping Well: TW22-01	P-Test Date: May 24, 2022
Analysis Performed by: SE	Method: Cooper Jacob Analysis	Analysis Date: June 2023
Aquifer Thickness: 40 m	Discharge: 91 L/min	Duration: 459 minutes

Pumping Test Analysis: Cooper-Jacob (TW22-01)

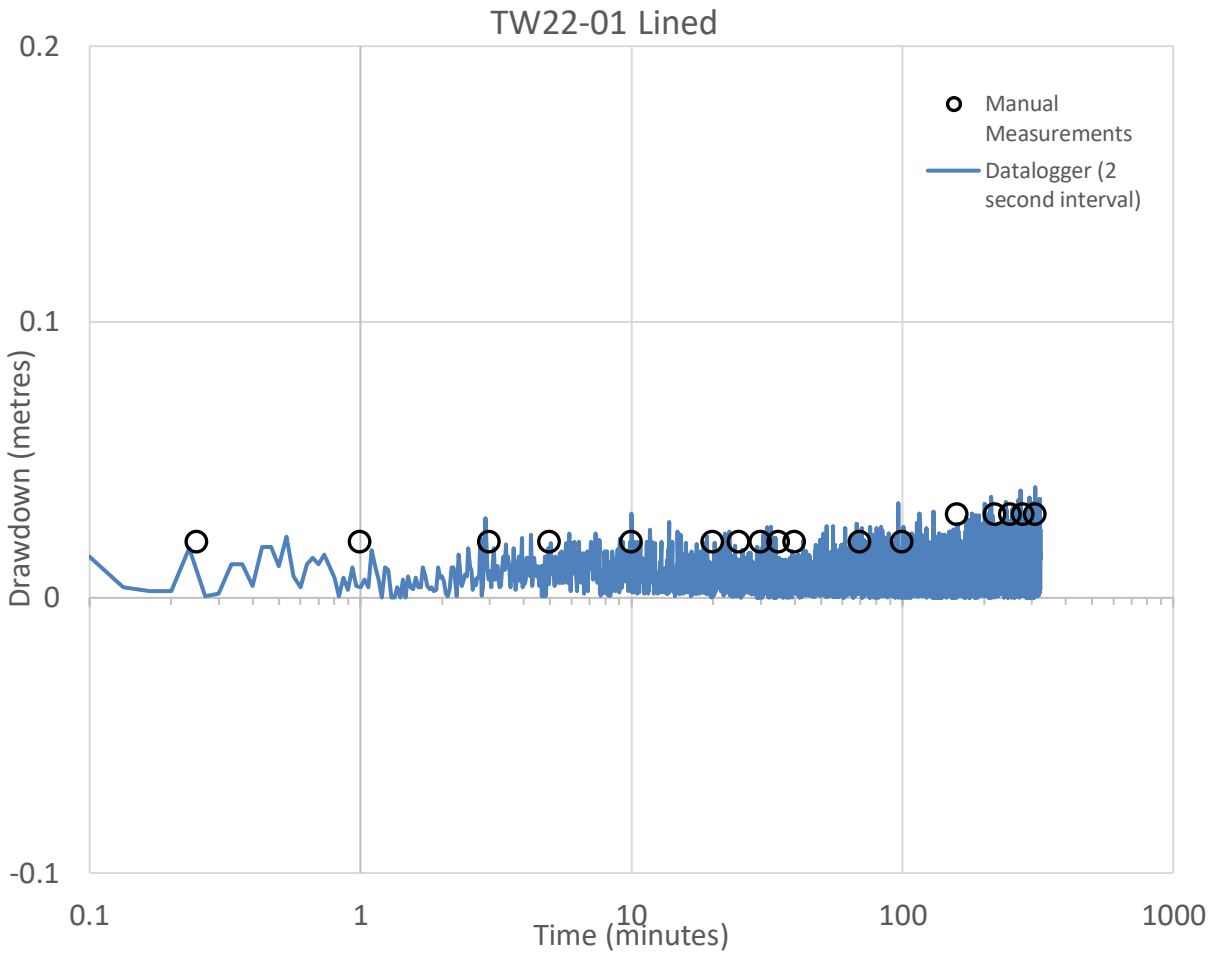


Aquifer Model: Confined
Estimated Transmissivity: 403 m^2/day
Estimated Storativity: 0.0001
Kz/Kr: 1

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100227.008		
Client: Crains Construction		
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: SE	Pumping Well: TW22-01 Lined	P-Test Date: April 25, 2023
Analysis Performed by: SE	Method: Constant rate	Analysis Date: June 2023
Aquifer Thickness: 100 m	Discharge: 75 L/min	Duration: 322 minutes

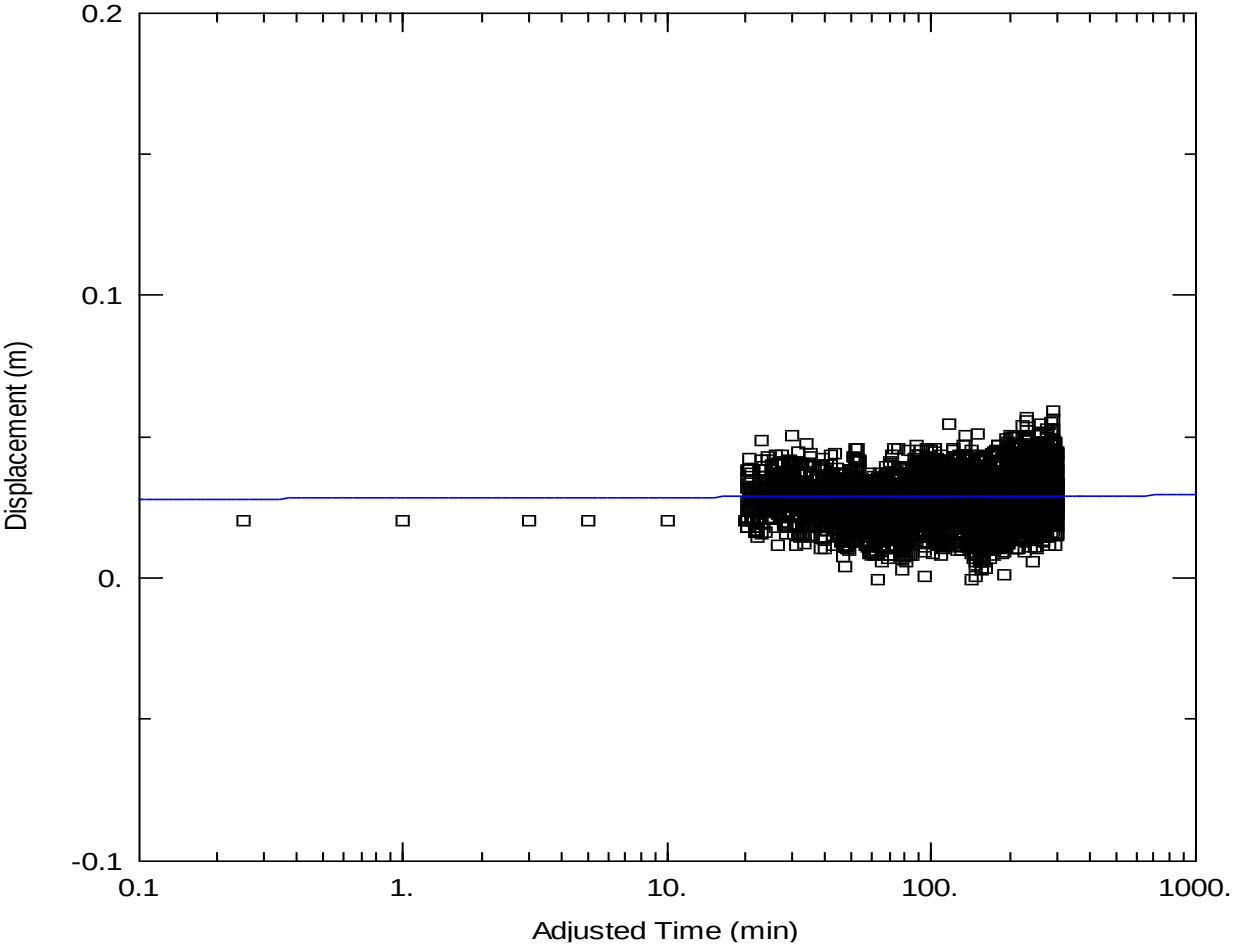
Pumping Test Data (TW22-01 Lined): Drawdown and Recovery



Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 5.09 m
End of pump test (360 minutes): 5.12 m
Final water level following recovery (3-min): 5.10 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: SE	Pumping Well: TW22-01 Lined	P-Test Date: April 25, 2023
Analysis Performed by: SE	Method: Cooper Jacob Analysis	Analysis Date: June 2023
Aquifer Thickness: 100 m	Discharge: 75 L/min	Duration: 322 minutes

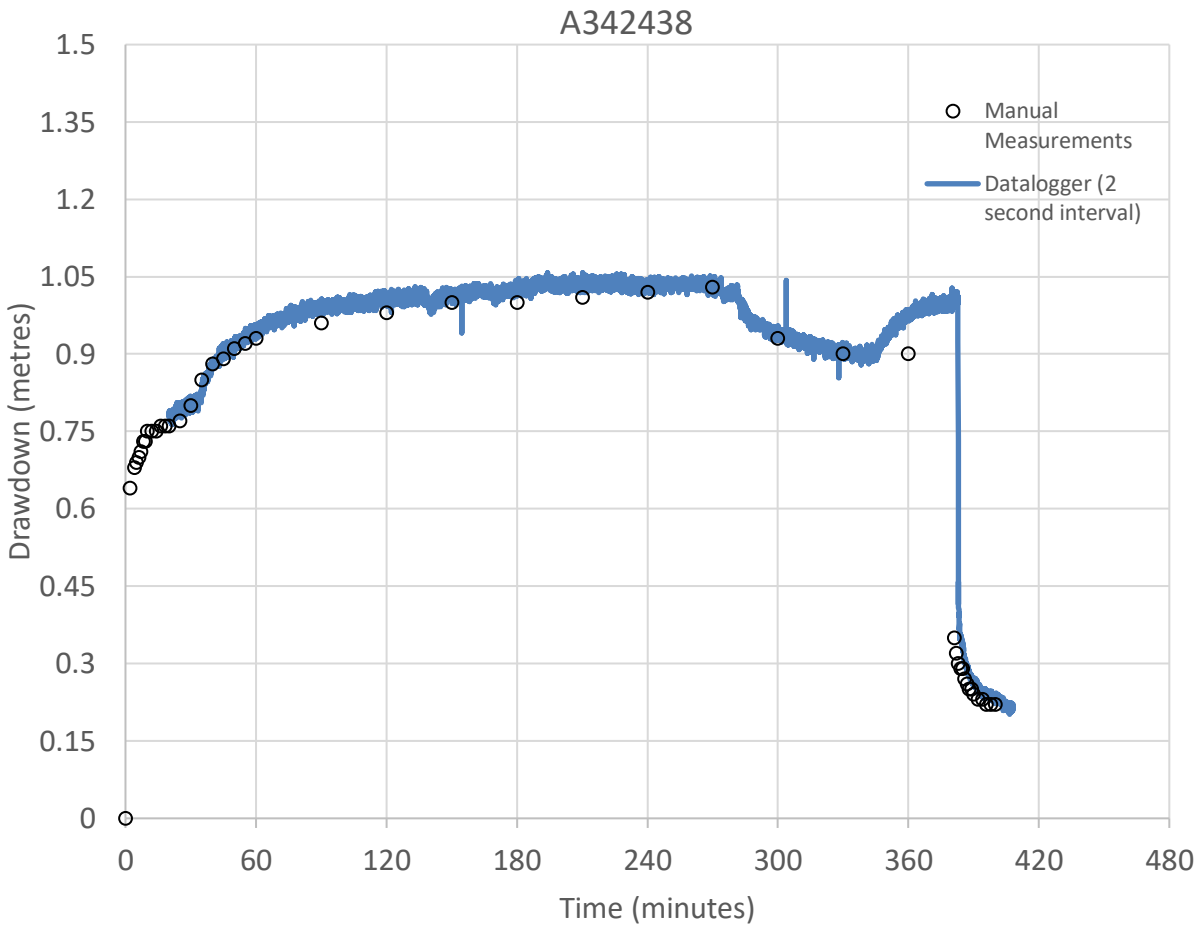


Aquifer Model: Confined
Estimated Transmissivity: 5.6E+04 m^2/day
Estimated Storativity: 0.0001
Kz/Kr: 1

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100227.008
	Client: Crains Construction

Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW22-8 Lined	P-Test Date: May 16, 2023
Analysis Performed by: SE	Method: Constant rate	Analysis Date: June 2023
Aquifer Thickness: 100 m	Discharge: 80 L/min	Duration: 360 minutes

Pumping Test Data (TW22-8 Lined): Drawdown and Recovery

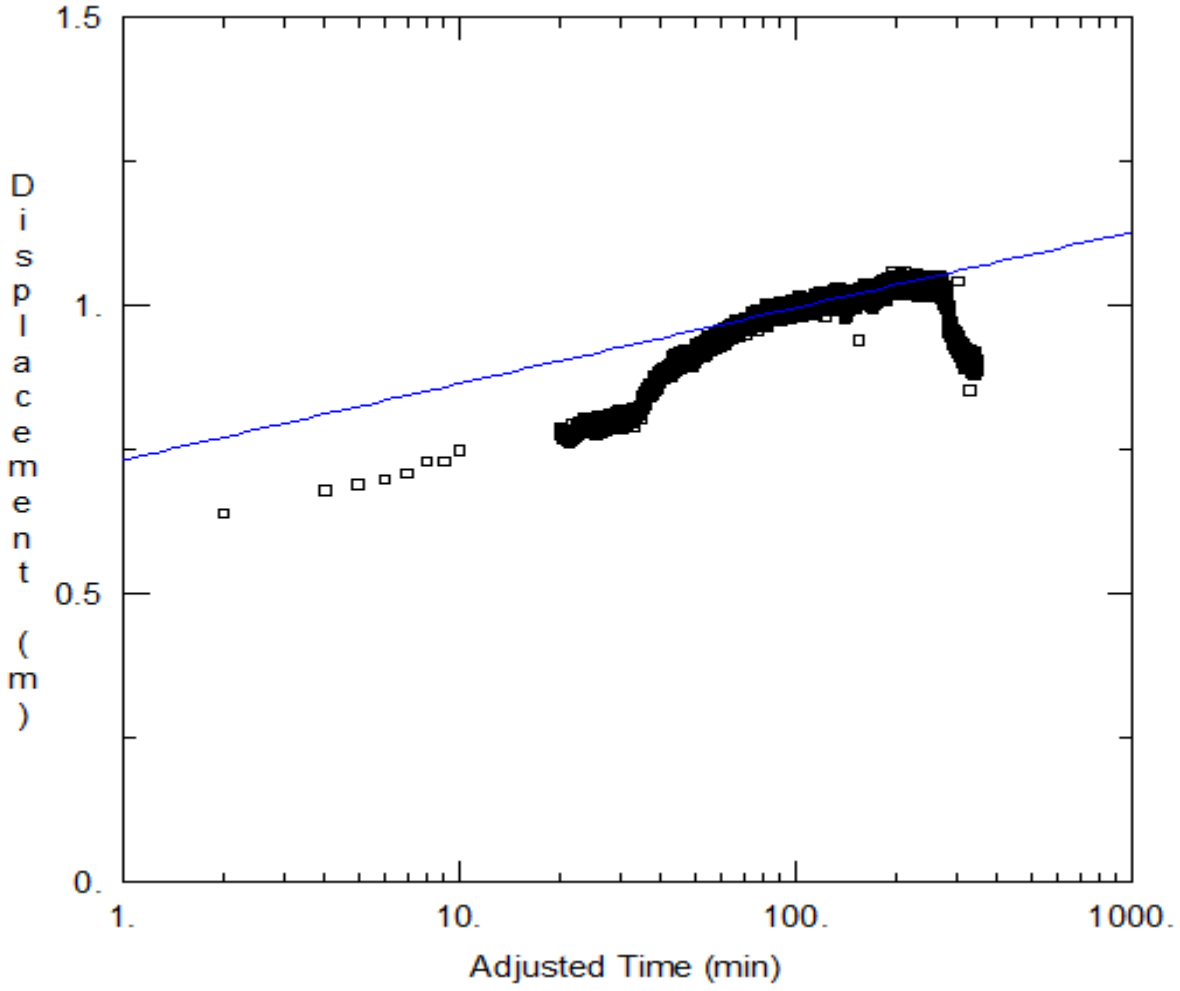


Water Levels (metres below top of casing)
Casing height above ground surface: 0.7
Static : 2.87 m
End of pump test (360 minutes): 3.77 m
Final water level following recovery (3-min): 3.09 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100227.008		
Client: Crains Construction		
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: BR	Pumping Well: TW22-8 Lined	P-Test Date: May 16, 2023
Analysis Performed by: SE	Method: Cooper Jacob Analysis	Analysis Date: June 2023
Aquifer Thickness: 100 m	Discharge: 80 L/min	Duration: 360 minutes

Pumping Test Analysis: Cooper-Jacob (TW22-8 Lined)

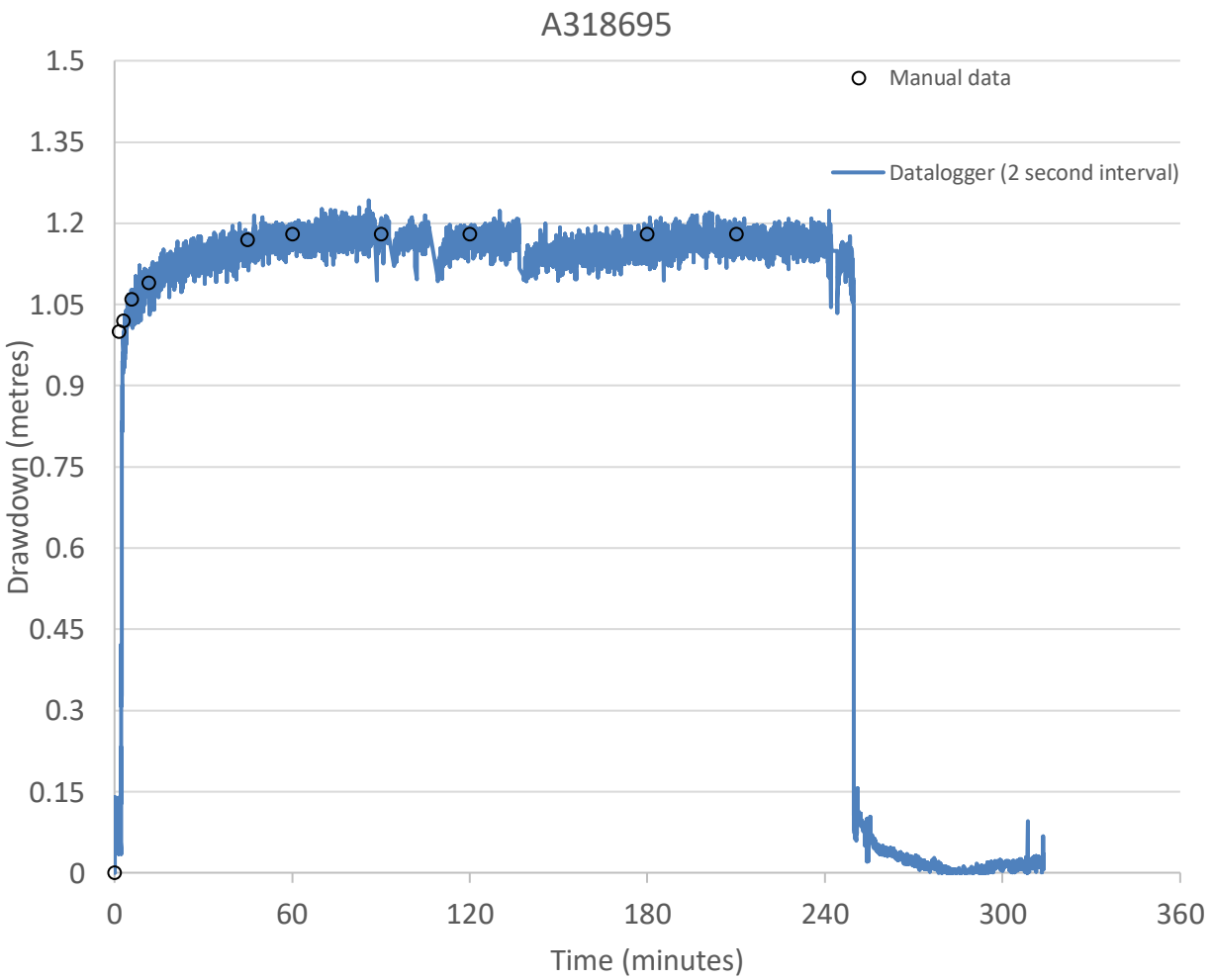


Aquifer Model: Confined
Estimated Transmissivity: 160 m^2/day
Estimated Storativity: 0.0003
Kz/Kr: 1

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100227.008		
Client: Crains Construction		
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: SE	Pumping Well: A318695	P-Test Date: May 16, 2023
Analysis Performed by: SE	Method: Constant rate	Analysis Date: June 2023
Aquifer Thickness: 100 m	Discharge: 90 L/min	Duration: 314 minutes

Pumping Test Data (TW A318695 Lined): Drawdown and Recovery

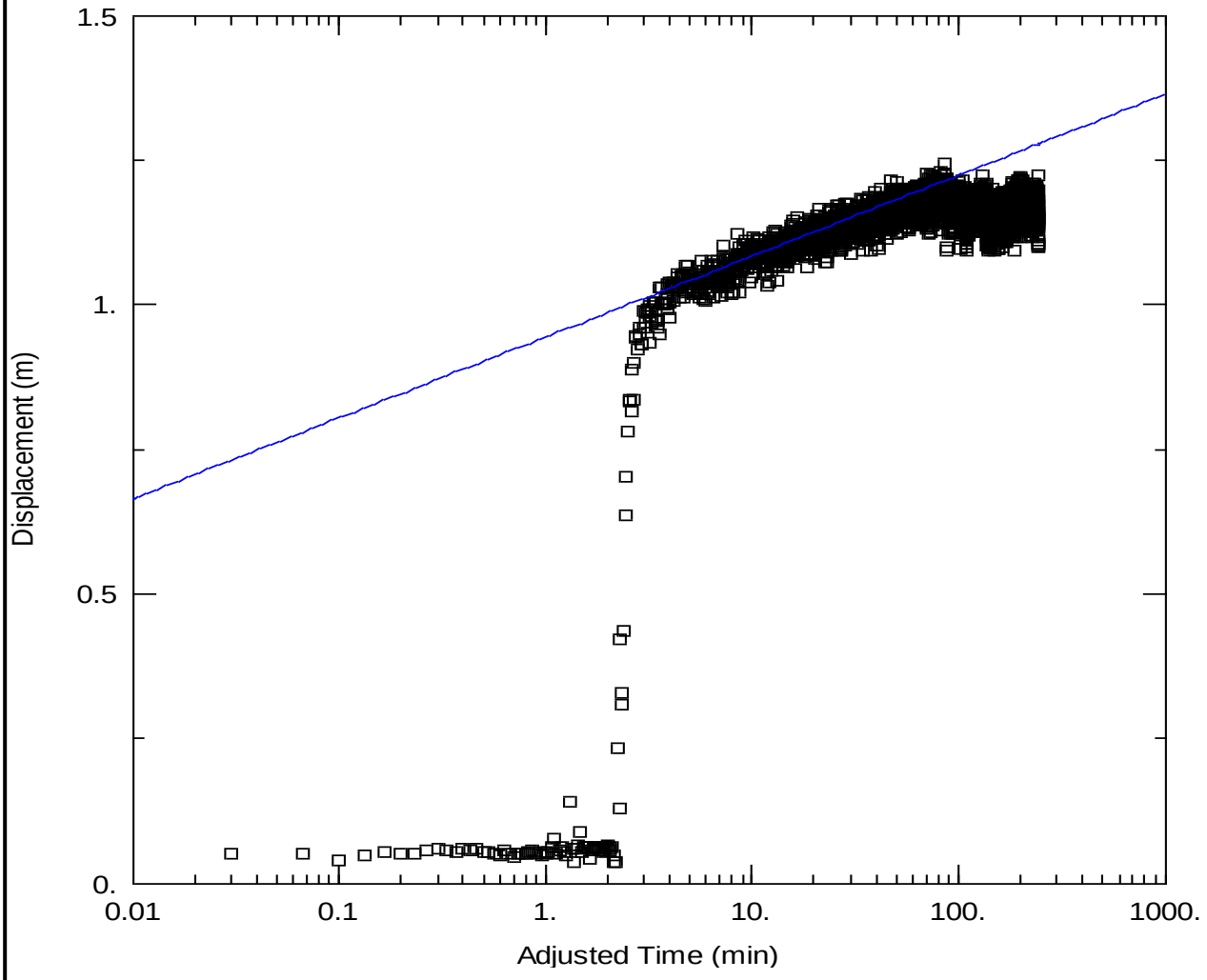


Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 2.45 m
End of pump test (360 minutes): 3.63 m
Final water level following recovery (3-min): 2.45 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100227.008		
Client: Crains Construction		
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: SE	Pumping Well: A318695	P-Test Date: May 16, 2023
Analysis Performed by: SE	Method: Cooper Jacob Analysis	Analysis Date: June 2023
Aquifer Thickness: 100 m	Discharge: 90 L/min	Duration: 314 minutes

Pumping Test Analysis: Cooper-Jacob (TW A318695 Lined)

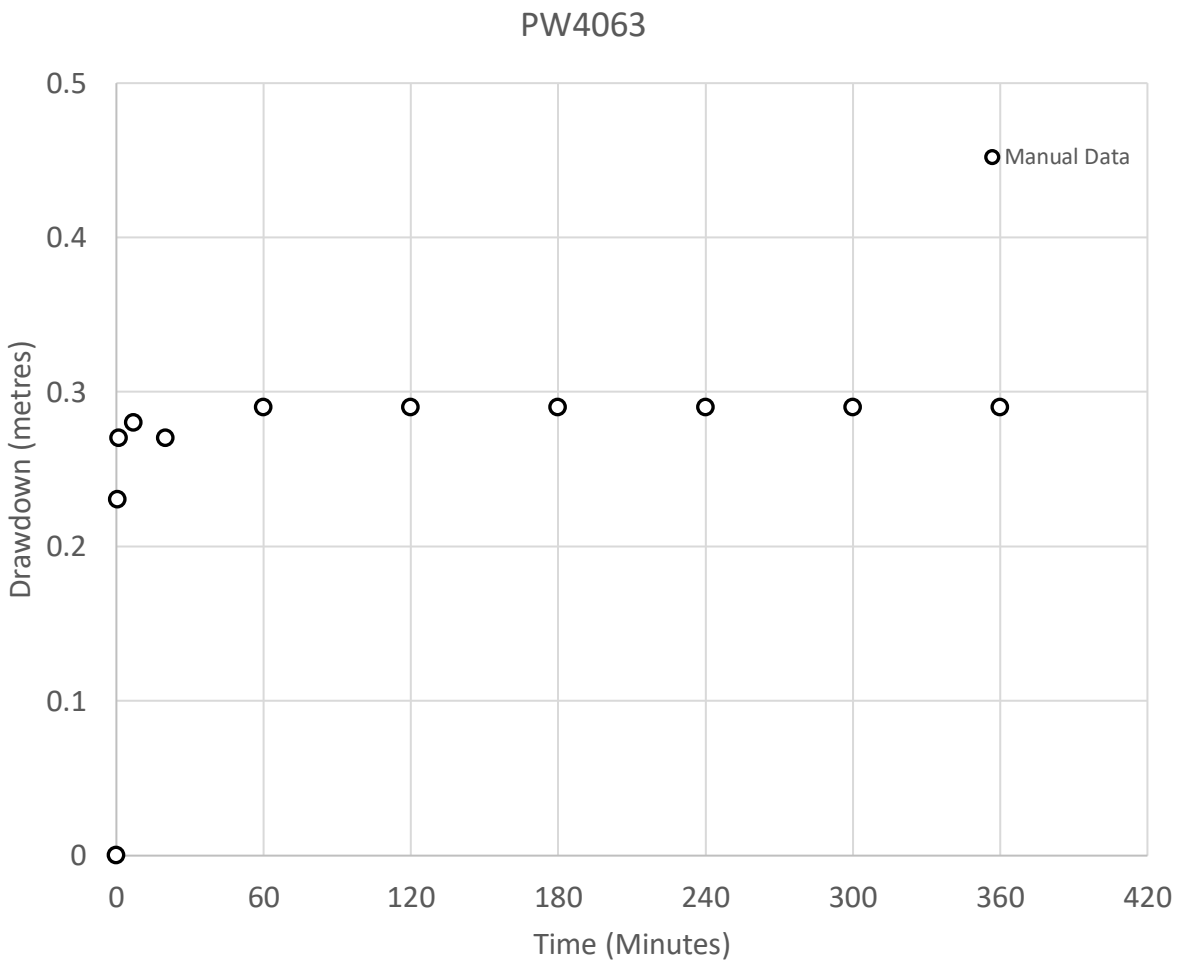


Aquifer Model: Confined
Estimated Transmissivity: 170 m^2/day
Estimated Storativity: 0.0001
Kz/Kr: 1

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100227.008		
Client: Crains Construction		
Location: Part of Lot 6 and Lot 7, Concession 1, Drummond		
Test Conducted by: SE	Pumping Well: PW4063	P-Test Date: May 24, 2022
Analysis Performed by: SE	Method: Constant rate	Analysis Date: June 2023
Aquifer Thickness: 40 m	Discharge: 26.5 L/min	Duration: 360 minutes

Pumping Test Data (PW4063): Drawdown and Recovery

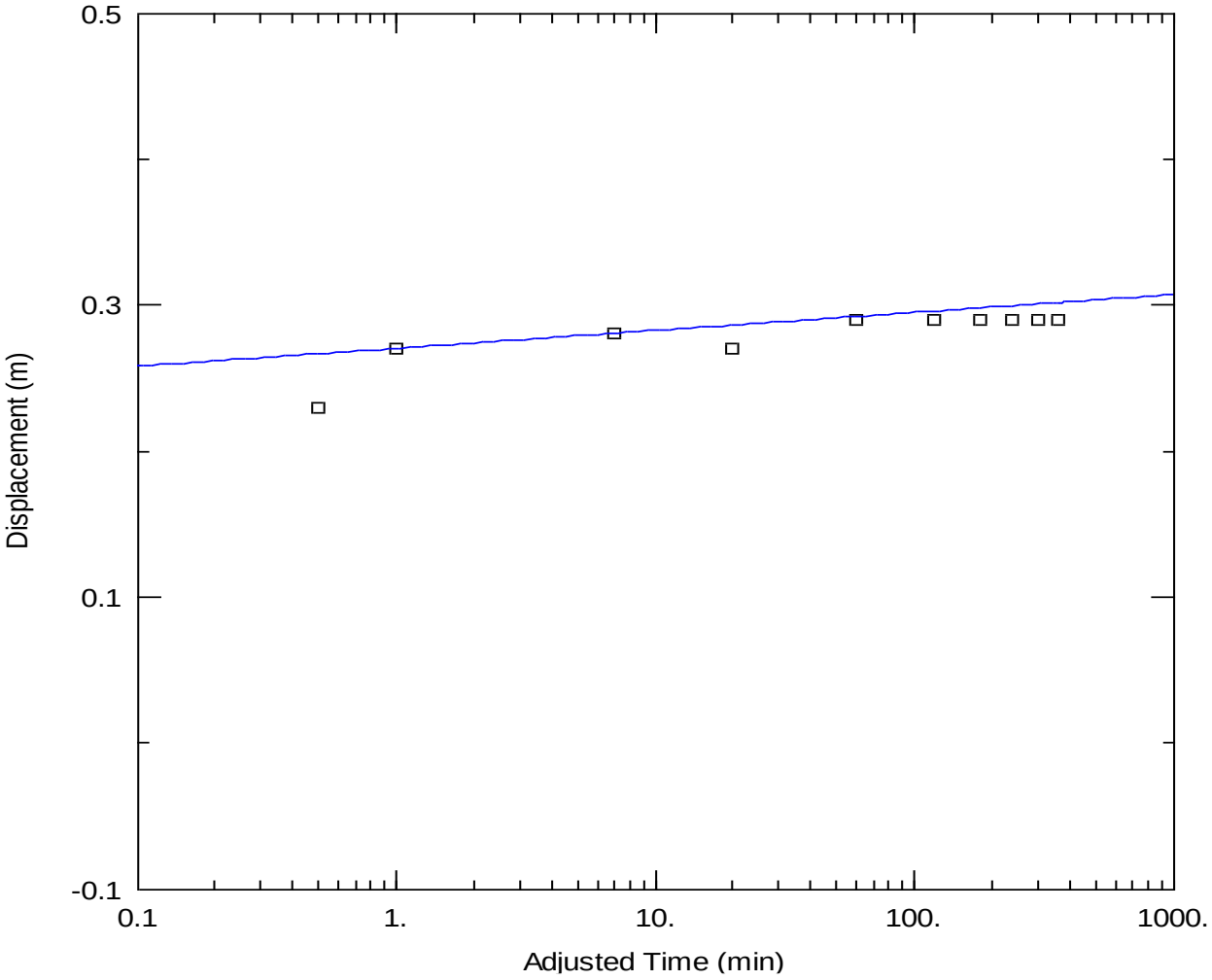


Water Levels (metres below top of casing)
Casing height above ground surface: 0.6
Static : 5.43 m
End of pump test (360 minutes): 5.72 m
Final water level following recovery: - (not monitored)

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100227.008		
Client: Crains Construction		
Location: 4063, Drummond Concession 2, Drummond		
Test Conducted by: SE	Pumping Well: PW4063	P-Test Date: May 24, 2022
Analysis Performed by: SE	Method: Cooper Jacob Analysis	Analysis Date: June 2023
Aquifer Thickness: 40 m	Discharge: 26.5 L/min	Duration: 360 minutes

Pumping Test Analysis: Cooper-Jacob (PW4063)



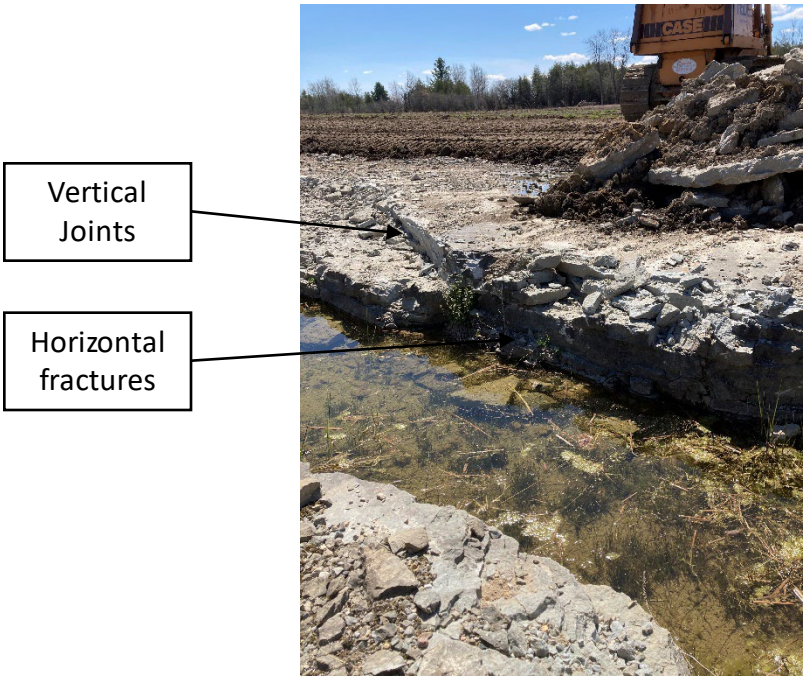
Aquifer Model: Confined
Estimated Transmissivity: 570 m^2/day
Estimated Storativity: 0.0001
Kz/Kr: 1

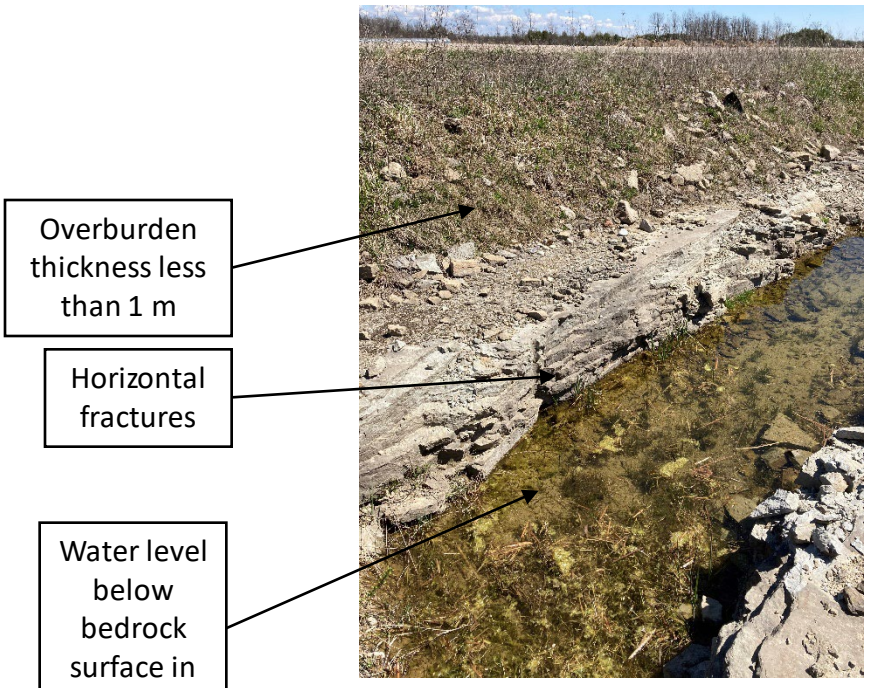
APPENDIX H

Site Photographs

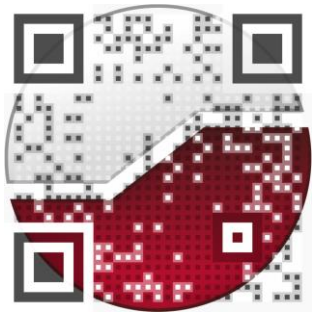
GEMTEC
Consulting Engineers and Scientists

Bedrock Surface Photos	
Project: Hydrogeological Investigation	
Project Number: 100227.008	
Client: Wilburt Crain	
Location: Burns Farm Development, Perth, Ontario	Date: April 19, 2021





experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive 613.836.1422
Ottawa, ON, Canada ottawa@gemtec.ca
K2K 2A9 www.gemtec.ca

October 5, 2023 File: 100227.008

Wilburt Crain
1800 Maberly Elphin Road
Maberly, Ontario
K0H 2B0

Attention: Mr. Wilburt Crain

Re: Response to Technical Review - Burns Farm
1660 Drummond Concession 2, Drummond / North Elmsley, Ontario

GEMTEC has provided responses to highlight changes in report titled "Consolidated Hydrogeological Investigation & Terrain Analysis, proposed Residential Subdivision Phase 1, Part of Lot 6 and Lot 7, Concession 1, Drummond Township, Ontario" dated July 11, 2023 based on comments provided by BluMetric in technical Review Memorandum titled "Technical Review Memorandum, Burns Farm Subdivision (1660 Drummond Concession Road 2, Proposed 30 Lot Subdivision, Hydrogeological Assessment by GEMTEC, dated: July 11, 2023".

Responses to the corresponding reviewer comments are provided below, along with a revised hydrogeological investigation report dated October 5, 2023.

Introduction and Context

BluMetric: It is suggested that a brief description of the proposed development be included in the opening sections of the report. The description should include the number of proposed lots, maximum and minimum lots sizes, and average lot size. Some contexts regarding the relationship between the original application and the current application would be helpful. It is suggested that the report include a reference to the zoning status of the site, and Figure 2 should reflect this information.

- **GEMTEC:** Updated section 1.0

Pre-Submission Consultation

BluMetric: A series of reviews and pre-submission consultation meetings were conducted with BluMetric and others prior to the submission of the latest report. The report should include a summary of pre-submissions consultations, a summary of review comments, reviewers, dates, and responses to reviews.

- **GEMTEC:** Project timeline added in Section 1.1, along with peer-review comments in Appendix B.

Hydrology

BluMetric: The hydrology section of the report should mention onsite drainage ditches and flow paths, flow directions beyond the site boundaries, and this information should be included on a figure. It is unclear if water from the site flows towards nearby provincially significant wetlands. The watershed and downgradient receiving surface water features should be clearly described.

- **GEMTEC:** Topography and Hydrology section added / updated (Section 1.4), Subwatershed info added to Figure 4.

Hydrogeology

BluMetric: The well records summary should be updated to include information about indications of well yields for wells within 500 m of the site. Key well records included in Appendix C should be suitably labelled / cross referenced (including primary test wells, secondary test wells, key neighboring wells, records of liner extension, and abandonment records).

- **GEMTEC:** Appendix C has been updated accordingly.

BluMetric: It is suggested that the description of test wells should be presented in terms of primary test wells (wells with casing extended to 36.6 mbgs as per report recommendations), and secondary test wells (sampled wells with less than 36.6 m casing).

- **GEMTEC:** Appendix C has been updated accordingly and text updated to clarify that primary test wells for the investigation.

BluMetric: The report does not address karst. Karst is not indicated at the site, but the report should include this information.

- **GEMTEC:** Karst information has been added to Section 2.3.

BluMetric: A conceptual model is provided in Section 4.1 of the report. The overburden and bedrock should be described as separate stratigraphic units. A discontinuous unconfined overburden water table at the overburden bedrock interface was observed at two test pit locations, and bedrock trenching identified some shallow groundwater. It is suggested that the inclusion of bedrock hydrostratigraphic units would be useful to better define the hydrogeological variations at the site (e.g., shallow fractured bedrock, upper bedrock, and lower bedrock). The concept of shallow and deep bedrock units is mentioned in Section 4.1 (third paragraph on page 32), and in

Section 8.1 (upper aquifer and lower aquifer) so the conceptual model should include this approach, and references to hydrostratigraphic units should be consistent throughout the report.

- **GEMTEC:** Updated conceptual model and referencing throughout report.

BluMetric: Section 5.3.3 of the report indicates observation wells were not used, but Section 5.5.1 indicates there was monitoring of observation wells during the pumping tests conducted at TW-01 to TW-05. No observation of similarly configured nearby wells (primary test wells) was conducted during recent pumping tests at the primary test wells. Monitoring of observation wells should have been conducted, as the proposed subdivision will have 30 wells within the 27.5 hectare site and the potential for well interference should be addressed. The potential for well interference is not addressed in the report and it is suggested that a well interference calculation should be provided (a Q20 safe yield analysis as per Farvolden (1959) and Maathius & Van der Kamp (2006) is considered suitable).

- **GEMTEC:** Water levels were not recorded in observations well during pumping of the primary test wells, this has been updated in the report.
- **GEMTEC:** Safe yield analysis included in section 5.7.

<u>Groundwater Quality</u>

BluMetric: A detailed field investigation was conducted over an extended period. It is suggested that a chronological summary of investigations and sampling should be included at the beginning of Section 5.

- **GEMTEC:** A bullet-point form chronological outline of hydrogeological investigation and sampling is provided in Section 5.3.

BluMetric: The description of sample collection according to industry standards should include information about holding times and chains of custody.

- **GEMTEC:** Updated in Section 5.4.4

BluMetric: A stated professional opinion should be provided regarding turbidity results (field turbidity versus lab turbidity).

- **GEMTEC:** Updated in Section 5.5.2.3.

BluMetric: The report should include a clear statement regarding groundwater analytical results at the primary test wells and the health-related limits of the ODWS (all appear to be below limits but this should be clearly stated).

- **GEMTEC:** Updated in Section 5.4.4 and conclusions 8.2.

BluMetric: Analytical results for apparent colour are elevated and potential buyers should be made aware of aesthetic issues associated with colour. This issue should be discussed, and treatment options should be presented. This information should be carried through to the recommendations section of the report.

- **GEMTEC:** Paragraph for color added to Section 5.5.2.2. Recommendation section also updated.
- True Colour (filtered) is within the ODWQS aesthetic objective of 5 TCU in the primary test wells completed in the proposed water supply aquifer.

BluMetric: Field parameter results associated with sampling of the primary test wells (TW22-01, TW22- 8, TW-A318659, and TW1710D) are not provided. A revised report should include all field parameter results and should confirm if the same instruments were used for all phases of sampling. Calibration records for the instruments used to determine residual chlorine and turbidity should be provided if possible.

- **GEMTEC:** Appendix D updated with primary test well field parameters. The field equipment was calibrated before use by GEMTEC, the details of field equipment are provided in Table 5.4. It is noted that for chlorine and colour measurements, the readings are zeroes prior to monitoring (i.e., colour zeroes using distilled water). Periodic testing is completed to confirm device functionality (i.e. testing chlorine in municipally chlorinated tap water). Calibration records are not available.

BluMetric: Bacteriological results for wells sampled when residual chlorine was not proven to be non- detectable (i.e. from April 21 and April 23, 2021 at TW-03, TW-04 and TW-05 and in private wells PW-3896, PW-3928, PW-1802 and PW-1562) should be removed from the summary tables in Appendix D. Bacteriological results cannot be relied upon unless the sampling was conducted in the proven absence of chlorine.

- **GEMTEC:** Acknowledged and updated.

BluMetric: Section 5.4.2.3 mentions analytical results exceeding the GCDWQ limit for manganese. Future buyers should be made aware of this issue and the specific health concerns involved. This information should be carried through to the recommendations section of the report.

- **GEMTEC:** Wording added to Recommendations section (Section 9.2).

Individual Onsite Sewage Systems Suitability

BluMetric: MECP Procedure D-5-4 indicates “where nitrate concentrations between 0 and 10 mg/l are found, the MOEE may also decide not to support development if the proponent’s consultant cannot provide a reasonable explanation for the existing levels of nitrate concentrations in the groundwater. However, if it can be demonstrated that existing levels of nitrates are the result of historical agricultural practices on the site (for example farming, feed lot, etc.), the proponent may be able to argue that the nitrate levels will decline after development”. Nitrate exceeding 2.5 mg/L is typically used as a trigger for the requirement for further investigations. The information provided in the report does not clearly demonstrate that nitrate concentrations in the upper bedrock hydrostratigraphic unit at the site are declining spatially or temporally. The acceptable impact of additional nitrate loading to the first receiving aquifer (upper bedrock hydrostratigraphic unit) associated with the proposed development is not supported. Further monitoring and additional monitoring well(s) would help to define spatial and temporal changes in nitrate concentrations.

- **GEMTEC:** Acknowledged. A phased approach and monitoring program is recommended to support the development, refer to Section 8.6 conclusions.

BluMetric: The report argues that nitrate concentrations in the area are elevated due to a combination of factors including:

- Septic systems: significant increases in nitrate concentrations in the upper bedrock hydrostratigraphic unit have been measured at the Fellinger Mills subdivision.

- Onsite fertilizer use: the report states “the majority of test wells do not show evidence of significant increases/decreases in nitrate concentrations”, but nitrate variations in the upper bedrock hydrostratigraphic unit significant. Some variability appears to be due to seasonal fluctuations, but concentrations at TW-01 and TW-05 are still above the investigation threshold limit. The report does not provide a conclusive argument that onsite nitrate concentrations are diminishing due to discontinuation of fertilizer application at the site.

- Geothermal systems / agricultural wells / private wells with shallow casings or poor construction: a number of examples are provided, and it is theorized that these sources may be a significant contributor to elevated nitrate concentrations in the area.

- **GEMTEC:** Acknowledged.

BluMetric: Livestock operations are not identified as a significant factor contributing to nitrate concentrations in groundwater in the area in Section 7.1 of the report. Livestock operations are mentioned in Section 2.1 of the report. It is suggested that livestock operations at the property to the immediate northwest of the site (3928 Drummond Concession 2) be discussed in greater detail and should be assessed in the discussion of potential sources of nitrates in Section 7.1 of the report.

- **GEMTEC:** Additional discussion on livestock operations will be included in the report, refer to Section 2.1 and 7.1. The property has a large horse track and based on information provided by the property owner (via client), there are only 3 horses that are kept on the property. A review of aerial images and online searches does not suggest any large scale business operations (e.g., horse stables, boarding, etc.) suggesting the horses are for personal use. This property is not considered to be a significant source of nitrates.

BluMetric: It is recognised that the consultant has made a substantial effort to identify sources of nitrates in the area and has conducted some monitoring of nitrates in the upper bedrock hydrostratigraphic unit in 2021 and 2022. The information provided does not conclusively demonstrate that nitrate concentrations are diminishing over time, so further protective measures are required. The primary test wells have casing that extends to 36.6 m bgs and the lower bedrock hydrostratigraphic unit has been demonstrated to contain negligible concentrations of nitrates (0.2 mg/L at TW22-01 (liner) and non-detectable at TW22-08 (liner), TW-A318695, and PW-1710D), so it appears that the lower bedrock hydrostratigraphic unit can provide a suitable source of groundwater for the development. The recommendations for future wells stipulate that casing must extend 36.6 m below ground surface and this is seen as a suitable protective measure.

- **GEMTEC:** Acknowledged.

BluMetric: Vertical hydraulic gradients are not discussed in the report. The report contains very limited information about static water levels at the primary test wells before and after they were lined (casings extended to 36.6 m bgs). The only information available is from TW22-01 which shows the water elevation was slightly higher following extension of casing which may indicate an upward vertical hydraulic gradient, but further information is needed to gain an understanding of vertical gradients between the upper and lower bedrock hydrostratigraphic units.

- **GEMTEC:** Section discussing vertical gradients added - section 5.8. There is limited water level information to assess vertical hydraulic gradients in detail. Regional studies (MVRVCA, 2011) indicate that the Site is located within a transitional area, where the water level between shallow and deep wells is +/- 5 metres, and not considered to be significantly recharging or discharging.
- The following water level information is available to assess vertical gradients:

Lined Wells Water Levels

Test Well ID	Date of Measurement	Water Level (m TOC)	Water Level (m, elevation)
TW22-01	May 24, 2022	5.63	133.6
TW22-01 (lined)	April 25, 2023	5.09	134.2

BluMetric: Drawing water from 30 new wells with casing extending to 36.6 m bgs at the proposed subdivision has the potential to draw nitrate impacted groundwater in the upper bedrock hydrostratigraphic unit down to the lower bedrock hydrostratigraphic unit. This possibility is not discussed in the report, and it is suggested that further analysis of data (static water levels pre and post casing extension, if available) may help to clarify the situation regarding vertical hydraulic gradients at the site and the potential for vertical migration of nitrate- impacted groundwater.

- **GEMTEC:** Section discussing vertical gradients provided in section 5.8.

BluMetric: MECP Procedure D-5-4 indicates “In situations where there is no existing development, it may be possible to develop lands considered in the planning document in phases, beginning with the upgradient portion. Information obtained from monitoring effluent discharged from individual on-site systems in the upgradient phase, and its impact on groundwater, can then be used to determine the extent to which the downgradient portion of the site can be developed. Before approving such a phased development, the Ministry must be satisfied by the Ministry of Municipal Affairs (MMA) or the delegated planning approval authority, that adequate planning controls are in place to regulate development of the downgradient portion of the site”. Since there is uncertainty regarding the potential long- term effects of development at the site, further protective measures are required. It is suggested that a phased approach to development based on a contingency plan would provide the County of Lanark with a sufficient degree of assurance that development will not cause unacceptable adverse effects to onsite and offsite well users and the environment. This concept was indicated in GRI review comments dated March 9, 2023, and was discussed in recent pre-consultation meetings. The consultant was advised that such an approach may allow the development to proceed on a basis that is sufficiently supported.

- **GEMTEC:** Phased approach for the proposed subdivision added, refer to conclusions section 8.6.

BluMetric: The consultant notes that technically representative information from the Fellinger Mills subdivision is available, but the Fellinger Mills site is more than 2 km away from the Burns Farm site and is not directly upgradient. Significant impacts to the upper bedrock hydrostratigraphic unit associated with septic systems have been measured at the Fellinger Mill site which draws water from the upper bedrock hydrostratigraphic unit (water well records indicate well casings typically extend to 10 m bgs), and it is proposed that groundwater for the Burns Farm site will be drawn from the lower bedrock stratigraphic unit. The reviewer agrees that information from the Fellinger Mills site is helpful for the determination of the preferred water supply aquifer at the subject site, but the information does not provide a suitable basis for development, so a phased approach should be used as a protective measure.

- **GEMTEC:** Phased approach for the proposed subdivision added, refer to conclusions section 8.6.

BluMetric: A revised report should include full details of a proposed phased approach to development. A contingency plan must be provided and should include full details of monitoring wells (locations, configurations), monitoring frequency, groundwater quality testing parameters and a schedule for reporting. The contingency plan should be specifically designed to address the potential for drawdown of nitrate impacted groundwater from the upper bedrock hydrostratigraphic unit to the lower bedrock hydrostratigraphic unit. The contingency plan should identify suitable trigger levels and a plan of actions to be taken if trigger levels are exceeded. Contingency actions should include the potential delay or cancellation of further development if significant adverse effects are indicated.

Figure 12 shows conceptual lot development layouts for each lot but does not include detailed topographic information. It is suggested that the slope at each lot be indicated with an arrow and the conceptual layout on each lot be optimised accordingly. The eastern lots currently appear to have wells located downgradient relative to septic beds and this must be addressed/corrected.

- **GEMTEC:** Phased approach for the proposed subdivision added, refer to conclusions section 8.6.
- Updated conceptual lot development plan Figure 14.

BluMetric: A three-step process is described for evaluation of septic system impacts according to MECP Procedure D-5-4 and a predictive nitrate impact assessment calculation is provided. It is unclear how the area for impermeable surfaces was calculated. The report indicates a value of 10% was applied but it is suggested that a tabulated breakdown of impervious areas be provided (including reasonable estimates for roof areas / driveways, and roadways).

The predictive nitrate impact assessment uses a topography factor for flat land. Topography at the site varies by more than 0.6 m per km (see definition for ‘flat land’ in Table 2 on page 4-62 in

MOEE Hydrogeological Technical Information Requirements for Land Development Applications (1995), and in Table 3.1 (Hydrologic Cycle Component Values) in MOE Stormwater Management Planning and Design Manual (2003).

- **GEMTEC:** Calculations have been revised accordingly. Hard surface areas for roads, houses and driveways equals approximately 9% of total site area, assumptions have been provide in the report. The topography factor has been reduced to 0.21 and the soils factor has been revised from 0.2 to 0.3 to reflect the on-site soil types which are primarily silty sands. The soils factor of 0.2 was used as a conservative assumption for the severance parcels to the west, where the soils are generally characterized as silty clay.

BluMetric: Section 6.1.2 of the report indicates tertiary treatment units could be considered for the development. Since there are clear indications of nitrate contamination to the upper bedrock hydrostratigraphic unit (and no information regarding potential long-term drawdown of nitrate contamination to the lower bedrock hydrostratigraphic unit), it is suggested that nitrate reducing tertiary treatment should be recommended for all lots. This approach was discussed during recent pre-submission consultation meetings. The recommendation for nitrate reducing tertiary treatment systems is seen as an additional protective measure, but as per pre-submission consultation meeting discussions, the long- term operation of such systems cannot be guaranteed so assessment for septic suitability (i.e. the predictive nitrate impact assessment calculation) must be based on conventional systems. The recommendation for nitrate reducing tertiary treatment systems should include reference to requirements for certified systems, a long-term maintenance agreement and a mechanism to ensure the County is aware that tertiary treatment systems have been installed and are being maintained.

- **GEMTEC:** Advanced treatment septic systems are recommended for all lots, updated in Section 9.3.

<u>Conclusions Section of Report</u>

BluMetric: After outstanding issues have been suitably resolved, substantiated professional conclusions should stipulate that “the proposed development will have no adverse impact on the reasonable use of groundwater on existing and future adjacent properties”.

- **GEMTEC:** Updated.

BluMetric: Best management practices for individual wastewater treatment systems should include a reference to the guides available at: https://www.oowa.org/homeowner-resources/.

- **GEMTEC:** Updated.

Recommendations Section of the Report

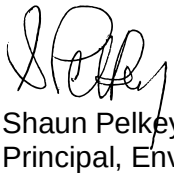
BluMetric: Concerns are raised in the report regarding effective sealing of wells in the area including a reference to possible damage due to blasting of bedrock (last bullet in Section 7.1). It is suggested that the recommendations include the requirement for grouting of well casings using a mixture including bentonite in future wells. The recommendation for well grouting inspections should also reference this requirement.

- **GEMTEC:** Updated.

CLOSURE

We trust that this memo is sufficient for your requirements. If you have any questions concerning this information, please call the undersigned.

Andrius Paznekas, M.Sc., P.Geo.
Hydrogeologist



Shaun Pelkey, M.Sc.E., P.Eng.
Principal, Environmental Engineer

SE / AP / SP

ZANDERPLAN
Your rural land planning experts

November 9, 2023

Koren Lam, Senior Planner
County of Lanark
99 Christie Lake Road
Perth, ON
K7H3C6

Brady McGlade, Planner
Township of Drummond/North Elmsley
310 Port Elmsley Road
Perth, ON
K7H 3C7

RE: Burns Farm Subdivision Minimum Distance Separation (MDS) Review
Part Lot 7, Concession 1
Geographic Township of Drummond
Township of Drummond / North Elmsley
Owner: 1394706 Ontario Inc. c/o Wib Crain

Dear Koren and Brady,

ZanderPlan recently re-visited all of the potential barns within 1500 metres of the proposed to ensure the information gathered was accurate. An MDS Calculation has been completed for nine (9) properties in proximity to the subdivision to assess for potential impacts relating to barns or livestock operations. This letter has been provided to provide supplementary information to support the MDS calculation completed. Four (4) additional properties were investigated and determined not to have livestock or not to have capable livestock facilities.

3978 Drummond Concession 2

Upon investigation of the property no presence of livestock were noted in either of the two accessory buildings on the property. Both were being used as storage for equipment. However, past correspondence with the owner indicated there is capacity for 10 cows and 2 horses within one of the buildings. AgMaps is an online GIS mapping tool issued by OMAFRA the same ministry responsible for the MDS Guidelines. Their mapping includes historic aerial photos from

2014 and 2008. Review of the historic aerial photos show in 2014 there did not appear to be any livestock activity (See Figure 1). In 2008, there was some livestock activity occurring between the two buildings (See Figure 2). An additional building, which has since been removed, is also visible. The largest structure closer to the road does not have the typical design of a livestock barn. Entryways are limited to one door on the northeast side. The smaller building to the rear with the darker roof is a run-in style structure typically used for beef cattle.

Figure 1 – 2014 Aerial Photo of 3978 Con 2

Figure 2 – 2008 Aerial Photo of 3978 Con 2

An MDS calculation was completed for the property based on the livestock numbers provided. The resulting MDS setback was 225 metres. This was measured from the closest corner of the dark roofed building. The closest point of the subdivision falls 245 metres from this facility. Additionally, the larger of the two buildings falls 225 metres from the closest part of the subdivision. The new subdivision lots would comply with MDS if measured from either building.

3928 Drummond Concession 2

This property contains a large riding ring with smaller run-in type structures for horses. Upon investigation two horses were noted in the field. Generally, smaller run-in style enclosures for horses are not counted as livestock facilities for the purpose of MDS. However, historic aerial photos of this property show that one of the structures has existed in place for many years providing facilities for the horses on-site. In 2008, it was the only building that appeared to be used for livestock (See Figure 3). Using the AgMaps measuring tool the structure was measured to be approximately 46 square metres. Using the Livestock Number Calculation tool the barn size was input which determined it was large enough for 2 horses.

Figure 3 – 2008 Aerial Photo of 3928 Con 2

Even though MDS calculations would not typically be done for structures such as these, out of an abundance of caution a calculation was completed for the historic structure using two horses. The resulting MDS setback was 162 metres. The closest part of the subdivision falls only 130 metres away from the barn/run-in. However, this setback covers only a small portion of two lots in the subdivision with more than 0.5ha outside of the setback for construction on each lot. The Grading Plan completed for the subdivision, which shows potential dwelling, septic and well locations, was overlaid with the current aerial photo. Using the Make A Map feature on AgMaps the 162m setback was plotted with an excerpt of the Grading Plan showing the proposed dwelling locations fall outside the setback (See Figure 4).

Figure 4 – Showing the 162m Setback in Relation to Proposed Dwelling Locations

Small horse farms such as the one at 3928 Drummond Concession 2 are not considered odourous livestock operations requiring significant land use setbacks. It is very common to find horses on rural residential properties in proximity to new lot severances. The purpose of completing the calculation was to demonstrate the proposed dwellings could comply with MDS setbacks if concerns were to be raised for this run-in. Since the proposal is a subdivision Type B Land Use was applied resulting in double the typical setback for a small livestock use such as this. Despite the MDS setback slightly covering two of the new lots the proposed separation distances for these dwellings per the Grading Plan exceed the minimum setback allowing for adequate separation from the run-in to ensure no future impacts on property owners.

3870 Drummond Concession 2

This property is a smaller lot measuring approximately 3.86ac in size. To the northeast side of the dwelling is a red barn structure with a very small paddock area. Upon recent inspection the grass around the structure had grown up and there was no sign of livestock present on the property (See Figure 5). However, the current aerial photo shows the area around the barn as disturbed, indicating livestock activity, with a horse visible in the photo (See Figure 6). Historic aerial photos also show two to three horses. Based on the size of the property it would not be suitable for any livestock uses beyond the keeping of a few horses. An MDS calculation was completed for the structure resulting in a minimum setback of 162 metres. The closest point of the subdivision lands is located 276 metres from this barn.

Figure 5 – Recent Photo of the Barn

Figure 6 – Current Aerial Photo of 3870 Con 2

3865 Drummond Concession 2

Upon review of this property there did not appear to be any signs of livestock anywhere on the lot. The property houses a dwelling and two smaller outbuildings. Review of the current aerial photo does not show any areas of disturbance around the outbuildings. The back fields are filled with tire tracks presumably from some type of off-road vehicle use. Review of the historic aerial photos does not show any signs of livestock (See Figures 7 & 8). An MDS calculation was not completed for this property.

Figure 7 – Current Aerial Photo of 3865 Con 2

Figure 8 – 2008 Aerial Photo of 3865 Con 2

3776 Drummond Concession 2

This property contains a residential dwelling and several outbuildings located at the front (east) corner of the property. Upon review of the property no livestock were visible within or around any of the outbuildings. The current aerial photo does not show any livestock activity on the property but there does appear to be concrete or cement areas on part of the lot (See Figure 9). This is generally conducive to some kind of livestock activity in the past. Review of the historic aerial photos showed significant livestock activity in 2014 and 2008 (See Figures 10 and 11). The activity was concentrated to the outbuilding directly behind the residential dwelling. The aluminum sided building near the road and the quonset hut do not appear to be used for livestock. This was confirmed by a recent site visit to the property. The building that was used as livestock now appears to be for storage (See Figure 12).

Figure 9 – Current Aerial Photo of 3776 Con 2

Figure 10 – 2014 Aerial Photo of 3776 Con 2

Figure 11 – 2008 Aerial Photo of 3776 Con 2

Figure 12 – Site Photo of 3776 Con 2

The livestock building would be considered an unoccupied livestock building for the purpose of MDS. The building was estimated to measure roughly 160 square metres or 1720 square feet in size. The resulting MDS setback for the unoccupied barn was 288 metres. The closest part of the subdivision lands are located 562 metres from this barn in compliance with the calculated setback for the facility.

3750 Drummond Concession 2

This property contains an old barn structure located next to the residential dwelling near the travelled road. Upon inspection of the property there was no sign of any livestock within or

around the barn (See Figure 13). Review of the current aerial photo shows there are no livestock present and no sign of livestock around the building (See Figure 14). However, review of historic aerial photos show this barn did operate as a livestock facility in the past (See Figures 15 and 16). The use has converted from a livestock operation to cash crops. Sometime between 2008 and 2014 a new dwelling was built on the property and located within one of the old paddock areas from when the barn was used for livestock. Substantial redevelopment and conversion to cash crops supports the finding the barn is no longer housing livestock.

Figure 13 – Site Photo of Barn and New House

Figure 14 – Current Aerial Photo of 3750 Con 2

Figure 15 – 2014 Aerial Photo of 3750 Con 2

Figure 16 – 2008 Aerial Photo of 3750 Con 2

Similar to the abutting property at 3776 Concession 2 this barn would constitute an unoccupied livestock facility for the purpose of MDS. The total barn area was estimated to be 483 square metres or 5200 square feet. The resulting MDS calculation determined a required setback of 396 metres for this unoccupied facility. The closest part of the subdivision lands fall 703 metres from the unoccupied facility.

3739 Drummond Concession 2

A site visit to the property along with current and historic air photos all show that a significant livestock operation is occurring on these lands. Multiple outbuildings are used for the housing of livestock with significant disturbance in and around these buildings. The operation appeared to be beef cattle. Prior to speaking with the owner the areas of the barns were fed into the Livestock Number Calculator in AgriSuite which determined up to 350 cattle could be housed on the property. ZanderPlan Inc. was able to contact the current property owner David Schlorff on November 7, 2023 to confirm livestock numbers. The owner confirmed the maximum capacity for beef cattle would be 350 head. The owner also indicated 4 sheep and 2 horses are kept on the property. Additionally, to the west of the largest barn is an open manure storage with a concrete base. An MDS calculation was completed which required a minimum separation distance of 577 metres from both the closest barn and the manure storage. The closest part of the subdivision lands are located 764 metres and 721 metres respectively from the closest barn and manure storage area.

3673 Drummond Concession 2

Back in 2021 ZanderPlan was retained by the owner of 3673 Drummond Concession 2 to complete an MDS calculation in support of three severances on the property fronting to Drummond Concession 1. That MDS did not include a barn calculation for the current property. However, upon review of aerials and a site visit the rear building appeared to be used for livestock. The property owner Anthony Timmerman was contacted and he confirmed they are raising beef cattle and have a maximum capacity of 12. The resulting MDS setback for this facility is 225 metres. The closest part of the subdivision lands fall 1092 metres from this facility.

1976 Drummond Concession 1

This property is owned by William and Susan Van Andel. ZanderPlan assisted the owners with a severance application for their property back in 2022. The old barns located on the property are not capable of housing livestock. No calculation was completed for the barn as part of the previous severance of the lot. As such, no MDS calculation is required in support of the subdivision for 1976 Drummond Concession 1.

1879 Drummond Concession 1

As part of the severance application for the Van Andel property ZanderPlan spoke to the owner of 1879 Drummond Concession 1 and completed an MDS calculation for 58 beef cattle. The calculation has been re-done as a Type B MDS in support of the proposed subdivision application. The calculation resulted in a setback of 359 metres for the barn. The closest part of the subdivision lands fall 745 metres from this barn.

1700 Drummond Concession 1

This property consists of a flag-shaped parcel of land measuring approximately 5.5 acres in size containing a house and two outbuildings. One of the two building is located in the back right corner of the property. The current aerial photo for the property does not indicate the presence of any livestock (See Figure 17). However, the 2008 aerial photo does show some activity around this barn (See Figure 18). This structure would constitute an unoccupied livestock facility for the purpose of MDS.

Figure 17 – Current Aerial Photo of 1700 Con 1

Figure 18 – 2008 Aerial Photo of 1700 Con 1

Using the measuring tool on AgMaps the barn was estimated to be 30ft by 35ft for a total area of 1,050sq.ft or 97.5 square metres (See Figure 19). Implementation Guideline #20 of Publication 853 speaks to MDS setbacks for Unoccupied Livestock Barns stating MDS I setbacks are not required when "the floor area of the unoccupied livestock facility is less than 100m^2." Based on the size of the facility being less than 100m^2 MDS I calculations would not be required for this use as it is undersized and unoccupied.

Figure 19 – Length and Width Dimension of the Unoccupied Facility

1381 Drummond Concession 1

As previously mentioned in this letter ZanderPlan completed an MDS calculation for Anthony Timmerman to support severances on his property fronting to Drummond Concession 1. The barn assessed in that calculation was 1381 Drummond Concession 1. Based on discussions with the owner it was determined the barn could house 12 beef cattle and 2 horses. These numbers have been input for the new calculation in support of the proposed subdivision. The required setback from the barn was determined to be 233 metres. The closest part of the subdivision lands fall 1,084 metres from the barn.

264 Rathwell Road

This property is located on the south side of Highway 43 falling within 1500 metres of the proposed subdivision. Based on current and historic air photos there is a barn building on this property. However, the appears to be significant damage to the barn roof on aerial photos. A subsequent visit to the property showed in fact large sections of the roof are missing (See Figure 20). Five horses were noted on the property during the visit. Also noted during the site visit was a brand new run-in structure not visible on current aerial photos (See Figure 21). This run-in was being used as shelter for the horses. There was no indication that the current barn

building in its state of disrepair was being used for livestock. The old barn is located more than 1200 metres from the subdivision lands separated by a major roadway with nearly one dozen dwellings intervening between the old barn and subdivision (See Figure 22). Given only a run-in is being used for a few horses on the property with several intervening uses an MDS calculation was deemed unnecessary.

Figure 20 – Site Photo of Current Barn

Figure 21 – Site Photo Showing Run-In

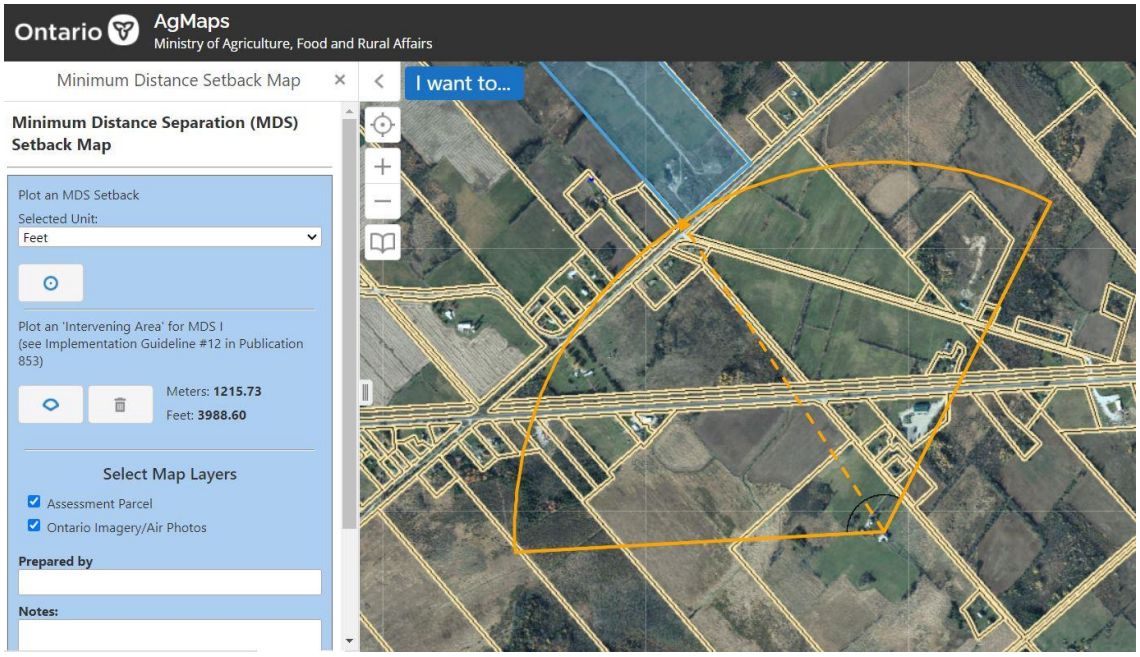


Figure 22 – Intervening Use Map between 264 Rathwell Road and Subdivision Lands

Based on the assessment completed for the 13 properties suspected of having livestock within 1500 metres of the Burns Farm Subdivision it has been demonstrated that none of the facilities will impact the proposed lots or placement of dwellings per the Grading Plan. The proposed subdivision would comply with the MDS Guidelines.

Should you have any further questions please do not hesitate to contact the undersigned.

Sincerely,

_____

Chris Clarke, B.Sc., CPT

Burns Farm

General information

Application date
Nov 3, 2023

Municipal file number

Proposed application
Lot creation that results in a cluster of four, or more, non-agricultural use lots in immediate proximity to one another

Applicant contact information

1394706 Ontario Inc.
1800 Elphin-Maberly Road
Maberly, ON
K0H 2B0
wilburt@crainsconstruction.com

Location of subject lands
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 1 , Lot Part Lot 7
Roll number: 091991901003300

Calculations

1381 Drummond Concession 1

Farm contact information
Margaret Barr
1381 Drummond Concession 1
RR1
Perth, ON
K7H 3C7
613-267-1885

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 1 , Lot Part Lot 9
Roll number: 091990801559700

Total lot size
116.6 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Horses, Medium-framed, mature; 227 - 680 kg (including unweaned offspring)	2	2 NU	500 ft²
Solid	Beef, Cows, including calves to weaning (all breeds), Yard/Barn	12	12 NU	600 ft²

Setback summary

Existing manure storage	**No storage required (manure is stored for less than 14 days)**
Design capacity	**14 NU**
Potential design capacity	**28 NU**

Factor A (odour potential) **0.7**
Factor D (manure type) **0.7**
Factor B (design capacity) **216**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**233 m (764 ft)**
Actual distance from livestock barn	**1084 m (3555 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**No existing manure storage**
Actual distance from manure storage	**NA**

Farm contact information
Sheila Spence
1879 Drummond Concession 1
RR1
Perth, ON
K7H 3C3
613-267-2232

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 1 , Lot Part Lot 6
Roll number: 091991901002300

Total lot size
23.7 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Beef, Cows, including calves to weaning (all breeds), Yard/Barn	58	58 NU	2900 ft²

Setback summary

Existing manure storage	**No storage required (manure is stored for less than 14 days)**
Design capacity	**58 NU**
Potential design capacity	**116 NU**

Factor A (odour potential) **0.7**
Factor B (design capacity) **332.58**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**359 m (1178 ft)**
Actual distance from livestock barn	**745 m (2445 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**No existing manure storage**
Actual distance from manure storage	**NA**

Farm contact information
James Anthony and Joanne Timmerman
3673 Drummond Concession 2
RR1
Perth, ON
K7H 3C3
613-264-0091

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 1 , Lot Part Lot 9
Roll number: 091991901003800

Total lot size
100 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Beef, Cows, including calves to weaning (all breeds), Yard/Barn	12	12 NU	600 ft²

Setback summary

Existing manure storage **No storage required (manure is stored for less than 14 days)**

Design capacity **12 NU**

Potential design capacity **24 NU**

Factor A (odour potential) **0.7**
Factor B (design capacity) **208**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**225 m (738 ft)**
Actual distance from livestock barn	**1092 m (3583 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**No existing manure storage**
Actual distance from manure storage	**NA**

Farm contact information
David, Doreen and Gordon Schlorff
3739 Drummond Concession 2
RR1
Perth, ON
K7H 3C3

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 1 , Lot Part Lot 9
Roll number: 091991901003700

Total lot size
91.4 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Sheep, Ewes & rams (for meat lambs; includes unweaned offspring & replacements), Outside Access	4	0.5 NU	60 ft²
Solid	Beef, Cows, including calves to weaning (all breeds), Yard/Barn	350	350 NU	17500 ft²
Solid	Horses, Medium-framed, mature; 227 - 680 kg (including unweaned offspring)	2	2 NU	500 ft²

Setback summary

Existing manure storage	**V3. Solid, outside, no cover, >= 30% DM**
Design capacity	**352.5 NU**
Potential design capacity	**450 NU**

Factor A (odour potential) **0.7**
Factor B (design capacity) **534.52**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**577 m (1893 ft)**
Actual distance from livestock barn	**764 m (2505 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**577 m (1893 ft)**
Actual distance from manure storage	**721 m (2365 ft)**

Farm contact information
Kevin Cassell Mary Cheetham
3750 Drummond Concession 2
Perth, ON
K7H 3C3

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 2 , Lot Part Lot 9
Roll number: 091991901008300

Total lot size
99 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Unoccupied Livestock Barn	5200 ft²	24.2 NU	5200 ft²

Confirm Livestock/Manure Information (3750 Drummond Concession 2)
The livestock/manure information has not been confirmed with the property owner and/or farm operator.

Unoccupied Barn or Unused Storage (3750 Drummond Concession 2)
The calculated setback is based on assumptions for an unoccupied barn or unused storage that may not reflect the actual design capacity.

Setback summary

Existing manure storage	**No storage required (manure is stored for less than 14 days)**
Design capacity	**24.2 NU**
Potential design capacity	**48.3 NU**

Factor A (odour potential) **1**
Factor B (design capacity) **256.64**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**396 m (1299 ft)**
Actual distance from livestock barn	**703 m (2306 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**No existing manure storage**
Actual distance from manure storage	**NA**

Farm contact information
Sarah Ann Rothwell
3776 Drummond Concession 2
RR1
Perth, ON
K7H 3C3

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 2 , Lot Part Lot 8
Roll number: 091991901008200

Total lot size
99 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Unoccupied Livestock Barn	1720 ft²	8 NU	1720 ft²

Confirm Livestock/Manure Information (3776 Drummond Concession 2)
The livestock/manure information has not been confirmed with the property owner and/or farm operator.

Unoccupied Barn or Unused Storage (3776 Drummond Concession 2)
The calculated setback is based on assumptions for an unoccupied barn or unused storage that may not reflect the actual design capacity.

Setback summary

Existing manure storage	**No storage required (manure is stored for less than 14 days)**
Design capacity	**8 NU**
Potential design capacity	**16 NU**

Factor A (odour potential) **1**
Factor B (design capacity) **186.59**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**288 m (945 ft)**
Actual distance from livestock barn	**562 m (1844 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**No existing manure storage**
Actual distance from manure storage	**NA**

Farm contact information
Bradley Mills Susan Upham
3879 Drummond Concession 2
RR2
Perth, ON
K7H 3C3

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 2 , Lot Part Lot 8
Roll number: 091991901008100

Total lot size
3.86 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Horses, Medium-framed, mature; 227 - 680 kg (including unweaned offspring)	3	3 NU	750 ft²

Confirm Livestock/Manure Information (3870 Drummond Concession 2)
The livestock/manure information has not been confirmed with the property owner and/or farm operator.

Setback summary

Existing manure storage	**No storage required (manure is stored for less than 14 days)**
Design capacity	**3 NU**
Potential design capacity	**3 NU**

Factor A (odour potential) **0.7**
Factor B (design capacity) **150**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**162 m (531 ft)**
Actual distance from livestock barn	**276 m (905 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**No existing manure storage**
Actual distance from manure storage	**NA**

Farm contact information
Gavin and Sarah Christie
3928 Drummond Concession 2
RR1
Perth, ON
K7H 3C3

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 2 , Lot Part Lot 7
Roll number: 091991901007901

Total lot size
42.2 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Horses, Medium-framed, mature; 227 - 680 kg (including unweaned offspring)	2	2 NU	500 ft²

Confirm Livestock/Manure Information (3928 Drummond Concession 2)
The livestock/manure information has not been confirmed with the property owner and/or farm operator.

Setback summary

Existing manure storage **No storage required (manure is stored for less than 14 days)**

Design capacity **2 NU**

Potential design capacity **2 NU**

Factor A (odour potential) **0.7**
Factor B (design capacity) **150**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E)
(minimum distance from livestock barn) **162 m (531 ft)**

Actual distance from livestock barn **130 m (427 ft)**

Storage base distance 'S'
(minimum distance from manure storage) **No existing manure storage**

Actual distance from manure storage **NA**

Farm contact information
Hubert and Judith Hogan
3978 Drummond Concession 2
RR1 STN MAIN
Perth, ON
K7H 3C3
613-267-6129

Location of existing livestock facility or anaerobic digestor
County of Lanark
Township of Drummond-North Elmsley
DRUMMOND
Concession 2 , Lot Part Lot 7
Roll number: 091991901007900

Total lot size
124.9 ac

Livestock/manure summary

Manure Form	Type of livestock/manure	Existing maximum number	Existing maximum number (NU)	Estimated livestock barn area
Solid	Horses, Medium-framed, mature; 227 - 680 kg (including unweaned offspring)	2	2 NU	500 ft²
Solid	Beef, Cows, including calves to weaning (all breeds), Yard/Barn	10	10 NU	500 ft²

Setback summary

Existing manure storage **No storage required (manure is stored for less than 14 days)**

Design capacity **12 NU**

Potential design capacity **24 NU**

Factor A (odour potential) **0.7**
Factor B (design capacity) **208**
Factor D (manure type) **0.7**
Factor E (encroaching land use) **2.2**

Building base distance 'F' (A x B x D x E) (minimum distance from livestock barn)	**225 m (738 ft)**
Actual distance from livestock barn	**245 m (804 ft)**
Storage base distance 'S' (minimum distance from manure storage)	**No existing manure storage**
Actual distance from manure storage	**NA**

Preparer signoff & disclaimer

Preparer contact information
Chris Clarke
ZanderPlan Inc.
0
Perth, ON
K7H 3M6
613-264-9600
chris@zanderplan.com

Signature of preparer

Chris Clarke

Chris Clarke , Planning Technician

Date (mmm-dd-yyyy)

Note to the user

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) has developed this software program for distribution and use with the Minimum Distance Separation (MDS) Formulae as a public service to assist farmers, consultants, and the general public. This version of the software distributed by OMAFRA will be considered to be the official version for purposes of calculating MDS. OMAFRA is not responsible for errors due to inaccurate or incorrect data or information; mistakes in calculation; errors arising out of modification of the software, or errors arising out of incorrect inputting of data. All data and calculations should be verified before acting on them.

Draft Plan of Subdivision and Stormwater Management Report: BURN'S FARM SUBDIVISION

Project No. 160401646

October 5, 2023

Prepared for:
Crain's Construction Ltd.
1800 Elphin-Maberly Rd,
Maberly, Ontario. K0H 2B0

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Revision Record							
Revision	**Description**	**Prepared By**		**Checked By**		**Approved By**	
0	1st Submission SPA	JY	2023-01-23	KK	2023-01-23	NC	2023-01-23
0	2nd Submission SPA	JY	2023-09-27	KK	2023-09-27	NC	2023-10-05

DRAFT PLAN OF SUBDIVISION AND
STORMWATER MANAGEMENT REPORT: BURN'S FARM SUBDIVISION

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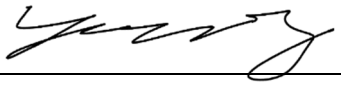
Prepared by 

John Yeong, P.Eng.

Reviewed by 

Kris Kilborn

Approved by _____

Neal Cody, P.Eng.

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Note: PCSWMM Model Result Files are included as a .ZIP file as part of this submission.

1.0 INTRODUCTION

1.1 BACKGROUND

Stantec Consulting Ltd. has been retained to complete the draft stormwater management (SWM) servicing design of the Crain subdivision lands located in Drummond North Elmsley fronting onto Drummond Concession 1 & 2 Roads in the County of Lanark. The proposed development property is located just outside Perth and occupies the east half of Lot 7, Concession 1 in the Geographic Township of Drummond / North Elmsley. The proposed subdivision is currently undeveloped, except for an existing road constructed within the property that connects both Concession Roads. The subject area is generally bounded by agricultural lands. However, a large wetland exists north-west of Drummond Concession Road 2. The 39.3-ha site will consist of a rural residential development and associated accessing infrastructure as shown on **Drawings SSGP-1 and SSGP-2**.

1.2 OBJECTIVE & SCOPE

This stormwater management (SWM) report and analysis has been prepared to demonstrate adherence to established design criteria and support Mr. Crain's development plan for the Draft Approval Phase of the Submission with the County of Lanark and Rideau Valley Conservation Authority (RVCA). The results of the SWM analysis, preliminary SWM servicing plans and grading plans are summarized in this report. This report does not include a detailed design of a stormwater management facility or detailed design of offsite drainage ditches that do not form part of the proposed subdivision.

1.3 BACKGROUND RESOURCES

The following studies, standards and GIS resources were referenced in the preparation of this report:

- *City of Ottawa Sewer Design Guidelines and Technical Bulletin Amendment*, 1st Ed., City of Ottawa, November 2004 amended January 31st, 2012
- *Stormwater Management Planning and Design Manual*, MOE (Ontario), March 2003
- *Engineer's Report on the Drummond-Elmsley Municipal Drain and Branches.* Township of Drummond, Township of North Elmsley. July 1967 (See Appendix B).
- *Addendum to the Engineer's Report on the Drummond-Elmsley Municipal Drain and Branches*. Township of Drummond, Township of North Elmsley. March 1970 (See Appendix C).
- Digital Elevation Model, 2 m resolution, 2014.
- *Topographical Site Survey*. October 2021

- *Constructed Drains Dataset*. Ontario Geo Hub. January 1st 1990, amended 2022.

2.0 DESIGN CRITERIA AND CONSTRAINTS

2.1 DESIGN CRITERIA

The stormwater management criteria were established through review of the background documentation, conversations with Rideau Valley Conservation Authority (RVCA) staff, and is supplemented with current design practices outlined by the City of Ottawa (2012) and MOE (2003) guidelines.

- 100-year water depths in roadside ditches cannot cause surface flooding on any building or structure
- Roadside ditches and realigned channels to be sized to convey the 100-year 24-hour SCS storm and the 100-year 24-hour SCS storm with City of Ottawa IDF parameters increased by 20% to account for climate change
- Post development runoff up to and including 100-year storm to be restricted to pre-development levels both at the Sommerville municipal drain north of the site and at the point where runoff from the southeast end of the proposed subdivision joins the Drummond-Elmsley Municipal Drain.
- Culverts along the roadside ditch to be sized to convey the 100-year 24-hour SCS storm without overtopping the roads
- Provide adequate emergency overflow conveyance off-site
- Divert all rooftop drainage onto the green grass along the property, some of which would get infiltrated and rest drained onto the proposed ditches.

3.0 TARGET DISCHARGE DETERMINATION

The allowable discharge rates from the development property must be determined in order to successfully design a stormwater management plan. This involves assessing the peak runoff from the site's existing conditions and determining the capacity of the existing municipal drains.

3.1 EXISTING DRAINAGE CONDITIONS

The current land use for the site is agricultural. The topography of the southeast corner of the site generally falls southeast towards Concession 1 Road. Drainage across the remaining site is facilitated through the Sommerville Branch and Imerson Branch of the Drummond-Elmsley Municipal Drain for the northwest and central portions, respectively.

3.2 EXISTING CONDITIONS MODEL

3.2.1 MODEL METHODOLOGY

A comprehensive hydrologic modeling exercise was completed with PC-SWMM version 7.4.3240 to generate pre-development runoff response from the site and external areas. The pre-development stage model is shown in **Figure 1.** The overall area was sub-divided into several subcatchments tributary to the system of roadside ditches, culverts and municipal drains. Due to the rural drainage area, the 100-year 24-hour SCS storm event was used to generate surface runoff from the site and external areas under the pre-development stage. The pre-development stage peak flows were obtained at three outlet locations as indicated in **Figure 1**:

1) Northwest outlet, a culvert leaving the site into Concession 2 Road ditch

2) Central outlet, the Imerson Branch ditch leaving the site at the mid-point of the subject site's northeastern property line

3) Southeast outlet, a channel at the southeast corner of the subject site's boundary, onto Concession 1 Road

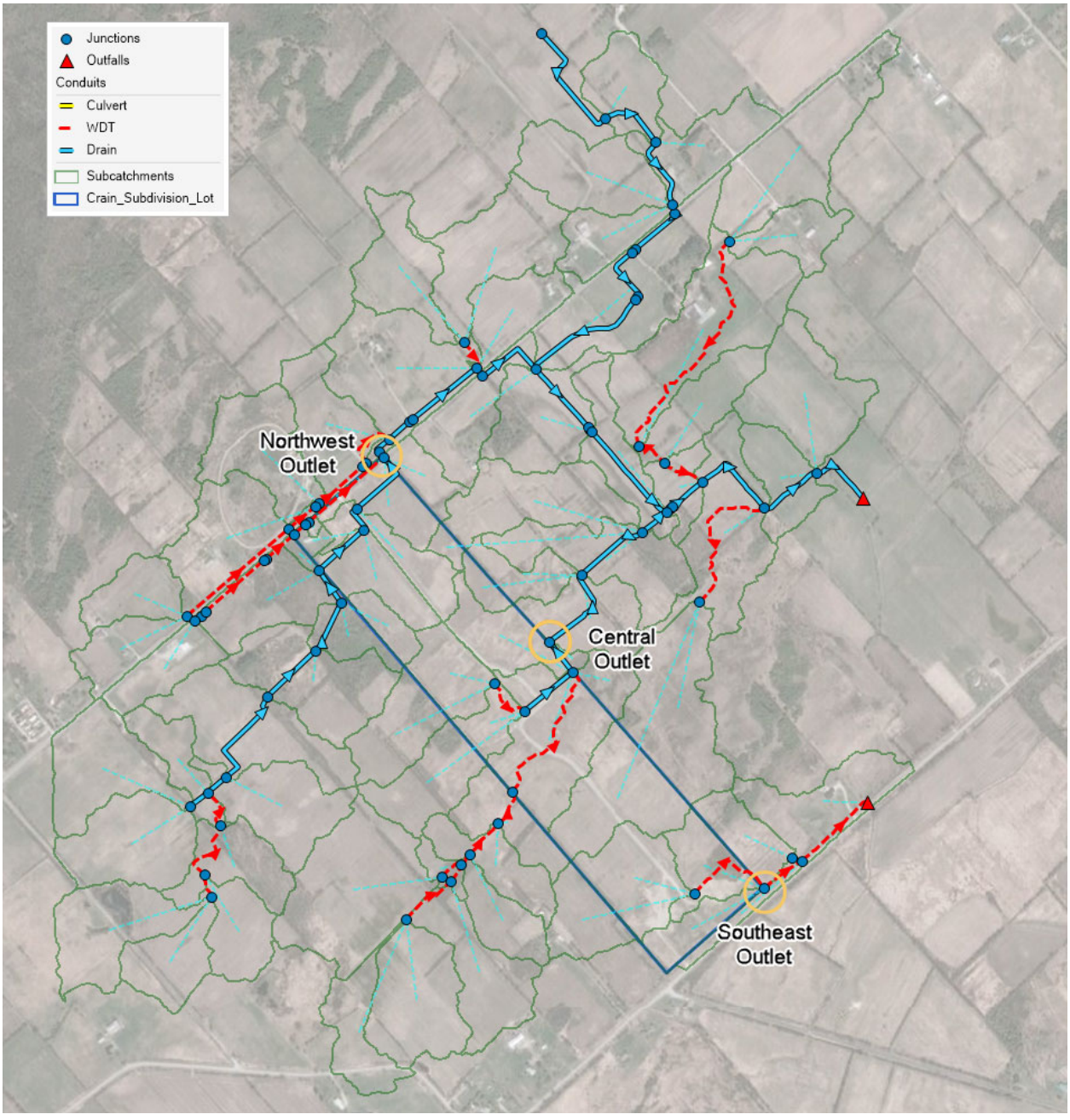


Figure 1. Existing Conditions Model Layout

The following assumptions were applied to the existing condition model:

- Hydrologic parameters as per Ottawa Sewer Design Guidelines, including Manning's 'n', initial abstraction and depression storage values (see **Appendix A.1**)

- The SCS Method was used to calculate CN values for each subcatchment based on existing land use and available soil information (see **Appendix A.2**)
- Land use across the site was obtained from aerial photographs as shown in **Figure 1**
- Subcatchment and drainage system were delineated using DEM data
- Ditch cross sections were estimated based on 2k mapping
- Model downstream system is truncated at a large hydraulic drop of the Drummond-Elmsley Municipal Drain and it is assumed that the downstream system will not back up due to the large drop

3.2.2 MODEL RESULTS

The pre-development model was run with 100-year 24-hour SCS storm event entirely. The simulated maximum flow is shown in **Table 3.3.1**. An alternative version of the model is also made, in which the northwest and central outlets are set to discharge freely without the downstream boundary condition. The free outlet maximum flows will be used to compare the post-development at these two locations. The Southeast outlet remains no change.

The post-development peak flows up to the 100-year 24-hour SCS storm event must be restricted to be less than or equal to these target flow rates.

Table 3.3.1: Target Release Rate

Outlet Location	Allowable Discharge Rate (m^3/s)	Allowable Discharge Rate with No Boundary Condition (m^3/s)
Northwest outlet	0.948	1.429
Central outlet	0.768	0.794
Southeast outlet	0.557	0.557

4.0 STORMWATER MANAGEMENT DESIGN

The following sections describe the proposed conditions for the post-development stage and the stormwater management plan for the Crain subdivision in the context of the background documents and governing criteria.

4.1 PROPOSED CONDITIONS

Stormwater from the subdivision will be collected in roadside ditches and ultimately directed to the Drummond-Elmsley Municipal Drain, through the three outlets.

4.2 PROPOSED CONDITIONS MODEL

4.2.1 MODEL METHODOLOGY

The post-development model (**Figure 2**) was built on top of the pre-development model. It includes new ditches along the future roadside and backyard of lots. The southwest backyard ditches will capture external flows from the upstream system.

To meet the stormwater discharge criteria for the proposed development, the proposed ditches will be used to promote stormwater detention and to reduce peak flow discharge from the area.

There is an elevation discrepancy between the proposed ditches based on surveying data and the existing drainage system generated from the more coarse DEM data. The surveying data is generally lower by around 1.0 to 1.5 meters and it results in a connectivity mismatch in the model at the proposed outlets such that the proposed ditch system is lower than the downstream system.

If true, it will only start to drain by gravity to the downstream system when water levels overcome the elevation difference. The level of accuracy in the 2 m by 2 m DEM data is expected to be relatively rougher and less precise than the on-site surveying data. It is recommended to perform on-site measurement at certain major downstream locations, such as culvert crossing, in order to verify the actual elevation and to adjust the level accordingly in the model.

For the outlet ditch boundary conditions, the Northeast and Central outlet ditches are assumed to have a normal depth at a slope of 0.2%. For the Southeast, DEM and survey elevations were available and so were used in this location.

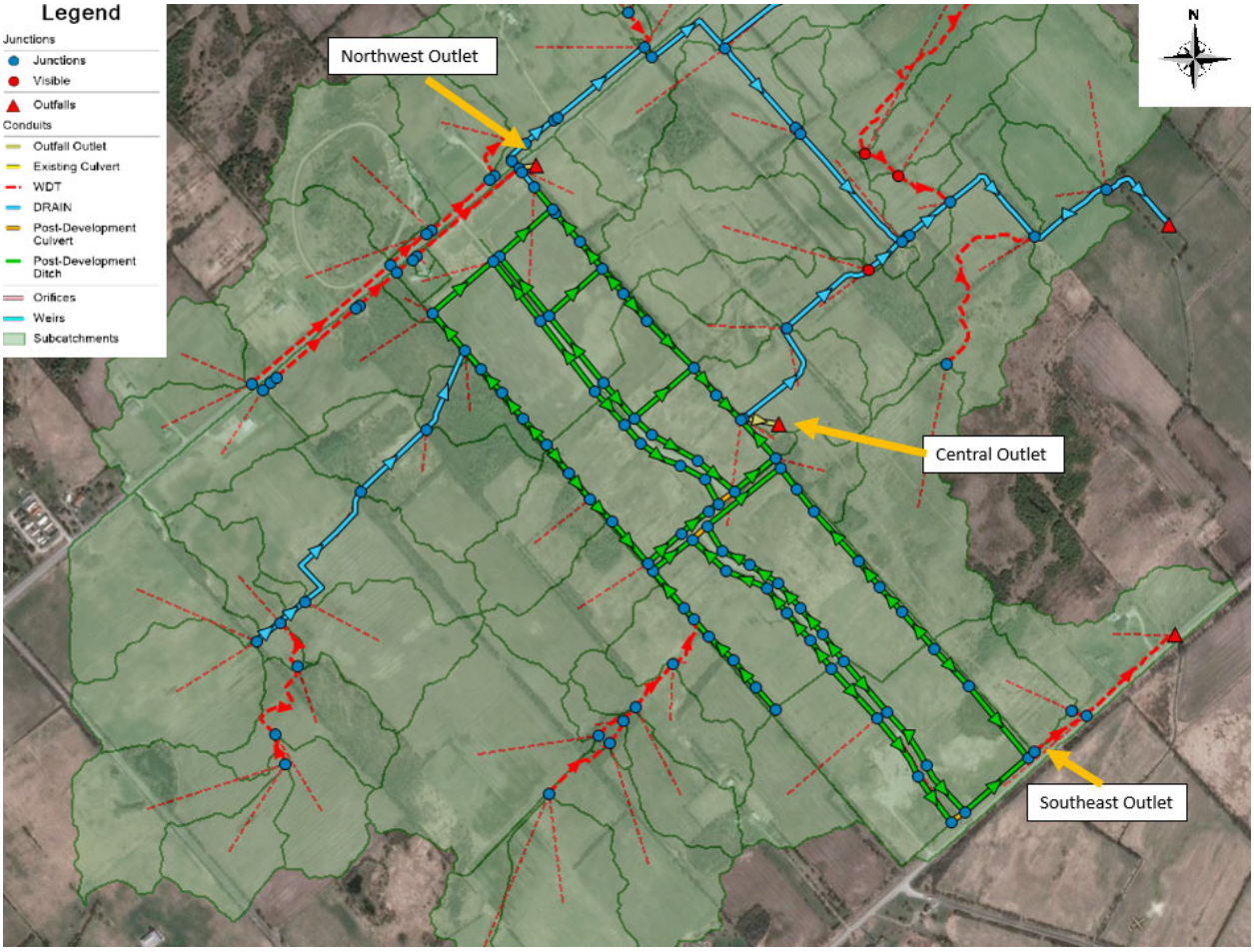


Figure 2: Proposed Conditions Model Layout

4.2.2 MODEL RESULTS

The post-development model was simulated with a 100-year 24-hour SCS rainfall event. Flows will be regulated via orifices or flow control devices to meet the allowable discharge rate of the pre-development stage. Future ditches in the area have been designed to store water during and after the rainfall event. **Table 4.1** outlines the maximum discharge flows at the three locations, in comparison with the flowrates at the pre-development stage.

Table 4.1: 100-Year Peak Maximum Release Rates

Outlet Location	Allowable Discharge Rate with No Boundary Condition (m^3/s)	Control Size (mm)	Maximum Discharge Flow (m^3/s)	Maximum Water Level (m)
Northwest outlet	1.429	900 x 1800 Rectangular	1.180	0.78
Central outlet	0.794	600 Diameter	0.590	1.41
Southeast outlet	0.557	690 Diameter	0.406	0.54

As can be seen from the table, post-development discharge rates at each of the three outlets are all below the pre-development allowable discharge rates. The proposed ditches and cross-sections have sufficient storage to detain the volumes generated.

4.2.3 MODEL RESULTS – CLIMATE CHANGE

The post-development model was also evaluated with a 100-year 24-hour SCS rainfall event with a 20% increase for testing potential climate change impacts. **Table 4.2** outlines the maximum discharge flows with the climate change impact at the three locations, in comparison with the flowrates at the pre-development stage. The drainage system will be able to maintain the water within the ditch system without causing any surface flooding, but it will result in an overflow in the northwest and central outlets through overflow weirs (the flow in the summary table includes both orifice and weir flows combined).

The drainage system should be reevaluated and verified with proper downstream boundary conditions once elevations of downstream system is properly readjusted with more accurate off-site survey data.

Table 4.2: 100-Year 20% Increase Peak Release Rates

Outlet Location	Allowable Discharge Rate with No Boundary Condition (m^3/s)	Control Size (mm)	Maximum Discharge Flow (m^3/s)	Maximum Water Level (m)
Northwest outlet	1.966	800 x 1400 Rectangular	1.643	0.91
Central outlet	1.106	600 Diameter	1.182	1.61
Southeast outlet	0.668	690 Diameter	0.553	0.66

5.0 EROSION AND SEDIMENT CONTROL

In order to control erosion and migration of sediment-laden runoff off site during construction, an erosion and sediment control plan will be required for the subdivision. Therefore, an appropriate inspection and maintenance program is necessary that will be employed by the contractor, and will consider the following goals:

- Minimizing erosion and release of sediment from the site
- Proposed channels to be dug well in advance of any other construction activities to ensure the banks are stabilized with vegetation prior to connections and flow conveyance
- Minimizing the risk of environmental damage
- Immediate stabilization and containment of any exposed soil and/or stockpiles
- Frequent inspection of all controls during construction and after significant rainfall events (greater than 13 mm) for sediment accumulation and erosion
- Protecting adjacent areas, watercourses, and other environmentally sensitive receptors
- Immediate repair of all noticeable erosion, with investigation into the cause so implementation of mitigation measures is done to prevent recurrence
- Complying with all applicable environmental regulatory requirements
- Maintenance of the erosion control measures during construction
- Preparation of monitoring reports outlining the condition of erosion control works, their overall performance, and any actions such as repairs, replacement or modification

The ESC Plan should preserve vegetation; establish construction access; control the flow rates; include site specific sediment controls; stabilize soils, channels and outlets; protect slopes and drain inlets; control pollutants and dewatering and finally maintain best management practices at all times.

6.0 APPROVALS

The Rideau Valley Conservation Authority (RVCA) will need to be consulted in order to obtain municipal approval for site development. A Requirement for an MECP Permit to strengthening, changing and/or diverting the south-north drainage course bisecting the site, which is subject to the Fill, Construction and Alteration to Waterways regulation may be required and can be confirmed by the geotechnical consultant at the time of application.

Though not stormwater related, it should be pointed out that an Environmental Impact Statement (EIS) is required by the County of Lanark to identify features like grasslands, species at risk and natural heritage features. EIS would also be looking at the impacts to the municipal drain/watercourse and is usually needed when development or site alteration is proposed or adjacent to the environmentally designated lands or other features of the natural heritage. Any impacts on trees, species or habitat should also be addressed.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 STORMWATER MANAGEMENT

The stormwater management plan provided can effectively control on-site runoff and meet the target allowable release rate. Ditches in the drainage system will be served as storage for retention of excess water volume by controlling the expected post-development 100-year storm run-off from the proposed development area to the existing 100-year storm runoff release rate.

The ultimate storm outlets for the site are split between three outlet locations i.e., the northwest outlet (culvert), central outlet (Imerson Branch ditch) and the southeast outlet (southeast corner channel). A pre- and post-development model was simulated with 100-year 24-hour SCS rainfall event. Flow discharge will be regulated to meet the allowable discharge rate of the pre-development stage and future ditches in the area will serve as storage to retain the waters during and after the rainfall event. Moreover, the post-development model was also evaluated with potential climate change impact. The drainage system will be able to maintain the water within the ditch system without causing any surface flooding, but it will result in an overflow in the northwest and central outlet through an emergency weir and will exceed the pre-development stage discharge limits at northwest and central outlet locations.

Due to the discrepancy in offsite ditch elevations between surveying data and DEM data, it is recommended to perform additional off-site survey after the draft plan stage, in order to verify the actual elevations of the outlet ditches. The current design assumes a normal depth of water for a 0.2% ditch slope at the outlets. The drainage system should be reevaluated and verified with surveyed downstream elevations at detailed design to ensure boundary conditions are accurately represented.

7.2 EROSION AND SEDIMENT CONTROL

An Erosion and Sediment Control plan is required to control erosion and migration of sediment-laden runoff off site during construction. All the elements of the ESC must be followed to adhere to the guidelines and protecting the adjacent areas, watercourses, and other environmentally sensitive areas.

7.3 APPROVALS/PERMITS

The Rideau Valley Conservation Authority (RVCA) will need to be consulted to obtain municipal approval for site development. An Environmental Impact Statement (EIS) under the requirement of the County of Lanark is needed to identify natural heritage features, species at risk and wetlands to determine the possible impacts.

APPENDICES

Appendix A Hydrological Parameters and SCS Method

A.1 HYDROLOGICAL PARAMETERS

HYDROLOGICAL PARAMETERS

1. Inlet Time / Time of Concentration

- an Inlet time of 10 minutes has been used for all land uses and lot grading configurations.

2. Runoff Coefficent

- the runoff coefficient (C) as applied in the Rational Method accounts for the process of hydrologic abstractions and runoff diffusion.
- the hydrologic abstractions include interception, infiltration, surface storage, evaporation, and evapotranspiration.

3. Imperviousness Ratio

- The imperviousness ratio (imp) provides the percentage of impervious area in relation to the total area.
- The following equation provides the basis for determining a blended runoff coefficient when a basin consists of a mixture of impervious and pervious areas:

$$\text{imp} = \frac{\text{impervious area}}{\text{total area}}$$

$$C = imp \times \left[C_{\text{impervious}} \right] + \frac{\text{perviousarea}}{\text{total area}} \times \left[C_{\text{pervious}} \right]$$

$$C = imp \times \left[C_{\text{impervious}} \right] + (0 - \text{imp}) \times \left[C_{\text{pervious}} \right]$$

4. Depression Storage

- If the intensity of the rainfall reaching the ground exceeds the ground's infiltration capacity, the excess will begin to fill the small depressions on the ground surface. For impervious surfaces, this will occur almost immediately. Once these tiny depressions have been filled, overland flow will start and will contribute to runoff.
- In the Ottawa Area, typical default values for depression storage are 1.57mm for impervious areas and 4.67 mm for pervious grassed areas.

5. Infiltration

- The Horton Method provides a hydrologic based approach to calculating infiltration rates and is commonly applied in urban drainage models. The Horton Method is described in this section since it is the most widely used when computer modeling urban basins.

- The Horton infiltration equation defines the infiltration capacity of the soil in time based on a decay function ranging from a initial maximum infiltration rate that changes to a lower limiting rate as the storm progresses.

$f = f_c + (f_o - f_c)e^{-k(t)}$

where: $f =$ infiltration rate at time t (mm/hr)

$f_c =$ final infiltration rate (mm/hr)

$f_o =$ initial infiltration rate (mm/hr)

$k =$ decay coefficient (t^{-1})

Typically in the Ottawa area the default values are:

$f_c =$ 13.2 mm/hr

$f_o =$ 76.2 mm/hr

$k =$ 0.00115 s^{-1}

A.2 SCS METHOD – CN VALUES AND RUNOFF COEFFICIENTS

Runoff Coefficients for Various Soil Conditions

Topography and Vegetation	Soil Texture		
	Open Sandy Loam	Clay and Silt Loam	Tight Clay
Woodland			
Flat 0-5 % Slope	0.10	0.30	0.40
Rolling 5-10 % Slope	0.25	0.35	0.50
Hilly 10-30 % Slope	0.30	0.50	0.60
Pasture			
Flat 0-5 % Slope	0.10	0.30	0.40
Rolling 5-10 % Slope	0.16	0.36	0.55
Hilly 10-30 % Slope	0.22	0.42	0.60
Cultivated			
Flat 0-5 % Slope	0.30	0.50	0.60
Rolling 5-10 % Slope	0.40	0.60	0.70
Hilly 10-30 % Slope	0.53	0.72	0.82

- For paved areas and roofs use: 0.9, gravel surfaces: 0.25 to 0.7 and road shoulders: 0.7
- For 25-year storms add 10%, 50 year storms add 20 % and 100 year storms add 25 % to C value

CN Values for Various Soil Groups

Cover Type and Hydrologic Condition	Hydrologic Soil Group			
	A	B	C	D
Open space: (lawns, parks, golf courses, cemeteries)				
Poor condition (grass cover < 50%)	68	79	86	89
Fair condition (grass cover 50% to 75%)	49	69	79	84
Good condition (grass cover >75%)	39	61	74	80
Impervious areas:				
Paved parking lots, roofs, driveways, etc.	98	98	98	98
(excluding right-of-way)				
Streets and roads:				
Paved; curbs and storm sewers excluding ROW	98	98	98	98
Paved; open ditches (including right-of-way)	83	89	92	93
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89

Source: Hydrology, Engineering Handbook, USDA, Soil Conservation Services (1968)
NOTE: Assume AMC II and $I_a = 0.2S$

Appendix B

Engineer's Report on Drummond-Elmsley Municipal Drain And Branches

ENGINEER'S REPORT

ON THE

DRUMMOND-ELMSLEY MUNICIPAL DRAIN

AND BRANCHES

TOWNSHIP OF DRUMMOND, TOWNSHIP OF NORTH ELMSLEY

JULY, 1967

To the Reeve & Members of Council,
c/o Mr. C. A. Menzies, Clerk
Township of Drummond,
Innisville, Ontario.

Reeve & Members of Council:

The following report is respectively submitted for Councils' consideration and deals with the improvement of the Drummond-Elmsley Municipal Drain and its branches, petitioned under Section 3, The Drainage Act, 1962-63.

Following is a brief description of the drains included in this report:

Drummond-Elmsley Municipal Drain

This drain was originally constructed in 1893 under provisions of The Ditches and Watercourses Act and was known as the Drummond and Elmsley Award Drain. It was last improved in the mid 1930's probably under provisions of the original Award. The original plan of this drain is available and shows the approximate commencement point and location of the drain. The name of this drain was modified slightly to Drummond-Elmsley Municipal Drain for this study.

The survey of the Drummond-Elmsley Municipal Drain follows the course of the original award drain with the following exceptions;

(i) the point of commencement was extended southerly approximately 2,470 feet to drain a low, wet area in the central portion of Lot 13 in Concession 1, Township of Drummond. Originally the award drain started at the road between Concessions 1 and 11 in mid-Lot 13.

Drummond-Elmsley Municipal Drain - Cont's..

(ii) a minor diversion was made at the request of Mr. C. Hands in Lot 10 of Concession 11, Township of Drummond. This diversion was made to facilitate the working of previously unused land.

(iii) a diversion was made at the request of the County of Lanark in Lot 9 of Concession 1, Township of Drummond, on the property of Mr. G. Couch. The drain originally ran for about 400 feet on the north side of the county road between Concession 1/11 and on the south side of the road for approximately 300 feet. This portion of drain has been relocated to run entirely on the south side of the county road outside an 86 foot allowance for the road.

(iv) a minor diversion was made at the request of Mr. G. Couch in Lot 9 of Concession 1, Township of Drummond. This diversion was made to facilitate the working of the land.

A brief description of the course of the drain is as follows: The Drain begins in the Township of Drummond approximately in the centre of Lot 13 in Concession 1(0+00) and runs in a northerly direction across Lot 13 crossing under the road between Concessions 1/11 (25+00); then continue in a generally northerly direction in Lot 13 of Concession 11 and along the line between Lots 12/13 of Concession 11 and in a westerly direction across Lots 12/11 of Concession 11 crossing under the road between Lots 10/11 (108+90) approximately 2,000 feet northerly from the road between Concessions 1/11; then continues in a westerly direction across Lot 10 and East-half Lot 9 in Concession 11 and in a southerly direction in Lot 9 crossing under the road between Concession 1/11 (164+60); then continues in a westerly direction across Lot 9 and part of Lot 8 in Concession 1 and in a generally southerly direction across Lots 8 and 9 crossing under the boundary road between the Township of Drummond and the Township of North Elmsley (247+85) approximately in the middle of Lot 8 in Concession 1, Township of Drummond; then continues in the Township of North Elmsley in a generally south-westerly direction across Lot 19 and part of Lot 20 of Concession x crossing under the established road known as the Old Perth Highway (267+37); then continuing in a south-westerly direction across Lot 20 and Concession X crossing under the road between Lots 19/20 (281+20); then continues in a south-westerly direction across Lot 21 of Concession X crossing under the Canadian Pacific Rail (283+85) and King's Highway No. 43 (284+85); then continues in a south-westerly direction across Lot 21 and the east-half of Lot 22 and in a southerly direction in the middle of Lot 22 of Concession X to connect with the Tay River and Canal.

Drummond-Elmsley Municipal Drain - Cont'd.-

The survey ended at Station 330+00 approximately 1,000 feet from the Tay River and Canal. The outlet into the Tay River and Canal is satisfactory with respect to ditch grade but a problem exists beca se of the artifically maintained water levels in the Canal. This is dealt with in more detail later in this report.

Hands Branch of the Drummond-Elmsley Municipal Drain

This drain was probably constructed as an award ditch. No record of improvement was available. This drain has been named after the owner bearing the largest assessment for the improvement.

The Hands Branch begins on the line between Lots 12/13 in Concession I, Township of Drummond, and runs in a generally northerly direction along the line between Lots 12/13 and across the north-western portion of Lot 13 in Concession I to intersect with the Drummond-Elmsley Municipal Drain. (Sta. 38+80, Hands Branch - Sta. 24+65, Drummond-Elmsley Municipal Drain).

Leach Branch of the Drummond-Elmsley Municipal Drain

This drain was probably constructed as an award ditch. No record of improvement was available. This drain has been named after the owner bearing the largest assessment for the improvement.

The Leach Branch begins in the middle of Lot 12 in Concession II, Township of Drummond, and runs in a generally easterly direction across Lot 12 to the line between Lots 12/13 to interesect with the Drummond-Elmsley Municipal Drain. (Sta. 9+74, Leach Branch-Sta. 45+56, Drummond-Elmsley Municipal Drain).

Doyle-Leach Branch of the Drummond-Elmsley Municipal Drain

This drain was originally constructed with the Drummond and Elmsley Award Drain in 1893 and may also have been improved in the mid 1930's. The drain generally follows the location of the original award drain except that the commencement point was extended approximately 700 feet easterly to provide better drainage to the area. No effort was made to determine the name of this award drain because of land ownership changes and it has been renamed after two of the owners bearing the largest assessment for the improvement.

Doyle-Leach Branch of the Drummond-Elmsley Municipal Drain-Cont'd

The Doyle-Leach Branch begins in Lot 13 of Concession II, Township of Drummond, and runs in a generally westerly direction across Lot 13 and the East-half of Lot 12 and in a southerly direction in Lot 12 to intersect with the Drummond-Elmsley Municipal Drain. (Sta. 24+03, Doyle-Leach Branch - Sta. 70+90, Drummond-Elmsley Municipal Drain).

Sommerville Branch of the Drummond-Elmsley Municipal Drain

This drain was originally constructed with the Drummond and Elmsley Award Drain in 1893 and may also have been improved in the mid 1930's. The drain generally follows the location of the original award drain insofar as the drain is shown on the old plan. However, considerable extensions of the drains must have been made since the original construction and a slight westerly extension was again made in this survey. No effort was made to determine the name of the award drain because of land ownership changes and it has been renamed after one of the owners bearing the largest assessment for the improvement.

The Sommerville Branch begins in Lot 6 of Concession I, Township of Drummond, and runs in a generally easterly and northerly direction across Lots 6 and 7 to the road between Concessions I/II; then continues in an easterly direction for approximately 400 feet along the southern side of the road crossing under the road between Concessions I/II (40+50) and continuing in an easterly direction for approximately 1,300 feet along the northern side of the road, again crossing under the road between Concessions 1/II (53+65); then continues in a southerly direction to intersect with the Drummond-Elmsley Municipal Drain. (Sta. 55+75, Sommerville Branch - Sta. 186+45, Drummond-Elmsley Municipal Drain).

Couch Branch of the Drummond-Elmsley Municipal Drain

This drain was probably constructed as an award ditch but no records pertaining to its construction or later improvement were available. A diversion was made to this drain at is southern end at the request of Mr. G. Couch. This diversion was beneficial to Mr. G. Rathwell also. This drain has been named after the owner bearing the largest assessment for the improvement.

The Couch Branch begins in the northern portion of the West-half Lot 9 in Concession I, Township of Drummond, and runs in a generally southerly direction in Lot 9 to intersect with the Drummond-Elmsley Municipal Drain. (Sta, 14+25, County Branch-Sta. 215+23, Drummond-Elmsley Municipal Drain).

Couch Branch of the Drummond-Elmsley Municipal Drain - Cont'd-

At some future date the Couch Branch could be extended northerly to more effectively drain its basin, however, the affected owners were against such an extension at this time.

T. Spence Branch of the Drummond-Elmsley Muncipal Drain

This drain was probably constructed as an award ditch but no records pertaining to its construction or later improvement were available. A slight extension of the drain was made to drain a wet area in Lot 4 of Concession I, Township of Drummond. This drain has been named after the owner bearing the largest assessment for the improvement.

The T. Spence Branch begins in the southern portion of Lot 4 in Concession I, Township of Drummond, and runs in a generally southerly direction crossing the boundary between the Township of Drummond and the Township of North Elmsley (1+90); continuing in a generally southerly direction in Lot 24 of Concession X, Township of North Elmsley and in a generally westerly direction across Lot 24 and part of Lot 23 of Concession X to intersect with the Spence-Cavanage Branch of the Drummond-Elmsley Municipal Drain. (Sta. 23+13, T. Spence Branch - Sta. 51+35, Spence-Cavanagh Branch.

Spence-Cavanagh Branch of the Drummond-Elmsley Municipal Drain

This drain was probably constructed as an award ditch but no records pertaining to its construction or later improvement were available. This drain has been named after the owners bearing the largest assessments for the improvement.

The Spence-Cavanagh Branch begins on the north side of the Old Perth Highway in Lot 5 of Concession I, Township of Drummond, crossing under the Old Perth Highway (0+55), and runs in a generally southerly direction along the line between Lots 5/6; then in a generally westerly direction across Lot 5 and parallel to the Canadian Pacific Railway, crossing under the C.P.R. (25+50) and King's Highway Number 43 (26+90); then continuing in a generally southerly direction in Lot 5 of Concession I crossing the boundary between the Township of Drummond and the Township of North Elmsley (38+30); then continuing in a generally southerly direction in Lot 23 of Concession X, Township of North Elmsley, and in a generally easterly direction across Lot 23 and the West-half Lot 22 of Concession X and in a generally southerly direction in Lot 22 to intersect with the Drummond-Elmsley Municipal Drain. (Sta. 84+43, Spence-Cavanaghe Branch - Sta. 314+33, Drummond-Elmsley Municipal Drain).

Summary of Drummond-Elmsley Municipal Drain and Branches

The following table summarizes the lengths of drain requiring improvement and the areas drained.

Drain	Length Requiring Improvement (lineal feet)	Area Drained (Acres)
Drummond-Elmsley Municipal Drain	32,927	4,341.3
Hands Branch	3,856	187.6
Leach Branch	974	39.1
Doyle-Leach Branch	2,303	86.0
Sammerville Branch	5,788	248.4
Couch Branch	1,425	86.2
T. Spence Branch	2,305	65.1
Spence-Cavanagh Branch	8,328	314.7
Total	57,906 lineal feet or 10.97 miles	

The total drainage area for the entire scheme is 4,341.3 acres, however, a relatively large area of 837.6 acres is involved only for outlet liability for improvement over a short section of approximately 7,800 feet at the lower end of the Drummond-Elmsley Municipal Drain. The major share of the cost of the drainage improvement therefore is bourne by owners in a drainage area of 3,503.7 acres.

Branch Drains Not included Under this Scheme

As instructed by Council, only those branches which the owners involved wanted included under this scheme were surveyed. For this reason, there are many other branches which are not included in this report. The main area where branches were not surveyed is in Lots 14-18, Concession X, Township of North Elmsley and Lots 11-13, Concession I, Township of Drummond. Similar areas are Lots 9-11, Concession I and Lots 6-8, Concession I, Township of Drummond. These branches are shown on the plan in a broke blue line.

If, in the future, the owners concerned wish to improve these branches, a new study will be necessary but this new study would in no way affect the assessments established in this report.

Tay River and Canal

As previously mentioned the Tay River and Canal provides a satisfactory outlet with respect to ditch grade but a problem exists because of the artificially maintained water level. On the profile of the Drummond-Elmsley Municipal Drain the water level is shown at the time of the field survey. This water level obviously affects the working of land at the lower end of the Drummond-Elmsley Municipal Drain and the Spence-Cavanagh Branch. However, a substantial drainage improvement could be realized if the raising of the water level in the Canal were delayed a couple of weeks. Prior to the raising of the level, which starts about the last week of April, the water level, at the upper sill of the Beveridge Lock Station is approximately 5'-0" whereas the normal summer depth is approximately 6'-4". It is recommended that consultation be made with the proper authorities to delay the raising of the water levels to about the first or second week in May.

Also a crossing with two 48" dian. C.S.P. culverts exists across the Drummond-Elmsley Municipal Drain at the Tay River and Canal, Our attempts to determine ownership of this crossing have been unsuccessful although it appears to have been installed possible as an access crossing for Canal maintenance. This crossing severely impedes spring run-off and should be removed. Provision for such removal is included in the tender for the work. No replacement crossing has been provided but should one be required it may be installed as extra work to the contract.

Plan

The original plan and profile for the construction of the Drummond and Elmsley Award Drain was available for reference.

A new plan was prepared from a mosiac of aerial photographs and on it are shown the names of the present owners within their respective properties, the area assessed for outlet liability and the area assessed for benefit. The area assessed for outlet is indicated by a red line and the benefit area is indicated by a dashed black line.

The benefit and outlet areas were obtained from aerial photographs viewed stereoscopically by a photogrammetric specialist. By this means a very accurate determination is made of the overall drainage basins i,e,, those areas assessed for outlet liability.Likewise, by use of aerial photographs taken in Spring, the specialist outlines the obviously wet areas and these areas are assessed for benefit.

Plan - Cont'd.-

It should be noted that the proposed drainage improvement, herein reported, will not immediately improve all these wet areas unless lateral drains are constructed by the individuals concerned.

The course of the Drummond-Elmsley Municipal Drain and Branches is indicated by a solid blue line.

Profile

To survey the drains, a traverse line was run adjacent to the course of the drain and major deviations in the course of the drains were located by establishing hubs known as points of intersection or P.I. adjacent to these deviations. Then, at 100 foot intervals along the traverse line, 2"x 2" hubs, driving flush to original ground grade, were established and marked by 1"x 1" stakes. From these hubs tape measurements were made to reference the drain to the traverse line and levels were taken along the course of the drain (or proposed course of the drain in the case of diversions) and on the top of the 100 foot hubs to obtain a profile of the existing drain and the traverse line.

Since considerable surface rock was in evidence, soundings were taken in all areas where rock might be encountered. These soundings were taken at 100 foot intervals generally and to a maximum depth of approximately 3½ feet below existing ditch profile. From these soundings a rock profile was determined for estimating purposes.

For each drain these profiles, the traverse chainage and the P.I.'s are all shown on the profile sheets. The proposed grade of the improved drain is also shown together with the various percentage grades, the vertical P.I.'s and reference bench marks.

On the last sheet of the drawings are listed the "cut" figures from the top of hub at original ground grade to the bottom (or profile grade) of the improved drain. These figures will be used by the contractor to construct the drain.

The accompanying plan and profiles, called the contract drawings, and the tender form and specifications govern the performance and extent of the work.

Recommended Improvement

To excavate the drain to design grade both rock and earth excavation will be necessary. The improvement will also include the removal of existing farm crossings and their replacement with the specified lengths and types of culverts.

Recommended Improvement - Cont'd..

The recommended improvement for the entire scheme involves the excavation of 22,012 cubic yards of earth and 940 cubic yards of rock. Also 532 lineal feet of corrugated steel pipe culverts of various sizes are necessary to provide for farm crossings.

A summary of the work required each drain is as follows:

Drain	Earth Execavation (Cubic Yards)	Rock Excavation (Cubic Yards)
Drummond-Elmsley Municipal Drain	15,257	878
Hands Branch	978	36
Leach Branch	231	
Doyle-Leach Branch	299	
Sommerville Branch	1,964	
Couch Branch	408	
T. Spence Branch	585	
Spence-Cavanagh Branch	2,290	26
Totals	22,012	940

Length of Culverts Required (Lineal feet)		Description of Culvert
32	-	18" dia. C.S.P.
66	-	21" dia. C.S.P.
88	-	24" dia. C.S.P
18	-	30" dia. C.S.P.
20	-	36" dia. C.S.P.
20	-	42" dia. C.S.P.
92	-	48" dia. C.S.P.
20	-	54" dia. C.S.P.
64	-	60" dia. C.S.P.
58	-	65"x 40" C.S.P.A.
54	-	72"x 44" C.S.P.A.

Total 532 lineal feet

Schedule K of the report gives the breakdown of farm crossings by drain and owner

Recommended Improvement - Cont'd..

A typical cross-section of the new drains will have a variable bottom width from 2½ feet to 10 feet with side slopes of either 1¼ horizontal to 1 vertical or 1½ horizontal to 1 vertical. The flatter slope is for use in areas where the ground is less stable than normal. In rock excavation the sides shall be vertical with the appropriate ditch bottom width. The depth and top width will be variable depending on the location of the drain within the scheme.

On the last sheet of the drawings ten typical cross-section are shown with the sections of drain applicable to each listed below.

The disposal of excavated material shall include the spreading and trimming of the material in the immediate vicinity of the drain except that in tillable areas such trimming and spreading shall not impede the drainage from the tillable land adjacent to the drain and all excess material, including boulders or other unsuitable material, shall be hauled away and disposed of at sites provided by the Contractor and at the Contractor's own expense or buried sufficiently below the ground level so as not to interfere with ploughing.

Allowances for Land

As mentioned previously in this report diversions of the drain have been made at the request of the County to provide for an 86 foot road allowance for County Road Number 4. The amount of the allowances to the owners affected by these diversions are listed in Schedule L.

A summary of the diversions to provide for widened road allowances is as follows:

1. Drummond-Elmsley Municipal Drain -
   From approximately Sta. 164+20 to 171+10 the drain is to be relocated outside of an 86 foot right-of-way for County Road Number 4. The present drain runs along the north side of the road and the relocated drain will run along the south to take advantage of natural ground elevation.

2. Hands Branch -
   From approximately Sta. 38+25 to 38+90 the drain is to be relocated outside an 86 foot right-of-way for County Road Number 4.

3. Sommerville Branch -
   From approximately Sta. 35+80 to 54+20 the drain is to be relocated outside an 86 foot right-of-way for County Road Number 4. The present drain runs entirely along the south

Allowances for Land - Cont'd..

side of the road and the relocated drain will run partely along the south side of the road (Sta. 35+80 to 40+00) and partly along the north side of the road (Sta. 40+°° to 54+20) to take advantage of natural ground elevations and especially to avoid a high knoll on the south side of the road. The relocation to the north side will require the relocation of possible two Bell Telephone Poles.

No diversions were required for township roads with the possible exception that a short diversion may be required where the Drummond-Elmsley Municipal Drain crosses the townline road. This will depend on decisions by both Townships as to the possibly improving the roadway alignment when the new culvert is installed.

Farm and Access Bridges

Provision has been made for farm bridges under this scheme. All reconstructed or new farm bridges shall be corrugated steel pipe culverts, the sizes and lengths being listed in Schedule "K" together with the names of the owners. The contractor shall be responsible for the supply and installation of all farm bridges.

During the field survey work we attempted to contact all owners regarding the necessity of farm bridges. However, some owners may have been missed or since our interview have realized that an additional crossing is necessary. It is recommended in such cases and where the need for a crossing is obvious that additional farm bridges be installed with the corresponding increase in the owner's assessment being made.

The owners shall be responsible for all reasonable and normal maintenance of these farm bridges.

Only two access bridges are involved in this scheme and all are on diversions being made to accomodate an 86 foot right-of-way for County Road Number 4. Because of this the County shall be responsible for the whole cost of supplying and installing of these bridges as specified later in this report and as shown on the drawings.

Road Bridges

All elevations given in this report and shown on the drawings are based on an assumed datum of 100.00. This assumed Bench Mark is indicated on Sheet #3 of the contract drawings.

Following are recommendations regarding road bridges:

Road Bridges - Cont'd.-

County of Lanark

1. Culvert crossing under County Road Number 4 (Road between Concessions I/II, Township of Drummond) at Sta. 25+00, Drummond-Elmsley Municipal Drain - The existing 24"ø C.S.P. culvert should be replaced with a 48"ø C.S.P. culvert with an invert elevation of 95.3.

2. Culvert crossing under County Road Number 4 at Sta. 164+80 Drummond-Elmsley Municipal Drain - The existing 30"ø C.S.P. culvert should be replaced with a twin 54"ø C.S.P. culvert or a 6'-9" Span x 4'-11" Rise Structural Plate Pipe Arch with an invert elevation of 82.8. The main flow of this drain formerly flowed through a combination 65"x 40",C.S.P.A. and 7'x4' timber crib culvert. approximately 700 feet westerly from this new culvert crossing. When the road is reconstructed this old westerly culvert may be replaced with a much smaller pipe or possible even eliminated depending on the proposed road drainage pattern.

3. Culvert crossing under private entrance at Sta. 169+10, Drummond-Elmsley Municipal Drain - The main drain at this location was relocated from the north side to the south side of County Road Number 4. The existing 36ø C.S.P. culvert should be replaced with a 60"ø C.S.P. with an invert elevation of 82.3.

4. Culvert crossing under County Road Number 4 at Sta. 40+45. Sammerville Branch - There is no existing culvert at this location. The new culvert should be 42"ø C.S.P. culvert installed on a 20° skew to fit the drain alignment and with an invert elevation of 81.7.

5. Culvert crossing under private entrance at Sta. 44+65, Sammerville Branch- There is no existing culvert at this location as a new culvert is required because the drain is being relocated from the south side to the north side of the road. The new culvert should be a 42"ø C.S.P. culvert with an invert elevation of 81.4.

6. Culvert crossing under County Road Number 4 at Sta. 53+50, Sammerville Branch - The existing 30"ø C.S.P. culvert should be replaced with a 48"ø C.S.P. with an invert elevation of 80.8.

Township of Drummond

1. Culvert crossing under road between Lots 10/11, Concession II at Sta. 108+90, Drummond-Elmsley Municipal Drain - The existing 5'x3½' timber crib culvert should be replaced with a 66"ø C.S.P. culvert with an invert elevation of 87.2.

Road Bridges - Cont'd..

2. Culvert crossing under Old Perth Highway at Sta. 0+65, Spence -Cavanagh Branch - The existing 2'x 2' concrete culvert is badly damaged and probably does not function. It is recommended that the old culvert be abandoned and that a 24"ø C.S.P. culvert be installed on a new alignment with an invert elevation of 78.2.

Township of Drummond and Township of North Elmsley

1. Culvert crossing under boundary road at Sta. 247+90, Drummond-Elmsley Municipal Drain - The existing twin 65"x 40" C.S.P.A. culverts should be replaced with either a 10'-3" span x 6'-9" rise structural plate pipe arch culvert or a 12' span x 4' heightconcrete culvert with an invert elevation of 70.0. Before a new culvert is installed the Township should consider the realignment of the boundary road at this location. Possible realignment may require a slight diversion of the drain to provide sufficient right-of-way and possible the skewing of the new culvery approxiately 20°.

Canadian Pacific Railway

1. Culvert crossing under C.P.R. tracks at Sta. 25+50, Spence-Cavanagh Branch - The existing twin 30" C.S.P. culverts with concrete headwall provide ample capacity but the inverts are too high to permit the proper drainage of the proposed drain. It is recommended that the C.P.R. be requested to install an additional 24"ø C.S.P. culvert under their tracks, using tunnel boring techniques, with an invert elevation of 70.8.

All other road culverts were satisfactory. No provisions were made for the cost of road culverts as it is the policy of the road authorities to assume the whole cost of such culvert replacement. However, as assistance for the purpose of budgeting funds for this work, the following summary is included:

County of Lanark

Culvert	Description of New Culvert	Approx. Cost (Incl. Installation)
1. County Road No.4 Sta. 25+00, Drummond-Elmsley Municipal Drain	64 l.f..48"øC.S.P. 12 gauge	$1,000
2. County Road No. 4 Sta. 164+80,Drummond-Elmsley Municipal Drain	TWIN - 72 l.f..54"ø C.S.P. 12 gauge OR 6'-9"x4'-11" Structural Plate Pipe Arch, 12 gauge	$2,800

County of Lanark - Cont'd

Culvert	Description of New Culvert	Approx. Cost (Incl. Installation)
3. Private Entrance Sta 169+10, Drummond-Elmsley Municipal Drain	32 l.f.-60"ø C.S.P. 12 gauge	$575
4. County Road No. 4 Sta. 40+45, Sammerville Branch	64 l.f.-42"ø C.S.P. 12 gauge	$800
5. Private Entrance Sta 44+65, Sammerville Branch	26 l.f.-42øC.S.P. 14 gauge	$1,000
6. County Road No. 4 Sta. 53+50, Sammerville Branch	64 l.f.-48"ø C.S.P. 12 gauge	$1,000
Township of Drummond		
1. Road Btn. Lots 10/11 Con II, Sta.108+90, Drummond-Elmsley Municipal Drain	40 l.f.-66"ø C.S.P. 10 gauge	$1,100
2. Old Perth Highway Sta. 0+65, Spence-Cavanagh Branch	24"ø C.S.P. 16 gauge Length Indeterminate	N/A
Township of Drummond and Township of North Elmsley		
1. Boundary Road, Sta. 247+90, Drummond-Elmsley Municipal Drain	46 l.f.-50 l.f. 10'-3"x6'-9" Structural Plate Pipe Arch, 8 gauge OR 12'x4' Concrete Culvert	$3,800

The above costs are approximate only and may vary in some cases, as much as 25%.

Future Maintenance

The Drummond-Elmsley Municipal Drain and Branches shall be maintained by the Township of Drummond and the Township of North Elmsley with each Township being responsible for that portion of the drainage works which lies within the limits of its municipality. The cost of future maintenance shall be assessed against the owners of lands and roads assessed for its construction, in the

Future Maintenance - Cont'd..

same proportion as shown in Schedule "A" to Schedule "H" except that where lands are subsequently subdivided appropriate pro-rated assessments shall be determined.

Schedule "J" is not to be used for assessing of maintenance costs as it is merely a supplementary schedule to facilitate the book-keeping for the improvement reported herein.

Estimate of Cost

The total estimated cost for the improvement reported herein for the Drummond-Elmsley Municipal Drain and Branches is $46,733.74 as is summarized as follows:

Earth Excavation	22,012 c.y. @0.85/c.y.	$18,710.20
Rock Excavation	940 c.y. @10.00/c.y.	9,400.00
Farm Bridges		9,171.54
Allowances for Land		92.00
Utility Pole Relocation		200.00
Advertisement for tenders		60.00
Preparing and Printing By-laws		250.00
Court of Revision		150.00
Meetings of Council		200.00
Clerk's Fees, Township of Drummond		900.00
Clerk's Fees, Township of North Elmsley		200.00
Engineering Fees, - Report and Tender Documents		6,300.00
Engineering Supervision		1,100.00
	Total Estimated Cost	$46,733.74

This total estimated cost has been apportioned as follows:

Township of Drummond

Outlet Liability - Real Property	$21,725.01
Benefit Liability - Real Property	13,575.02
Outlet Liability - Roads, County of Lanark	660.16
Benefit Liability - Roads, County of Lanark	1,548.03
Outlet Liability - Roads, Township of Drummond	783.59
Benefit Liability - Roads, Township of Drummond	176.86

Estimate of Cost - Cont'd..

Outlet Liability - Roads, Department of Highways	$ 118.67
Benefit Liability - Roads, Department of Highways	Nil
Outlet Liability - Canadian Pacific Railway	120.61
Benefit Liability - Canadian Pacific Railway	Nil
Sub-Total, Township of Drummond	$38,707.95

Township of North Elmsley

Outlet Liability - Real Property	4,102.55
Benefit Liability - Real Property	2,873.58
Outlet Liability - Roads, Township of North Elmsley	436.63
Benefit Liability - Roads, Township of North Elmsley	217.31
Outlet Liability - Roads, Department of Highways	156.39
Benefit Liability - Roads, Department of Highways	32.92
Outlet Liability - Canadian Pacific Railways	173.49
Benefit Liability - Canadian Pacific Railways	32.92
Sub-Total, Township of North Elmsley	$ 8,025.79
Total Estimated Cost	46,733.74

Combining the preceeding summaries shows the apportionment between real and other porperty for the shole scheme as follows:

Outlet Liability - Real Property	$25,827.56
Benefit Liability - Real Property	16,448.60
Outlet Liability - Others	2,449.54
Benefit Liability - Others	2,008.04
Total Estimated cost	$46,733.74

Under provisions of The Drainage Act, 1962-63 and the Agricultural Rehabilitation and Development Act, grants totalling two-thirds of the cost of such drainage improvements that drain agricultural lands are available. These grants, when received, will reduce the cost of this improvement assessed against real property by $28,184.11 leaving an estimated cost of $14,092.05 to be shared in accordance with the attached schedules.

No grants are available to reduce the assessments against the Township of Drummond, Township of North Elmsley, County of Lanark, Department of Highways and the Canadian Pacific Railways.

Yours very truly,

RMK/br

R. M. KOSTUCH P.Eng.

July 31st, 1967
Brockville, Ontario.

SCHEDULE "A"

SCHEDULE OF ASSESSMENT

HANDS BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
E. McConnel	12	1-2	69.7	$190.16	$289.42
W. Leach	12	2	12.2	-	$ 62.16
J. Ferguson	12	1	42.6	-	$204.33
J. Hands	13	1	55.9	$508.50	$284.83
County ofLanark Part of Road Btn. Conc. I/II	12-13	1-2	7.2	$ 15.86	$110.07

SCHEDULE "B"

SCHEDULE OF ASSESSMENT

LEACH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
ownship of Drummond					
Leach	12	2	16.4	$193.81	$ 97.67
McConnel	12	2	20.8	-	$123.88
McConnel	11	2	1.9	-	$ 11.32

SCHEDULE "C"

SCHEDULE OF ASSESSMENT

DOYLE-LEACH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
M. Doyle	13	2	40.4	$101.73	$207.67
G. McConnel	13	2	9.1	-	$ 46.78
W. Leach	12	2	30.6	$259.32	$148.55
E. McConnel	12	2	4.8	$ 19.24	$ 18.51
E. Hughes	14	2	1.1	-	$ 5.65

SCHEDULE "D"

SCHEDULE OF ASSESMENT

SUMMERVILLE BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
ownship of Drummond					
Spence	6	1	28.7	$ 63.85	$147.99
Moore	6	1	47.4	$ 74.18	$244.42
rs.C.Donovan & Sommerville T.	7	1	28.5	$238.47	$146.96
	7	1	26.2	$231.71	$135.10
Imeson	8	1	12.2	$ 19.53	$ 62.91
Rathwell	6-8	1-2	38.9	$ 57.29	$200.59
Drysdale	7-8	2	35.5	$127.60	$183.07
Hogan	7	2	21.5	$ 27.35	$110.87
unty of Lanark rt of Road Btn. ac. I/II		1-2	9.5	$794.98	$146.96

SCHEDULE "E"

SCHEDULE OF ASSESSMENT

COUCH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
J. Sels	11	2	0.2		$ 0.76
C. Hands	10	2	19.2		$73.27
J. Cook	9	2	0.9		$ 3.43
I. Kerr	10	1	10.1		$38.55
A. Gilchrist	9	1	33.4		$127.47
G. Couch	9	1	19.9	$342.74	$75.95
County of Lanark Part of Road Btn. Conc. I/II	9-10	1-2	2.5		$28.63

SCHEDULE "F"

SCHEDULE OF ASSESSMENT

T. SPENCE BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
G. Cavanagh	4	1	20.6	$109.54	$157.23
Township of Drummond Part of Boundary Road	4	1	0.8	-	$ 18.33
Township of North Elmsley					
T. Spence	23-24	10	42.9	$404.98	$327.42
Township of North Elmsley Part of Boundary Road	23-24	10	0.8	-	$ 18.33

SCHEDULE "G"

SCHEDULE OF ASSESSMENT

SPENCE AND CAVANAGH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
G. Cavanagh	4-5	1	78.1	$524.39	$406.92
D. Spence	6	1	40.3	$ 64.73	$195.77
P. McFarlane	5	1	52.2	$ 64.73	$285.26
A. Moore	6	1	6.2	-	$ 13.62
D. Evans	5	1	1.7	-	$ 22.95
Township of Drummond Part of Boundary Road, Part of Road Btn.Lots 5/6, Conc. 1, Part of Former Perth Highway	5-6 & Old Hwy.	1	12.0	-	$153.15
Department of Highways, Part of King's Hwy.No.43	5	1	6.3	-	$ 88.49
Canadian Pacific Railroad	5	1	6.5	-	$ 89.47
Township of North Elmsley					
. Spence	23	10	105.1	$652.11	$267.99
. Spence	22	10	61.0	$284.26	$ 82.90
. Stone	22	10	6.0	-	$ 24.62
Palmer & Palmer	21-22	10	6.7	-	$ 11.00
Balfour	21-22	10	57.6	$126.02	$ 94.56
wnship of rth Elmsley rt of Boundary ad	21-22	10	3.4	-	$ 30.50
partment of ghways, rt of King's Hwy. 43	20-21	10	5.8	-	$ 28.56
adian Pacific lroad	20-21	10	3.6	-	$ 17.73

SCHEDULE "H"

SCHEDULE OF ASSESSMENT

DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
J. Hands	13	1	100.0	$ 137.91	$ 666.91
C. Hands	13-10	1-2	239.5	2,958.49	3,164.03
E. Couch	14	1	33.4	-	519.49
D. Couch	14	1	1.7	-	47.54
County of Lanark Part of Road Btn. Conc. I/II			31.1	737.19	374.50
Township of Drummond, Parts of Road Btn. Lots 10/11 Lots 5/6, Townline Road, Old Perth Highway			43.0	176.86	612.11
E. Hughes	14	2	11.1	~~177.98~~	119.51
G. McConnel	13-11	2	239.2	~~1,543.98~~	2,615.20 ←
W. Leach	12	2	96.7	446.35	1,027.18
E. McConnel	12	2	96.3	603.45	1,476.16
T. Stafford	12	3	0.8	-	4.54
J. Sels	11	2	82.0	662.33	782.42
M. Doyle	13	2	40.4	-	457.30
J. Ferguson	12	1	100.0	-	405.53
W. Cunningham	11	1	50.0	-	129.38
H. Kerr	11-10	1	155.0	-	607.51
A. Ebert	10-11	1	195.0	-	776.96
A. Gilchrist	9	1	100.0	23.28	424.47
E. Couch	9	1	100.0	818.86	506.74
D. Spence	6-8	1	132.8	634.37	388.83
R. Rathwell	6-8	1-2	96.9	1,118.05	446.27

SCHEDULE "H"

SCHEDULE OF ASSESSMENT

DRUMMOND-ELMSLEY MUNICIPAL DRAIN

Cont'd..

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
H. Imeson	8	1	100.0	$ 75.16	$ 406.05
Mrs.C.Donovan &T.	7	1	98.5	-	362.34
E. Sommerville	7	1	100.0	-	379.87
A. Moore	6	1	100.0	-	292.57
J. Cook	9	2	61.7	772.01	677.75
J. Tysick	11	3	0.9	-	5.93
B. Moore	9	2	50.1	561.91	594.64
Ontario Prov. Police.(Comm. Tower)	7	1	1.5	-	9.62
G. Cavanagh	4-5	1	98.7	-	157.62
D. Evans	5	1	1.7	-	6.71
Canadian Pacific Railway	4-5-6	1	16.5	-	31.14
Dept. of Highways Part of King's Hwy. No. 43	4-5-6	1	16.3	-	30.18
P. McFarlane	5	1	52.2	-	83.36
G. Drysdale	7-8	2	35.5	-	63.96
N. Hogan	7	2	25.1	-	38.76
Township of North Elmsley					
W. Cunningham	16	10	86.8	-	73.09
J. Ferguson	17	10	90.7	-	95.0[illegible]
J. McTavish	17	10	94.4	-	110.63
Mrs. C. Barr	18	10	180.3	-	161.17
J. Moore	19	10	76.5	146.27	297.77
[illegible]pence	20-22	10	149.5	465.36	720.49
J.J.Clark	19	10	15.9	-	102.
[illegible] & B.Parlmer	21	10	58.0	72.58	

SCHEDULE "H"

SCHEDULE OF ASSESSMENT

DRUMMOND-ELMSLEY MUNCIPAL DRAIN

Cont'd

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Mrs. Motyka	20	10	2.0	-	$ 32.06
F. Armstrong	20	10	8.9	-	57.07
D. Belfour	21-22	10	110.0	$ 384.02	469.70
T. Belfour	21	10	51.4	337.98	329.61
T. Spence	23	10	148.9	-	225.35
B. Stone	22	10	6.0	-	23.96
B. Nagle	14	10	67.1	-	56.26
B. McTavish	14-15	10	215.6	-	174.97
F. Malloy	16	10	85.4	-	70.51
Dept. of Highways, Part of King's Hwy. No 43	22-21-20	10	11.0	32.92	127.83
Canadian Pacific Railway	22-21-20	10	10.8	32.92	15[illegible]76
Township of North Elmsley Part of Roads Btn. Lot 20/21, Lot 15, Townline Road, Old Perth Highways			37.2	217.31	387.80
G. A. Clark	20	10	1.1	-	6.00

SCHEDULE "J"

SCHEDULE OF ASSESSMENT

COMBINED ASSESSMENTS UNDER SCHEDULES "A" TO "H"

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
J. Hands	13	1	100.0	$ 646.41	$ 951.74
C. Hands	13-10	1-2	239.5	2,958.49	3,237.30
E. Couch	14	1	33.4	-	519.49
D. Couch	14	1	1.7	-	47.54
County of Lanark, Part of Road Btn. Conc. I/II			31.1	1,548.03	660.16
Township of Drummond Parts of Roads Btn. Lots 10/11, Lots 5/6, Townline Rd. Old Perth Highway			43.0	176.86	783.59
E. Hughes	14	2	11.1	~~1,771.98~~	125.16
G. McConnel	13-11	2	239.2	~~1,543.98~~	~~2,615.20~~ 2673.30
W. Leach	12	2	96.7	899.48	1,335.56
E. McConnel	12	2	96.3	812.85	1,853.97
T. Stafford	12	3	0.8	-	4.54
J. Sels	11	2	82.0	662.33	783.18
M. Doyle	13	2	40.4	101.73	664.97
J. Ferguson	12	1	100.0	-	609.86
W. Cunningham	11	1	50.0	-	129.38
I. Kerr	11-10	1	155.0	-	646.06
A. Ebert	11	1	195.0	-	776.96
A. Gilchrist	9	1	100.0	23.28	551.94
G. Couch	9	1	100.0	1,161.60	582.69
D. Spence	6-8	1	132.8	762.95	732.59

SCHEDULE "J"

SCHEDULE OF ASSESSMENT

COMBINED ASSESSMENTS UNDER SCHEDULES "A" TO "H"

Cont'd

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
G. Rathwell	8-6	1-2	96.9	$1,175.34	$ 646.86
H. Imeson	8	1	100.0	94.69	468.96
Mrs.C. Donovan	7	1	98.5	238.47	509.30
E. Sommerville C.T.	7	1	100.0	231.71	514.97
A. Moore	6	1	100.0	74.18	550.61
V. Cook	9	2	61.7	772.01	681.18
J. Tysick	11	3	0.9	-	5.93
B. Moore	9	2	50.1	561.91	594.64
Ontario Prov. Police (Comm. Tower)	7	1	1.5	-	9.62
G. Cavanagh	4-5	1	98.7	633.93	721.77
D. Evans	5	1	1.7	-	29.66
Canadian Pac. Railway	4-5-6	1	16.5	-	120.61
Dept. of Hwy. Pt. of King's Hwy No. 43	4-5-6	1	16.3	-	118.67
P. McFarlane	5	1	52.2	64.73	368.62
G. Drysdale	7-8	2	35.5	127.60	247.03
M. Hogan	7	2	25.1	27.35	149.63
Township of North Elmsley					
W. Cunningham	16	10	86.8	-	73.09
J. Ferguson	17	10	90.7	-	95.08
E. McTavish	17	10	94.4	-	110.63
Mrs. C. Barr	18	10	180.3	-	161.17
G. Moore	19	10	76.5	146.27	297.77
D. Spence	20-22	10	149.5	749.62	803.39

SCHEDULE "J"

SCHEDULE OF ASSESSMENT

COMBINED ASSESSMENTS UNDER SCHEDULES "A" TO "H"

Cont'd

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Twp. of North Elmsley, (Part of Roads Btn. Lot20/21 Lot 15, Town-line Road, Old Perth Highway)			37.2	$ 217.31	$ 436.63
K. J. Clark	19	10	15.9	-	101.97
E. & B. Parlmer	21	10	58.0	72.58	299.37
Mrs. Motyka	20	10	2.0	-	32.06
F. Armstrong	20	10	8.9	-	57.07
D. Balfour	21-22	10	110.0	510.04	564.26
T. Balfour	21	10	51.4	337.98	329.61
Can. Pac. Rwy.	22-21-20	10	10.8	32.92	173.49
Dept. of Hwys. Part of King's Hwy. No 43	22-21-20	10	11.0	32.92	156.39
T. Spence	23	10	148.9	1,057.09	820.76
B. Stone	22	10	6.0	-	48.58
B. Nagle	14	10	67.1	-	56.26
B. McTavish	15	10	215.6	-	174.97
F. Malloy	16	10	85.4	-	70.51
G. A. Clark	20	10	1.1	-	6.00

SCHEDULE "K"

SCHEDULE OF FARM BRIDGES

DRUMMOND-ELMSLEY MUNCIPAL DRAIN & BRANCHES

OWNER	PROPERTY LOT	PROPERTY CONC.	STATION	DESCRIPTION
HANDS BRANCH				
J. Hands	13	1	26+75	1 @ 18' of 30" C.S.P.
LEACH BRANCH				
W. Leach	12	2	5+00	1 @ 16' of 18" C.S.P.
DOYLE LEACH BRANCH				
M. Doyle	13	1	7.50	1 @ 16' of 21" C.S.P.
W. Leach	12	2	14+30	1 @ 16' of 24" C.S.P.
SOMMERVILLE BRANCH				
A. Moore	6	1	5+25	1 @ 16' of 18" C.S.P.
Mrs. C. Donovan & T.	7	1	21+40	1 @ 18' of 24" C.S;P.
COUCH BRANCH				
G. Couch	9	1	14+00	1 @ 18' of 24" C.S.P.
T. SPENCE BRANCH				
T. Spence	23	10	6+80	1 @ 16' of 21" C.S.P.
	23	10	7+20	1 @ 16' of 21" C.S.P.
SPENCE-CAVANAGH BRANCH				
G. Cavanagh	5	1	12+75	1 @ 18' of 21" C.S.P.
	5	1	16±70	1 @ 18' of 24" C.S.P.
T. Spence	23	10	43+30	1 @ 20' of 36" C.S.P.
D. & E. DRAIN				
C. Hands	13	1	23+50	1 @ 18' of 24" C.S.P.
	10	2	114+20	1 @ 20' of 60" C.S.P.
	10	2	121+00	1 @ 18' of 72"x44" C.S.P.A.
G. McConnel	13	2	33+75	1 @ 20' of 42" C.S.P.
W. Leach	12	2	66+05	1 @ 20' of 48" C.S.P.
E. McConnel	12	2	75+60	1 @ 20' of 54" C.S.P.
G. McConnel	11	2	84+95	1 @ 18' of 65"x40" C.S.P.A.
J. Sels	11	2	103+75	1 @ 18' of 72"x44" C.S.P.A.

SCHEDULE "K"

SCHEDULE OF FARM BRIDGES

DRUMMOND-ELMSLEY MUNICIPAL DRAIN & BRANCHES

Cont'd

OWNER	PROPERTY LOT	PROPERTY CONC.	STATION	DESCRIPTION
J. Cook	9	2	136+50	1 @ 22' of 60" C.S.P.
B. Moore	8	2	152+95	1 @ 22' of 60" C.S.P.
G. Rathwell	8	1	183+60	1 @ 18' of 72"x44" C.S.P.S.
	8	1	190+60	1 @ 18' of 48" C.S.P.
	8	1	190+60	1 @ 18' of 48" C.S.P.
G. Couch	9	1	221+05	1 @ 18' of 48" C.S.P.
	9	1	221+05	1 @ 18' of 48" C.S.P.
T. Balfour	21	10	281+20	1 @ 20' of 65"x40" C.S.P.A.
	21	10	281+20	1 @ 20' of 65"x40" C.S.P.A.

SCHEDULE "L"

SCHEDULE OF ALLOWANCE FOR LAND

OWNER	PROPERTY LOT	PROPERTY CONC.	ALLOWANCE	REMARKS
DRUMMOND & ELMSLEY MUNICIPAL DRAIN				
G. Couch	9	1	$30.00	Moving Drummond & Elmsley Municipal Drain to provide for 86' Road Allowance (County Road No. 4)
SOMMERVILLE BRANCH				
G. Drysdale	7-8	2	40.00	Moving Summerville Branch to provide for 86' Road Allowance (County Road No. 4)
G. Rathwell	8	2	4.00	
E. Sommerville	7	2	16.00	
HANDS BRANCH				
J. Hands	13	1	2.00	Moving Hands Branch to provide for 86' Road Allowance (County Road No. 4)

CONTRACT No. 67-02
W.P. No.

(1)

R.M. KOSTUCH P.Eng.
Consulting Civil Engineer
Brockville, Ontario.

DRUMMOND-ELMSLEY MUNICIPAL DRAIN & BRANCHES

DRUMMOND-ELMSLEY MUNICIPAL DRAIN
HANDS BRANCH
LEACH BRANCH
DOYLE & LEACH BRANCH
SOMMERVILLE BRANCH
COUCH BRANCH
SPENCE & CAVANAGH BRANCH
T. SPENCE BRANCH
IMESON BRANCH

CON. X LOTS 14 to 24 TWP. OF NORTH ELMSLEY
CON. II & III LOTS 4 to 14 TWP. OF DRUMMOND

SCALE 1" = 500' (Approx.)

N

SEE SHEET No. 2 FOR SOUTHERLY CONTINUATION OF PLAN

SEE SHEET No.1 FOR NORTHERLY CONTINUATION OF PLAN

2

CONTRACT No. 67-02

DRUMMOND – ELMSLEY MUNICIPAL DRAIN & BRANCHES

SCALE 1" = 500' (Approx.)

R.M. KOSTUCH P.Eng.
Consulting Civil Engineer
Brockville, Ontario.

DRUMMOND

NORTH ELMSLEY

LOT 6 · LOT 7 · LOT 8 · LOT 9 · LOT 10 · LOT 11 · LOT 12 · LOT 13 · LOT 14 · LOT 15 · LOT 16 · LOT 17 · LOT 18 · LOT 19 · LOT 20 · LOT 21 · LOT 22 · LOT 23 · LOT 24

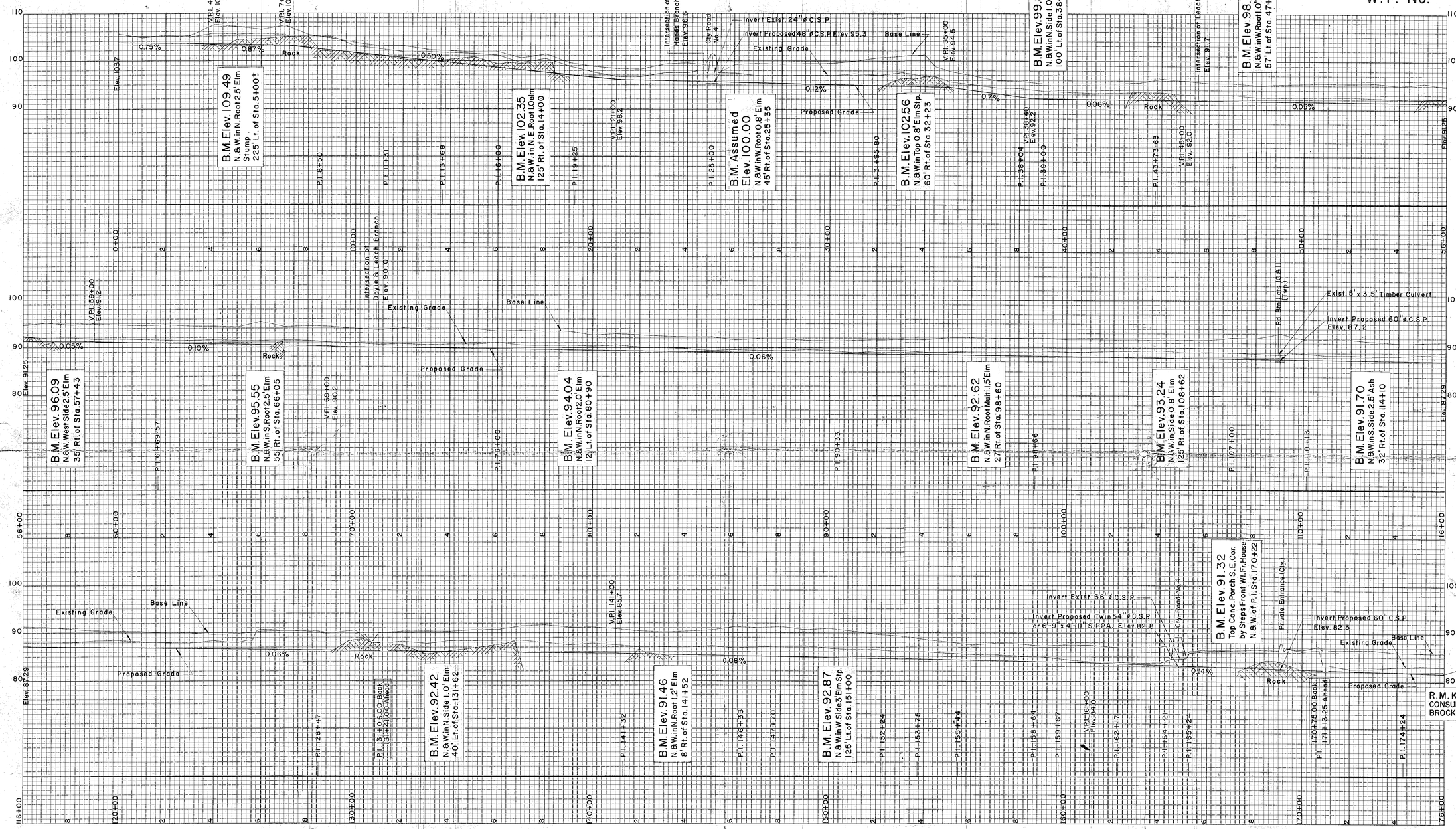
CON. II · CON. I · CON. X

N. Hogan · J. Rathwell · County Road No. 4 · BRANCH · SOMMERVILLE · E. Sommerville · H. Imeson · IMESON BRANCH · DRUMMOND ELMSLEY MUNICIPAL DRAIN · D. Spence · G. Couch · A. Gilchrist · I. Kerr · G. Barr · J. Ferguson · W. Cunningham · F. Malloy · B. McTavish · E. McTavish · B. Donovan · A. Moore · O.P.P. Tower · NATURAL GAS PIPELINE · G. Moore · K.J. Clark · G. Clark · Old Perth Highway · E. & B. Parlow · C.P.R. · Kings Highway No. 43 · P. McFarlane · G. Cavanagh · CAVANAGH BRANCH · UNOPENED ROAD · D. Evans · B. Stone · D. Belfour · A. Mohyla · F. Armstrong · T. Belfour · T. Spence · BRANCH · DRUMMOND-ELMSLEY MUNICIPAL DRAIN · Sta. 330+00 · TAY RIVER CANAL

DRUMMOND - ELMSLEY MUNICIPAL DRAIN

CONTRACT No. 67-02
W.P. No.

(3)



R.M. KOSTUCH P. Eng.
CONSULTING CIVIL ENGINEER
BROCKVILLE, ONTARIO.

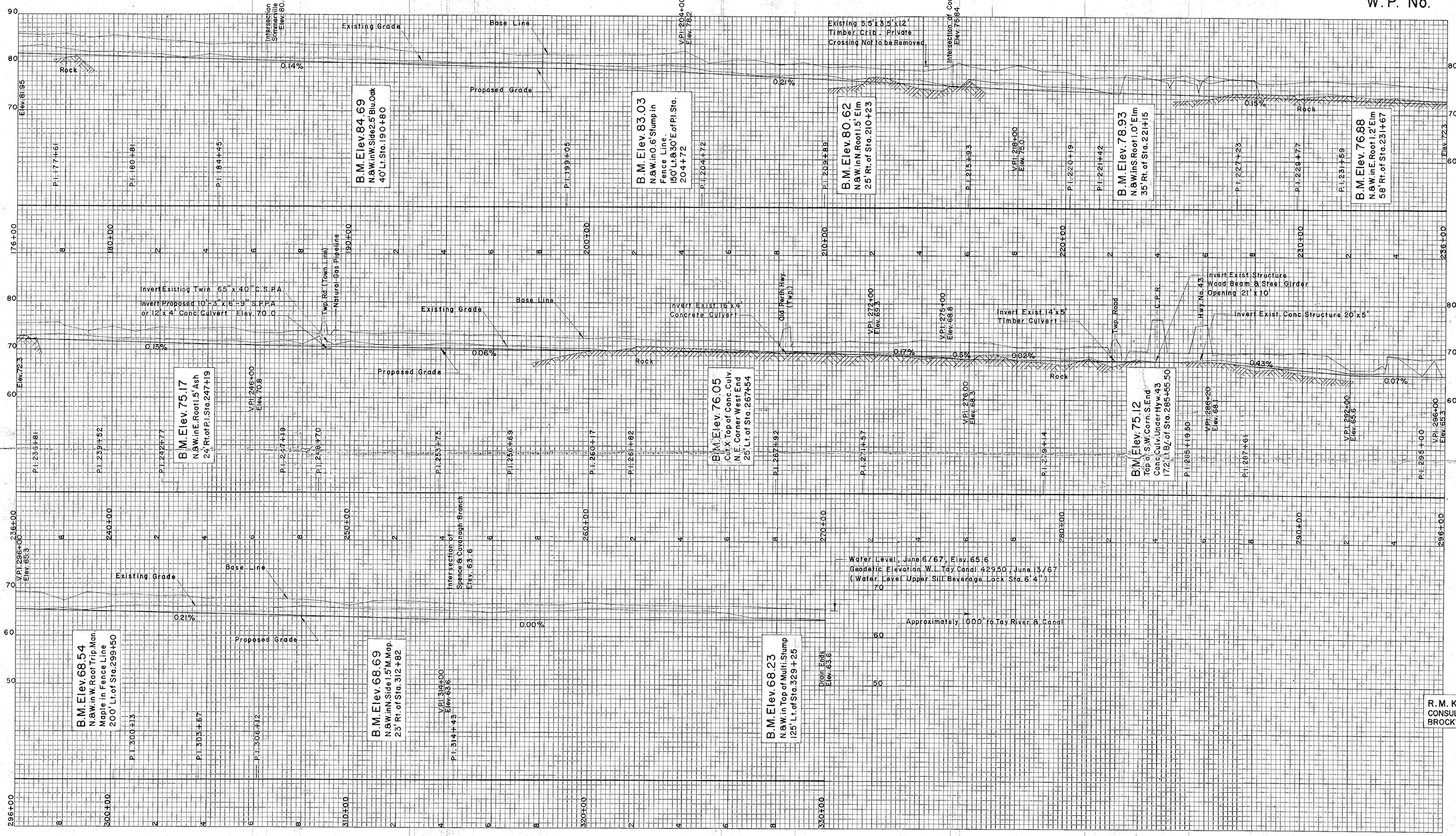
SCALES
1" = 200' Horizontal
1" = 10' Vertical

		Totals
Earth Cut		Earth Cut
Stripping		Stripping
Ditching		Ditching
Muskeg Excavation		Muskeg Excav.
Earth Fill		Earth Fill
Rock Cut		Rock Cut
Shatter		Shatter
Rock Fill		Rock Fill
Muskeg Backfill		Muskeg Backfill

DRUMMOND – ELMSLEY MUNICIPAL DRAIN

CONTRACT No. 67-02
W.P. No.

(4)



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BROCKVILLE, ONTARIO.

SCALES

1" = 200'
Horizontal

1" = 10'
Vertical

		Totals	
Earth Cut			Earth Cut
Stripping			Stripping
Ditching			Ditching
Muskeg Excavation			Muskeg Excav.
Earth Fill			Earth Fill
Rock Cut			Rock Cut
Shatter			Shatter
Rock Fill			Rock Fill
Muskeg Backfill			Muskeg Backfill

CONTRACT No. 67-02
W.P. No.

5

SOMMERVILLE BRANCH

Existing Grade — Base Line — Proposed Grade

0.47% | 0.10% | 0.07%

B.M. Elev. 88.20
N. & W. in E. Side of 1.0' Twin Manitoba Maple in Fence Line 45' N. of P.I. Sta. 2+60

B.M. Elev. 89.59
N. & W. in Top 2.0' Stump 41' Rt. & East of P.I. Sta. 13+57

B.M. Elev. 86.46
N. & W. in N. Side 1.0' Elm 30' Rt. of Sta. 25+20

B.M. Elev. 86.10
N. & W. in S. Side 0.8' Ash 65' Rt. of Sta. 40+51

V.P.I. 3+00 Elev. 85.6
V.P.I. 36+00 Elev. 82.4
V.P.I. 55+75.00 Elev. 81.0

Invert Proposed 42" C.S.P. Elev. 81.7
Invert Proposed 42" C.S.P. Elev. 81.4
Invert Exist. 30" C.S.P.
Invert Proposed 48" C.S.P. Elev. 80.8

County Road No. 4 — Private Lane (County) — County Road No. 4

Sta. 54+17.70 Back
Sta. 52+04.00 Ahead

Drain Ends Elev. 81.0

55+75.00 Summerville Branch =
186+45.00 Drummond & Elmsley Drain

DOYLE & LEACH BRANCH

To be Excav. to Bed Rock — Existing Grade — Base Line — Proposed Grade — Rock

0.20% | 0.06%

B.M. Elev. 98.81
N. & W. in S. Roof 3.0' Elm 150' Rt. of Sta. 0+75

B.M. Elev. 94.87
N. & W. in W. Roof 2.0' Elm 45' Lt. & Back of P.I. Sta. 9+80

V.P.I. 10+00 Elev. 90.9

Drain Ends Elev. 90.0

24+03.00 Doyle & Leach Branch =
70+90.00 Drummond & Elmsley Drain

LEACH BRANCH

Existing Grade — Base Line — Proposed Grade

0.30% | 0.11% | 0.50%

B.M. Elev. 89.28
N. & W. in W. Root of 1.0' Twin Cedar: 57' Lt. of Sta. 47+43

B.M. Elev. 106.37
N. & W. in E. Side 0.6' Elm 25' Rt. of Sta. 1+25

B.M. Elev. 104.24
N. & W. in Top 0.3' Shaped Ash Stump: 20' Rt. of Sta. 15+50

B.M. Elev. 103.82
N. & W. in Top 1.5' Elm Stp. 34' Rt. of Sta. 23+80

V.P.I. 1+00 Elev. 94.0
V.P.I. 8+00 Elev. 93.2
V.P.I. 8+00 Elev. 100.5
V.P.I. 30+00 Elev. 97.5
V.P.I. 23+00 Elev. 99.6

Drain Ends Elev. 92.4

Elev. 103.8 — 0.60% — V.P.I. 1+00 Elev. 103.0

Rock — 0.36% — 0.06% — 0.30% — 0.10% — Rock

9+74.00 Leach Branch =
45+56.00 Drummond & Elmsley Dr.

38+80.00 Hands Branch =
24+65.00 Drummond & Elmsley Drain

HANDS BRANCH

Drain Ends Elev. 96.6

R.M. KOSTUCH P.Eng.
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Brockville, Ontario

SCALES
1" = 200' Horizontal
1" = 10' Vertical

	Totals
Earth Cut	
Stripping	
Ditching	
Muskeg Excavation	
Earth Fill	
Rock Cut	
Shatter	
Rock Fill	
Muskeg Backfill	

Earth Cut	
Stripping	
Ditching	
Muskeg Excav.	
Earth Fill	
Rock Cut	
Shatter	
Rock Fill	
Muskeg Backfill	

CONTRACT No. 67-02
W.P. No.

6

Invert Exist. 2'x2' Conc. Culvert
Invert Proposed 24" C.S.P. Elev. 78.2

Old Perth Hwy.

B.M. Elev. 82.75
N&W. in N. root 2.5 elm
30' Rt. of Sta. 1+25

Elev. 78.8

V.P.I. 2+00 Elev. 78.0

0.20%

Existing Grade

Base Line

0.50%

Proposed Grade

B.M. Elev. 78.51
N&W. in N.E. root 1.5 twin elm
125' Lt. of Sta. 10+60

0.22%

Rock

P.I. 10+34

V.P.I. 11+00 Elev. 74.6

Invert Exist Twin 24" C.S.P. in Conc. Header Walls

0.06%

V.P.I. 17+00 Elev. 73.20

P.I. 18+70

C.P.R. Natural Gas Pipeline

Hwy. No. 43

Invert Exist. 5'x3' Conc. Culvert

V.P.I. 28+00 Elev. 71.0

0.11%

Elev. 72.71

P.I. 25+07

P.I. 25+77

Elev. 71.25

B.M. Elev. 77.09
N.E. corner conc. header wall
of Railway Structure
Rt. of Sta. 25+25

Rock

0.30%

B.M. Elev. 72.74
N&W. in W side Bl. Pole
7' Lt. of Sta. 36+57

P.I. 36+38

P.I. 38+30

Twp. Boundary

V.P.I. 40+00 Elev. 67.4

0.40%

Base Line

Existing Grade

0.10%

Intersection of T. Spence Branch Elev. 63.83

V.P.I. 56+00 Elev. 64.8

Proposed Grade

P.I. 51+35

V.P.I. 44+00 Elev. 66.0

V.P.I. 56+00 Elev. 64.8

Existing Grade

Base Line

0.04%

Proposed Grade

Water Level, June 6/67, Elev. 65.6
Geodetic Elevation W.L. Tay Canal 429.50, June 13/67
(Water Level Upper Sill Beverage Lock Sta. 6'4")

SPENCE & CAVANAGH BRANCH

Drain Ends Elev. 63.6

Base Line

Existing Grade

0.08%

Proposed Grade

Elev. 79.0

Elev. 78.37

IMESON BRANCH

P.I. 60+51

P.I. 62+06

P.I. 71+00

P.I. 1+00

P.I. 6+00

84+43.00 Spence & Cavanagh Branch =
314+23.00 Drummond & Elmsley Drain

7+82.00 Imeson Branch =
99+05.00 Drummond & Elmsley Drain

Existing Grade

Base Line

0.08%

Rock

0.06%

Proposed Grade

Elev. 69.5

V.P.I. 12+80 Elev. 59.0

V.P.I. 4+00 Elev. 66.5

B.M. Elev. 74.20
N&W. in S.E. side 10 elm
35' Rt. of Sta. 1+90

P.I. -1+50

P.I. -0+30

P.I. 2+29

P.I. 13+36

P.I. 12+38

B.M. Elev. 69.32
N.&W. in W. side 0.8 elm
6' Rt. of Sta. 23+00

Drain Ends Elev. 65.4

T. SPENCE BRANCH

23+13.00 T. Spence Branch =
51+35.00 Spence & Cavanagh Branch

Existing Grade

Base Line

0.08%

0.33%

0.92%

Proposed Grade

Rock

Elev. 84.0

V.P.I. 1+00 Elev. 83.0

V.P.I. 11+00 Elev. 80.0

7+82

B.M. Elev. 82.09
N.&W. in N.E. root 1.2 twin apple
50' Lt. of Sta. 13+80

Drain Ends Elev. 77.0

COUCH BRANCH

14+25.00 Couch Branch =
215+23.00 Drummond & Elmsley Drain

R.M. KOSTUCH P.Eng.
Consulting Civil Engineer
Brockville, Ontario

SCALES

1" = 200'
Horizontal

1" = 10'
Vertical

	Totals
Earth Cut	Earth Cut
Stripping	Stripping
Ditching	Ditching
Muskeg Excavation	Muskeg Excav.
Earth Fill	Earth Fill
Rock Cut	Rock Cut
Shatter	Shatter
Rock Fill	Rock Fill
Muskeg Backfill	Muskeg Backfill

DRUMMOND - ELMSLEY MUNICIPAL DRAIN & BRANCHES

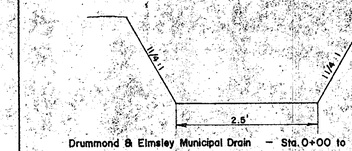
CONTRACT No. 67-02
W.P. No.

(7)

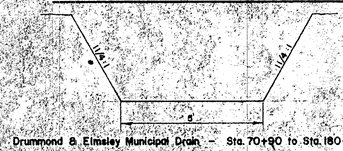
CORRUGATED STEEL PIPE, PIPE ARCH AND STRUCTURAL PLATE CULVERTS

Culvert No.	Station	LENGTH OF CULVERTS (L.F.)											
	Dia./Span	18"	21"	24"	30"	36"	42"	48"	54"	60"	65" x 44"	72" x 44"	
	Height												
	Gauge	16	16	16	14	14	12	12	12	10	12	10	
	Type	C.S.P.	C.S.P.	C.S.P.	C.S.P.	C.S.P.	C.S.P.	C.S.P.	C.S.P.	C.S.P.	C.S.P.A.	C.S.P.A.	
	Treatment												
	Position												
	Drummond-Elmsley Tot. & Municipal Drain Conc.												
	23+50	13-1			18								
	33+75	13-2					20						
	66+05	12-2						20					
	75+60	12-2							20				
	84+05	11-2									18		
	103+75	11-2										18	
	114+20	10-2								20			
	121+00	10-2										18	
	136+50	9-2								22			
	152+05	8-2								22			
	183+60	8-1										18	
	190+60	8-1						18					
	190+60	8-1						18					
	221+05	9-1						18					
	221+05	9-1						18					
	281+20	21-10									20		
	281+20	21-10									20		
	Hands Branch												
	26+75	13-1				18							
	Leach Branch												
	5+00	12-2	16										
	Doyle-Leach Branch												
	7+50	13-1		16									
	14+30	12-2			16								
	Summerville Branch												
	5+25	6-1	16										
	21+40	7-1			18								
	Couch Branch												
	14+00	9-1			18								
	T. Spence Branch												
	6+80	23-10		16									
	7+20	23-10		16									
	Spence-Cavanagh Branch												
	12+75	9-1		18									
	16+70	9-1			18								
	43+35	23-10					20						
	TOTALS	32	66	88	18	20	20	92	20	64	58	54	
	ITEM No.	3	4	5	6	7	8	9	10	11	12	13	

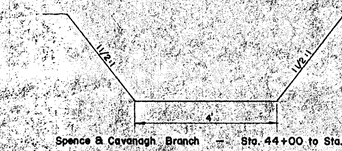
TYPICAL DRAIN CROSS-SECTIONS



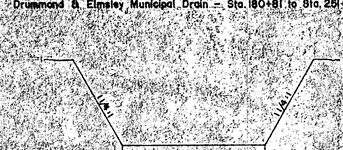
Drummond & Elmsley Municipal Drain – Sta. 0+00 to Sta. 24+80
Hands Branch – Sta. 0+00 to Sta. 26+00
Leach Branch – Sta. 0+00 to Sta. 9+74
Doyle & Leach Branch – Sta. 0+00 to Sta. 24+03
Sommerville Branch – Sta. 0+00 to Sta. 35+50
Couch Branch – Sta. 0+00 to Sta. 14+25
Spence & Cavanagh Branch – Sta. 0+00 to Sta. 44+00
T. Spence Branch – Sta. 0+00 to Sta. 4+00



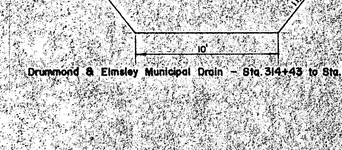
Drummond & Elmsley Municipal Drain – Sta. 70+90 to Sta. 180+81



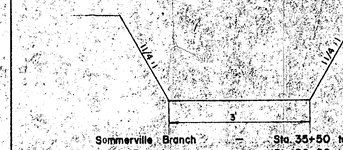
Spence & Cavanagh Branch – Sta. 44+00 to Sta. 84+43
T. Spence Branch – Sta. 4+00 to Sta. 23+13



Drummond & Elmsley Municipal Drain – Sta. 180+81 to Sta. 251+50

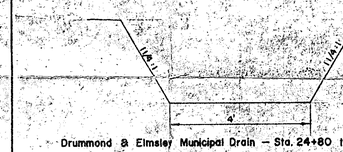


Drummond & Elmsley Municipal Drain – Sta. 314+43 to Sta. 330+00

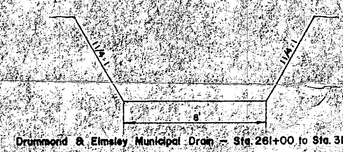


Sommerville Branch – Sta. 35+50 to Sta. 55+75
Hands Branch – Sta. 26+00 to Sta. 38+80

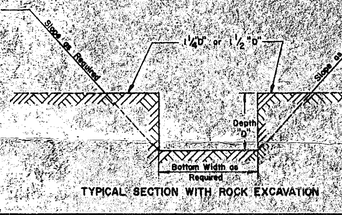
Drummond & Elmsley Municipal Drain – Sta. 251+50 to Sta. 261+00



Drummond & Elmsley Municipal Drain – Sta. 24+80 to Sta. 70+90



Drummond & Elmsley Municipal Drain – Sta. 261+00 to Sta. 314+43



TYPICAL SECTION WITH ROCK EXCAVATION

SUMMARY OF CUTS – TOP OF PLUGS TO PROFILE GRADE

DRUMMOND-ELMSLEY MUNICIPAL DRAIN															
Station	Cut	Station	Cut	Station	Cut	Station	Cut	Station	Cut	Station	Cut	Station	Cut	Station	Cut
1+00		42+00	3.3	83+00	3.0	124+00	2.7	165+00	3.7	206+00	3.0	247+00	2.7	288+00	2.7	329+00	2.4
2+00		43+00	3.6	84+00	2.9	125+00	3.0	166+00	3.9	207+00	3.4	248+00	3.2	289+00	2.9	330+00	2.2
3+00		44+00	4.4	85+00	3.0	126+00	3.4	167+00	3.2	208+00	2.7	249+00	4.2	290+00	3.6		
4+00	4.1	45+00	4.0	86+00	2.4	127+00	3.7	168+00	3.5	209+00	3.3	250+00	3.2	291+00	3.6		
5+00	3.7	46+00	3.5	87+00	2.8	128+00	3.8	169+00	3.3	210+00	2.7	251+00	3.2	292+00	4.0		
6+00	3.0	47+00	3.5	88+00	2.8	129+00	3.4	170+00	3.5	211+00	3.1	252+00	3.1	293+00	1.0		
7+00	4.1	48+00	3.3	89+00	2.5	130+00	4.1	171+00		212+00	3.4	253+00	3.1	294+00	3.9		
8+00	2.5	49+00	3.4	90+00	2.5	131+00		172+00	3.8	213+00	2.8	254+00	2.8	295+00	3.5		
9+00	3.2	50+00	3.6	91+00	2.6	132+00	3.3	173+00	4.0	214+00	2.8	255+00	2.8	296+00	3.9		
10+00	1.8	51+00	3.7	92+00	2.9	133+00	4.0	174+00	3.7	215+00	3.8	256+00	2.9	297+00	4.0		
11+00	1.7	52+00	3.8	93+00	2.9	134+00	3.9	175+00	3.8	216+33	4.9	257+00	2.9	298+00	4.2		
12+00	2.1	53+00	3.9	94+00	3.0	135+00	4.4	176+00	3.8	217+00	4.4	258+00	2.7	299+00	4.2		
13+00	1.9	54+00	3.5	95+00	3.5	136+00	4.7	177+00	3.7	218+00	4.9	259+00	2.6	300+00	3.6		
14+00	2.3	55+00	4.0	96+00	3.5	137+00	5.3	178+00	4.1	219+00	4.0	260+00	2.5	301+00	4.1		
15+00	2.4	56+00	3.3	97+00	3.4	138+00	5.8	179+00	3.4	220+00	4.2	261+00	3.0	302+00	3.7		
16+00	2.9	57+00	3.9	98+00	3.4	139+00	5.3	180+00	4.0	221+00	2.9	262+00	2.6	303+00	3.9		
17+00	2.2	58+00	3.5	99+00	3.6	140+00	5.4	181+00	3.9	222+00		263+00	2.4	304+00	3.3		
18+00	4.0	59+00	3.7	100+00	3.5	141+00	5.2	182+00	3.4	223+00	3.2	264+00	2.4	305+00	3.7		
19+00	2.4	60+00	3.6	101+00	3.3	142+00	4.6	183+00	3.3	224+00	3.2	265+00	2.5	306+00	3.6		
20+00	2.1	61+00	3.5	102+00	3.5	143+00	4.6	184+00	2.8	225+00	4.2	266+00	2.4	307+00	3.7		
21+00	2.1	62+00	3.9	103+00	3.6	144+00	4.8	185+00	3.3	226+00	2.7	267+00	2.3	308+00	3.6		
22+00	2.1	63+00	3.6	104+00	3.5	145+00	5.3	186+00	3.3	227+00	3.8	268+00	2.4	309+00	3.5		
23+00	3.4	64+00	3.7	105+00	3.7	146+00	6.0	187+00	3.6	228+00	3.4	269+00		310+00	3.4		
24+00	3.6	65+00	3.6	106+00	3.5	147+00	5.9	188+00	3.6	229+00	3.1	270+00	2.2	311+00	3.6		
25+00		66+00	4.9	107+00	4.2	148+00	6.3	189+00	3.6	230+00	3.8	271+00	2.7	312+00	3.8		
26+00	3.6	67+00	4.9	108+00	4.1	149+00	5.8	190+00	3.5	231+00	3.9	272+00	2.4	313+00	3.6		
27+00	3.9	68+00	4.2	109+00	5.2	150+00	6.0	191+00	3.4	232+00	3.9	273+00	2.5	314+00	3.4		
28+00	3.9	69+00	4.0	110+00	4.2	151+00	5.4	192+00	2.9	233+00	4.1	274+00	3.2	315+00	3.2		
29+00	4.1	70+00	3.8	111+00	4.1	152+00	5.1	193+00	2.6	234+00	3.8	275+00	3.2	316+00	3.3		
30+00	4.3	71+00	3.7	112+00	4.2	153+00	4.6	194+00	2.7	235+00	3.7	276+00	3.6	317+00	3.3		
31+00	4.9	72+00	4.1	113+00	3.7	154+00	4.0	195+00	2.8	236+00	3.3	277+00	3.3	318+00	3.2		
32+00	5.7	73+00	3.9	114+00	3.5	155+00	3.6	196+00	3.0	237+00	3.6	278+00	2.5	319+00	3.2		
33+00	6.1	74+00	4.0	115+00	3.7	156+00	3.1	197+00	2.6	238+00	3.1	279+00	2.6	320+00	3.5		
34+00	6.4	75+00	4.1	116+00	3.8	157+00	3.5	198+00	2.9	239+00	2.3	280+00	2.5	321+00	3.2		
35+00	5.4	76+00	3.5	117+00	3.8	158+00	3.5	199+00	3.0	240+00	3.3	281+00	3.0	322+00	3.1		
36+00	3.1	77+00	3.9	118+00	3.6	159+00	3.0	200+00	3.0	241+00	2.5	282+00	4.2	323+00	2.9		
37+00	2.9	78+00	3.6	119+00	3.2	160+00	3.4	201+00	3.1	242+00	3.5	283+00	2.0	324+00	2.8		
38+00	3.5	79+00	3.7	120+00	3.2	161+00	3.5	202+00	3.5	243+00	3.2	284+00	2.0	325+00	2.8		
39+00	3.0	80+00	3.0	121+00	3.1	162+00	3.1	203+00	3.7	244+00	2.5	285+00		326+00	2.9		
40+00	3.2	81+00	3.4	122+00	3.0	163+00	3.2	204+00	4.4	245+00	3.7	286+00		327+00	2.8		
41+00	3.3	82+00	3.2	123+00	3.1	164+00	3.4	205+00	2.2	246+00	2.7	287+00	2.0	328+00	2.5		

HANDS BRANCH	
Station	Cut
0+00	0.0
1+00	1.6
2+00	1.5
3+00	1.3
4+00	1.4
5+00	1.5
6+00	1.7
7+00	1.7
8+00	1.8
9+00	2.1
10+00	2.1
11+00	2.6
12+00	1.8
13+00	1.7
14+00	1.6
15+00	2.0
16+00	2.3
17+00	2.2
18+00	2.6
19+00	2.6
20+00	4.1
21+00	2.9
22+00	3.7
23+00	4.0
24+00	3.4
25+00	3.3
26+00	3.3
27+00	2.5
28+00	2.3
29+00	1.3
30+00	2.3
31+00	2.0
32+00	1.8
33+00	1.7
34+00	2.5
35+00	2.4
36+00	2.7
37+00	2.7
38+00	2.8
38+85 Ties Into Main Drain	

LEACH BRANCH	
Station	Cut
0+00	0.3
1+00	1.6
2+00	2.5
3+00	2.6
4+00	1.9
5+00	1.7
6+00	2.6
7+00	2.3
8+00	2.6
9+00	3.6
+74 Ties Into Main Drain	

DOYLE-LEACH BRANCH	
Station	Cut
1+00	1.9
2+00	2.1
3+00	2.6
4+00	2.4
5+00	2.7
6+00	2.0
7+00	2.5
8+00	2.0
9+00	2.3
10+00	2.5
11+00	2.3
12+00	1.9
13+00	2.0
14+00	2.2
15+00	2.0
16+00	2.0
17+00	1.9
18+00	2.1
19+10	2.1
20+00	2.3
21+00	2.6
22+00	3.6
23+00	4.0
24+00	3.9
24+03 Intersects Main Drain	

SOMMERVILLE BRANCH	
Station	Cut
0+00	0.9
1+00	0.9
2+00	1.4
3+00	1.6
4+00	2.2
5+00	1.5
6+00	1.6
7+00	1.8
8+00	2.3
9+00	3.1
10+00	3.2
11+00	2.3
12+00	2.4
13+00	2.0
14+00	2.5
15+00	2.1
16+00	2.3
17+00	2.4
18+00	2.2
19+00	2.2
20+00	2.1
21+00	1.7
22+00	2.9
23+00	2.9
24+00	3.3
25+00	2.5
26+00	2.7
27+00	2.5
28+00	2.6
29+00	2.4
30+00	2.7
31+00	2.4
32+00	2.5
33+00	3.0
34+00	2.7
35+00	3.3
36+00	3.2
37+00	3.4
38+00	3.1
39+00	2.6
40+00	2.2

SOMMERVILLE BRANCH Cont'd.	
Station	Cut
41+00	2.8
42+00	2.7
43+00	2.7
44+00	3.0
45+00	3.1
46+00	3.3
47+00	2.7
48+00	1.5
49+00	2.6
50+00	2.9
51+00	2.9
52+00	3.2
53+00 No Plug Elev.	
54+00	3.5
54+17.70 Back =52+04.00 Ahead	
53+00	3.3
54+00	2.6
55+00	3.0
55+75 Intersects Main Drain	

COUCH BRANCH	
Station	Cut
0+00	0.7
1+00	1.5
2+00	2.0
3+00	2.0
4+00	2.5
5+00	2.7
6+00	3.1
7+00	2.8
8+00	2.3
9+00	2.2
10+00	2.0
11+00	2.5
12+00	2.3
13+00	2.2
14+00	1.9
+25 Intersects Main Drain	

T. SPENCE BRANCH	
Station	Cut
0+00	3.3
1+00	3.2
2+00	3.4
3+00	1.9
4+00	0.2
5+00	2.2
6+00	2.3
7+00	2.1
8+00	2.0
9+00	2.1
10+00	1.9
11+00	2.3
12+00	2.4
13+00	2.5
14+00	2.8
15+00	2.7
16+00	2.8
17+00	2.8
18+00	3.4
19+00	3.7
20+00	3.7
21+00	3.5
22+00	3.5
23+00	2.7
+13 Intersects Main Drain	

SPENCE-CAVANAGH BRANCH	
Station	Cut
0+00	2.2
1+00	2.8
2+00	2.6
3+00	2.4
4+00	2.4
5+00	2.4
6+00	2.5
7+00	2.6
8+00	2.6
9+00	2.6
10+00	2.4
11+00	2.6
12+00	3.0
13+00	2.3
14+00	2.3
15+00	3.3
16+00	4.4
17+00	1.8
18+00	2.3
19+00	2.7
20+00	3.6
21+00	3.2
22+00	3.0
23+00	3.3
24+00	3.3
25+00	3.7
26+00	3.6
27+00	3.6
28+00	3.1
29+00	3.1
30+00	2.7
31+00	2.9
32+00	3.0
33+00	2.4
34+00	2.7
35+00	3.1
36+00	3.6
37+00	3.5
38+00	4.2
39+00	3.0
40+00	2.3

SPENCE-CAVANAGH BRANCH Cont'd.-	
Station	Cut
41+00	2.1
42+00	2.8
43+00	2.9
44+00	2.4
45+00	2.8
46+00	3.2
47+00	3.0
48+00	3.0
49+00	3.0
50+00	3.4
51+00	3.5
52+00	3.4
53+00	3.2
54+00	3.1
55+00	2.7
56+00	2.0
57+00	2.2
58+00	2.0
59+00	1.9
60+00	2.0
61+00	2.1
62+00	2.1
63+00	2.7
64+00	2.2
65+00	2.6
66+00	2.9
67+00	2.4
68+00	2.3
69+00	2.6
70+00	2.7
71+00	2.9
72+00	2.7
73+00	2.9
74+00	2.7
75+00	3.0
76+00	3.1
77+00	2.9
78+00	2.9
79+00	2.9
80+00	2.9
81+00	3.2

SPENCE-CAVANAGH Cont'd.-	
Station	Cut
82+00	2.9
83+00	3.1
84+00 +43 Intersects Main Drain	3.0

Appendix C Addendum To the Engineer's Report

ADDENDUM TO THE

ENGINEER'S REPORT

ON THE

DRUMMOND-ELMSLEY MUNICIPAL DRAIN AND BRANCHES

TOWNSHIP OF DRUMMOND, TOWNSHIP OF NORTH ELMSLEY

March, 1970

To the Reeve & Members of Council,
c/o Mr. C.A. Menzies, Clerk,
Township of Drummond,
Innisville, Ontario.

Reeve & Members of Council:

This addendum is respectfully submitted to be attached to the above noted Engineer's Report dated July 1967, and is intended to update the aforesaid report because of changes made during the course of construction. All changes that affected assessments, either increases or decreases, were made with the full approval of the owners involved.

Following is a brief description of the amendments to the Engineer's Report:

T. SPENCE BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

During construction Mr. G. Cavanagh requested that this drain be extended some 400 L.F. commencing at Sta. 0+00 and running in a generally westerly direction across the south westerly portion of Lot 4 in Concession 1, Township of Drummond.

SPENCE-CAVANAGH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

During construction the proposed grade from Sta. 17+00 to Sta. 25+25 was revised. The V.P.I. at Sta. 16+00, Elev. 73.4 was deleted and a new V.P.I. was created at

Sta. 17+00, Elev. 73.2 with a percent grade from V.P.I. Sta. 11+00 to V.P.I. Sta. 17+00 of 0.22% and a percent grade from the V.P.I. at Sta. 17+00 to Sta. 25+25 of 0.06%.

This revision was made because the cost of the proposed 24"ø steel culvert under the Canadian Pacific Railway embankment was much more than expected and was not commensurate with the extra benefit that would have been realized. Maximum outlet advantage was obtained by the aforementioned grade revision through the existing culvert under the railway.

IMESON BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

The Imeson Branch was added during the course of construction.

This drain was probably constructed as an award ditch but no records pertaining to its construction or later improvement were available. This drain has been named after the owner bearing the largest assessment for the improvement.

The Imeson Branch begins in the middle of the western half of Lot 8, Concession 1, and runs in a generally easterly direction across Lot 8 to intersect with Drummond-Elmsley Municipal Drain (Sta. 8+00, Imeson Branch = Sta. 199+05, Drummond-Elmsley Municipal Drain).

FARM CROSSINGS

Extra farm crossings were requested by various owners during construction and the farm crossing schedule has been revised accordingly. (See Schedule "K" Supplemental.) The assessment of the owners involved has been increased accordingly under the appropriate Schedule of Assessment.

ALLOWANCES UNDER SECTION 8 (1) THE DRAINAGE ACT 1962-63

No provisions for allowances were made for crop and land damage under the Engineer's Report dated July, 1967. During construction of the drainage scheme some damage to crops and land did result. Therefore allowances have been provided to compensate the owners affected and these allowances are summarized in Schedule "N" - Supplemental of this addendum.

REVISIONS TO VARIOUS SUMMARIES IN ENGINEER'S REPORT

Some of the summaries shown in the Engineer's Report dated July, 1967 require revision because of the aforementioned changes. The figures marked with an asterisk indicate a change from the original report.

Drain	Earth Excavation (Cubic Yards)	Rock Excavation (Cubic Yards)
Drummond-Elmsley Municipal Drain	15,257	878
Hands Branch	978	36
Leach Branch	231	--
Doyle-Leach Branch	299	--
Summerville Branch	1,964	--
Couch Branch	408	--
T. Spence Branch	757*	3*
Spence-Cavanagh Branch	2,203*	26
Imeson Branch	88*	--
Totals	22,185*	943*

Length of Culverts Required (lineal feet)		Description of Culvert
32	-	18" dia. C.S.P.
66	-	21" dia. C.S.P.
106*	-	24" dia. C.S.P.
18	-	30" dia. C.S.P.
38*	-	36" dia. C.S.P.
56*	-	42" dia. C.S.P.
164*	-	48" dia. C.S.P.
20	-	54" dia. C.S.P.
82*	-	60" dia. C.S.P.
58	-	65"x 40" C.S.P.A.
54	-	72"x 44" C.S.P.A.

Total 694* lineal feet

Drain	Length Requiring Improvement (lineal feet)	Area Drained (Acres)
Drummond-Elmsley Municipal Drain	32,927	4,341.3
Hands Branch	3,856	187.6
Leach Branch	974	39.1
Doyle-Leach Branch	2,303	86.0
Summerville Branch	5,788	248.4
Couch Branch	1,425	86.2
T. Spence Branch	2,705*	65.1
Spence-Cavanagh Branch	8,328	314.7
Imeson Branch	800*	171.6
Total	59,106* lineal feet or 11.19* miles.	

Because of the changes herein listed, the total estimated cost, based on the estimates used in the original Engineer's Report, increases from $46,733.74 to $50,335.00. The actual final cost is somewhat higher because more rock was encountered than originally anticipated and engineering fees were more than estimated. Also provision is made for higher Clerk's Fees because of the extra work added to the scheme and the prolonged period of completion of the work. The revised estimated cost is as follows with figures marked with an asterisk indicating a change from the original report.

Earth Excavation	22,185 c.y. @ $0.85/c.y.	$18,857.25*
Rock Excavation	943 c.y. @ $10.00/c.y.	9,430.00*
Farm Bridges		10,445.75*
Allowance for Land Section 8 (1) The Drainage Act 1962-63		1,600.00*
Allowances for Land		92.00
Utility Pole Relocation		200.00
Advertisement for Tenders		60.00
Preparing and Printing By-laws		250.00
Court of Revision		150.00
Meeting of Council		200.00
Clerk's Fees Township of Drummond		1,200.00*
Clerk's Fees Township of North Elmsley		250.00*
Engineering Fees Report & Tender Documents		6,400.00*
Engineering Supervision		1,200.00*
	Total Estimated Cost	$50,335.00*

The contract drawings have been revised to show the as-constructed Imeson Branch, the grade revision on the Spence-Cavanagh Branch, the extension of the T. Spence Branch and the locations of all farm crossings.

Maintenance of the added portions of drain shall be in accordance with the provisions of the original Engineer's Report.

Because of the extra work added and changes made to the drainage scheme some of the schedules had to be revised and are attached hereto. Schedule "J", Revised, combining the assessments under Schedules "A" to "H" and "M" Supplemental,

has been revised also and in addition shows the percentage each owner will bear of the final total cost.

The by-law for this scheme should be amended in accordance with this Addendum and the total final cost of the drainage scheme.

Yours very truly,

R.M. KOSTUCH ASSOCIATES LTD.

R.M. Kostuch, P.Eng.

RMK:lgc
March 16th, 1970.
Brockville, Ontario.

REGISTERED PROFESSIONAL ENGINEER
R. M. KOSTUCH
PROVINCE OF ONTARIO

SCHEDULE "D" - REVISED

SCHEDULE OF ASSESSMENT

SUMMERVILLE BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
D. Spence	5	1	25.7	$ 53.85	$147.99
A. Moore	6	1	47.4	74.18	244.42
B. Donovan	7	1	28.5	238.47	146.96
E. Summerville	7	1	26.2	332.15*	135.19
H. Ireson	8	1	12.2	19.53	62.91
C. Bathwell	6-8	1-2	38.9	57.29	200.59
G. Drysdale	7-8	2	35.5	127.60	183.07
M. Hogan	7	2	21.5	27.35	110.87
County of Lanark Part of Road Btn. Conc. I/II		1-2	9.5	794.98	146.96
			248.40		£.3114.27

SCHEDULE "E" - REVISED

SCHEDULE OF ASSESSMENT

COUCH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
J. Sels	11	2	0.2		$ 0.76
C. Hands	10	2	19.2		$ 73.27
J. Cook	9	2	0.9		$ 3.43
I. Kerr	10	1	10.1		$ 38.55
A. Gillcrist	9	1	33.4		$127.47
G. Couch	9	1	19.9	403.94*	$ 75.95
County of Lanark Part of Road Btn. Conc. I/II	9-10	1-2	2.5		$ 28.63

SCHEDULE "F" - REVISED

SCHEDULE OF ASSESSMENT

T. SPENCE BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OTHER LIABILITY
Township of Drummond					
G. Cavanagh	4	1	20.6	$229.64*	$277.43*
Township of Drummond Part of Boundary Road	4	1	0.8	-	$ 18.33
Township of North Elmsley					
T. Spence	23-24	10	42.9	$404.98	$327.42
Township of North Elmsley Part of Boundary Road	23-24	10	0.8	-	$ 18.33

SCHEDULE "C" - REVISED

SCHEDULE OF ASSESSMENT

SPENCE AND CAVANAGH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
G. Cavanagh	4-5	1	78.1	$458.56*	$405.92
D. Spence	6	1	40.3	$ 64.73	$195.77
P. McFarlane	5	1	52.2	$ 56.61*	$285.25
A. Moore	6	1	6.2	-	$ 13.62
D. Evans	5	1	1.7	-	$ 22.95
Township of Drummond Part of Boundary Road, Part of Road Btn. Lots 5/6, Conc. I, Part of Former Perth Highway	5-6 & Old Hwy.	1	12.0	-	$153.15
Department of Highways, Part of King's Hwy.No.43	5	1	6.3	-	$ 88.49
Canadian Pacific Railroad	5	1	6.5	-	$ 89.47
			203.3 Ac.	579.90	1,265.63
Township of North Elmsley				1,835.53	
T. Spence	23	10	105.1	$652.11	$267.99
D. Spence	22	10	61.0	$284.26	$ 82.90
B. Stone	22	10	6.0	-	$ 24.62
E. Palmer & B. Palmer	21-22	10	6.7	-	$ 11.00
D. Belfour	21-22	10	57.6	$126.02	$ 94.56

SCHEDULE "C" - REVISED

SCHEDULE OF ASSESSMENT

SPENCE AND CAVANAGH BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

Cont'd.-

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of North Elmsley Part of Boundary Road	21-22	10	3.4	-	$ 30.50
Department of Highways, Part of King's Hwy. No. 43	20-21	10	5.8	-	$ 26.56
Canadian Pacific Railroad	20-21	10	3.6	-	$ 17.73
				1062.39	557.86
				1620.25	

SCHEDULE "H" - REVISED

SCHEDULE OF ASSESSMENT

DRUMMOND-RAMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Township of Drummond					
J. Hands	13	1	100.0	$ 137.91	$ 666.91
C. Hands	13-10	1-2	239.5	2,958.49	3,164.03
E. Couch	14	1	33.4	-	519.49
D. Couch	14	1	1.7	-	47.54
County of Lanark Part of Road Btn. Conc. I/II	✓		31.1	737.19	374.50
Township of Drummond Parts of Roads Btn. Lots 10/11, Lots 5/6, Townline Road, Old Perth Highway	✓		43.0	176.86	612.11
E. Hughes	14	2	11.1	-	119.51
C. McConnel	13-11	2	239.2	1,777.98*	2,615.20
W. Leach	12	2	96.7	446.38	1,027.18
E. McConnel	12	2	96.3	603.45	1,422.16
T. Stafford	12	3	0.8	-	4.54
J. Sels	11	2	82.0	662.33	782.42
M. Doyle	13	2	40.4	-	457.30
J. Ferguson	12	1	100.0	-	405.53
W. Cunningham	11	1	50.0	-	129.38
I. Kerr	11-10	1	155.0	-	607.51

11

SCHEDULE "H" - REVISED

SCHEDULE OF ASSESSMENT

DRUMMOND-ELMSLEY MUNICIPAL DRAIN

Cont'd.-

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
A. Ebert	10-11	1	295.0	-	$ 776.98
A. Gilcrist	9	1	100.0	$ 23.28	24.47
G. Couch	9	1	100.0	1396.86*	506.74
D. Spence	6-8	1	132.8	634.37	388.85 ?
G. Nathwell	6-8	1-2	96.9	1418.05*	446.27 ?
M. Imeson	8	1	100.0	75.10	406.05
B. Donovan	7	1	98.5	-	352.34
E. Summerville	7	1	100.0	-	379.87
A. Moore	6	1	100.0	-	292.57
J. Cook	9	2	61.7	772.01	677.75
J. Cisick	11	3	0.9	-	5.93
B. Moore	9	2	50.1	561.91	594.64
Ontario Provincial Police (Communications Tower)	7	1	1.5	-	9.62
G. Cavanagh	4-5	1	98.7	-	157.62
D. Evans	5	1	1.7	-	6.71
Canadian Pacific Railway	4-5-6	1	16.5	-	31.14
Department of Highways, Part of King's Hwy. No. 43	4-5-6	1	16.3	-	30.18
P. McFarlane	5	1	52.2	-	63.36

= 247 69

12.

SCHEDULE "E" - REVISED

SCHEDULE OF ASSESSMENT

DRUMMOND-ELMSLEY MUNICIPAL DRAIN

Cont'd.-

OWNER	PROPERTY LOT	CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
C. Drysdale	7-8	2	35.5	-	$ 63.96
N. Hogan	7	2	25.1	-	38.70
Township of North Elmsley				12,382 20	18,639 09
W. Cunningham	16	10	86.8	-	73.09
J. Ferguson	17	10	90.7	-	95.06
S. McTavish	17	10	94.4	-	110.63
Mrs. C. Barr	18	10	100.3	-	161.17
G. Moore	19	10	76.5	$146.27	297.77
D. Spence	20-22	10	149.5	465.36	720.49
K.J. Clark	19	10	15.9	-	101.97
E.& B. Palmer	21	10	58.0	72.58	288.37
Mrs. Motyka	20	10	2.0	-	32.06
F. Armstrong	20	10	8.9	-	57.07
D. Belfour	21-22	10	110.0	384.02	469.70
T. Belfour	21	10	51.4	337.98	329.61
T. Spence	23	10	140.9	-	225.35
B. Stone	22	10	6.0	-	23.96
B. Nagle	14	10	67.1	-	56.26
B. McTavish	14-15	10	215.6	-	174.97
F. Malony	16	10	85.4	-	70.51

SCHEDULE "H" - REVISED

SCHEDULE OF ASSESSMENT

DRUMMOND-ELMSLEY MUNICIPAL DRAIN

Cont'd.-

OWNER	PROPERTY LOT	PROPERTY CONC.	AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
Department of Highways, Part of King's Hwy. No. 43	22-21-20	10	11.0	$ 32.92	$147.83
Canadian Pacific Railway	22-21-20	10	10.8	32.92	155.76
Township of North Elmsley Part of Roads Btn. Lot 20/21, Lot 15, Tomline Road, Old Perth Highway			37.2	217.31	337.80
C.A. Clark	20	10	1.1	-	6.00
				1,489.36	3,965.45

SCHEDULE "J" - REVISED

SCHEDULE OF ASSESSMENT

COMBINED ASSESSMENTS UNDER SCHEDULES

"A" TO "H" AND "M" SUPPLEMENTAL

OWNER	PROPERTY		AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY	OWNER'S PERCENTAGE
	LOT	CONC.				
Township of Drummond						
J. Hands	13	1	100.0	646.41	951.74	3.30
J. Hands	13-10	1-2	239.5	2,958.49	3,237.30	12.78
E. Couch	14	1	33.4	--	519.49	1.08
J. Couch	14	1	1.7	--	47.54	0.10
County of Lanark West of Road Btn. Conc. I/II			31.1	1,548.03	660.16	4.56
Township of Drummond Parts of Roads Btn. Lots 10/11, Lots 5/6, Townline Road Old Perth Highway			43.0	176.86	788.18	2.00
J. Hughes	14	2	11.1	--	125.16	0.26
G. McConnel	13-11	2	239.2	1,777.98*	2,673.30	9.19
J. Leach	12	2	96.7	899.48	1,335.56	4.61
J. McConnel	12	2	96.3	812.85	1,853.97	5.51
T. Stafford	12	3	0.8	--	4.54	0.02
Sels	11	2	82.0	662.33	783.18	2.99
M. Doyle	13	2	40.4	101.73	664.97	1.59
Ferguson	12	1	100.0	--	609.86	1.26
Cunningham	11	1	50.0	--	129.38	0.27
Kerr	11-10	1	155.0	--	646.06	1.34

SCHEDULE "J" - REVISED

SCHEDULE OF ASSESSMENT

COMBINED ASSESSMENTS UNDER SCHEDULES

"A" TO "H" AND "M" SUPPLEMENTAL

Cont'd.

OWNER	PROPERTY		AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY	OWNER'S PERCENTAGE
	LOT	CONC.				
. Ebert	11	1	195.0	--	776.96	1.60
. Gilcrist	9	1	100.0	23.28	551.94	1.18
G. Couch	9	1	100.0	1,800.80*	582.69	4.92
. Spence	6-8	1	132.8	762.95	749.21*	3.12
G. Rathwell	8-6	1-2	96.9	1,515.34*	655.58*	4.48
. Imeson	8	1	100.0	182.53*	496.02*	1.39
Donovan	7	1	98.5	238.47	559.46*	1.65
E. Summerville	7	1	100.0	332.15*	548.92*	1.82
Moore	6	1	100.0	74.18	592.47*	1.38
J. Cook	9	2	61.7	772.01	681.18	2.99
Tisick	11	3	0.9	--	5.93	0.02
Moore	9	2	50.1	561.91	594.64	2.39
Ontario Provincial Police Communications Tower)	7	1	1.5	--	9.62	0.02
Cavanagh	4-5	1	98.7	688.20*	841.97*	3.16
D. Evans	5	1	1.7	--	29.66	0.06
nadian Pacific Railway	4-5-6	1	16.5	--	120.61	0.24
partment of hways (Part of 's Hwy. No.43)	4-5-6	1	16.3	--	118.67	0.24

SCHEDULE "J" - REVISED

SCHEDULE OF ASSESSMENT

COMBINED ASSESSMENTS UNDER SCHEDULES

"A" TO "H" AND "M" SUPPLEMENTAL

Cont'd.

OWNER	PROPERTY		AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY	OWNER'S PERCENTAGE
	LOT	CONC.				
. McFarlane	5	1	52.2	56.61*	368.62	0.87
Drysdale	7-8	2	35.5	127.60	247.03	0.77
N. Hogan	7	2	25.1	27.35	149.63	0.36
ownship of North Elmsley						
Nra Frances MacLeod Cunningham	16	10	86.8	--	73.09	0.15
I. Ferguson ARDA	17	10	90.7	--	95.08	0.19
McTavish	17	10	94.4	--	110.63	0.22
rs. C. Barr	18	10	180.3	--	161.17	0.33
G. Moore	19	10	76.5	146.27	297.77	0.91
Spence	20-22	10	149.5	749.62	803.39	3.20
Township of orth Elmsley, art of Roads Btn. Lot 20/21, t 15, Townline ad, Old Perth Highway)			37.2	217.31	436.63	1.34
J. Clark	19	10	15.9	--	101.97	0.21
& B. Palmer	21	10	58.0	72.58	299.37	0.76
rs. Motyka	20	10	2.0	--	32.06	0.06
Armstrong	20	10	8.9	--	57.07	0.11
elfour	21-22	10	110.0	510.04	564.26	2.21
Belfour	21	10	51.4	337.98	329.61	1.39
nadian Pacific ilway	22-21-20	10	10.8	32.92	173.49	0.42

SCHEDULE "J" - REVISED

SCHEDULE OF ASSESSMENT

COMBINED ASSESSMENTS UNDER SCHEDULES

"A" TO "H" AND "M" SUPPLEMENTAL

cont'd.

OWNER	PROPERTY		AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY	OWNER'S PERCENTAGE
	LOT	CONC.				
epartment of Highways, Ontario, Part of King's Hwy. No. 43)	22-21-20	10	11.0	32.92	156.39	0.39
L. Spence	23	10	148.9	1,057.09	820.76	3.86
. Stone	22	10	6.0	--	48.58	0.10
Nagle	14	10	67.1	--	56.26	0.11
B. McTavish	15	10	215.6	--	174.97	0.36
Malony	16	10	85.4	--	70.51	0.14
C.A. Clark	20	10	1.1	--	6.00	0.02

SCHEDULE "K" - SUPPLEMENTAL

SCHEDULE OF FARM CROSSINGS

DRUMMOND-ELMSLEY MUNICIPAL DRAIN AND BRANCHES

The Culverts listed below were requested by the owners involved and are in addition to those shown in Schedule "K" of the original Engineer's Report."

OWNER	PROPERTY		STATION	DESCRIPTION
	LOT	CONC.		
Township of Drummond				
ummerville Branch				
E. Summerville	7	1	35+00	1 @ 18' of 36"ø C.S.P.
Couch Branch				
Couch	9	1	1+60	1 @ 18' of 24"ø C.S.P.
E. Drain				
G. McConnell	13	2	30+62	1 @ 18' of 42"ø C.S.P.
McConnell	13	2	36+85	1 @ 18' of 42"ø C.S.P.
Couch	9	1	174+50	1 @ 18' of 60"ø C.S.P.
. Rathwell	8	1	200+00 200+00	1 @ 18' of 48"ø C.S.P. 1 @ 18' of 48"ø C.S.P.
Couch	9	1	214+10 214+10	1 @ 18' of 48"ø C.S.P. 1 @ 18' of 48"ø C.S.P.

SCHEDULE "M" - SUPPLEMENTAL

SCHEDULE OF ASSESSMENT

IMESON BRANCH OF THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN

OWNER	PROPERTY		AREA DRAINED (ACRES)	BENEFIT	OUTLET LIABILITY
	LOT	CONC.			
Township of Drummond					
. Rathwell	8	1	2.8	40.00	8.74
. Imeson	8	1	26.7	87.84	27.06
E. Sommerville	7	1	33.5		33.95
. Donovan	7	1	49.5		50.16
. Moore	6	1	41.3		41.86
. Spence	6	1	16.4		16.62
nship of Drummond, rt of Old Perth Highway, ot 6, Con. 1			1.4		4.59
				127.84	192.98
				310.82	

SCHEDULE "N" - SUPPLEMENTAL

SCHEDULE OF ALLOWANCES UNDER SECTION 8 (1)

THE DRAINAGE ACT 1962-63

THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN AND BRANCHES

OWNER	PROPERTY		AMOUNT	REMARKS
	LOT	CONC.		
Township of Drummond				
C. Hands	13-10	1-2	146.08	Drummond-Elmsley Drain
C. McConnel	13-11	2	102.56	Drummond-Elmsley Drain
. Leach	12	2	144.32	Drummond-Elmsley Drain, Doyle-Leach Branch and Leach Branch.
. McConnel	12	2	29.12	Drummond-Elmsley Drain
J. Sels	11	2	28.96	Drummond-Elmsley Drain
Cook	9	2	46.40	Drummond-Elmsley Drain
B. Moore	9	2	43.36	Drummond-Elmsley Drain
. Couch	9	1	129.76	Drummond-Elmsley Drain and Couch Branch
. Rathwell	8-6	1-2	111.68	Drummond-Elmsley Drain, Summerville Branch and Imeson Branch.
. Spence	6-8	1	70.56 (5-5-4.56)	Drummond-Elmsley Drain, Summerville Branch and Spence-Cavanagh Branch.
. Hands	13	1	105.44	Hands Branch
. Doyle	13	2	24.48	Doyle-Leach Branch
. Moore	6	1	34.08	Summerville Branch
. Donovan	7	1	26.72	Summerville Branch
. Summerville	7	1	47.36	Summerville Branch
Drysdale	7-8	2	33.12	Summerville Branch
. Hogan	7	2	4.64	Summerville Branch
. Imeson	8	1	14.08	Imeson Branch

SCHEDULE "N" - SUPPLEMENTAL

SCHEDULE OF ALLOWANCES UNDER SECTION 8 (1)

THE DRAINAGE ACT 1962-63

ont'd. THE DRUMMOND-ELMSLEY MUNICIPAL DRAIN AND BRANCHES

OWNER	PROPERTY		AMOUNT	REMARKS
	LOT	CONC.		
G. Cavanagh	4-5	1	44.80	Spence-Cavanagh Branch and T. Spence Branch
. McFarlane	5	1	43.20	Spence-Cavanagh Branch
ownship of North Elmsley				
. Moore	19	10	15.04	Drummond-Elmsley Drain
. Spence	20-22	10	83.84	Drummond-Elmsley Drain and Spence-Cavanagh Branch
& B Palmer	21	10	7.36	Drummond-Elmsley Drain
. Belfour	21-22	10	125.60	Drummond-Elmsley Drain and Spence-Cavanagh Branch
. Belfour	21	10	8.32	Drummond-Elmsley Drain
. Spence	23-24	10	129.12	Spence-Cavanagh Branch and T. Spence Branch

STAGE 1 AND 2
ARCHAEOLOGICAL ASSESSMENT
OF THE BURNS FARM PROPERTY
PART LOT 7, CONCESSION 1
GEOGRAPHIC TOWNSHIP OF DRUMMOND
NOW TOWNSHIP OF DRUMMOND/
NORTH ELMSLEY
COUNTY OF LANARK, ONTARIO

PAST RECOVERY
ARCHAEOLOGICAL SERVICES INC.

STAGE 1 AND 2 ARCHAEOLOGICAL ASSESSMENT OF THE BURNS FARM PROPERTY, PART LOT 7, CONCESSION 1, GEOGRAPHIC TOWNSHIP OF DRUMMOND NOW TOWNSHIP OF DRUMMOND/NORTH ELMSLEY, COUNTY OF LANARK, ONTARIO

Prepared for:	Julie Stewart, MCIP, RPP Planner McIntosh Perry Consulting Engineers Ltd. 3240 Drummond Concession 5A Perth, Ontario K7H 3C9 Phone: 613-267-6524 ext. 219 E-mail: j.stewart@mcintoshperry.com
Re:	Proposed subdivision, pre-submission
Prepared by:	Peter Sattelberger Associate Archaeologist Past Recovery Archaeological Services 4534 Bolingbroke Road, R.R. #3 Maberly, Ontario K0H 2B0 Phone: 613-267-7028 E-mail: pras@pastrecovery.com
PRAS Project No.:	PR13-18
Licencee:	Peter Sattelberger, Licence P111 Past Recovery Archaeological Services Inc.
P.I.F. No.:	P111-005-2013
Date:	November 20, 2013 Original report

ACKNOWLEDGMENTS

Ms. Julie Stewart, MCIP, RPP, the project planner with McIntosh Perry Consulting Engineers Ltd., provided support with the coordination of this assessment.

Mr. Robert von Bitter, Data Coordinator, Ontario Ministry of Tourism, Culture, and Sport, provided a current listing of archaeological sites in the general study area.

PROJECT PERSONNEL

Project Manager	Jeff Earl, M.Soc Sc., Licence P031
Stage 1/2 Field Director/Licencee	Peter Sattelberger, M.A., Licence P111
Historical Research	Peter Sattelberger Jeff Earl
Stage 2 Field Crew	Julie de Puyjalon Whitney Moyle Shyong En Pan Chris Cadue
Report Writing	Peter Sattelberger
Report Review	Jeff Earl

EXECUTIVE SUMMARY

Past Recovery Archaeological Services was retained by McIntosh Perry Consulting Engineers Ltd. on behalf of Crains' Construction Ltd. to undertake Stage 1 and 2 archaeological assessments of a proposed subdivision located within Part Lot 7, Concession 1 of the geographic Township of Drummond, County of Lanark (see Figures 1 and 2). The subject property contained approximately 95 acres (38.32 ha) of open farmland.

The purpose of the Stage 1 assessment was to assess the archaeological potential of the study area and to present recommendations for the mitigation of any significant known or potential archaeological resources. To this end, preliminary historical, environmental and archaeological research was conducted and a visual inspection of the study area was undertaken in order to make a determination of archaeological potential. The results of this study deemed that the subject property possessed potential for both pre-Contact and historic period archaeological resources. The property inspection, however, revealed significant deep disturbance had occurred on portions of the subject property, including both the north and south ends next to Drummond Concessions 1 and 2, and along a newly constructed road running northwest/southest down the centre of the lot. These areas were deemed to have no archaeological potential.

The purpose of the Stage 2 assessment was to determine if there were any archaeological resources within the study area and if so to recommend appropriate next steps. As the undisturbed portions of the property consisted of undisturbed open fields, these lands were ploughed, disced and allowed to weather before being fieldwalked at five metre intervals. Small areas of non-draining or permanent standing water were avoided. No cultural material or other evidence of archaeological interest was identified during the Stage 2 pedestrian survey.

This study provides the basis for the following recommendation:

1) No further archaeological investigation of the study area as defined in Figure 3 is required

The reader is also referred to Section 5.0 below to ensure compliance with the Ontario Heritage Act as it may relate to this project.

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1.0 INTRODUCTION

Past Recovery Archaeological Services Inc. (Past Recovery) was retained by McIntosh Perry Consulting Engineers Ltd. on behalf of Crains' Construction Ltd. to undertake a Stage 1 and 2 archaeological assessment of a proposed subdivision located within Part of Lot 7, Concession 1 of the geographic Township of Drummond, now the Township of Drummond/North Elmsley, County of Lanark (see Figures 1 to 3).

The objectives of the combined Stage 1 and 2 archaeological assessment were as follows:

- To provide information about the geography, history and current land condition of the study area;
- To describe any previous archaeological fieldwork and evaluate the archaeological potential of the study area;
- To recommend appropriate strategies for Stage 2 archaeological assessment in the event further assessment is warranted;
- To document all archaeological resources on the property; and
- To determine whether the property contains archaeological resources requiring further assessment.

2.0 PROJECT CONTEXT

This section of the report provides the context for the archaeological work undertaken, including a description of the study area, the related legislation or directives triggering the assessment and the confirmation of permission to access the land.

2.1 Development Context

The study area is located within Part of Lot 7, Concession 1, of the geographic Township of Drummond, County of Lanark (see Figures 1 and 2). The property consists of a rectangular lot comprised of approximately 95 acres (38.32 ha) of open farmland extending between Drummond Concessions 1 and 2 (Figure 3). A small lot (approximately 5 acres or 2.15 ha in size) at the north end next to Drummond Concession 2 (County Road 10) had previously been severed and was excluded from this survey.

This project was initiated by McIntosh Perry Consulting Engineers Ltd. (the project planner) on behalf of Crains' Construction Ltd. (the project proponent). The subject property will be the subject of an application for approval of a plan of subdivision. The project is in the preliminary stages, and no formal submission has been made to the County of Lanark (the Planning Act approval authority for the plan of subdivision) as of yet. The project planner has had a pre-consultation meeting with the Township of Drummond/North Elmsley planning administrator. Given that the property is located adjacent to features of archaeological potential, the project proponent and project planner hired Past Recovery to complete Stage 1 and Stage 2 archaeological assessments.

A draft plan of subdivision is forthcoming but was unavailable for inclusion in this report. A satellite image of the study area showing the limits of the subject property as described by the project planner can be seen in Figure 3.

2.2 Access Permission and Limitations

Permission to access the subject property and complete all aspects of the archaeological assessment, including photography and the recovery of any artifacts found, was granted by the project proponent on behalf of the current land owner.

3.0 STAGE 1 ARCHAEOLOGICAL ASSESSMENT

The purpose of the Stage 1 archaeological assessment was to provide background information about the study area to determine the archaeological potential of the property and to present recommendations for the mitigation of any significant known or potential archaeological resources.

3.1 Historical Context

This section includes a summary of previous research undertaken in the general area, a brief overview of human settlement in the region with the intention of providing a context for the evaluation of known and potential archaeological sites and property specific documentary research presenting a record of land use history. Historical research was undertaken at Library and Archives Canada (LAC), the Lanark County Land Registry Office (LCLRO) in Almonte, the map room at the Stouffer Library at Queen's University and the Perth Historical Society.

3.1.1 Previous Historical Research

There are numerous histories of Lanark County which offer some insights into the development of the study area. Belden's *Illustrated Historical Atlas of Lanark County* provides a nineteenth century description of the county's geography and settlement and also includes information on North Elmsley Township (Belden 1880). More recent histories of Lanark County include *A Pioneer History of the County of Lanark* (McGill 1968) and *Lanark Legacy* (Brown 1984). Two more detailed accounts of the Perth area are *A History of Drummond Township* (Ebbs 1999) and *Perth: Tradition & Style in Eastern Ontario* (Turner 1998).

3.1.2 Regional Pre-Contact Cultural Overview

The objective of this section is to briefly summarize human settlement in the region with the intention of providing a context for the evaluation of known and potential archaeological sites.

The earliest human occupation of southern Ontario began approximately 11,000 years ago with the arrival of small groups of hunter-gatherers referred to by archaeologists as Palaeo-Indians. These groups gradually moved northward as the glaciers and glacial lakes retreated. While very little is known about their lifestyle; it is likely that Palaeo-Indian groups travelled widely relying on the seasonal migration of caribou as well as small animals and wild plants for subsistence. They produced a variety of distinctive stone tools including fluted projectile points, scrapers, burins and gravers.

Most archaeological evidence for the Palaeo-Indian period has been found in south-western and south-central Ontario at sites located on the former shorelines of glacial Lake Algonquin. First Nations settlement of eastern Ontario was late in comparison to these other parts of the province as a result of the high water levels of the St. Lawrence Marine Embayment of the post-glacial Champlain Sea (Hough 1958:204). Some evidence has been found along the north shore of Lake

Ontario and in the Rideau Lakes. Late Palaeo-Indian non-fluted lanceolate points have been found in the Thousand Islands and along the Cataraqui River, just north of Kingston (Kennett and Earl 2000).

During the succeeding Archaic period (ca. 7000 to 1000 B.C.), populations continued to follow a mobile hunter-gatherer subsistence strategy, although there appears to have been a greater reliance on fishing and gathered food (e.g. plants and nuts) and more diversity between regional groups. The tool kit also became increasingly diversified, reflecting an adaptation to environmental conditions similar to those of today. This included the presence of adzes, gouges and other ground stone tools believed to have been used for heavy woodworking activities such as the construction of dug-out canoes, grinding stones for processing nuts and seeds, specialized fishing gear including net sinkers and plummets and a general reduction in the size of projectile points. The middle and late portions of the Archaic period saw the development of trading networks spanning the Great Lakes, and by 6,000 years ago copper was being mined in the Upper Great Lakes and traded into southern Ontario. There is increasing evidence of ceremonialism and elaborate burial practices and a wide variety of non-utilitarian items such as gorgets, pipes and 'birdstones' were being manufactured. By the end of this period populations had increased substantially over the preceding Palaeo-Indian occupation.

More extensive First Nations settlement of eastern Ontario began during this period, sometime between 5,500 and 4,500 B.C. (Kennedy 1970:61; Ellis, Kenyon and Spence 1990:93). By this time, the Mississippi, Rideau and Ottawa River systems had developed and would have served as major transportation corridors. Artifacts from Archaic sites in eastern Ontario suggest a close relationship to the Laurentian Archaic stage peoples of New York State. Laurentian peoples occupied the Canadian biotic province transition zone between the deciduous forests to the south and the boreal forests to the north. The Laurentian Archaic artifact complex contains large, broad bladed, chipped stone and ground slate projectile points, and heavy ground stone tools. This stage is also known for the extensive use of cold-hammered copper tools including "bevelled spear points, bracelets, pendants, axes, fishhooks, and knives" (Kennedy 1970:59). Sites from the Archaic period are thus more common in the region, with a number of finds in the Rideau Lakes area (Clermont 1999; Ellis & Ferris 1990:94; Gordon Watson 1979, 1981, 1982).

Three Archaic sites are recorded on Big Rideau Lake: the Inderwick site (BeGb-1) on the north shore of Noble's Bay is a small chipping station; the Adam's Creek site (BeGb-8) slightly further north is a campsite or fishing station; and the Coutts site (BfGa-14) at the north end of the lake is an undiagnostic Archaic occupation. Archaic sites have also been identified along the north shore of Lake Ontario, in the Upper Ottawa Valley and along the South Nation River at Jessup's Falls. The earliest recorded human burials in eastern Ontario date to the Middle Archaic period.

The introduction of ceramics marked the beginning of the Woodland period (ca. 1000 B.C. to A.D. 1550). These populations continued to participate in an extensive trade network that, at its zenith ca. A.D. 200, spanned much of North America and included the movement of conch shell, fossilized shark teeth, mica, copper and silver. Social structure appears to have become increasingly complex, with some status differentiation evident in burials. It was in the Middle

Woodland period (ca. 300 B.C. to A.D. 900) that distinctive trends or 'traditions' evolved in different parts of Ontario for the first time, noted by archaeologists through variations in artifacts left behind. The Middle Woodland tradition found in eastern and south-central Ontario has become known as 'Point Peninsula' (Spence, Pihl and Murphy 1990:157). A greater number of known sites from this period has allowed archaeologists to develop a better picture of the seasonal round followed in order to exploit a variety of resources within a home territory. Through the late fall and winter, small groups would occupy an inland 'family' hunting area. In the spring, these dispersed families would congregate at specific lakeshore sites to fish, hunt in the surrounding forest and socialize. This gathering would last through to the late summer when large quantities of food would be stored up for the approaching winter.

Although uncommon, Early and Middle Woodland sites have been found throughout the Rideau Lakes. The Wyght (BfGa-11), Driscoll (BfGa-24) and Briggs Island (BfGa-6) sites on or near the south shore of Lower Rideau Lake provide important insights into this period of occupation (Gordon Watson 1979, 1980, 1999b). The Loon site (BeGb-3), located within Murphys Point Provincial Park is a Middle or Late Woodland campsite (Swayze 1975). At the south end of Big Rideau Lake, the Tracy's Point site (BeGb-5) has been identified as an undiagnostic Woodland chipping station.

Towards the end of the Woodland period (ca. A.D. 800) domesticated plants were introduced in areas to the south of the Canadian Shield. Initially only a minor addition to the diet, the cultivation of corn, beans, squash, sunflowers and tobacco eventually gained in importance for Late Woodland peoples. Along with this shift in subsistence, settlements located adjacent to the corn fields began to take on greater permanency as sites with easily tillable farmland became more important. Eventually, semi-permanent and permanent villages were built, many of which were surrounded by palisades, suggesting growing hostilities between neighbouring groups.

Three pre-Contact stage tribal groups occupied eastern Ontario in the final decades prior to the arrival of Europeans. Agricultural villages, dating to A.D. 1400, of an Iroquoian people referred to as "proto-Huron" have been found in southern Hastings and Frontenac Counties (Pendergast 1972).[1] The St. Lawrence Iroquois occupied the upper St. Lawrence River valley. Finally, various Algonquin groups occupied the Ottawa Valley (Day and Trigger 1978:793).

3.1.3 Regional Post-Contact Cultural Overview

Samuel de Champlain was the first European to document his explorations of eastern Ontario, initially in 1613 and again in 1615. At this time he travelled from the Ottawa River up the Mississippi River to the southeast shore of Mississippi Lake and then overland along an Indian trail to the Rideau River. Champlain was preceded by two of his emissaries, Étienne Brûlé around 1610 and Nicholas de Vignau in 1611, and it is possible that they travelled portions of the Rideau River system before him. At this time, several changes occurred in the pattern of settlement for aboriginal populations in the region. By 1615 the Huron had left much of the area,

[1] By A.D. 1500, the easternmost settlements of the Huron were located between Balsam Lake and Lake Simcoe.

and following their dispersal by the Five Nations in 1646, the Cayuga occupied the North Shore of Lake Ontario. The region was settled by the Mississauga through the eighteenth and part of the nineteenth centuries.

In the wake of Champlain's travels, the Ottawa River became the principal route to the interior for explorers, missionaries, and fur traders. Throughout the seventeenth and eighteenth centuries this route remained an important link in the French fur trade. The French established Fort Frontenac at the present site of Kingston in 1673 and then La Presentation (Ogdensburg, New York) in 1700. These forts were constructed to solidify the French hold on the lucrative fur trade and to enhance their ties with the local Native population. Both forts were occupied by the British after the end of the Seven Year's War in 1763.

The recovery of European trade goods (i.e. iron axes, copper kettle pieces and glass beads) from Native sites throughout the Ottawa River drainage basin provides evidence of the extent of contact between Natives and the fur traders during this period. The establishment of Fort Frontenac in 1673 undoubtedly led to an increase in the use of the Cataraqui River system. As a major tributary of the Ottawa and with headwaters close to those of the Cataraqui, it is likely that the Rideau system was used throughout this period by both Natives and Europeans. The English, upon assuming possession of the New France, continued to use the Ottawa River as an important transportation corridor.

At first, the end of the French regime in 1760 brought little change to eastern Ontario. Extensive European settlement did not begin until the late eighteenth century, spurred by the need for land on which to settle refugees of the American Revolution. This led the British government into hasty negotiations with their military allies, the Mississauga, who were assumed, erroneously, to be the only Native peoples inhabiting Eastern Ontario.[2] Captain William Redford Crawford, who enjoyed the trust of the Mississauga chiefs living in the Bay of Quinte region, negotiated on behalf of the British government. In the so-called 'Crawford Purchase,' the Mississauga were cajoled into giving up Native title to most of Eastern Ontario, including what would become the counties of Stormont, Dundas, Glengarry, Prescott, Russell, Leeds, Grenville and Prince Edward, as well as the front townships of Frontenac, Lennox, Addington and Hastings and much of what is now the City of Ottawa (Lockwood 1996:24). Settlement along the north bank of the St. Lawrence River and the eastern end of Lake Ontario began in earnest about this time. Land from the Cataraqui River west to the Bay of Quinte was laid out in townships to be settled by some of the more than ten thousand United Empire Loyalists from Vermont, Connecticut, and New York who had gathered throughout Lower Canada awaiting supplies and transport to what was to become Upper Canada.

By the late 1780s the waterfront townships were full and more land was required to meet both an increase in the size of grants[3] to all Loyalists and grant obligations to the children of Loyalists

[2] At this time, there was a significant Algonquin presence in eastern Ontario and Mohawk Reserves had been established at Tyendinaga near Desoronto and at St. Regis near Cornwall.

[3] Civilians now received 200 acres instead of 100 acres, with an additional 200 acres for each of their children. The size of grants for military veterans increased with rank with privates receiving 200 acres at the low end and, at the

who were now entitled to 200 acres in their own right upon reaching the age of 21 or in the case of daughters, being married. Furthermore, in 1792 John Graves Simcoe offered free grants of land to anyone who would swear loyalty to the King, a policy aimed at attracting more American settlers. As the government also dictated the setting aside of one-seventh of all the land for the Protestant Clergy and another one-seventh as Crown reserves, pressure mounted to open up more of the interior. As a result, between 1790 and 1800 most of the remainder of the Crawford Purchase was divided into townships (Lockwood 1994:30).

In 1815, the British government issued a proclamation in Edinburgh to further encourage settlement in British North America. The offer included free passage and 100 acres of land for each head of family with each male child to receive his own 100 acre parcel upon reaching the age of 21 (Belden 1880:16). At the same time, the government was seeking land on which to resettle disbanded soldiers from the War of 1812. Demobilized forces, it was theorized, would act as a force-in-being to oppose any possible future incursions from the United States. To this end veterans were encouraged to take up residence within a series of newly created 'military settlements' established at Lanark (1816), Perth (1816) and Richmond (1818). Veteran land grants varied in size depending upon rank beginning with 100 acres for privates to as much as 1,200 acres for senior officers (Ebbs 1999:6). The military were also responsible for the construction of a road linking the military settlements of Perth and Richmond that eventually became Concession 2, Drummond Township (Ebbs 1999:99). The north end of the subject property fronts along this historical transportation route.

The new 'Military Colony of Perth' and the townships of Bathurst, Drummond and Beckwith were surveyed between 1815 and 1816 by Reuben Sherwood and John Booth, while military surveyors also opened a road from Brockville to Perth through the winter months (Belden 1880:17). These were the first townships to be laid out specifically for British emigrants and demobilized military following the War of 1812. Settlers began arriving at Perth in April of 1816, which became the administrative centre for the new District of Bathurst in 1823 (Turner 1992:33).

With the settlement of Perth underway, somewhat after the fact, Lieutenant Governor Gore ordered Captain Ferguson, the Resident Agent of Indian Affairs at Kingston, to arrange the purchase of four or five townships to the rear of Crosby, Burgess, Elmsley, Montague and Marlborough from the chiefs of the Chippewa and Mississauga Nations (Ebbs 1999:5). The Treaty in which Indian rights to the district were surrendered was signed by the Mississaugas in 1819.[4] The 300,000 acres acquired corresponded to the already created townships of Bathurst, Beckwith and Drummond (Brown 1984:10).

high end, field officers being granted 5,000 acres with an additional 200 acres for each member of their family. In 1784 a field officer had only received 1,000 acres and an additional 50 acres per family member (Lockwood 1994: 30-32).

[4] This, and the earlier 'Crawford Purchase,' ignored the fact that Native groups other than the Mississauga had legitimate claims to much of eastern Ontario. The British chose only to deal with the Mississauga, with whom they had relatively good relations.

Understandably, as they moved onto their allotted parcels of land, the early European settlers found Native groups still residing in the area. They also found evidence of the former extent of Native occupation. In 1819, Andrew Bell wrote from Perth:

> *All the country hereabouts has evidently been once inhabited by the Indians, and for a vast number of years too. The remains of fires, with the bones and horns of deers round them, have often been found under the black mound... A large pot made of burnt clay and highly ornamented was lately found near the banks of the Mississippi, under a large maple tree, probably two or three hundred years old. Stone axes have been found in different parts of the settlement. Skeletons of Indians have been several times found, where they had died suddenly or had been killed by accident in the woods.*
>
> (cited in Brown 1984:8)

By 1817, 84 individuals were residing in Elmsley Township, the number rising to 1,832 by 1822 (Ancestry.com). As European settlement spread, the Natives were increasingly pushed out of the region, moving further to the north and west.

3.1.4 Property History

The Crown patent for the east half of Lot 7, Concession 1 in Drummond Township, amounting to a 100 acre grant, was issued to John McKenzie in 1820. It is not known if McKenzie actually occupied the property. In 1833, McKenzie sold the half lot to the Honourable Peter McGill of Montreal for an undisclosed sum (Lanark County Land Registry Office or LCLRO Instrument F-124). McGill may well have been influenced in his purchase of the property as an investment by Benjamin Holmes, an executive with the Bank of Montreal of which McGill was also a director. Holmes, a veteran of the War of 1812, had received a Crown patent for the 100 acre west half of Lot 7, Concession 1, and for a brief period was involved in a commercial partnership in Perth before returning to Montreal (Dictionary of Canadian Biography 1976). McGill sold the 100 acres to John H. McDonagh (McDonough?) in 1844 (LCLRO Instrument H-136). Two years later Rev. McDonough, (as his name then appeared in the land registry records) sold the property to John C. (G.?) Malloch (LCLRO Instrument I-236). Upon Malloch's death in 1854 the property was left to Edward G. Malloch, likely a son (LCLRO Instrument GR-151 and GR-152). In 1874 the lot was sold to Michael McManus (LCLRO Instrument 2F-763); the mortgage was held by Edward Malloch, who, according to the 1871 census, was then an established barrister in Perth (LAC microfilm reel C-10018). The property passed to McManus' son John in 1911, who eventually sold it to Percy James Gray in 1942 (LCLRO Instrument 2P-5192 and 2S-7658).

The property history of Lot 7, Concession 1 suggests a speculative pattern of early ownership preceeding a stable occupation period that began with the Michael McManus purchase in 1874, and carried through to the mid-twentieth century. McManus appears in both the 1881 and 1891 census records (LAC microfilm reel C-13233 and T-6349). In the latter, he is described as a fifty-two year old farmer with a wife and a family of seven children.

Whether or not there were nineteenth century structures on the property is unknown. Historic maps of the area such as Walling's map of 1863 and Belden's map of 1880 did not assign any name to the property, nor do they depict any structures on it (Figures 4 and 5). It is important to remember, however, that these historical atlases were sold by subscription, and for this reason the absence of names and/or structures from individual lots does not constitute evidence that the lot was not settled at the time. Moreover, when structures were depicted on farm properties on these maps they invariably represented residences; other contemporary structures, such as barns, outhouses, sheds, smokehouses, etc., were rarely indicated.

The earliest known depiction of structures on the subject property appears on a 1935 topographical map at a scale of one inch to one mile (Figure 6). It shows two unidentified buildings, likely a house and barn, within the southwest corner of the property fronting along Concession 1. This structural arrangement remained relatively unchanged for several years as indicated on a later 1950 map (Figure 7), though by 1989 the smaller building, to the west of the larger structure, may have been replaced by another structure closer to the road (see Figure 1). A communications tower had been erected immediately to the west. A satellite image dating to 2005 illustrates the two buildings in this area, connected to the road by a short driveway (Figure 8). It depicts a long rectangular barn like structure on the east side of the driveway aligned parallel with Concession 1, along with a smaller building immediately to the west situated at right angles to the road. These buildings had been removed by 2009 (see Figure 3).

3.2 Archaeological Context

This section describes the environmental and cultural context of the study area and, combined with the historical context outlined above, provides an evaluation of archaeological potential for the property.

3.2.1 Previously Recorded Archaeological Sites

A request for a search of all archaeological sites registered with the Provincial Archaeological Site Database maintained in Ontario by the Ministry of Tourism, Culture, and Sport (MTCS) revealed that no archaeological sites have previously been recorded within 1.0 kilometre of the subject property.

3.2.2 Previous Archaeological Research

To date there have been few archaeological investigations within the Perth area; most of these have been on historic properties within the town. These include Inge-va (Stewart 1987; Dieterman 1988; Williamson 1989 and numerous excavations by the Ontario Heritage Trust from the early 1990s until present, Doroszenko, personal communication, 2010), McMartin House (Penny 1974; Stewart 1987), the Perth Museum (Blaubergs, personal communication, 2000), the Lanark County Court House (Adams 1993, 1994; Daechsel 2005) and the former St. Andrews Presbyterian Church (Gromoff 2007, 2010).

Work within Drummond Township has been sporadic. An initial archaeological survey of the Mississippi River was completed in 1977 and 1978 (Phill Wright, personal communication, 2004). The proposed Sheridan Subdivison along Highway 511 was assessed by Ken Swayze in 2000, resulting in the identification of three pre-contact lithic scatters (Swayze 2000). An assessment of the old Innisville bridge area was undertaken in 1982 and at that time a small collection of Native artifacts was recovered from a local resident who had found them in his garden (Ballantine 1982). Tom Ballantine also undertook a survey of the Highway 511 corridor through the township (Ballantine 1984). Adams Heritage completed an assessment of a gas pipeline route from Perth to Smith Falls extending through the extreme south-western section of the township, as well as Stage 2 and 3 assessments for a proposed subdivision near Innisville which resulted in the discovery of a large Middle Woodland site associated with a wetland adjacent to Mississippi Lake and a c.1850 cabin site (Nick Adams, 1997 and personal communication, 2006). Heritage Quest Inc. undertook Stage 1 to 3 heritage assessments of Highway 7 improvements between Perth and Innisville, resulting in the identification of artifacts relating to a nineteenth century Orange Hall (Kennett 2000a, 2000b, 2001).

No previous archaeological studies have been undertaken within or within fifty metres of the study area.

3.2.3 Identified Local Cultural Heritage Resources

There are no extant buildings, historical plaques or cemeteries on the subject property.

3.2.4 Local Environment

The assessment of present and past environmental conditions in the study area is a necessary component in determining the potential for past occupation. Factors such as nearness to water, soil types, forest cover, and topography all contribute to the suitability of the land for exploitation and/or settlement. As well, an examination of the geophysical evolution of the study area provides an indication of the possible range in age of pre-Contact sites that potentially could be found on the property.

The study area lies within the Smiths Falls Limestone Plain physiographic region. This region is characterized by shallow soils overlying limestone of the Beekmantown Group, including grey limestone, magnesian limestone, blue-grey dolostone and calcareous sandstone. The surface topography is generally level with many undrained depressions forming bogs or wetlands (Chapman and Putnam 1984:196-197). Surficial geology mapping shows that the study area lies mainly within an area of glacial till veneer with less than a metre of soil cover, apart from the northeast corner which contains glaciolacustrine offshore sediments (Figure 9). An assumed marine limit associated with the Champlain Sea runs through the property. The topography of the study area is generally flat.

Soil mapping of Lanark County conducted in the 1966 identifies the soils in the north and south ends of the study area as sandy loams belonging to the Tennyson Series, a well drained grey-

brown podzolic soil which in this area is moderately stony but gently sloping (Figure 10). The central section of the property consists of Balderson sandy loam, an imperfectly drained grey-brown podzolic soil, fairly level and moderately stoney. Both soil types are similar apart from the drainage, generally confirmed by the presence of wet areas in the centre of the property during the Stage 2 assessment (Hoffman, Miller and Wicklund 1967:28-29 and Map Sheet for Lanark County, South Sheet).

The study area lies within the Upper St. Lawrence Sub-region of the Great Lakes-St. Lawrence Forest Region. Natural forests within this region include sugar maple and beech, along with basswood, white and red ashes, yellow and white birch, red maple, large tooth aspen, and red, white, and bur oaks. Less common are rock elm, blue-beech, bitternut hickory, butternut, cottonwood and slippery elm, found in river valleys. Small stands of black and silver maple appear in fertile lowlands, while poorly drained depressions have black ash. In terms of conifers, hemlock, white pine, white spruce and balsam fir are most common, with red pine appearing on coarse textured soils, and black spruce and eastern white cedar appearing in wet soils (Rowe 1977). The area would have been cleared of the natural forest cover with the intensification of Euro-Canadian settlement and extensive logging in the early nineteenth century.

The subject property is located within the Rideau Valley watershed. Historically large wetland areas extended over much of Drummond Township until drainage projects, beginning in the last quarter of the nineteenth century, were undertaken by the local Council to improve conditions for agriculture (Epps 1999:107). Recent topographic mapping provides an indication of the wetland areas that characterize much of the present Drummond/North Elmsley Township (see Figure 1). Long Swamp lies immediately to the west of the property, though is more than 300 metres away.

3.2.5 Property Inspection

In order to gain first-hand knowledge of the geography, topography, and current conditions of the study area to inform an evaluation of archaeological potential, a preliminary property inspection was undertaken on June 3rd, 2013. The property inspection was conducted according to the archaeological fieldwork standards outlined in *Standards and Guidelines for Consultant Archaeologists* (MTCS 2011). The weather was warm and sunny, permitting visibility of the local topography and the identification and documentation of features influencing archaeological potential.

Field conditions and features influencing archaeological potential were documented with digital photographs. The complete photographic catalogue is included as Appendix 1 and the locations and orientations of all photographs used in this report are shown in Figure 11. As per the *Terms and Conditions for Archaeological Licences* in Ontario, curation of all field notes, photographs, and maps generated during the Stage 1 archaeological assessment is being provided by Past Recovery Archaeological Services pending the identification of a suitable repository. An inventory of the records generated by the assessment is provided below in Table 1.

Table 1. Inventory of the Stage 1 Documentary Record.

Type of Document	Description	Number of Records	Location
Photographs	Digital photographs documenting the Stage 1 property inspection	10 photographs	On PRAS computer network – file PR13-18

The property was accessed through a gate situated in the centre of the property frontage along Drummond Concession 2 (County Road 10). This portion of the subject property had been subject to recent and extensive machine grading that extended approximately 30 m from the road (Figure 12). Soil, presumably resulting from this activity, had been banked adjacent to the west lot line in this area.

Other on-site developments were clearly ongoing and noted both during this inspection and the subsequent Stage 2 investigation that followed. The construction of a road through the center of the property was underway, which, when completed, will presumably connect Drummond Concessions 1 and 2 (Figure 13). Work on this road construction had been begun at the gate entrance on Concession 2 and extended in a straight line southward. This construction entailed the grading and preparation of a roadbed and the excavation of ditches along both sides. A substrate of stone and gravel was being trucked in and levelled with the aid of a bulldozer in preparation for the road surface. This work revealed shallow soil depths (under a metre in thickness) over limestone bedrock along the construction corridor. The bedrock, laid bare by this work, was observed within the southern portion of the property in alignment with the projected course of the roadway (Figure 14).

A concurrent project was also underway within the southern portion of the property fronting along Drummond Concession 1. As observed, this work entailed extensive grading, filling and levelling activities, much of which was concentrated in the southwest corner of the property where, according to historic twentieth century cartographic and aerial photographic evidence, at least two unidentified structures had once stood (Figures 15 and 16).

With the exception of these areas, the entire study area was comprised of previously cultivated fields occupying relatively flat topography, averaging 137 masl (450 ft.) (Figures 17 and 18). The topography declined gently to the south along the frontage with Drummond Concession 1. The open fields were bordered to the west and east by cedar rail and page wire fences within overgrown and broken tree lines. No water courses were noted on or in close proximity to the subject property, although a degree of ponding was evident in the central portion of the lot, as well as in the southeast corner (Figures 19 and 20).

3.3 Analysis and Conclusions

3.3.1 Determination of Archaeological Potential

A number of factors are used to determine archaeological site potential. For pre-Contact sites criteria are principally focused on topographical features such as the distance from the nearest source of water and the nature of that water body, areas of elevated topography including features such as ridges, knolls and eskers, and the types of soils found within the area being assessed. For historic sites, the assessment of archaeological site potential is more reliant on historical research (land registry records, census and assessment rolls, etc.), cartographic and aerial photographic evidence and the inspection of the study area for possible above ground remains or other evidence of a demolished historical structure. Also considered in determining archaeological potential are known archaeological sites within or in the vicinity of the study area.

Archaeological assessment standards established by MTCS (*Standards and Guidelines for Consultant Archaeologists*, 2011) establish minimum distances to be tested from features indicating archaeological potential. Areas that are considered to have pre-Contact site potential and therefore require testing include lands within 300 metres of water sources, wetlands or elevated features in the landscape including former river scarps. Areas of historic archaeological site potential requiring testing include locations within 300 metres of sites of early Euro-Canadian settlement and 100 metres from historic transportation corridors. Further, areas within 300 metres of registered archaeological sites, designated heritage buildings or structures/ locations of local historical significance are considered to have archaeological potential and require testing.

The review of the local environmental conditions provided above in Section 3.2.4 indicates that the study area lies in proximity to or contains features of archaeological potential. Specifically, detailed surficial geology mapping of the study area shows that it contains offshore marine sediments and an assumed marine limit associated with the Champlain Sea. This indicates that there is potential for late Palaeo-Indian or early Archaic period archaeological sites on the property. Given this, all portions of the subject property should be considered to have potential for the presence of archaeological resources. In addition, the soils of the study area are for the most part well-drained sandy loams, presenting favourable conditions for both pre-Contact and early historic settlement.

The review of archival documents and mapping described above in Section 3.1.4 suggests that the subject property exhibits potential for the presence of archaeological resources associated with nineteenth century Euro-Canadian settlement and land-uses. Though no documentation was found indicating that there was a historical farmstead on the east half of Lot 7 prior to the mid-1870s, both Drummond Concession 1 and Drummond Concession 2 were historical transportation corridors, the latter road joining Perth to Franktown and Richmond in the early nineteenth century. Thus it is possible the lot was occupied prior to the McManus purchase in 1874.

Thus the Stage 1 archaeological assessment has concluded that the entire subject property exhibits potential for pre-Contact archaeological sites focussed on physiographic features and that the north and south ends of the property exhibit potential for historic Euro-Canadian archaeological sites given the presence of historical transportation corridors, as laid out in *Standards and Guidelines for Consultant Archaeologists* (MTCS 2011).

There were, however, features in the landscape illustrating the presence of deep disturbance, allowing some parts of the property to be eliminated from further archaeological survey (Figure 21); specifically:

- there was evidence of grading, filling and levelling activities taking place in proximity to the existing roadways bordering the subject property to the north and south;
- there was extensive disturbance noted within the southwest portion of the subject property resulting from the complete removal of the two buildings previously situated in this area as indicated by cartographic and satellite evidence presented in this report; and
- a road with flanking ditching had been extended through the center of the subject property along a northwest to southeast alignment, below which all soil had been removed to bedrock

A Stage 2 archaeological assessment is recommended for the remainder of the study area (see Figure 21), consisting of the open fields that dominate the majority of the property. This should be undertaken by means of a pedestrian surface survey at 5 metre intervals after the fields have been ploughed and allowed to weather through at least one heavy rainfall.

3.3.2 Stage 1 Recommendations

The results of the Stage 1 assessment formed the basis for the following recommendations:

1) A Stage 2 archaeological assessment is recommended for the undisturbed portions of the study area as presently defined in Figure 21. The Stage 2 assessment strategy should include surface survey of the open areas which can be ploughed, and, where necessary, shovel testing at 5 metre intervals in areas inaccessible to ploughing.

2) The recommended Stage 2 work should be undertaken by a licensed archaeologist in accordance with the *Ontario Heritage Act* (Section 7) and in compliance with *Standards and Guidelines for Consultant Archaeologists* (MTCS 2011).

4.0 STAGE 2 ARCHAEOLOGICAL ASSESSMENT

The purpose of this assessment was to determine whether archaeological resources with cultural heritage value were present on the property and to determine whether these resources require further assessment. More specifically, the aim was to address the recommendations of the Stage 1 archaeological assessment. As outlined in the section above (see Section 3.3.1), the study area had the potential to contain archaeological resources associated with both pre-Contact First Nations and historical Euro-Canadian land uses and/or settlement.

4.1 Fieldwork Methodology

The Stage 2 fieldwork was completed over the course of two days (June 7th and June 26th, 2013). Weather conditions on both occasions were bright, clear and warm. Fieldwork was restricted to those times when weather and lighting conditions permitted good visibility of the ground surface and acceptable conditions for the identification, documentation, and recovery of archaeological resources. Given that the study area consisted almost entirely of recently cultivated fields on a relatively flat plain, all level areas of the subject were ploughed and disced, allowed to weather through several rainfalls, and assessed by means of a pedestrian survey at five metre intervals (Figures 22 to 25). Surface visibility ranged from 80 to 100 percent.

Omitted from the pedestrian survey were areas impacted by the current on-site developments previously noted in section 3.3.1, specifically:

- the strips of land adjacent to the existing roadways bounding the subject property to the north and south where ongoing grading, filling and levelling activities have been taking place;
- the locations of the former buildings at the south end of the property where extensive grading has occurred; and
- the location of the road extending through the center of the property along a northwest/southeast alignment (see Figure 22).

Further, surface ponding resulting from both recent rains and permanently wet areas was present in the central portion of the study area during the June 7th survey. This area was subsequently revisited on June 26th to complete the survey. While the wet conditions were found to have improved, they had not been and could not be entirely eliminated, resulting in the omission of a further two small sections in the centre of the property from this survey (see Figure 22). Similarly, wet conditions prevailed within a low lying area in the southeast corner, adjacent to Drummond Concession 1, which was also excluded.

Field conditions and activities were recorded through field maps and digital photographs. A catalogue of the field records generated through the Stage 2 property survey is included below in Table 2. A complete photographic catalogue is included as Appendix 1 and the locations and orientations of all photographs used in this report are shown in Figure 11.

Table 2: Inventory of the Stage 2 Documentary Record.

Type of Document	Description	Number of Records	Location
Photographs	Digital photographs documenting the Stage 2 field conditions and assessment	58 photographs	On PRAS computer network – file PR13-18
Maps	Printed 2005 satellite image with property limit overlay	1 map	PRAS office – file PR13-18

4.2 Fieldwork Results

No artifacts or archaeological features were discovered during this pedestrian survey of the open fields comprising the majority of the subject property.

Proximity to historic transportation routes, as discussed previously in Section 3.3.1, is an important factor in the determination of historic archaeological potential. This study revealed extensive and deep disturbance had significantly impacted the subject property within the 100 metre buffer of historic potential from both Drummond Concessions 1 and 2. Grading, filling, and levelling activities were well underway within the southwest portion of the property during this study (Figures 26 to 28). This work also resulted in the complete removal of the two twentieth century buildings known from historic maps and satellite images to have previously stood in this area (see Figures 1, 6, 7 and 8). A bulldozed tangle of fence posts and wire (Figure 29) and an abandoned drilled well casing with much of the ground around it cut away (Figure 30) represent the only remaining structural evidence associated with these buildings.

The impact of the various ongoing developments on the subject property has resulted in extensive secondary fill deposits being trucked in from off-site (Figure 31). The southwest section of the property, in particular, has received a heavy overburden of fill. As a consequence of this activity the possible secondary deposition of archeological materials from elsewhere must also be acknowledged.

4.3 Analysis and Conclusions

As stated above, no archaeological resources of possible cultural heritage value or interest were discovered during this pedestrian survey.

4.4 Stage 2 Recommendations

This report forms the basis for the following recommendation:

1) No further archaeological investigation of the study area as defined in Figure 3 is required

The reader is also referred to Section 5.0 below to ensure compliance with the Ontario Heritage Act as it may relate to this project.

5.0 ADVICE ON COMPLIANCE WITH LEGISLATION

In order to ensure compliance with the *Ontario Heritage Act*, the reader is advised of the following:

1) This report is submitted to the Minister of Tourism, Culture, and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture, and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

2) It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

3) Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.

4) The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

5) Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.

6.0 LIMITATIONS AND CLOSURE

Past Recovery Archaeological Services Inc. has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the archaeological profession currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied, is made.

This report has been prepared for the specific site, design objective, developments and purpose prescribed in the client proposal and subsequent agreed upon changes to the contract. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the client in the design of the specific project.

Special risks occur whenever archaeological investigations are applied to identify subsurface conditions and even a comprehensive investigation, sample and testing program may fail to detect all or certain archaeological resources. The sampling strategies in this study comply with those identified in the Ministry of Tourism, Culture, and Sport's *Standards and Guidelines for Consultant Archaeologists* (2011).

The documentation related to this archaeological assessment will be curated by Past Recovery Archaeological Services Inc. until such a time that arrangements for their ultimate transfer to an approved and suitable repository can be made to the satisfaction of the project owner(s), the Ontario Ministry of Tourism, Culture, and Sport and any other legitimate interest group.

We trust that this report meets your current needs. If you have any questions of if we may be of further assistance, please do not hesitate to contact the undersigned.

Jeff Earl, M.Soc.Sc.
Principal
Past Recovery Archaeological Services Inc.

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8.0 MAPS

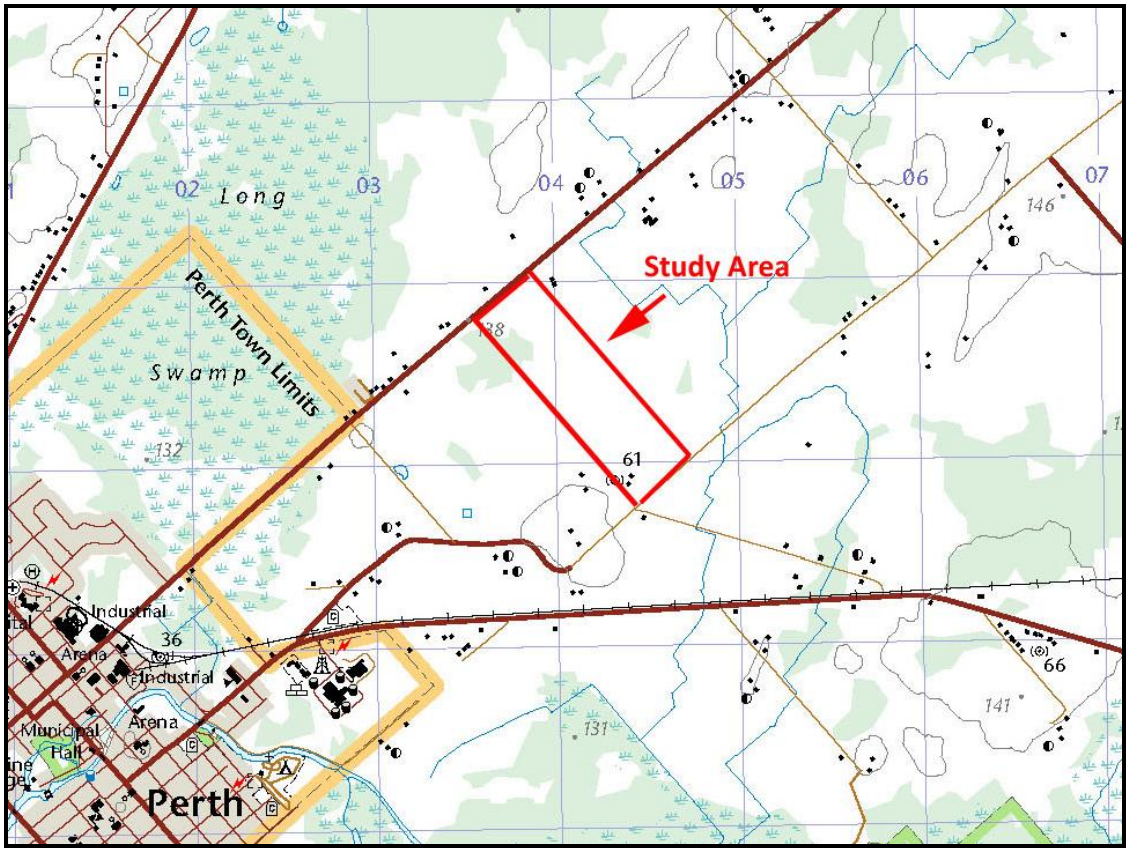

Figure 1. Location of the study area (outlined in red). (3th Edition 1:50,000 topographic sheet 31C16: Perth, 1989)

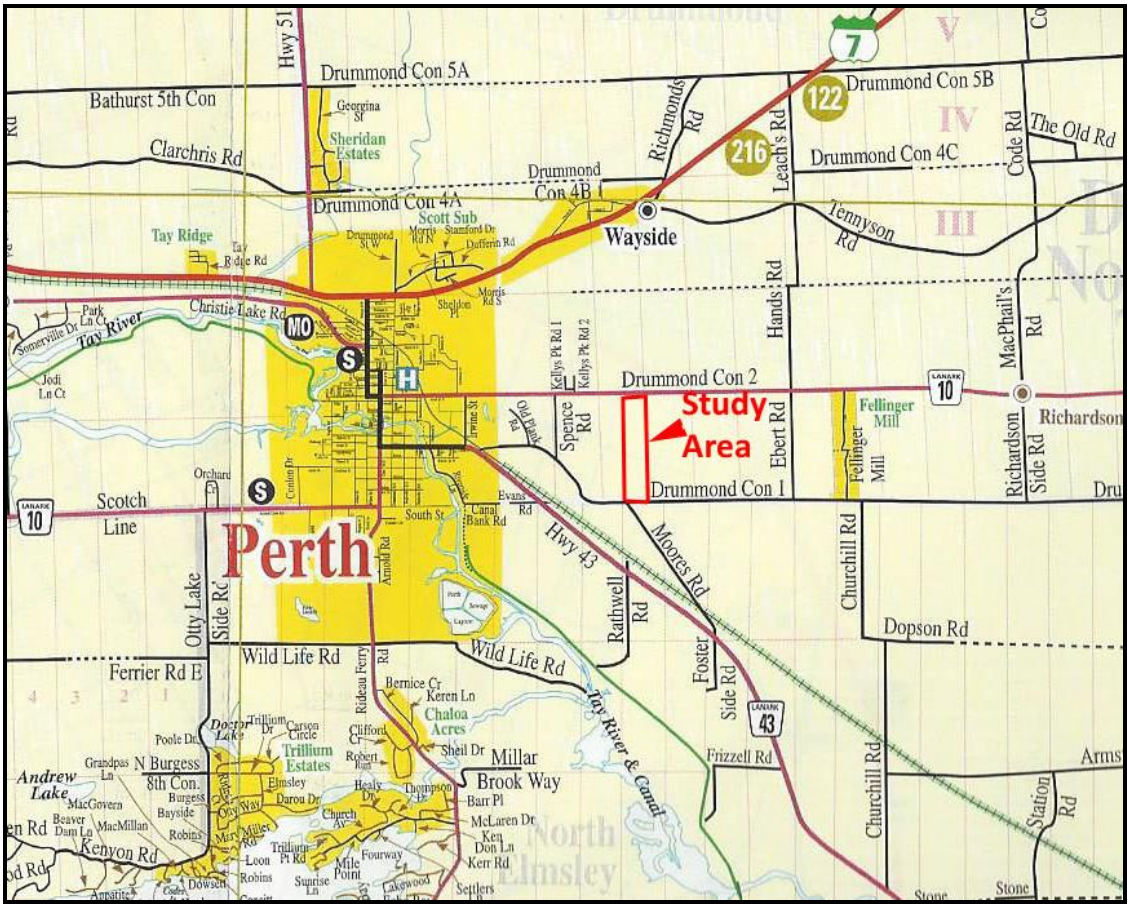

Figure 2. Segment of a Lanark County map showing lots and concessions (study area outlined in red). (Lanark County, n.d.)

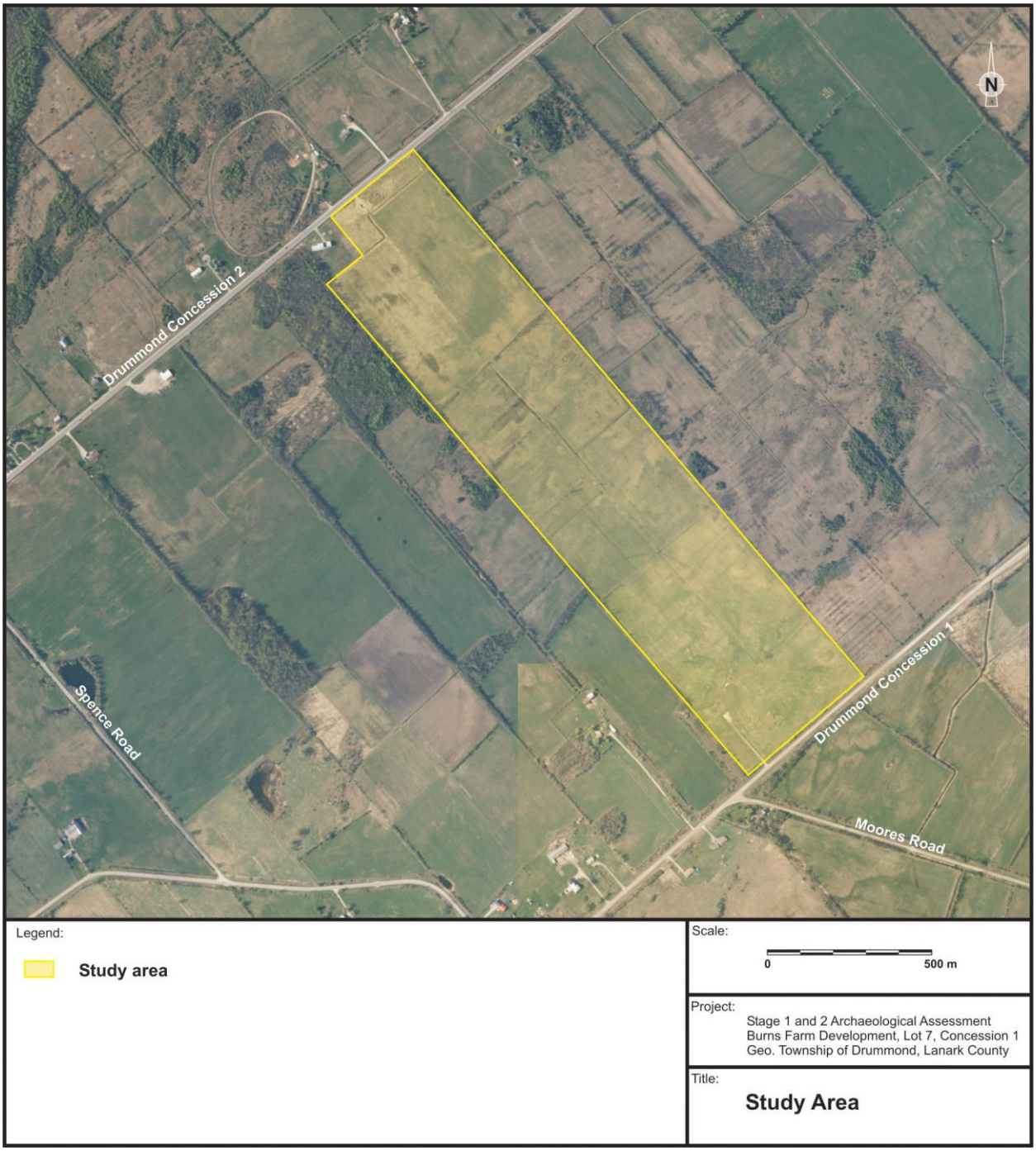

Figure 3. Satellite image of the subject property (outlined in yellow). Note the former building locations at the end of the laneway in the lower left hand corner. (Base: 2008-2009 DRAPE satellite image)

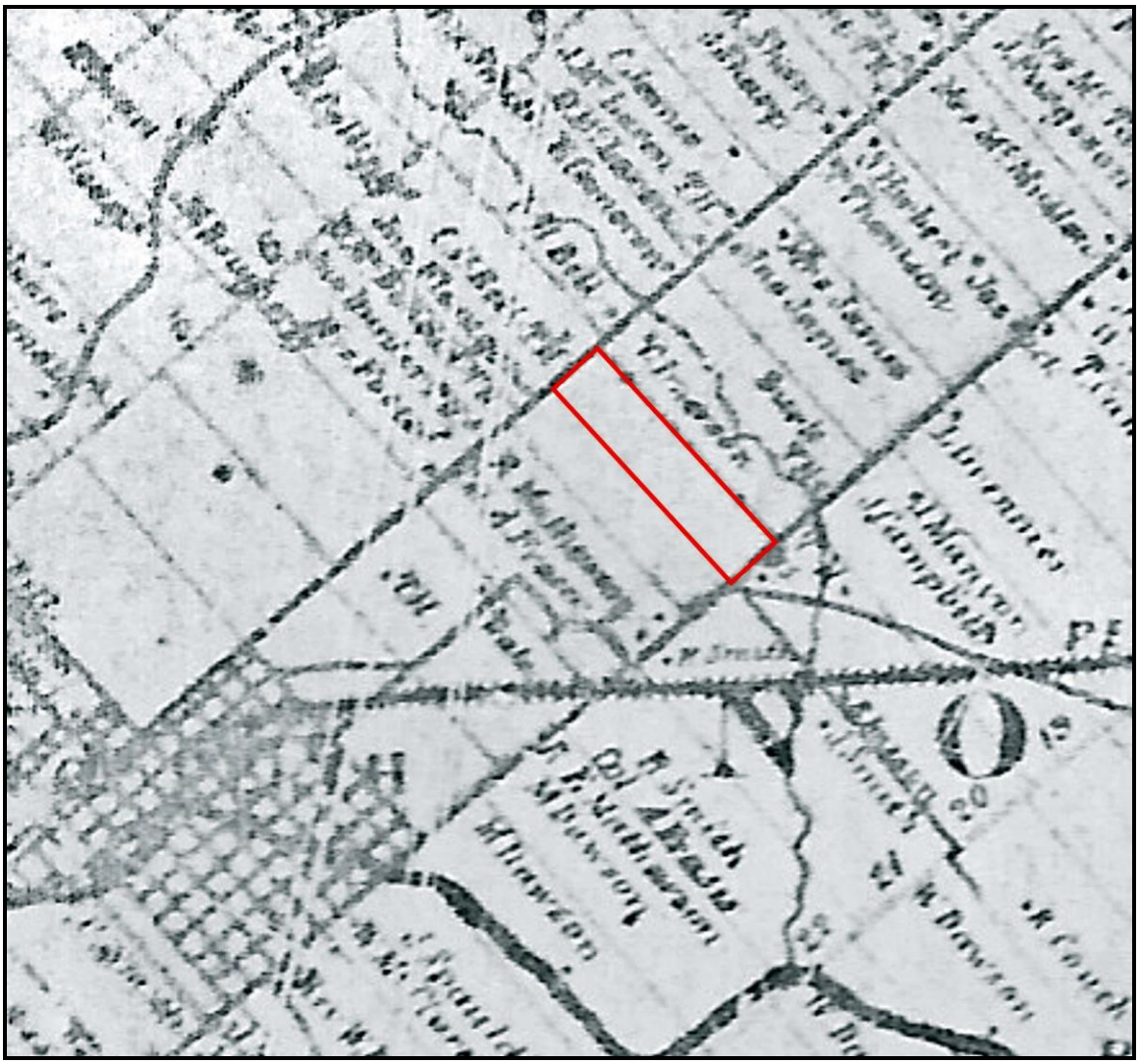

Figure 4. Segment of the 1863 Walling Map showing the subject property outlined in red.
(LAC NMC 21920)

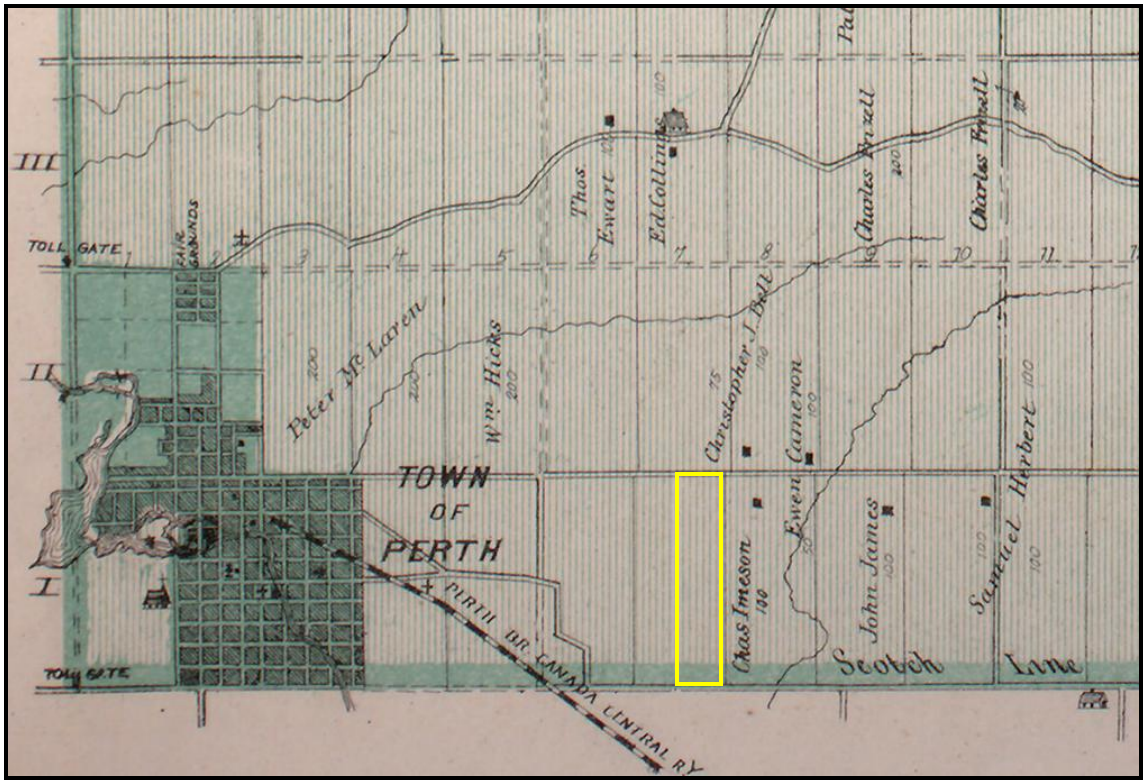

Figure 5. Segment of the 1880 Belden map of Drummond Township showing the subject property outlined in yellow. (Belden 1880:38)

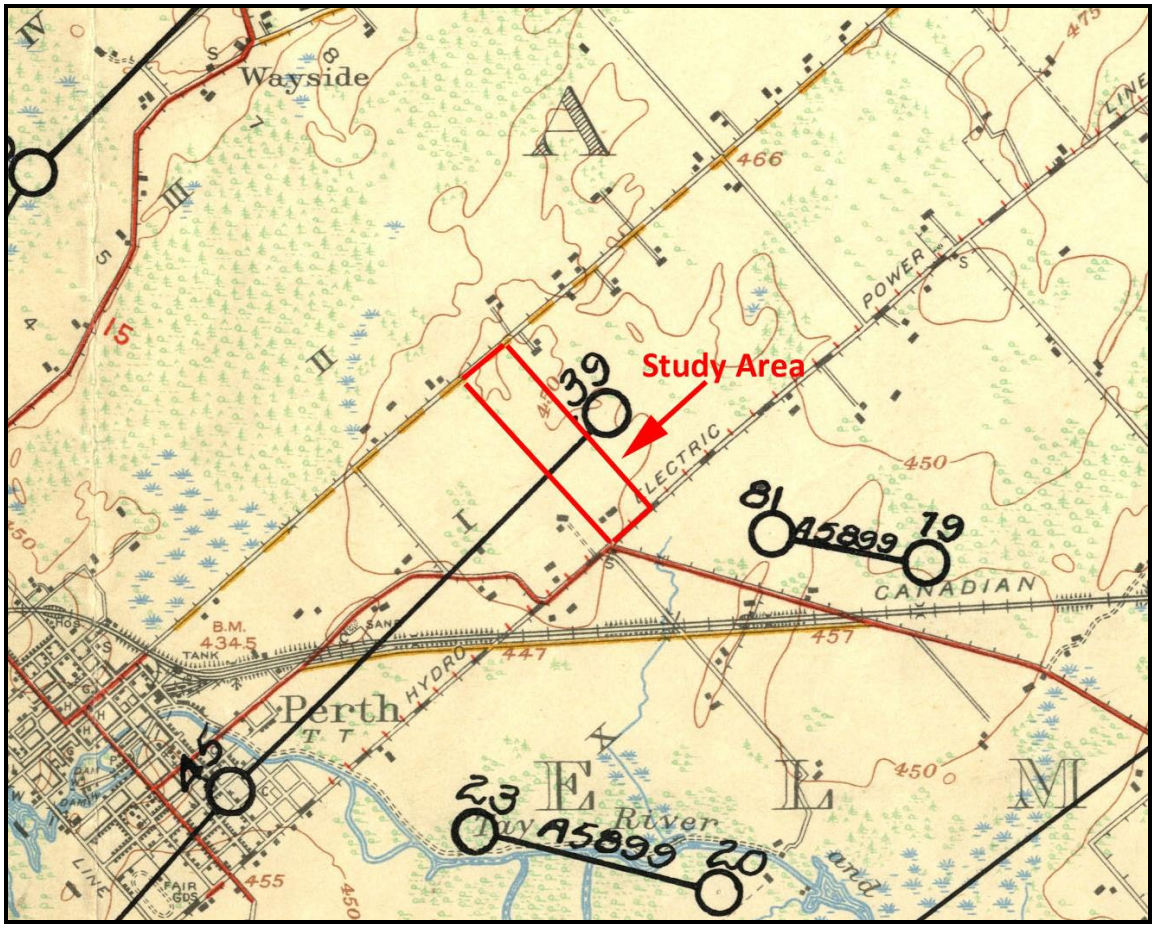

Figure 6. Segment of one-inch-to-one-mile topographic map 31C16 showing the study area (outlined in red), 1935. (National Air Photo Library website)

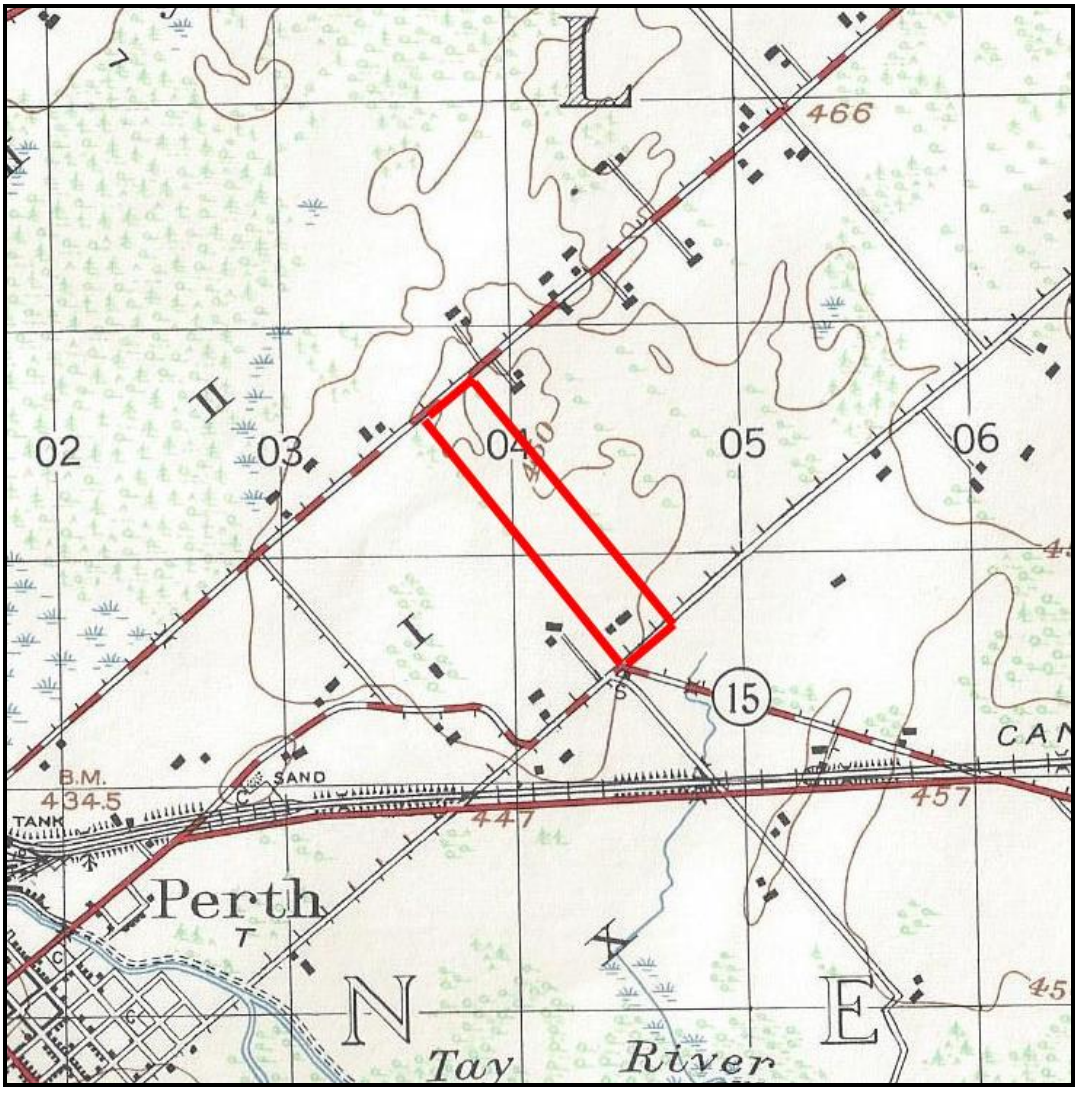

Figure 7. Segment of 1:50,000 topographic map 31C16 showing the study area, 1950. (PRAS office)

Figure 8. Satellite image showing the structures at the south end of the study area in 2005. (Google Earth)

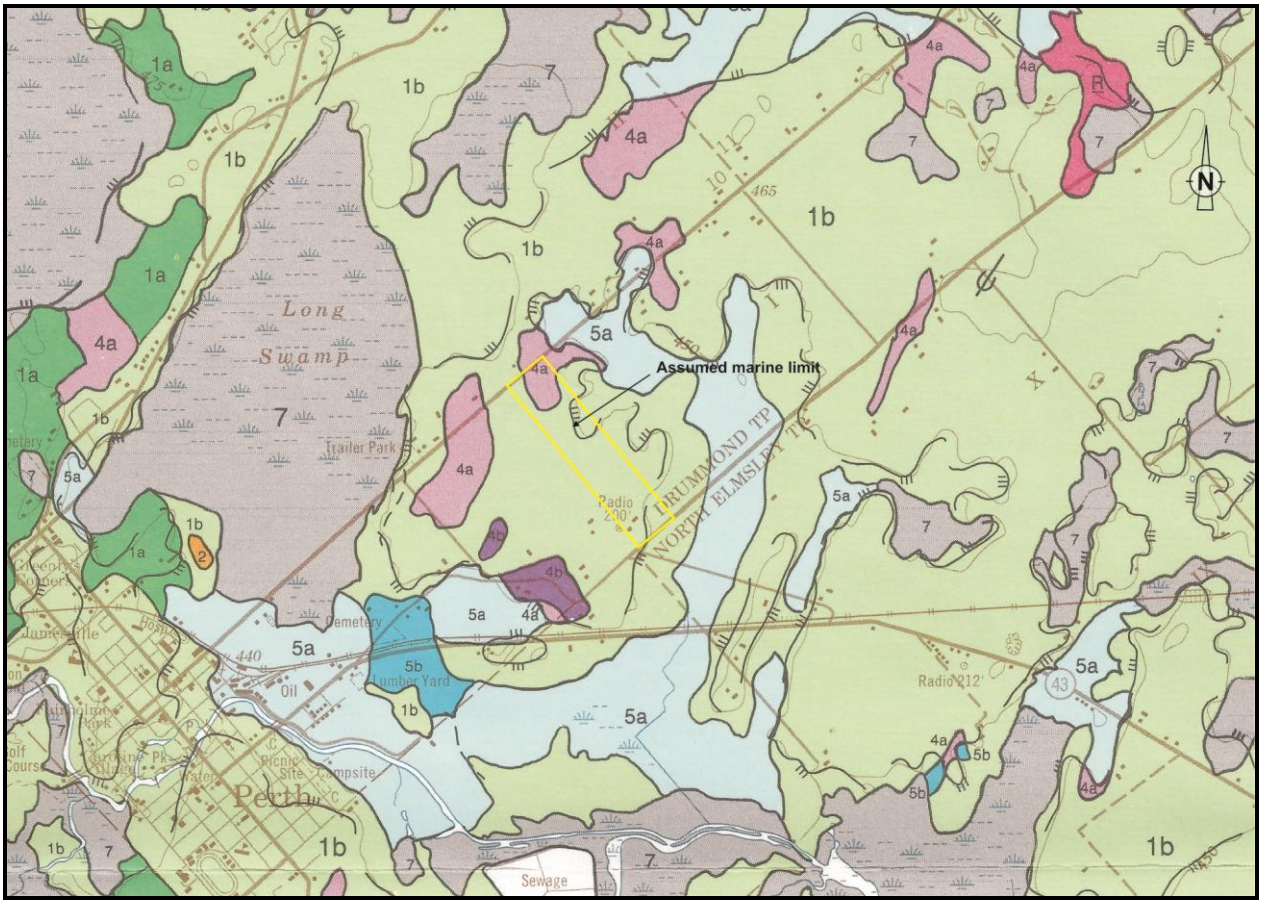

Figure 9. Surficial geology within the study area. Study area outlined in yellow. 1b: till veneer glacial deposit; 4a: offshore sediments glaciolacustrine deposit; 5a: offshore sediments glaciomarine deposit (Kettles 1992)

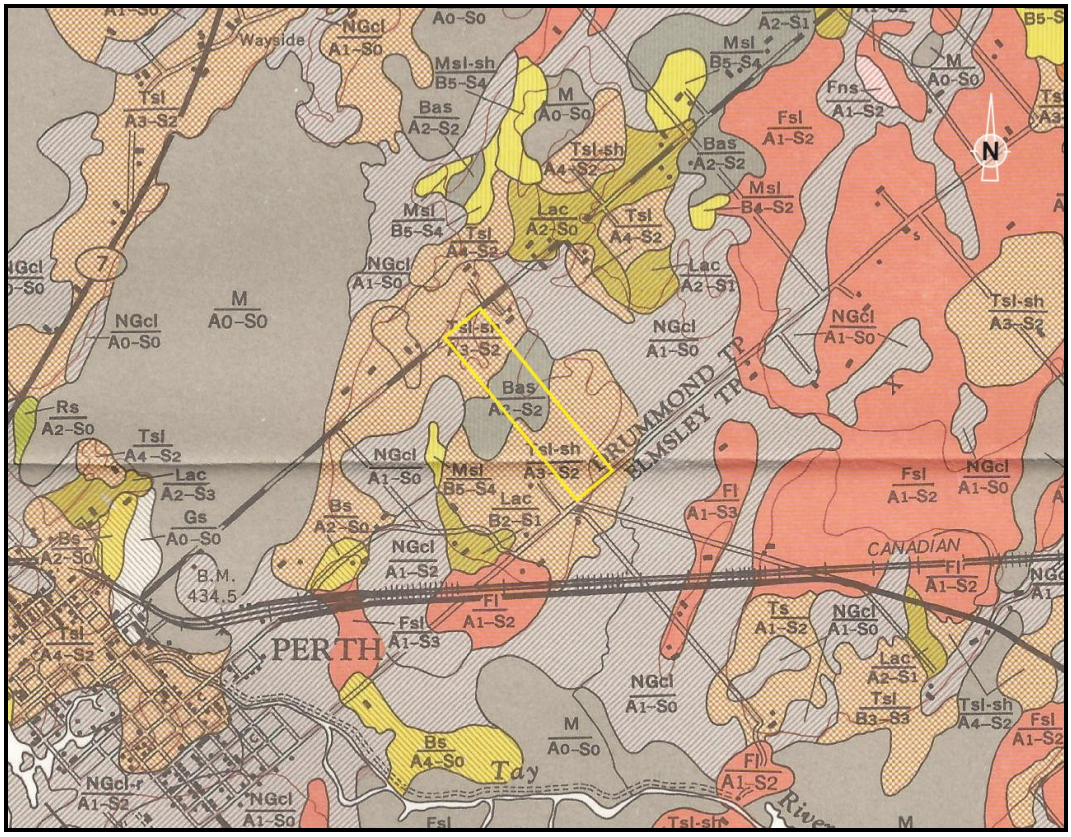

Figure 10. Soils within the study area. Study area outlined in yellow. Bas/A2-S2: Balderson sandy loam, level and moderately stoney; Tsl/A3-S2: Tennyson sandy loam, gently sloping and moderately stoney (Hoffman, Miller and Wicklund 1967:Soil map for South Lanark)

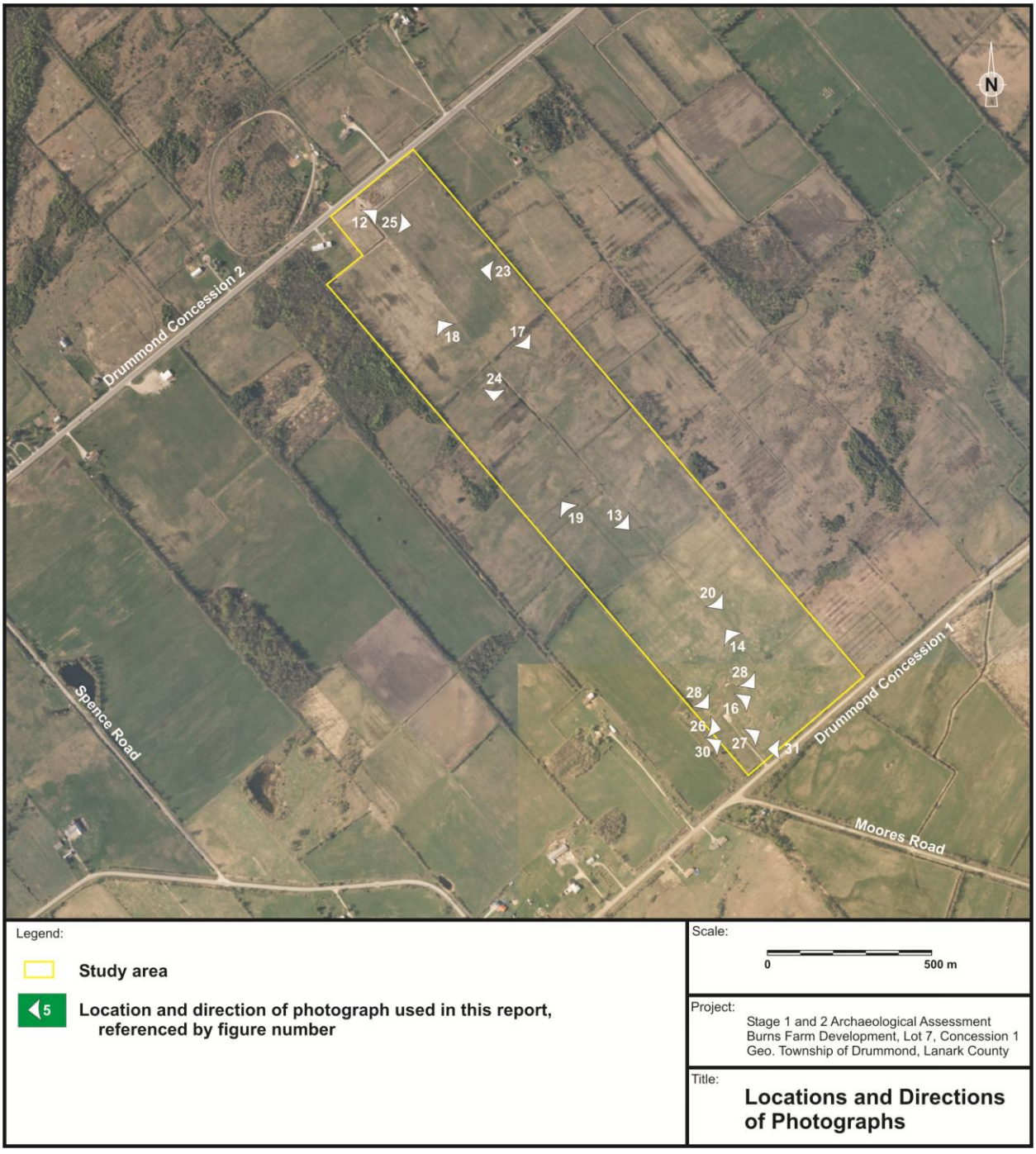

Figure 11. Satellite image of the study area showing locations and directions of photographs used in this report. Numbers refer to figures in the report. (Base: 2008-2009 DRAPE satellite image)

Figure 12. Rear of disturbed area fronting on Drummond Concession 2, looking northeast. (PR13-18D043)

Figure 13. Road construction in progress down the centre of the property, looking southeast. (PR13-18D053)

Figure 14. Projected course of roadway currently under construction extending into wet conditions within southeast section of subject property, looking northwest. Note the exposed bedrock surface in the foreground and machine piled topsoil to the right. (PR13-18D019)

Figure 15. Southern end of the property showing fill disturbance, looking northeast. (PR13-18D055)

Figure 16. Southern end of the property showing fill disturbance and an area of scraped bedrock, looking east. (PR13-18D063)

Figure 17. Typical field area to the east of the road, looking southeast. (PR13-18D044)

Figure 18. Typical field area to the west of the road, looking northwest. (PR13-18D049)

Figure 19. Surface ponding within the central portion of study area west of the new road construction, looking northwest. (PR13-18D024)

Figure 20. Southern portion of the roadway construction corridor with an exposed bedrock surface in the foreground, looking southeast. Note the fill deposits extending into this area on the right. (PR13-18D018)

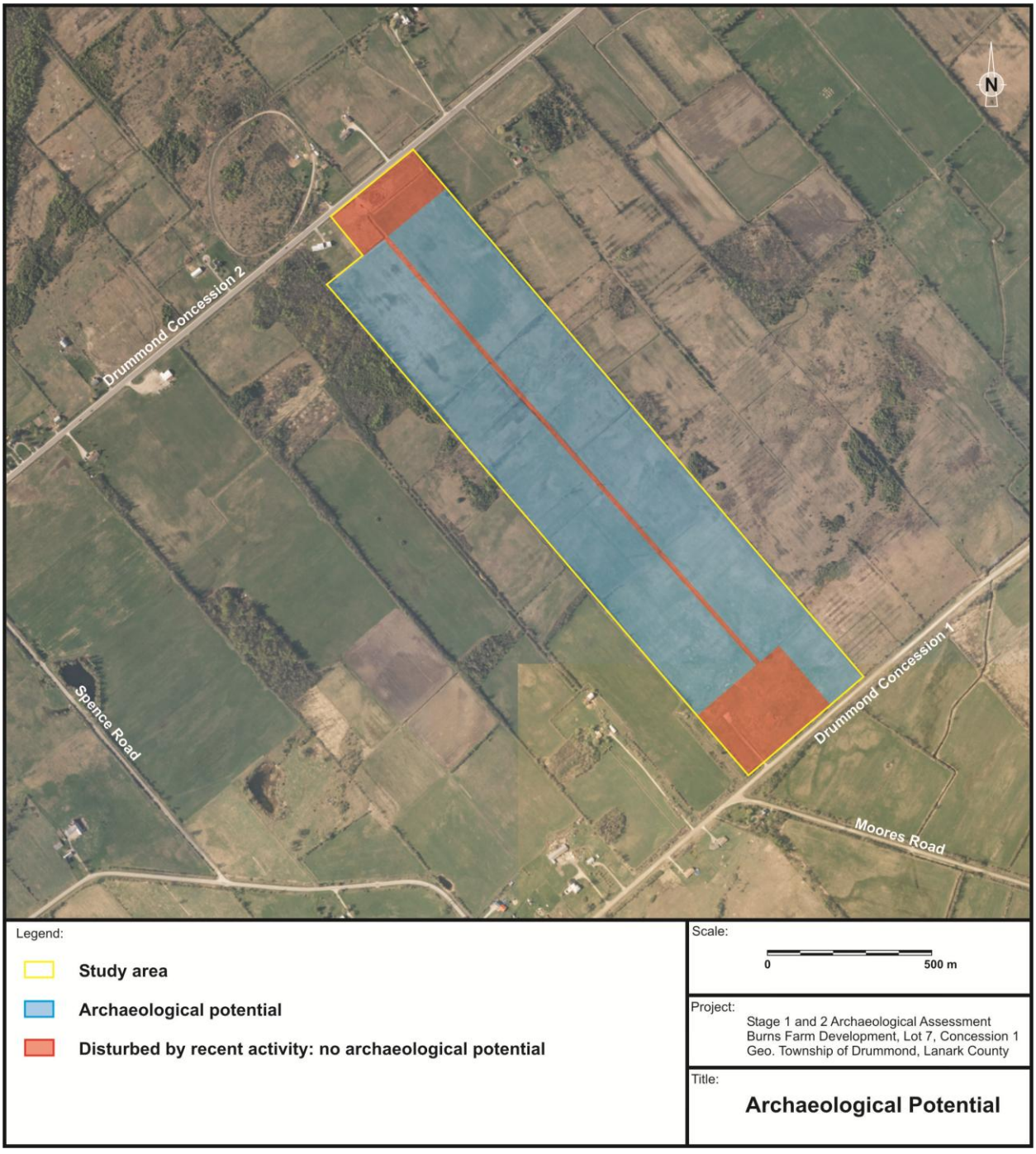

Figure 21. The study area showing archaeological potential and areas requiring Stage 2 assessment. Areas requiring assessment are shown in blue. (Base: 2008-2009 DRAPE satellite image)

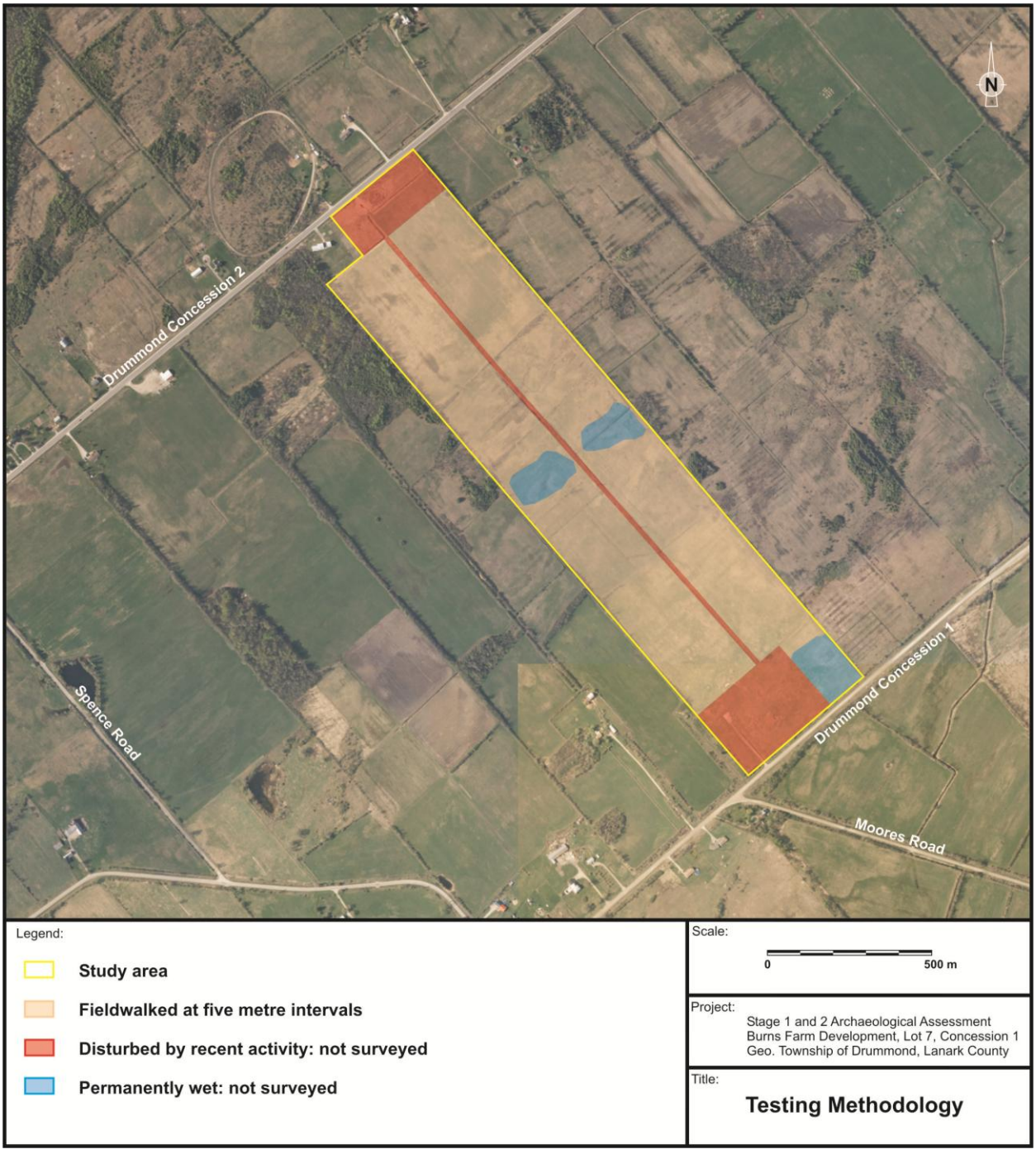

Figure 22. The study area showing the Stage 2 methodology and areas excluded from the survey. (Base: 2008-2009 DRAPE satellite image)

Figure 23. Pedestrian survey on the east half of the property in progress, looking west.
Note the road constructed through the property in the background. (PR13-18D002)

Figure 24. Pedestrian survey on the west half of the property in progress, looking south.
(PR13-18D003)

Figure 25. Pedestrian survey near the eastern edge of the property in progress, looking east. (PR13-18D020)

Figure 26. View of fill deposited east of the driveway entrance within the southwest corner of the subject property, looking east. (PR13-18D013)

Figure 27. Crew member standing on the driveway surface in the southwest corner of the property, looking northeast. Note depth of the fill and levelling deposits applied in this area. (PR13-18D014)

Figure 28. Fill deposited over the southwest corner of the subject property to the west of the driveway entrance off Drummond Concession 1, looking southeast. (PR13-18D012)

Figure 29. Bulldozed fence posts, wire and gate within the southwest portion of the study area, looking southeast. (PR13-18D017)

Figure 30. Abandoned metal drilled well casing, looking northeast. Note the disturbance in the background. (PR13-18D016)

Figure 31. Fill being trucked onto the property from the entrance off Drummond Concession 1, looking west. (PR13-18D015)

APPENDIX 1: Photographic Catalogue

Catalogue No.	Description	Dir.
PR13-18D001	Survey in progress	E
PR13-18D002	Survey in progress	W
PR13-18D003	Survey in progress	S
PR13-18D004	View along east side of property	S
PR13-18D005	View along west side of property	S
PR13-18D006	Survey in progress	SW
PR13-18D007	View of NE portion of subject property, note soil bank adjacent to neighbouring property	N
PR13-18D008	Wet conditions within west center portion of subject property	N
PR13-18D009	Wet conditions within east center portion of subject property	E
PR13-18D010	Banked Fill deposits within southwest portion of subject property	E
PR13-18D011	View of grading, fill and levelling area within southwest portion of subject property with front end loader in background, note metal well casing in foreground	SW
PR13-18D012	Fill deposited over the southwest corner of the subject property to the west of the driveway entrance off Concession No. 1.	SE
PR13-18D013	View of fill deposited east of driveway within southwest corner of subject property.	E
PR13-18D014	Crew member, Shyong En Pan, standing on driveway surface in southwest corner of the subject property. Note depth of fill and levelling deposits applied in this area.	NE
PR13-18D015	Fill being trucked onto the subject property from the entrance off Drummond Concession No. 1.	W
PR13-18D016	Abandoned metal drilled well casing. Note disturbance in background.	NE
PR13-18D017	Bulldozed fence posts, wire and gate within southwest portion of study area.	SE
PR13-18D018	Exposed bedrock surface within southern portion of roadway construction corridor.	SE
PR13-18D019	Projected course of roadway currently under construction extending into wet conditions within southeast section of subject property. Note exposed bedrock surface in foreground and machine piled topsoil at right.	NW
PR13-18D020	Survey in progress, east side of property	E
PR13-18D021	View from center area along west side of property	S
PR13-18D022	View from center area along west side of property	N
PR13-18D023	Wet conditions within center area on west side of property	S
PR13-18D024	Surface ponding within center portion of study area west of new road construction	NW
PR13-18D025	View of tree line along west side of property	W
PR13-18D026	View of east property line with cedar rail fence	SE
PR13-18D027	Looking north along east side of property	N
PR13-18D028	Looking north along east side of property	N
PR13-18D029	Looking south along east side of property	S
PR13-18D030	Wet conditions within center area on east side of property	NE
PR13-18D031	Ploughed wet area in the centre of the property, west of the new road	SE
PR13-18D032	Ploughed wet area in the centre of the property, west of the new road	NW
PR13-18D033	Wet conditions within center area on west side of property	SE
PR13-18D034	Wet conditions within center area on west side of property	NW
PR13-18D035	Wet conditions within center area on west side of property	SW
PR13-18D036	Wet conditions within center area on east side of property	NE
PR13-18D037	Wet conditions within center area on east side of property	NW
PR13-18D038	Ploughed wet area in the centre of the property, east of the new road	NW
PR13-18D039	Ploughed wet area in the centre of the property, east of the new road	SE
PR13-18D040	Wet conditions within center area on east side of property	N
PR13-18D041	Mounded fill at the north end of the property	SW

Catalogue No.	Description	Dir.
PR13-18D042	Entrance gate and disturbed area at the north end of the property	NW
PR13-18D043	Disturbed area and drainage ditch at the north end of the property	NE
PR13-18D044	Typical field in the east half of the property	SE
PR13-18D045	Ploughed field in the east half of the property	NW
PR13-18D046	Piled fill along the eastern edge of the property	E
PR13-18D047	Crew surveying in the east half of the property	SE
PR13-18D048	Crew surveying in the east half of the property	S
PR13-18D049	Ploughed field in the west half of the property	NW
PR13-18D050	Crew surveying in the east half of the property	NW
PR13-18D051	Mounded disturbance along the western edge of the property	SW
PR13-18D052	Typical field in the west half of the property	SE
PR13-18D053	Road construction through the centre of the property	SE
PR13-18D054	Crew surveying in the west half of the property	S
PR13-18D055	Mounded fill and disturbance at the south end of the property	NE
PR13-18D056	Mounded fill and disturbance at the south end of the property	E
PR13-18D057	Mounded fill and disturbance at the south end of the property	S
PR13-18D058	Communications tower next to the south end of the property	W
PR13-18D059	Scraped area at the south end of the property	NE
PR13-18D060	Mounded fill and wet area at the south end of the property	SW
PR13-18D061	Abandoned well at the south end of the property	W
PR13-18D062	Mounded fill and disturbance at the south end of the property	SE
PR13-18D063	Mounded fill and scraped area at the south end of the property	NE
PR13-18D064	Spectator to the field survey from the road	SW
PR13-18D065	Spectator to the field survey from the road	SW
PR13-18D066	Spectator to the field survey from the road	SW
PR13-18D067	South end of the scraped road	SE
PR13-18D068	Crew surveying in the west half of the property	S

APPENDIX 2: Glossary of Archaeological Terms

Archaeology:
The study of human past by excavation of cultural material.

Archaeological Sites:
The physical remains of any building, structure, cultural feature, object, human event or activity which, because of the passage of time, are on or below the surface of the land or water.

Archaic:
A term used by archaeologists to designate a distinctive cultural period dating between 8000 and 1000 B.C. in eastern North America. The period is divided into Early (8000 to 6000 B.C.), Middle (6000 to 2500 B.C.) and Late (2500 to 1000 B.C.). It is characterized by hunting, gathering and fishing.

Artifact:
An object manufactured, modified or used by humans.

B.P.:
Before Present. Often used for archaeological dates instead of B.C. or A.D. Present is taken to be 1951, the date from which radiocarbon assays are calculated.

Backdirt:
The soil excavated from an archaeological site. It is usually removed by shovel or trowel and then screened to ensure maximum recovery of artifacts.

Chert:
A type of silica rich stone often used for making chipped stone tools. A number of chert sources are known from southern Ontario. These sources include outcrops and nodules.

Contact Period:
The period of initial contact between Native and European populations. In Ontario, this generally corresponds to the seventeenth and eighteen centuries depending on the specific area.

Cultural Resource / Heritage Resource:
Any resource (archaeological, historical, architectural, artifactual, archival) that pertains to the development of our cultural past.

Cultural Heritage Landscapes:
Cultural heritage landscapes are groups of features made by people. The arrangement of features illustrate noteworthy relationships between people and their surrounding environment. They can provide information necessary to preserve, interpret or reinforce the understanding of important historical settings and changes to past patterns of land use. Cultural landscapes include neighbourhoods, townscapes and farmscapes.

Diagnostic:
An artifact, decorative technique or feature that is distinctive of a particular culture or time period.

Disturbed:
In an archaeological context, this term is used when the cultural deposit of a certain time period has been intruded upon by a later occupation.

Excavation:
The uncovering or extraction of cultural remains by digging.

Feature:
This term is used to designate modifications to the physical environment by human activity. Archaeological features include the remains of buildings or walls, storage pits, hearths, post moulds and artifact concentrations.

Flake:
A thin piece of stone (usually chert, chalcedony, etc.) detached during the manufacture of a chipped stone tool. A flake can also be modified into another artifact form such as a scraper.

Fluted:
A lanceolate shaped projectile point with a central channel extending from the base approximately one third of the way up the blade. One of the most diagnostic Palaeo-Indian artifacts.

Lithic:
Stone. Lithic artifacts would include projectile points, scrapers, ground stone adzes, gun flints, etc.

Lot:
The smallest provenience designation used to locate an artifact or feature.

Midden:
An archaeological term for a garbage dump.

Mitigation:
To reduce the severity of development impact on an archaeological or other heritage resource through preservation or excavation. The process for minimizing the adverse impacts of an undertaking on identified cultural heritage resources within an affected area of a development project.

Multicomponent:
An archaeological site which has seen repeated occupation over a period of time. Ideally, each occupation layer is separated by a sterile soil deposit that accumulated during a period when the site was not occupied. In other cases, later occupations will be directly on top of earlier ones or will even intrude upon them.

Operation:
The primary division of an archaeological site serving as part of the provenience system. The operation usually represents a culturally or geographically significant unit within the site area.

Palaeo-Indian:
The earliest human occupation of Ontario designated by archaeologists. The period dates between 9000 and 8000 B.C. and is characterized by small mobile groups of hunter-gatherers.

Profile:
The profile is the soil stratigraphy that shows up in the cross-section of an archaeological excavation. Profiles are important in understanding the relationship between different occupations of a site.

Projectile Point:
A point used to tip a projectile such as an arrow, spear or harpoon. Projectile points may be made of stone (either chipped or ground), bone, ivory, antler or metal.

Provenience:
Place of origin. In archaeology this refers to the location where an artifact or feature was found. This may be a general location or a very specific horizontal and vertical point.

Salvage:
To rescue an archaeological site or heritage resource from development impact through excavation or recording.

Stratigraphy:
The sequence of layers in an archaeological site. The stratigraphy usually includes natural soil deposits and cultural deposits.

Sub-operation:
A division of an operation unit in the provenience system.

Survey:
To examine the extent and nature of a potential site area. Survey may include surface examination of ploughed or eroded areas and sub-surface testing.

Test Pit:
A small pit, usually excavated by hand, used to determine the stratigraphy and presence of cultural material. Test pits are often used to survey a property and are usually spaced on a grid system.

Woodland:
The most recent major division in the pre-Contact cultural sequence of Ontario. The Woodland period dates from 1000 B.C. to A.D. 1550. The period is characterized by the introduction of ceramics and the beginning of agriculture in southern Ontario. The period is further divided into Early (1000 B.C. to A.D. 0), Middle (A.D. 0 to A.D. 900) and Late (A.D. 900 to A.D.1550).

Ministry of Tourism, Culture and Sport

Archaeology Programs Unit
Programs and Services Branch
Culture Division
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Toronto ON M7A 0A7
Tel.: (519) 675-6898
Email: Shari.Prowse@ontario.ca

Ministère du Tourisme, de la Culture et du Sport

Unité des programmes d'archéologie
Direction des programmes et des services
Division de culture
401, rue Bay, bureau 1700
Toronto ON M7A 0A7
Tél. : (519) 675-6898
Email: Shari.Prowse@ontario.ca

Ontario

Feb 17, 2016

Peter Sattelberger (P111)
Past Recovery Archaeological Services
2 - 99c Dufferin Perth ON K7H3A5

RE: Review and Entry into the Ontario Public Register of Archaeological Reports: Archaeological Assessment Report Entitled, "Stage 1 and 2 Archaeological Assessment of the Burns Farm Property, Part Lot 7, Concession 1, Geographic Township of Drummond, Now Township of Drummond North Elmsley, County of Lanark, Ontario", Dated Jan 13, 2016, Filed with MTCS Toronto Office on Jan 25, 2016, MTCS Project Information Form Number P111-005-2013, MTCS File Number 0003800

Dear Mr. Sattelberger:

This office has reviewed the above-mentioned report, which has been submitted to this ministry as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c 0.18.[1] This review has been carried out in order to determine whether the licensed professional consultant archaeologist has met the terms and conditions of their licence, that the licensee assessed the property and documented archaeological resources using a process that accords with the 2011 Standards and Guidelines for Consultant Archaeologists set by the ministry, and that the archaeological fieldwork and report recommendations are consistent with the conservation, protection and preservation of the cultural heritage of Ontario.

The report documents the Stage 1-2 assessment of the study area as depicted in Figures 3 and 22 of the above titled report and recommends the following:

1) No further archaeological investigation of the study area as defined in Figure 3 is required

Based on the information contained in the report, the ministry is satisfied that the fieldwork and reporting for the archaeological assessment are consistent with the ministry's 2011 Standards and Guidelines for Consultant Archaeologists and the terms and conditions for archaeological licences. This report has been entered into the Ontario Public Register of Archaeological Reports. Please note that the ministry makes no representation or warranty as to the completeness, accuracy or quality of reports in the register.

Should you require any further information regarding this matter, please feel free to contact me.

Sincerely,

Shari Prowse
Archaeology Review Officer

cc. Archaeology Licensing Officer
Julie Stewart,McIntosh Perry Consulting Engineers Ltd.
Wilburt Crain,Crains Construction Ltd.
Mary Kirkham,County of Lanark
Karl Grenke,Township of Drummond/North Elmsley

[1]In no way will the ministry be liable for any harm, damages, costs, expenses, losses, claims or actions that may result: (a) if the Report(s) or its recommendations are discovered to be inaccurate, incomplete, misleading or fraudulent; or (b) from the issuance of this letter. Further measures may need to be taken in the event that additional artifacts or archaeological sites are identified or the Report(s) is otherwise found to be inaccurate, incomplete, misleading or fraudulent.

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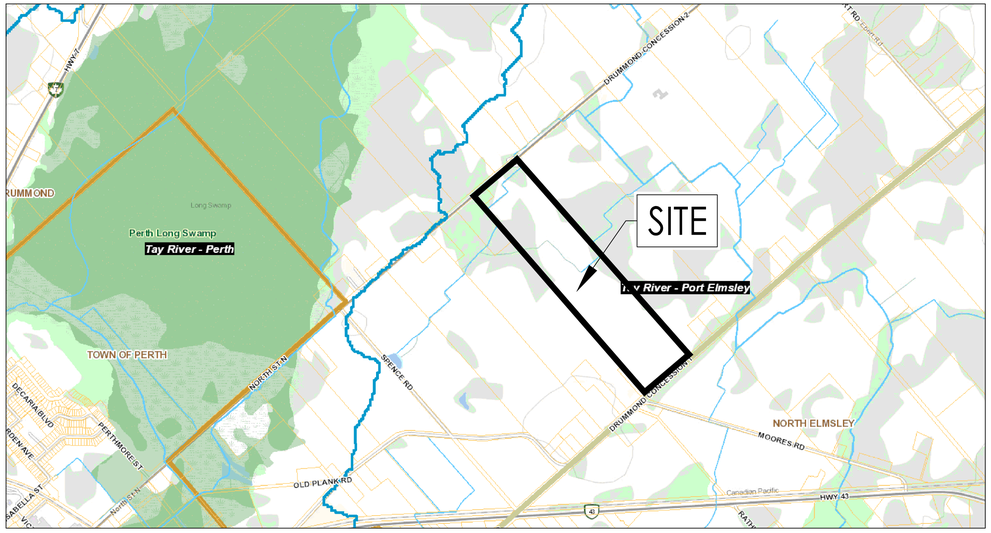
BURN'S FARM
DRAFT PLAN OF SUBDIVISION

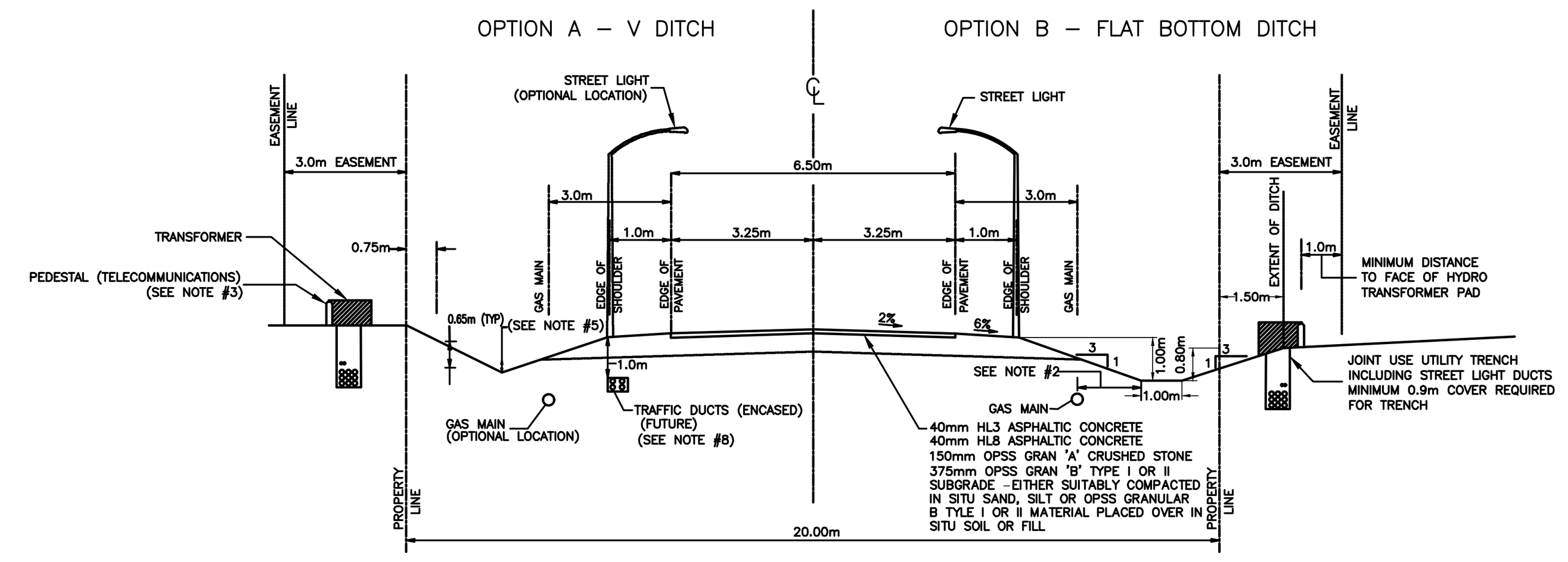


INDEX		
SHEET NO.		DESCRIPTION
1	OF 6	SSGP–1 – DRAFT SITE SERVICING AND GRADING PLAN
2	OF 6	SSGP–2 – DRAFT SITE SERVICING AND GRADING PLAN
3	OF 6	SSGP–3 – DRAFT SITE SERVICING AND GRADING PLAN
4	OF 6	EC/DS–1 – DRAFT EROSION CONTROL PLAN & DETAILS SHEET
5	OF 6	EX–SD–1 – EXISTING STORM DRAINAGE PLAN
6	OF 6	SD–1 – DRAFT STORM DRAINAGE PLAN

OCT 2023

160401646

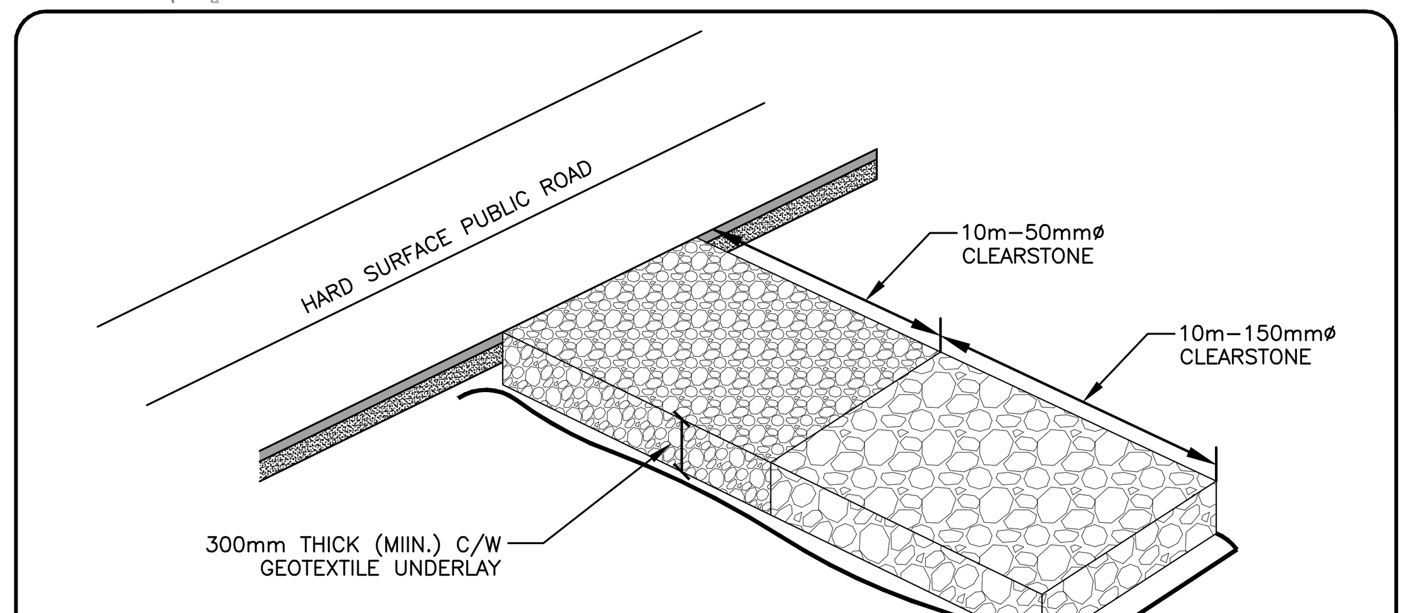
ORIGINAL SHEET - ARCH D



NOTES:

1. REFERENCE STANDARD NOTES ROAD ALLOWANCE (DGN: ROW-NOTES).
2. GAS MAINS SHALL BE LOCATED 3.0m FROM THE EDGE OF PAVEMENT WHEN POSSIBLE. HOWEVER, MINIMUM OFFSET FROM DITCH CENTERLINE SHALL BE 1.0m
3. ALL PEDESTALS TO BE INSTALLED IN LINE WITH HYDRO TRANSFORMERS OR ON SIDE OF TRENCH AWAY FROM ROAD.
4. JOINT USE TRENCH DETAIL PER HYDRO OTTAWA/HYDRO ONE SPECIFICATIONS.
5. DITCHES SHALL BE CONSTRUCTED TO A MINIMUM OF 300mm BELOW SUBGRADE ELEVATION.
6. CULVERT ACCESS AS REQUIRED BY HYDRO OR HYDRO ONE AT TRANSFORMER.
7. JOINT USE POLES MAY BE USED FOR OVERHEAD UTILITIES ON RURAL ROADS THAT ARE NOT LOCATED IN DEVELOPMENTS. THE POLES SHALL BE LOCATED 5.0m FROM EDGE OF PAVEMENT.
8. TRAFFIC DUCTS (ENCASED) CAN BE INSTALLED ON EITHER SIDE OF ROADWAY. 1.0m OF COVER ON ENCASED DUCTS.
9. SHOULDERS SHALL BE PAVED AS REQUIRED.
10. PLANT TREES NEAR JOINT USE EASEMENT WHERE POSSIBLE.
11. REFERENCE IS MADE TO OPSD 200.010 AND OPSD 201.010.

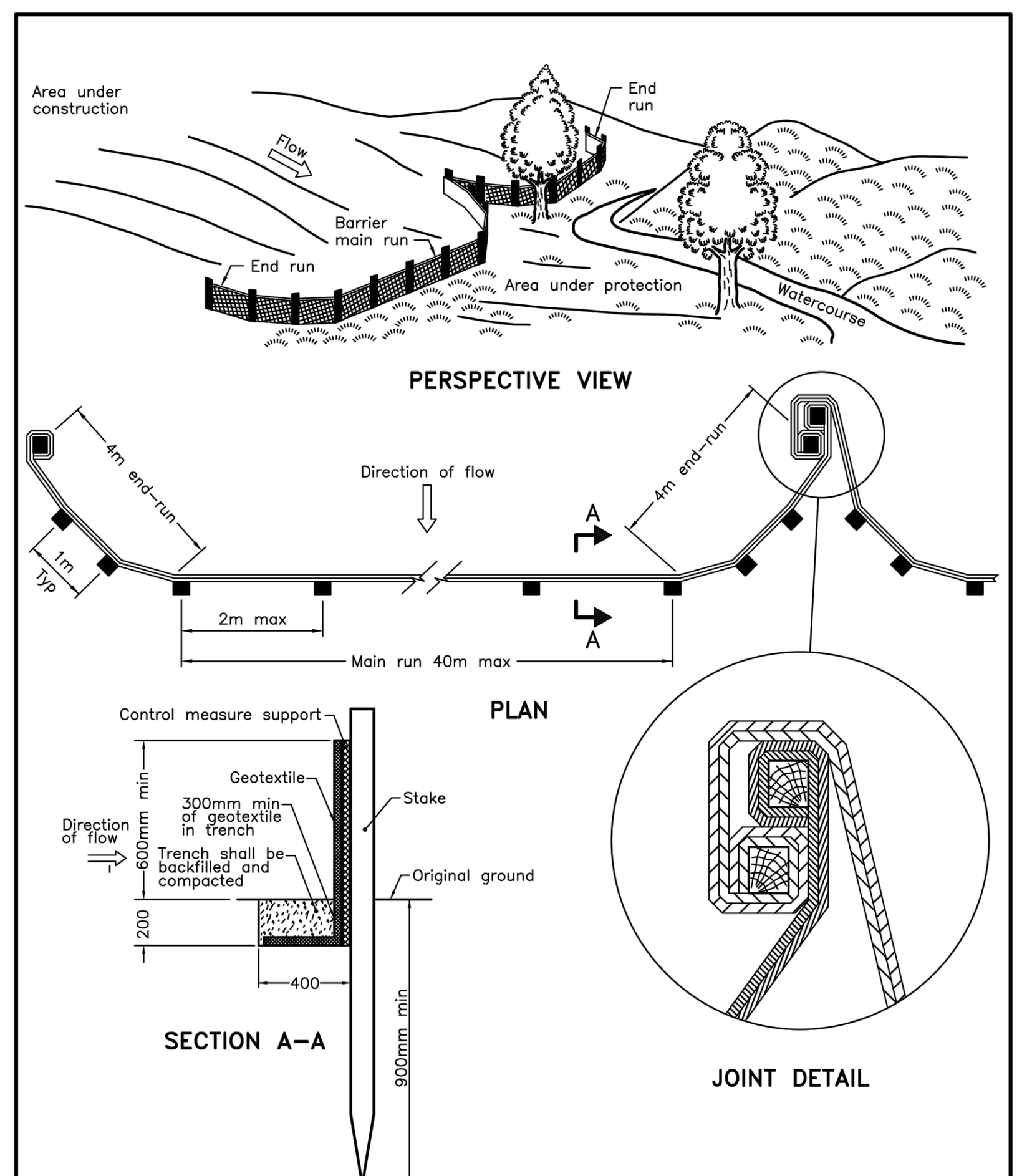
MODIFIED
RESIDENTIAL ROAD
20.0m ROAD ALLOWANCE
RURAL SECTION



NOTES:

1. MUD MAT TO BE INSTALLED AT ALL CONSTRUCTION ENTRANCES
2. MUD MAT TO EXTEND FULL WIDTH OF ENTRANCE
3. IN THE CASE THAT THE ACCESS CROSSES A CULVERT OR DITCH, SEDIMENT FENCING SHOULD BE INSTALLED ALONG THE EDGES OF THE ACCESS TO PREVENT SEDIMENT FROM BEING WASHED AWAY WITH RUNOFF.
4. THE GRANULAR MATERIAL WILL REQUIRE PERIODIC REPLACEMENT AS IT BECOMES CONTAMINATED BY VEHICLE TRAFFIC.
5. SEDIMENT SHALL BE CLEANED FROM PUBLIC ROADS AT THE END OF EACH DAY.
6. STORM INLETS BOTH ON AND IN THE PROXIMITY OF THE SITE SHALL BE PROTECTED WITH INLET CONTROL MEASURES PRIOR TO ROAD CLEANING ACTIVITIES.

MUD MAT ENTRANCE DETAIL
SCALE: N.T.S.

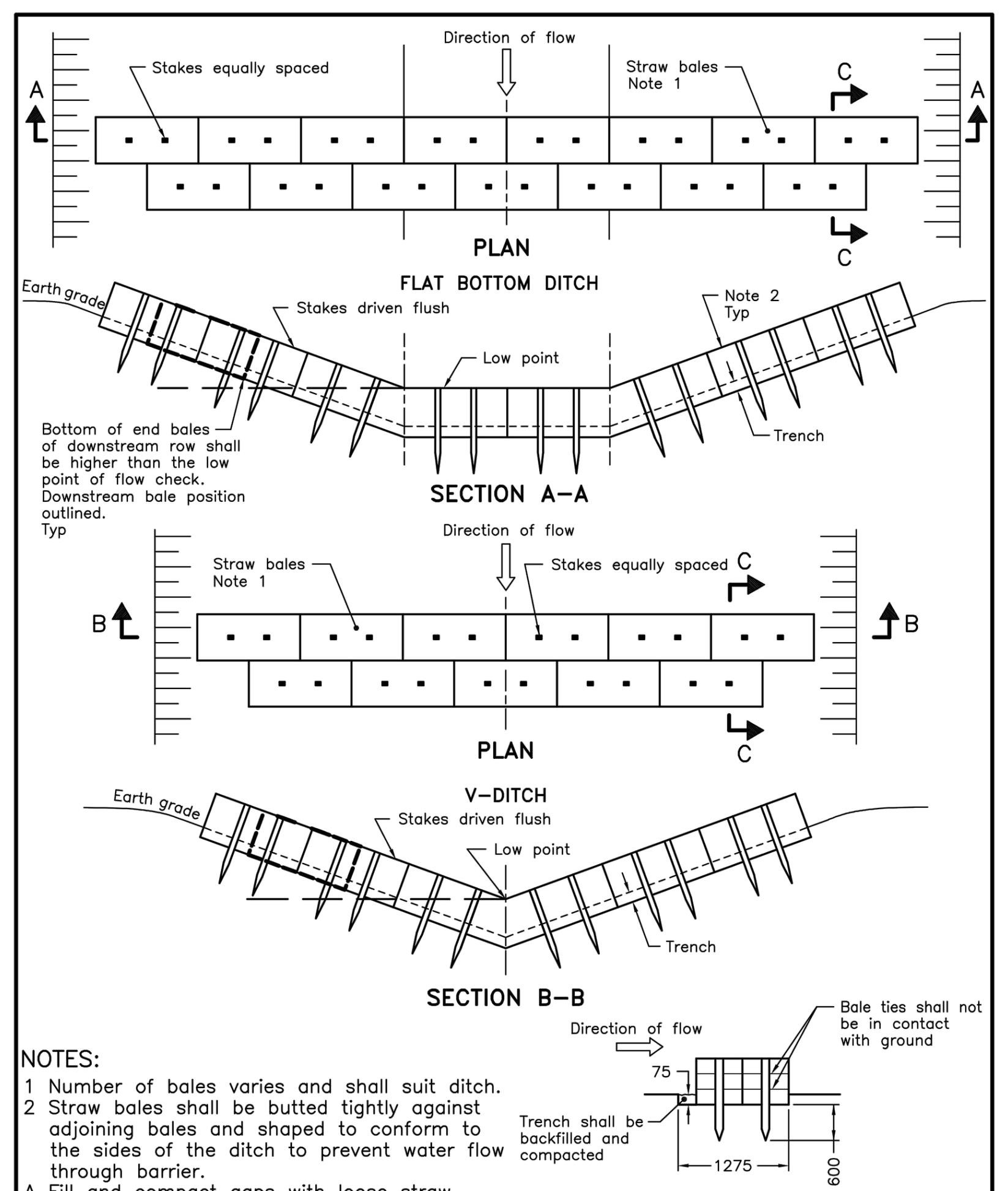


NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2021 | Rev 3

HEAVY–DUTY SILT FENCE BARRIER

OPSD 219.130

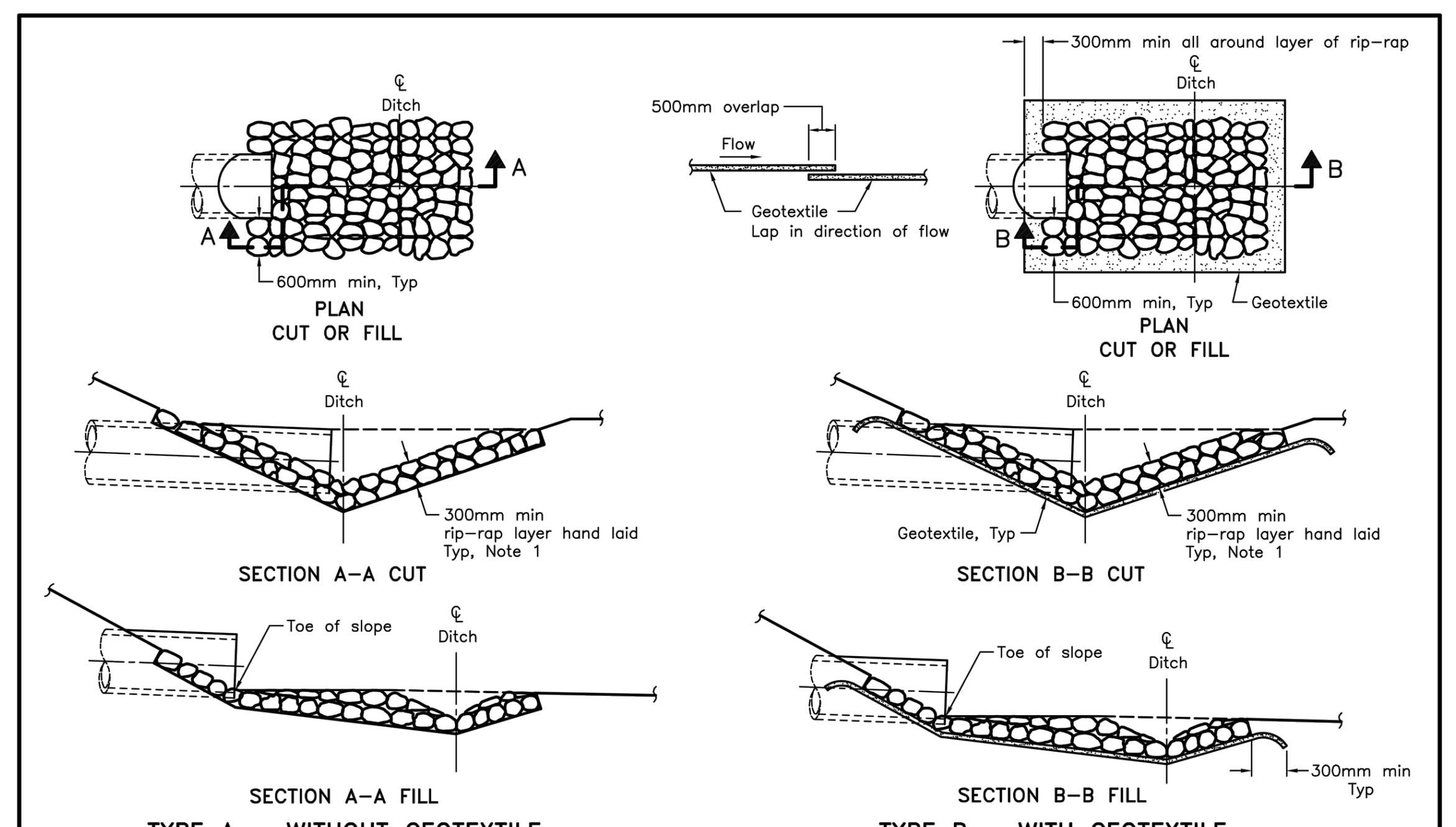


NOTES:
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.
A Fill and compact gaps with loose straw.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2021 | Rev 3

STRAW BALE FLOW CHECK DAM

OPSD 219.180



NOTES:
1 The thickness of the rip–rap layer shall be at least 1.5 times the rip–rap mean diameter.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 3

GENERAL RIP–RAP LAYOUT FOR SEWER AND CULVERT OUTLETS

OPSD 810.010

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Ottawa ON
Tel. 613.722.4420
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Legend

- POTENTIAL CULVERT LOCATION
- POTENTIAL SILT FENCE BOUNDARY
- POTENTIAL STRAW BALE LOCATION
- TP-4 TEST PIT LOCATION BASED ON PATTERSON GEOTECHNICAL INVESTIGATION PG-0486-1
- PHASE LINE
- POTENTIAL MUD MAT LOCATION

Revision	By	Appd.	YY.MM.DD
1 ISSUED FOR REVIEW	JP	KK	23.01.31

File Name: 160401646-DB.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
Permit-Seal	JP	KK	JP	21.10.07

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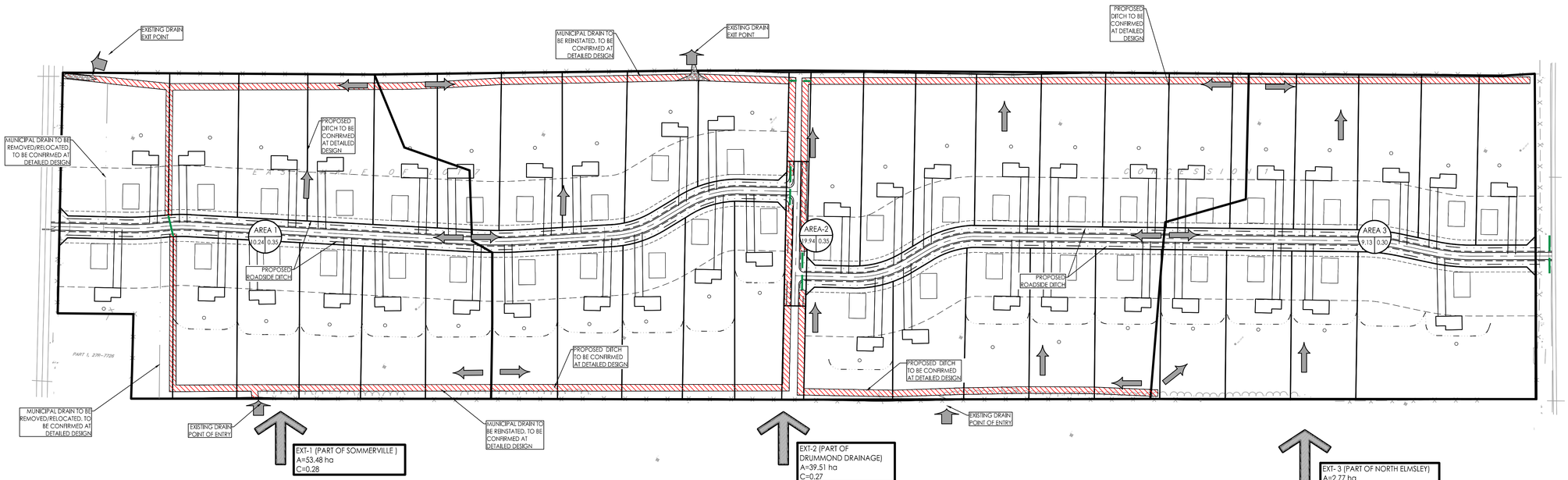
BURN'S FARM SUBDIVISION

LANARK, ON

Title
DRAFT EROSION CONTROL PLAN & DETAILS SHEET

Project No. 160401646
Scale 1:2000 (0 20 60 100m)

Drawing No. EC/DS-1
Sheet 4 of 6
Revision 1



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Tel. 613.722.4420
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Legend

- SB-2 / 6.02 | 0.26 — DRAINAGE AREA NO. / TIME TO PEAK (hrs) / STORM DRAINAGE AREA (ha)
- POST DEVELOPMENT DRAINAGE DIVIDE
- DIRECTION OF OVERLAND FLOW
- PROPOSED DITCH
- DRAINAGE FROM EXTERNAL AREAS

1	ISSUED FOR REVIEW	JP	KK	23.01.31
	Revision	By	Appd.	YY.MM.DD

File Name: 160401646-D8.dwg	JP	KK	JP	21.10.07
Permit-Seal	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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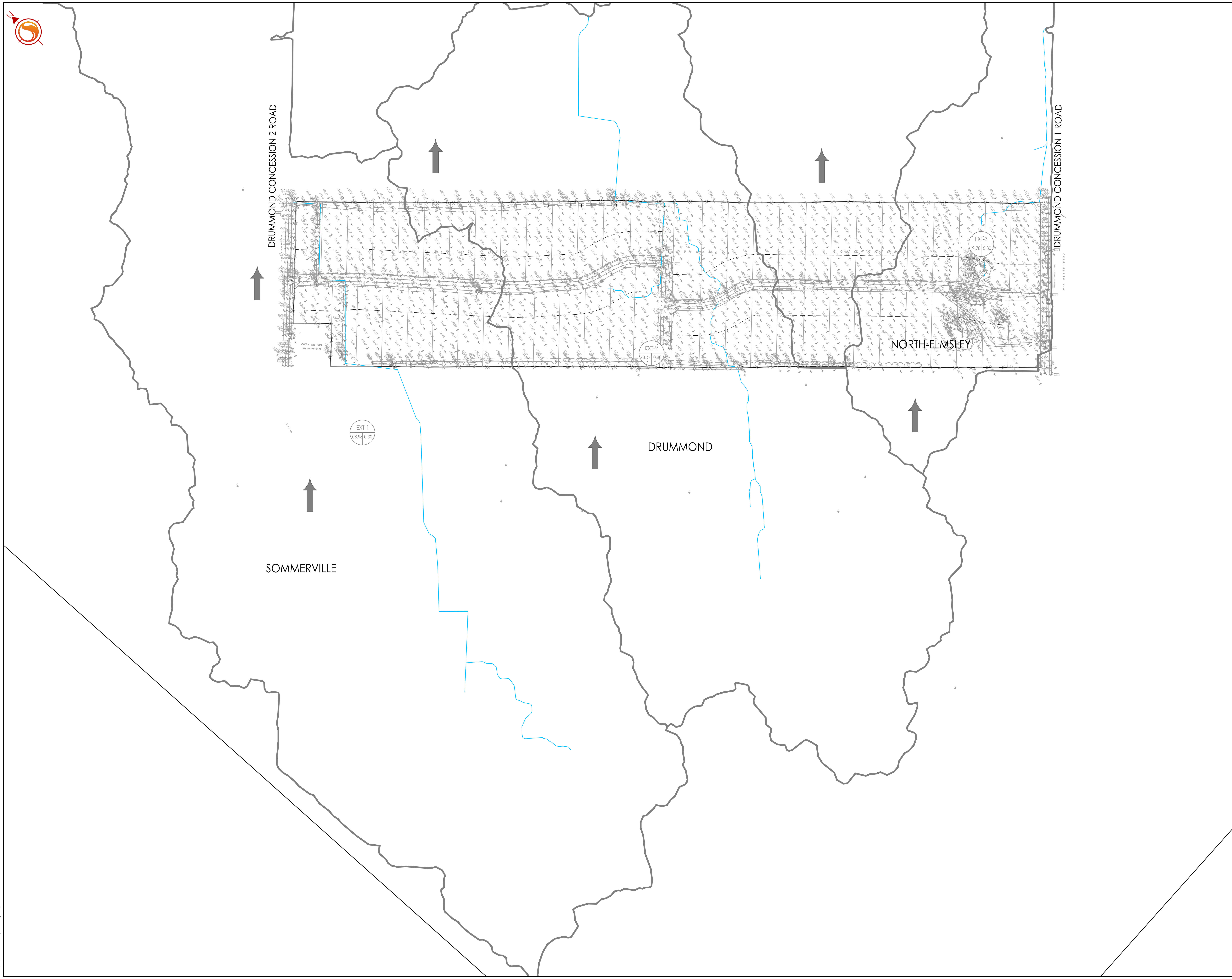
BURN'S FARM SUBDIVISION

LANARK, ON

Title
DRAFT STORM DRAINAGE PLAN

Project No.	Scale	
160401646	1:2000	0 20 60 100m
Drawing No.	Sheet	Revision
SD-1	6 of 6	1

ORIGINAL SHEET - ARCH D



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Legend

SB-2 — DRAINAGE AREA NO.
6.02 | 0.26 — TIME TO PEAK (hrs) / STORM DRAINAGE AREA (ha)
PRE-DEVELOPMENT DRAINAGE DIVIDE
DIRECTION OF PRE-DEVELOPMENT OVERLAND FLOW
PRE DEVELOPMENT DRAIN

Revision		By	Appd.	YY.MM.DD
1	ISSUED FOR REVIEW	JP	KK	23.01.31

File Name: 160401646-DB.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	JP	KK	JP	21.10.07

Permit-Seal

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BURN'S FARM SUBDIVISION

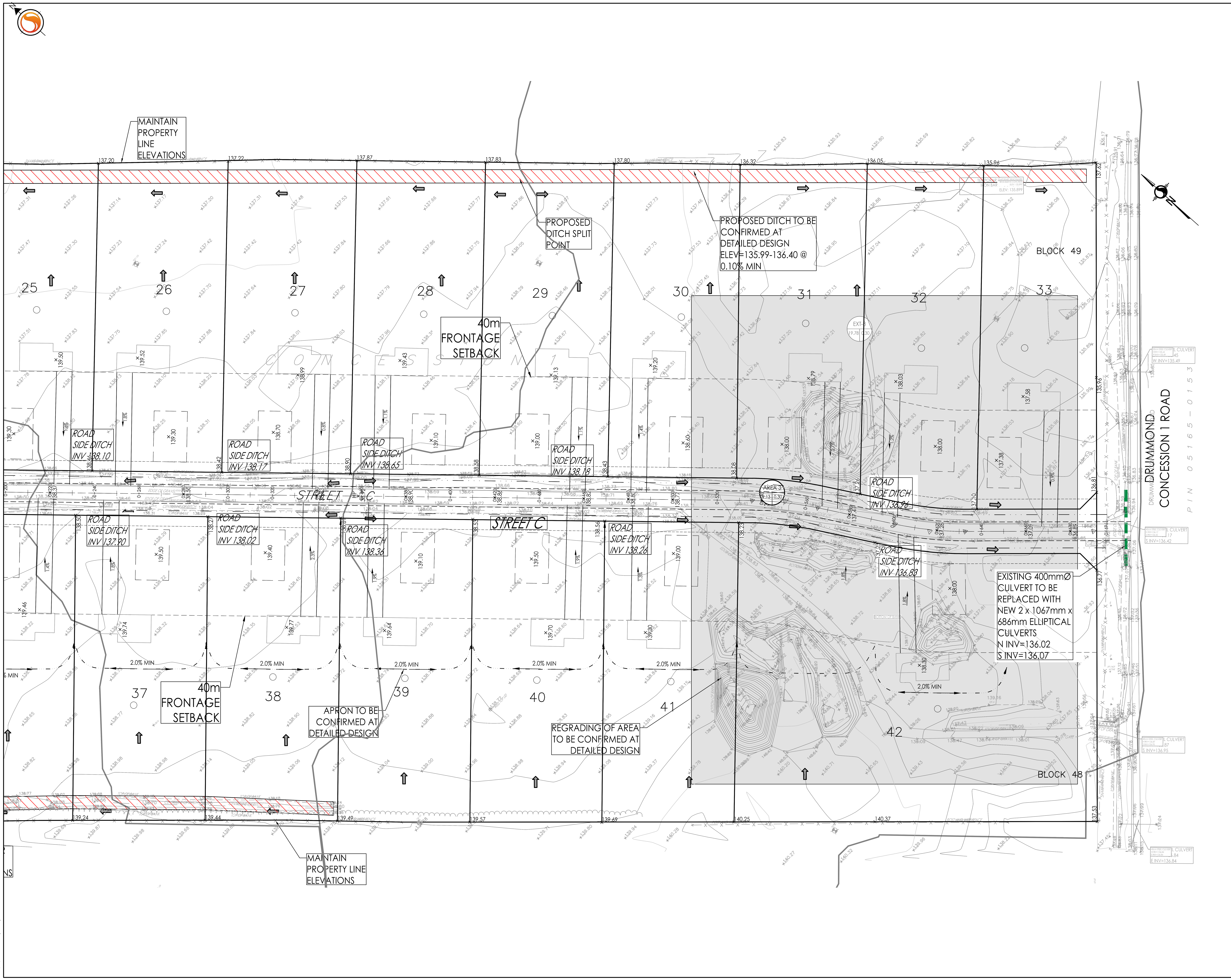
LANARK, ON

Title
EXISTING STORM DRAINAGE PLAN

Project No. 160401646
Scale 1:3000 (0 30 90 150m)

Drawing No. EX-SD-1
Sheet 5 of 6
Revision 1

ORIGINAL SHEET - ARCH D



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Legend

× 99.99	ORIGINAL GROUND ELEVATION
99.99	PROPOSED ELEVATION
99.99(S)	PROPOSED DITCH ELEVATION
× 99.99 / 98.88	PROPOSED LOT CORNER ELEVATION EXISTING ELEVATION AT LOT CORNER
2.0%	FLOW DIRECTION AND GRADE
2.0% (S)	PROPOSED DITCH SLOPE
	PROPOSED DITCH
	PROPOSED CULVERT

NOTES:

1. ALL DITCHES SHALL BE CONFIRMED AT DETAILED DESIGN
2. UNDERSIDE OF FOOTING (USF) ELEVATIONS SHALL BE 0.30M (MIN) ABOVE THE C/L DITCH ELEVATION TO KEEP UNIT ABOVE EXPECTED GROUNDWATER ELEVATION AND PREVENT EXCESSIVE PUMPING OF FOUNDATION DRAIN.
3. ALL UNITS TO BE EQUIPPED WITH BACKWATER VALVES AND SUMP PUMPS TO DISCHARGE FOUNDATION DRAIN.
4. MIN. USF ELEVATIONS TO BE ADJUSTED IN CONJUNCTION WITH ANY UPDATES TO HYDROGEOLOGY AND TERRAIN ANALYSIS, AS WELL AS UPDATED HOUSE SITINGS.
5. ROOF DOWNSPOUTS TO BE DIRECTED TO FRONT YARDS
6. ALL RETAINING WALLS GREATER THAN 1.0m IN HEIGHT ARE TO BE DESIGNED, APPROVED, AND STAMPED BY STRUCTURAL ENGINEER.
7. FENCES OR RAILINGS ARE REQUIRED FOR RETAINING WALLS GREATER THAN 0.60m IN HEIGHT.
8. REFER TO SWM REPORT FOR PROPOSED DITCH ELEVATIONS

Revision	By	Appd.	YY.MM.DD
1 ISSUED FOR REVIEW	JP	KK	23.01.31

Permit-Seal	Dwn.	Chkd.	Dsgn.	YY.MM.DD
File Name: ACAD-160401646-DB.dwg	JP	KK	JP	21.10.07

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Title

DRAFT SERVICING & GRADING PLAN PHASE II

Project No. 160401646

Scale 1:750 (0 – 7.5 – 22.5 – 37.5m)

Drawing No. SSGP-3

Sheet 3 of 6

Revision 1

ORIGINAL SHEET - ARCH D

RIP-RAP EXISTING OUTLET TO BE CONFIRMED AT DETAILED DESIGN

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=134.50-134.87 @ 0.10% MIN

MAINTAIN PROPERTY LINE ELEVATIONS

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=134.50-136.12 @ 0.10% MIN

PROPOSED 900mmØ CULVERT TO BE CONFIRMED AT DETAILED DESIGN
W INV=134.82
E INV=134.91
RIP-RAP AS PER OPSD 810.010

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=134.91-136.40 @ 0.10% MIN

EXISTING 500mmØ CULVERT TO BE REPLACED WITH 600mmØ CULVERT. TO BE CONFIRMED AT DETAILED DESIGN.
N INV=134.90
S INV=134.97
RIPRAP PER OPSD 810.010

40m FRONTAGE SETBACK

ROAD SIDE DITCH INV =136.40

ROAD SIDE DITCH INV =136.55

ROAD SIDE DITCH INV =136.20

ROAD SIDE DITCH INV 136.34

ROAD SIDE DITCH INV 136.48

ROAD SIDE DITCH INV 136.65

ROAD SIDE DITCH INV 136.75

ROAD SIDE DITCH INV 136.31

ROAD SIDE DITCH INV 136.76

ROAD SIDE DITCH INV 137.94

ROAD SIDE DITCH INV 137.80

ROAD SIDE DITCH INV 138.10

ROAD SIDE DITCH INV 138.17

ROAD SIDE DITCH INV 137.90

ROAD SIDE DITCH INV 138.02

ROAD SIDE DITCH INV 135.58

STREET A

STREET B

STREET C

PROPOSED 900mmØ CULVERT TO BE CONFIRMED AT DETAILED DESIGN
S INV=135.40
N INV =135.33
RIP-RAP AS PER OPSD 810.010

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=135.40-139.33 @ 0.10% MIN

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=136.33-134.90 @ 0.10% MIN

SEE SWM REPORT FOR EXTERNAL DRAINAGE PROPOSED ELEVATIONS

2.0% MIN

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Legend

99.99	ORIGINAL GROUND ELEVATION
99.99	PROPOSED ELEVATION
99.99(S)	PROPOSED DITCH ELEVATION
99.99 / 98.88	PROPOSED LOT CORNER ELEVATION / EXISTING ELEVATION AT LOT CORNER
2.0%	FLOW DIRECTION AND GRADE
2.0% (S)	PROPOSED DITCH SLOPE
	PROPOSED DITCH
	PROPOSED CULVERT

NOTES:

1. ALL DITCHES SHALL BE CONFIRMED AT DETAILED DESIGN
2. UNDERSIDE OF FOOTING (USF) ELEVATIONS SHALL BE 0.30M (MIN) ABOVE THE C/L DITCH ELEVATION TO KEEP UNIT ABOVE EXPECTED GROUNDWATER ELEVATION AND PREVENT EXCESSIVE PUMPING OF FOUNDATION DRAIN.
3. ALL UNITS TO BE EQUIPPED WITH BACKWATER VALVES AND SUMP PUMPS TO DISCHARGE FOUNDATION DRAIN.
4. MIN. USF ELEVATIONS TO BE ADJUSTED IN CONJUNCTION WITH ANY UPDATES TO HYDROGEOLOGY AND TERRAIN ANALYSIS, AS WELL AS UPDATED HOUSE SITINGS.
5. ROOF DOWNSPOUTS TO BE DIRECTED TO FRONT YARDS
6. ALL RETAINING WALLS GREATER THAN 1.0m IN HEIGHT ARE TO BE DESIGNED, APPROVED, AND STAMPED BY STRUCTURAL ENGINEER.
7. FENCES OR RAILINGS ARE REQUIRED FOR RETAINING WALLS GREATER THAN 0.60m IN HEIGHT.
8. REFER TO SWM REPORT FOR PROPOSED DITCH ELEVATIONS

1	ISSUED FOR REVIEW	JP	KK	23.01.31
	Revision	By	Appd.	YY.MM.DD

File Name: 160401646-DB.dwg		JP	KK	JP	21.10.07
	Permit-Seal	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Client/Project
CRAINS' CONSTRUCTION LTD.

BURN'S FARM SUBDIVISION

LANARK, ON

Title
DRAFT SERVICING & GRADING PLAN
PHASE II

Project No.
160401646

Scale
1:750
0 7.5 22.5 37.5m

Drawing No.
SSGP-2

Sheet
2 of 6

Revision
1

V:\01-Ott-Active\160401646\design\drawings\160401646-DB.dwg
2023/09/26 1:33 PM By: Fraser.Jupiter

ORIGINAL SHEET - ARCH D

RIP-RAP EXISTING OUTLET TO BE CONFIRMED AT DETAILED DESIGN

EXISTING MUNICIPAL DRAIN TO BE FILLED AND RELOCATED. TO BE CONFIRMED AT DETAILED DESIGN.

PROPOSED DITCH/ MUNICIPAL DRAIN TO BE CONFIRMED AT DETAILED DESIGN ELEV=135.78-135.87 @ 0.10% MIN

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=135.75-136.12 @ 0.10% MIN

DITCH SPLIT POINT

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=134.50-136.12 @ 0.10% MIN

DRUMMOND CONCESSION 2 ROAD

EXISTING CSP TO BE REMOVED/ABANDONED

40m FRONTAGE SETBACK

40m FRONTAGE SETBACK

STREET A

STREET A

ROAD SIDE DITCH INV =137.04

ROAD SIDE DITCH INV =137.55

ROAD SIDE DITCH INV =136.20

ROAD SIDE DITCH S INV =136.05

ROAD SIDE DITCH INV 136.22

ROAD SIDE DITCH INV 136.62

ROAD SIDE DITCH INV 137.40

ROAD SIDE DITCH INV 137.45

ROAD SIDE DITCH INV 136.75

MAINTAIN PROPERTY LINE ELEVATIONS

2x900 mmØ CULVERT TO BE CONFIRMED AT DETAILED DESIGN
N INV=135.87
S INV=135.97
RIP-RAP AS PER OPSD 810.010

EXISTING MUNICIPAL DRAIN TO BE FILLED AND RELOCATED. TO BE CONFIRMED AT DETAILED DESIGN.

PART 1, 27R-7726

PIN 05165-0141

EAST HALF OF LOT 7

2.0% MIN

MUNICIPAL DRAIN TO BE REINSTATED. TO BE CONFIRMED AT DETAILED DESIGN.
ELEV=136.05-136.32 @ 0.10% MIN

EX. MUNICIPAL DRAIN ENTRANCE TO SITE

PROPOSED DITCH TO BE CONFIRMED AT DETAILED DESIGN ELEV=136.33-134.90 @ 0.10% MIN

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Legend

99.99	ORIGINAL GROUND ELEVATION
99.99	PROPOSED ELEVATION
99.99(S)	PROPOSED DITCH ELEVATION
99.99 / 98.88	PROPOSED LOT CORNER ELEVATION EXISTING ELEVATION AT LOT CORNER
2.0%	FLOW DIRECTION AND GRADE
2.0% (S)	PROPOSED DITCH SLOPE
	PROPOSED DITCH
	PROPOSED CULVERT

NOTES:

1. ALL DITCHES SHALL BE CONFIRMED AT DETAILED DESIGN
2. UNDERSIDE OF FOOTING (USF) ELEVATIONS SHALL BE 0.30M (MIN) ABOVE THE C/L DITCH ELEVATION TO KEEP UNIT ABOVE EXPECTED GROUNDWATER ELEVATION AND PREVENT EXCESSIVE PUMPING OF FOUNDATION DRAIN.
3. ALL UNITS TO BE EQUIPPED WITH BACKWATER VALVES AND SUMP PUMPS TO DISCHARGE FOUNDATION DRAIN.
4. MIN. USF ELEVATIONS TO BE ADJUSTED IN CONJUNCTION WITH ANY UPDATES TO HYDROGEOLOGY AND TERRAIN ANALYSIS, AS WELL AS UPDATED HOUSE SITINGS.
5. ROOF DOWNSPOUTS TO BE DIRECTED TO FRONT YARDS
6. ALL RETAINING WALLS GREATER THAN 1.0m IN HEIGHT ARE TO BE DESIGNED, APPROVED, AND STAMPED BY STRUCTURAL ENGINEER.
7. FENCES OR RAILINGS ARE REQUIRED FOR RETAINING WALLS GREATER THAN 0.80m IN HEIGHT.
8. REFER TO SWM REPORT FOR PROPOSED DITCH ELEVATIONS

Revision		By	Appd.	YY.MM.DD
1	ISSUED FOR REVIEW	JP	KK	23.01.31

Permit-Seal	File Name: 160401646-DB.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
		JP	KK	JP	21.10.07

Client/Project
CRAINS' CONSTRUCTION LTD.

BURN'S FARM SUBDIVISION

LANARK, ON

Title
DRAFT SERVICING & GRADING PLAN
PHASE I

Project No.	Scale	Drawing No.	Sheet	Revision
160401646	1:750 (0, 7.5, 22.5, 37.5m)	SSGP-1	1 of 6	1

Drummond 40477.

Dated May 7th 1970.

EARLE CAMERON SOMERVILLE and
ANNE HARRIET SOMERVILLE

TO

DAVID P. DIXON,

9 Mary Street,
Perth, Ontario.

Deed of Land

SITUATE

Township of Drummond

Newsome and Gilbert, Limited, Toronto

O'DONNELL & DULMAGE
BARRISTERS, SOLICITORS, ETC.
PERTH · ONTARIO

THIS SPACE TO BE RESERVED FOR REGISTRY OFFICE CERTIFICATES

8½ 7-1

North Lanark 3:15 p.m.
26th May
1970 Number 40477
Edward M. Hunter
Registrar

Deed without Dower
Form 109
Newsome and Gilbert, Limited, Toronto

This Indenture

made in duplicate the --------7th----------day of---May-----
one thousand nine hundred and seventy.

In Pursuance of the Short Forms of Conveyances Act:

Between

EARLE CAMERON SOMERVILLE, of the Township of Drummond, in the County of Lanark and Province of Ontario, and ANNE HARRIET SOMERVILLE, his wife, of the same place, hereinafter called the GRANTORS,

OF THE FIRST PART

- and -

DAVID P. DIXON, of the Town of Perth, in the County of Lanark and Province of Ontario, an Unmarried Man, hereinafter called the GRANTEE,

OF THE SECOND PART

WHEREAS the said Grantors are seized in fee simple as joint tenants of the lands hereinafter described.

Witnesseth that in consideration of THIRTEEN THOUSAND AND FIVE HUNDRED--

($13,500.00)----------dollar s of lawful money of Canada now paid by the said grantee to the said grantor s (the receipt whereof is hereby by them acknowledged) t hey the said grantor s DO GRANT unto the said grantee in fee simple

ALL and Singular that certain parcel or tract of land and premises, situate, lying and being in the Township of Drummond, in the County of Lanark and Province of Ontario, containing by admeasurement One Hundred (100) Acres, be the same more or less, being composed of the East Half of Lot Number Seven (7) in the First (1st) Concession of the Township of Drummond aforesaid.

TO HAVE AND TO HOLD unto the said grantee his heirs and assigns to and for their sole and only use forever,

SUBJECT NEVERTHELESS to the reservations, limitations, provisoes and conditions expressed in the original grant thereof from the Crown.

The said grantor s COVENANT with the said grantee THAT they ha ve the right to convey the said lands to the said grantee notwithstanding any act of the said grantor

AND that the said grantee shall have quiet possession of the said lands free from all encumbrances.

AND the said grantors COVENANT with the said grantee that they will execute such further assurances of the said lands as may be requisite.

AND the said grantors COVENANT with the said grantee that they have done no act to encumber the said lands.

AND the said grantors RELEASE to the said grantee ALL their claims upon the said lands.

IN WITNESS WHEREOF the said parties hereto have hereunto set their hands and seals.

Signed, Sealed and Delivered IN THE PRESENCE OF

Earl F. C. Somerville

Annie Somerville

AFFIDAVIT AS TO LEGAL AGE AND MARITAL STATUS

PROVINCE OF ONTARIO
COUNTY OF Lanark
To Wit:

I/WE EARLE CAMERON SOMERVILLE and ANNE HARRIET SOMERVILLE of the Township of Drummond in the County of Lanark

Strike out words and parts not applicable and initial.

in the within instrument named, make oath and say that at the time of the execution of the within instrument,

If Attorney see footnote.

1. ~~I was~~ we were of the full age of twenty-one years;

2. And that we were legally married to each other.

3. [illegible]

4. [illegible]

SWORN before me at the Town
of Perth
in the County
of Lanark
this 24th day of May
A.D. 19 70.

Earle C. Somerville
Anne Somerville

A Commissioner for taking Affidavits, etc.

NOTE: If Attorney, substitute in space provided, "I am Attorney for.....(State name).....,
one of the parties named therein and he/she was of the full age of twenty-one years."

Affidavit, Land Transfer Tax Act

IN THE MATTER OF THE LAND TRANSFER TAX ACT.

PROVINCE OF ONTARIO
COUNTY OF LANARK
To Wit:

I, ~~GERALD RICHARD DULMAGE~~ Hugh John Affleck of the Town of Perth in the County of Lanark, Solicitor for the Grantors named in the within (or annexed) transfer make oath and say:

'This affidavit may be made by the purchaser or vendor or by any one acting for them under power of attorney or by an agent accredited in writing by the purchaser or vendor or by the solicitor of either of them.

1. I am Solicitor for the Grantors named in the within (or annexed) transfer.

2. I have a personal knowledge of the facts stated in this affidavit.

3. The true amount of the monies in cash and the value of any property or security included in the consideration is as follows:

(a) Monies paid in cash		$ 13,500.00
(b) Property transferred in exchange;		
Equity value $	nil	
Encumbrance $	nil	$ nil
(c) Securities transferred to the value of		$ nil
(d) Balances of existing encumbrances with interest owing at date of transfer		$ nil
(e) Monies secured by mortgage under this transaction		$ nil
(f) Liens, legacies, annuities and maintenance charges to which transfer is subject		$ nil
Total consideration		$ 13,500.00

All blanks must be filled in

4. If consideration is nominal, is the transfer for natural love and affection? nil
5. If so, what is the relationship between Grantor and Grantee? n/a
6. Other remarks and explanations, if necessary n/a

Sworn before me at the Town
of Perth
in the County
of Lanark
this 26th day of May
A.D. 19 70.

A Commissioner, etc.

CANADA
PROVINCE OF ONTARIO
County of
TO WIT:

I, Hugh John Cameron
of the Town of Perth in the
County of Lanark
Solicitor make oath and say:

1. THAT I was personally present and did see the within or annexed Instrument and a duplicate thereof duly signed, sealed and executed by Earle Cameron Somerville and Anne Harriet Somerville

two of the parties thereto.

2. THAT the said Instrument and duplicate were executed by the said parties at the Town of Perth.

3. THAT I know the said parties.

4. THAT I am a subscribing witness to the said Instrument and duplicate.

SWORN before me at the Town
of Perth in the County
of Lanark this 26
day of May A.D. 1970.

Edward M. Hunter
A Commissioner for taking Affidavits, etc.
Hugh John Cameron

CANADA
PROVINCE OF ONTARIO
of
TO WIT:

I,
of the of in the
of
make oath and say:

1. THAT I was personally present and did see the within or annexed Instrument and a duplicate thereof duly signed, sealed and executed by

of the parties thereto.

2. THAT the said Instrument and duplicate were executed by the said part at the of

3. THAT I know the said part

4. THAT I am a subscribing witness to the said Instrument and duplicate.

SWORN before me at the
of in the
of this
day of A.D. 19

A Commissioner for taking Affidavits, etc.

* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT * SUBJECT TO RESERVATIONS IN CROWN GRANT *

PROPERTY DESCRIPTION: FIRSTLY: PT E1/2 LT 7 CON 1 DRUMMOND AS IN RS40477 EXCEPT PART 1, PLAN 27R7726 & FORCED WID; DRUMMOND-N ELMSLEY; SECONDLY: PT SW1/2 LT 7, CON 1 DRUMMOND BEING PART 1, PLAN 27R11793; DRUMMOND-N ELMSLEY; TOWNSHIP OF DRUMMOND/NORTH ELMSLEY

PROPERTY REMARKS: PLANNING ACT CONSENT IN DOCUMENT LC247617.

ESTATE/QUALIFIER:
FEE SIMPLE
LT CONVERSION QUALIFIED

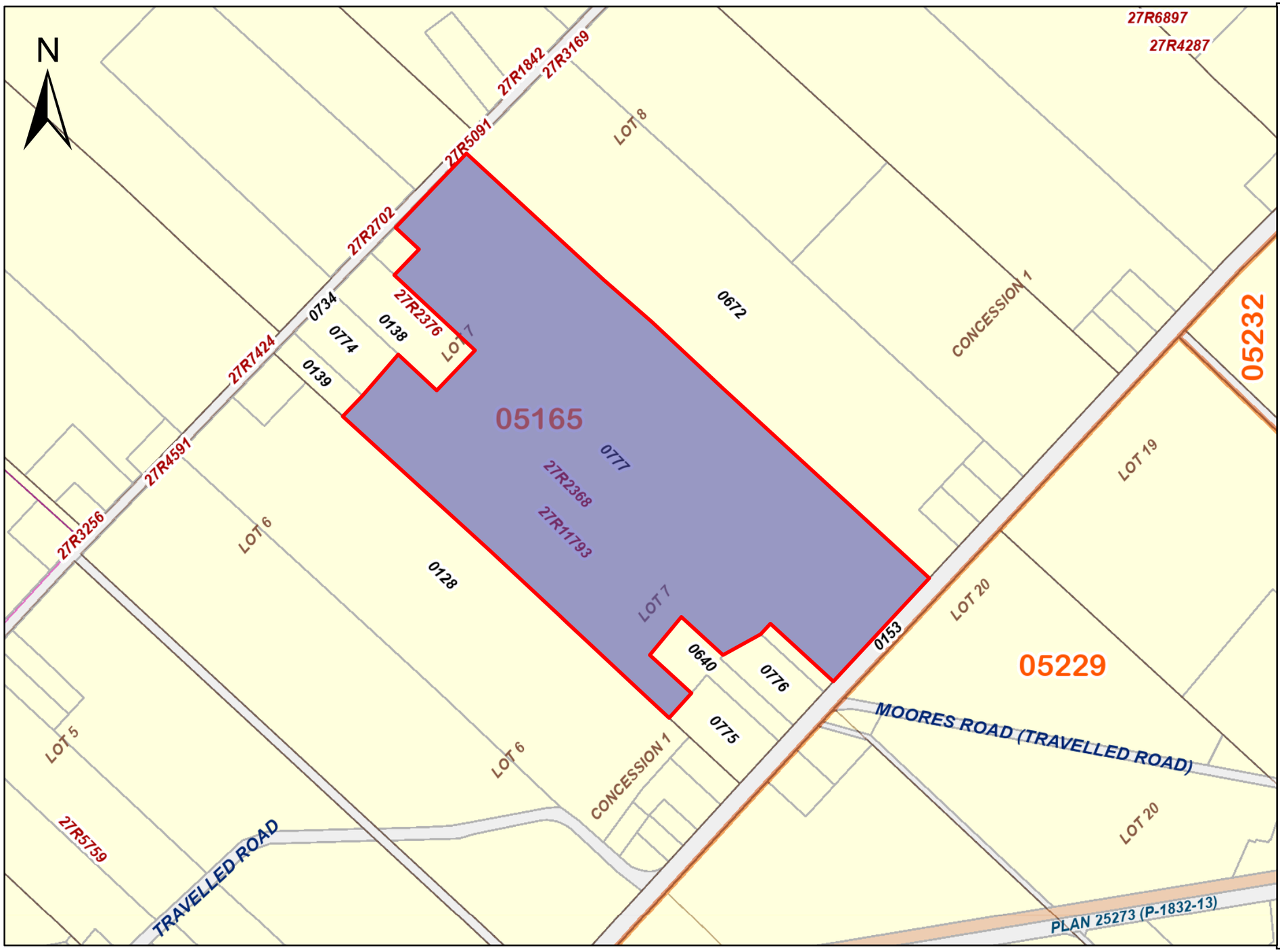
RECENTLY:
CONSOLIDATION FROM 05165-0140, 05165-0773

PIN CREATION DATE:
2023/05/23

OWNERS' NAMES
1394706 ONTARIO INC.

CAPACITY SHARE

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
** PRINTOUT INCLUDES ALL DOCUMENT TYPES (DELETED INSTRUMENTS NOT INCLUDED) **						
**SUBJECT, ON FIRST REGISTRATION UNDER THE LAND TITLES ACT, TO:						
** SUBSECTION 44(1) OF THE LAND TITLES ACT, EXCEPT PARAGRAPH 11, PARAGRAPH 14, PROVINCIAL SUCCESSION DUTIES *						
** AND ESCHEATS OR FORFEITURE TO THE CROWN.						
** THE RIGHTS OF ANY PERSON WHO WOULD, BUT FOR THE LAND TITLES ACT, BE ENTITLED TO THE LAND OR ANY PART OF						
** IT THROUGH LENGTH OF ADVERSE POSSESSION, PRESCRIPTION, MISDESCRIPTION OR BOUNDARIES SETTLED BY						
** CONVENTION.						
** ANY LEASE TO WHICH THE SUBSECTION 70(2) OF THE REGISTRY ACT APPLIES.						
**DATE OF CONVERSION TO LAND TITLES: 2002/04/08 **						
27R2368	1982/06/16	PLAN REFERENCE				C
LC35651	2005/08/04	TRANSFER	$140,000	DIXON, DAVID P.	1394706 ONTARIO INC.	C
27R11793	2022/01/07	PLAN REFERENCE				C
LC246322	2023/02/07	NOTICE	$2	THE CORPORATION OF THE TOWNSHIP OF DRUMMOND/NORTH ELMSLEY		C
LC247617	2023/03/31	TRANSFER	$300,000	5001190 ONTARIO LTD.	1394706 ONTARIO INC.	C
LC247618	2023/03/31	NOTICE	$1	1394706 ONTARIO INC.	THE CORPORATION OF THE COUNTY OF LANARK	C
LC248364	2023/05/01	APL CONSOLIDATE		1394706 ONTARIO INC.		C



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FOR FRANCIS01

SCALE

0 80 160 240 320 400 480 meters

PROPERTY INDEX MAP

LANARK(No. 27)

LEGEND

FREEHOLD PROPERTY	
LEASEHOLD PROPERTY	
LIMITED INTEREST PROPERTY	
CONDOMINIUM PROPERTY	
RETIRED PIN (MAP UPDATE PENDING)	
PROPERTY NUMBER	*0449*
BLOCK NUMBER	**08050**
GEOGRAPHIC FABRIC	
EASEMENT	

THIS IS NOT A PLAN OF SURVEY

NOTES

REVIEW THE TITLE RECORDS FOR COMPLETE PROPERTY INFORMATION AS THIS MAP MAY NOT REFLECT RECENT REGISTRATIONS

THIS MAP WAS COMPILED FROM PLANS AND DOCUMENTS RECORDED IN THE LAND REGISTRATION SYSTEM AND HAS BEEN PREPARED FOR PROPERTY INDEXING PURPOSES ONLY

FOR DIMENSIONS OF PROPERTIES BOUNDARIES SEE RECORDED PLANS AND DOCUMENTS

ONLY MAJOR EASEMENTS ARE SHOWN

REFERENCE PLANS UNDERLYING MORE RECENT REFERENCE PLANS ARE NOT ILLUSTRATED

Ontario