SUBSURFACE & ONSITE SERVICING IMPACT ASSESSMENT

Proposed Land Division

131 Harris Road

Delaware, Ontario

Municipality of Middlesex Centre
County of Middlesex

Prepared for:

Mr. Phil Pattyn

By:
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February 4, 2021

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1. INTRODUCTION

This report presents a subsurface investigation and sewage impact assessment carried out at the site of a proposed development at 131 Harris Road in Delaware, Municipality of Middlesex Centre.

Drawing 1 in Appendix D provides a draft plan of the property and the proposed development with soil test pit logs and locations. The parcel is approximately 5.2 ha in size and currently houses one home. The land is surrounded by residential development on three sides with some agricultural land at the north/rear. The agricultural land abuts a forested river valley along its northerly border.

Frontage onto Harris Road is approximately 56.22m. It is proposed to sever one lot with frontage of 36.10 m and depth of 100.06 m (0.36 ha) leaving the remainder as a retained parcel with frontage of 20m for a future road allowance.

Typically, the Municipality requires verification of the native soils and septic system requirements and assessment of the potential impact of the system with respect to nitrates in groundwater. This is particularly true if the development is in the vicinity of a natural heritage area with Conservation Authority concerns. The subject property is within the Dingman Creek watershed and the retained lot abuts the creek valley.

2. EXISTING SUBSURFACE

Three soil test pits were formed on January 15, 2021 to document the native soils across the property. A summary of the test pit logs is provided on drawing 1 in Appendix "D" for convenience. Appendix "A" includes soil grain size analyses of the soil layers encountered.

Test pits were relatively consistent across the property. Following are the test pit logs:

TEST PIT	*DEPTH (cm)*	*SOIL TYPE*
TP 1	*0 - 20*	*TOPSOIL*
	20 - 89	*Silty SAND*
	89 - 168	*SP Poorly Graded Fine SAND (Tested: T = 8 min/cm)*

TP 2	*0 - 20*	*TOPSOIL*
	20 - 91	*Coarse Gr SAND*
	91 - 155	*SP Poorly Graded Fine SAND (Tested: T = 8 min/cm)*
TP 3	*0 - 30*	*TOPSOIL*
	30 - 61	*Fine Silty SAND*
	61 - 183	*SP Poorly Graded Fine SAND (Tested: T = 8 min/cm)*

ALL TEST PITS WERE DRY

3. PROPOSED SERVICING

The lot is to be serviced by municipal water and a private on-site wastewater treatment system. The system will be designed for municipal approval according to the requirements of the Ontario Building Code (OBC) for systems with *peak daily loading of less than 10,000 L/day*. Such on-site systems are used in unserviced areas and provide primary treatment of effluent for dissipation and dilution into the subsoil and eventually to receiving waters.

Drawing 1 in Appendix D provides assumptions for the proposed home characteristics as well as the soils, servicing details and calculations. A typical building envelope and sanitary wastewater treatment system is indicated on the plan.

Enhanced pre-treatment systems are currently in common use to provide improved treatment of wastewater prior to subsurface discharge. In the context of a multi-lot development, Middlesex Centre requires assessment of groundwater impacts in accordance with MOE Procedure D5-4 to ensure that offsite nitrate concentrations do not exceed 10 mg/L.

The proposed sites and wastewater systems were assessed using conventional primary pre-treatment.

4. SEWAGE IMPACT ASSESSMENT PROCEDURE

MOE Procedure D5-4 outlines a multi-step process to gauge the effects of the effluent discharges from individual sewage systems in a development based on nitrates as nitrogen as an indicator of groundwater impact potential.

The procedure is essentially a dilution assessment.

The average daily design sewage load for a single residence is 1000 L/day, based on techniques required by the Ontario Ministry of the Environment in Procedure D-5-4 “Technical Guideline for Individual On-Site Sewage Systems – Water Quality Impact

Risk Assessments". Typically, average daily sewage loads are less than 50% of the sewage system peak design loads.

The following Guideline D5-4 Predictive Assessment was completed to quantify the risk of environmental impacts at the property boundaries and to provide any necessary recommendations to minimize such risks.

4.1 Nitrates and Maximum Acceptable Concentration

Residential sewage systems for treatment of domestic wastewater generally produce nutrients and bacteria in their effluent waters for treatment and uptake by the soil and vegetation. Bacteria and phosphorus are adequately removed by adsorption in soils where at least 15m of buffering exists. However, nitrogen is a parameter that remains in solution after effluent treatment by sewage systems and can be transmitted to groundwater and laterally to off-site properties. Nitrogen in its many forms, is therefore considered the critical and representative parameter for analysis of domestic sewage system impacts on groundwater in sandy soils.

In the Ontario Drinking Water Guidelines, the maximum acceptable concentration of nitrate is set at 10 mg/L as N. Nitrogen has typically been found in conventional septic tank effluent at concentrations of 40 mg/L, in studies conducted by MOE.

Precipitation and infiltration through the soil to groundwater normally provide dilution and provide the basis for the following impact calculations. Alternatively, enhanced pre-treatment can be used to achieve the reduction at source.

4.2 Estimated Effluent Flow

The sewage system load was described at the beginning of section 4. Following is an annual load estimate of the total effluent volume, as documented on the drawings, based on each lot.

Residence:

(1000 L/day) x 365 days/year = 365,000 L/year

TOTAL ANNUAL SEWAGE LOAD: 365,000 L/year

4.3 Precipitation Recharge Estimation

The recharge capacity of the property is based on topography, soils and vegetative cover on the site. The amounts of infiltration and runoff are of course, directly dependent on the total precipitation in conjunction with the above factors.

The mean annual precipitation for this area is 990mm/yr based on the London Airport weather station. Evaporation is estimated at 570mm/yr based on regional stormwater balance calculations for the London area. The soils are hydraulically conductive and infiltration is conservatively estimated at 55% of available water for runoff after evaporation, representing only 23% of total precipitation.

4.4 Impact Calculations

The nitrate concentration at the property boundary can be expressed by the following relationship:

$$C_o = [Q_E (N_E) + D_W (N_B)]/[D_W + Q_E]$$

Where: C_o = Nitrate Concentration at the property boundary (mg/L);
N_E = Nitrate Concentration of the sewage effluent (from the tank) (mg/L);
Q_E = Yearly volume of effluent produced (L/year);
D_W = Dilution Water available (L/yr);
N_B = Background Nitrate Concentration in diluting precipitation, (mg/L).

Although it is actually the concentration of nitrogen in precipitation that dilutes the sewage, approval agencies sometimes prefer to assume that the measured background concentration in nearby wells represents that of the diluting rainfall.

On November 10th, 2017 a water sample was taken from an existing well on a property east of the site. The sample was submitted to Paracel Laboratories Ltd and tested for drinking water parameters. The combined nitrate and nitrite concentration as N was documented as 2.75 mg/L. Results as well as quality control procedures are presented in Appendix B.

On this basis, the concentration of nitrogen in the dilution precipitation was assumed to be 2.75 mg/L, as measured in a former easterly water supply well. Table 1 in Appendix C is an application of the dilution formula for the proposed 0.36ha lot. Assessment was made under two scenarios:

a.) Conventional Septic tank Pre-treatment with natural infiltration
b.) Conventional Septic tank Pre-treatment with 100% enhanced infiltration

Based on this assessment, using nearby groundwater quality as dilution water, the 0.36 ha lot will meet the 10 mg/L threshold only with enhanced (100%) infiltration. See sensitivity analysis in section 5.

4.5 Existing Water Wells

There appear to be no wells documented in the Provincial Water Well Records downstream in the direction of probable groundwater flow toward the Dingman Creek Valley. The local Conservation Authority does however normally require that drinking water quality be maintained for natural habitat.

Although municipally-serviced, the client believes there may be a remnant well on the retained lot that should be located and professionally decommissioned.

5. SENSITIVITY ANALYSIS

The analysis undertaken in Table 1 of Appendix C has been completed using the documented onsite nitrate plus nitrite concentration (2.75 mg/L) of the easterly domestic water well, as documented.

From a practical standpoint, the actual concentration of nitrates in the diluting precipitation is closer to zero. An assessment of each lot using a nitrate concentration of 0 mg/L in the diluting precipitation is presented as Table 2 in Appendix C. Using 0 nitrate concentration in precipitation, at least 73% of annual precipitation must infiltrate to meet Ontario Drinking Water Guidelines on the lot.

6. CONCLUSIONS & RECOMMENDATIONS

Based on the preceding assessment, the following conclusions and recommendations are made:

1. A lot size of 0.36ha at this site can accommodate a typical home and conventional on-site septic system that meets Ontario Drinking Water Guidelines at the lot lines. However, enhanced infiltration is required that ensures at least 73% of annual precipitation enters the groundwater. This may be accommodated by infiltration swales or galleries in strategic locations in the native sandy soils.

2. The lot size allows CR-1 zoning characteristics to be met. However, the existing lot immediately west of the future road allowance may not conform to the required setback from the new road allowance.

3. Nitrogen treatment measures exist but are not considered by the Municipality in lot sizing.

4. Since the area is serviced with municipal water, the remnant well that the client believes may exist on the retained parcel should be located and decommissioned or so verified. This well was not documented in the Ontario Water Well database.

Respectfully Submitted,
BOS Engineering & Environmental Services Inc.

A. W. Bos, P.Eng.
Encl - Appendices

APPENDIX A

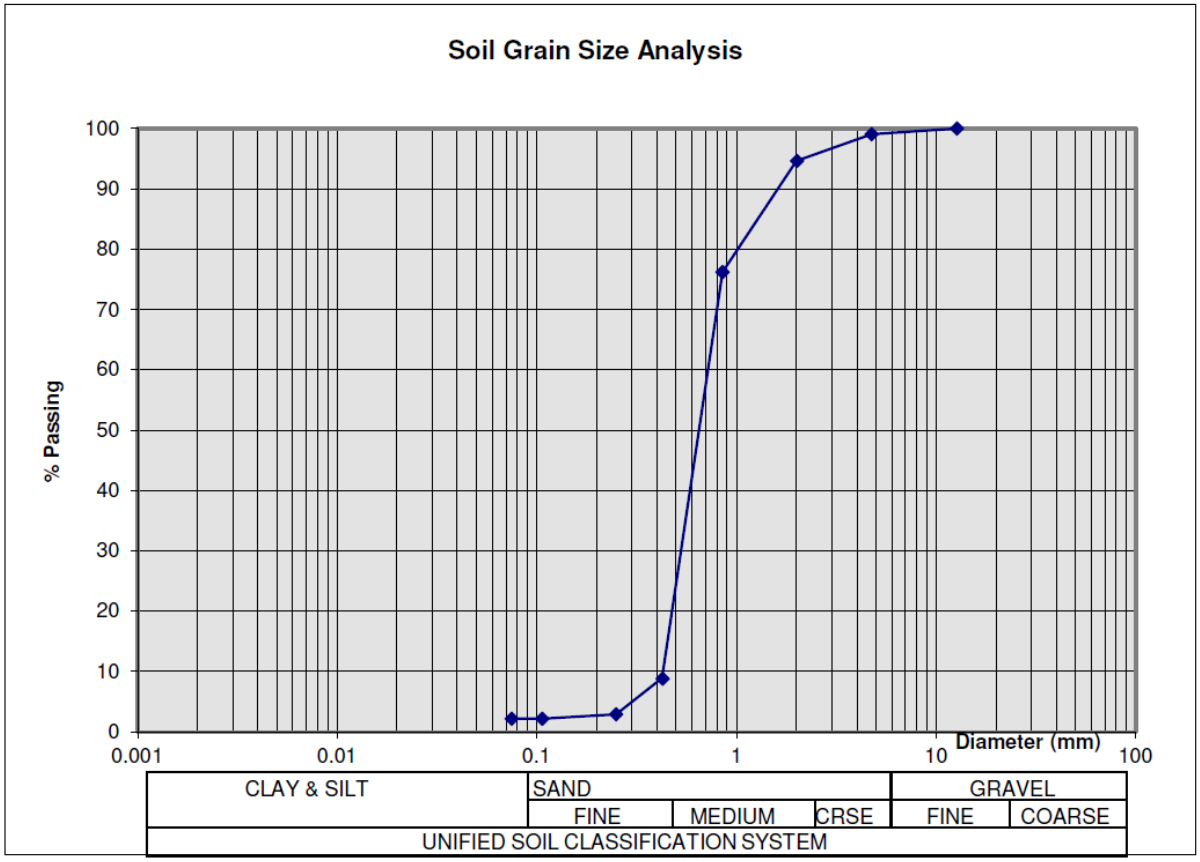
SOIL GRAIN SIZE ANALYSES

BOS Engineering Environmental Services

Project :	131 Harris Rd	***Client :***	Phil Pattyn
Test Pit :	TP 1	***RE:***	Wastewater Treatment System
Depth :	89 to 168 cm	***Proj. No .***	2011-03
Dry Mass:	189.0 g	***Date:***	Jan 17-21

CHART DATA

Sieve No.	Mass	Cum. Mass	Diam. (d)	% Passing
	0.0	0	12.7	100
4	1.7	1.7	4.75	99
10	8.4	10.1	2	95
20	34.9	45	0.85	76
40	127.3	172.3	0.425	9
60	11.3	183.6	0.25	3
140	1.3	184.9	0.106	2
200	0.0	184.9	0.075	2



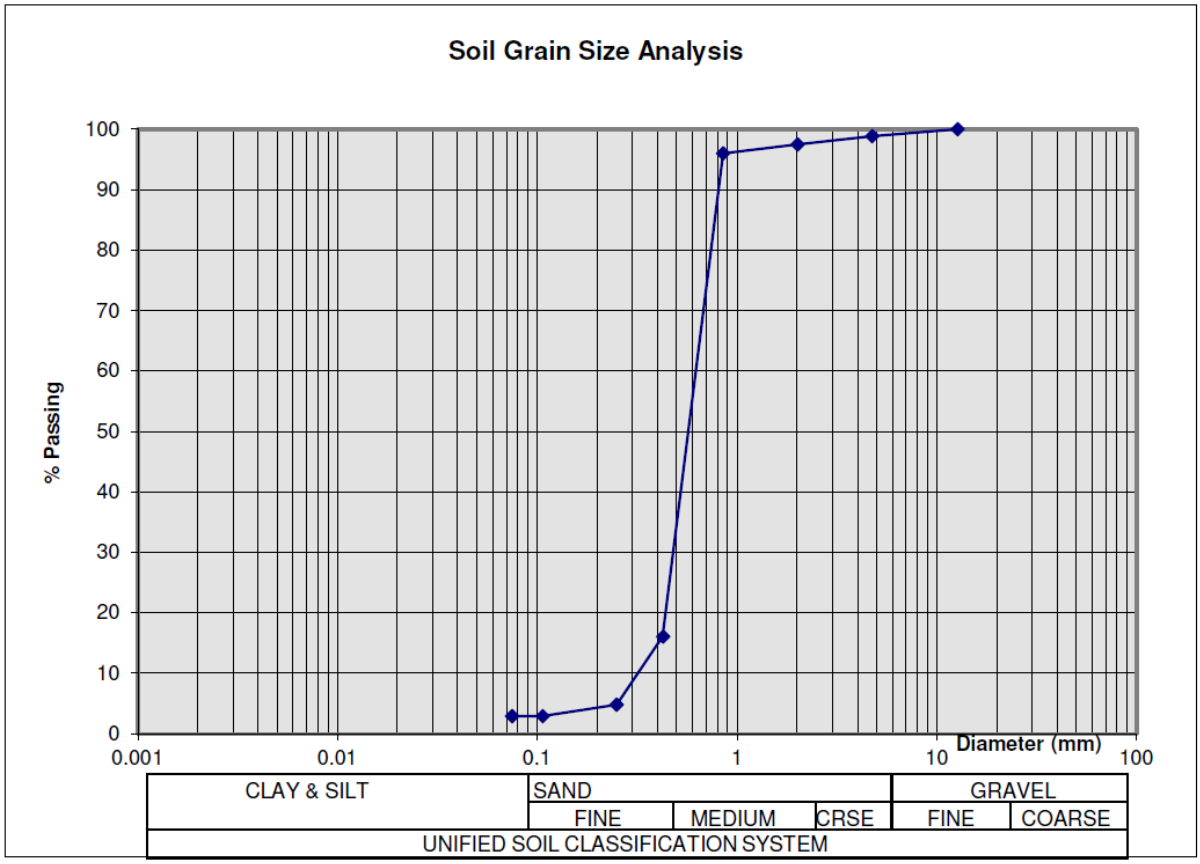
Unified System Classification:
SP Poorly Graded Fine SAND (2% Finer than No. 200 sieve)
Est. Percolation Time: T = 8 min/cm

BOS Engineering Environmental Services

Project :	131 Harris Rd	***Client :***	Phil Pattyn
Test Pit :	TP 2	***RE:***	Wastewater Treatment System
Depth :	91 to 152cm	***Proj. No .***	2011-03
Dry Mass:	190.3 g	***Date:***	Jan 17-21

CHART DATA

Sieve No.	Mass	Cum. Mass	Diam. (d)	% Passing
	0.0	0	12.7	100
4	2.1	2.1	4.75	99
10	2.7	4.8	2	97
20	2.8	7.6	0.85	96
40	152.2	159.8	0.425	16
60	21.4	181.2	0.25	5
140	3.6	184.8	0.106	3
200	0.0	184.8	0.075	3



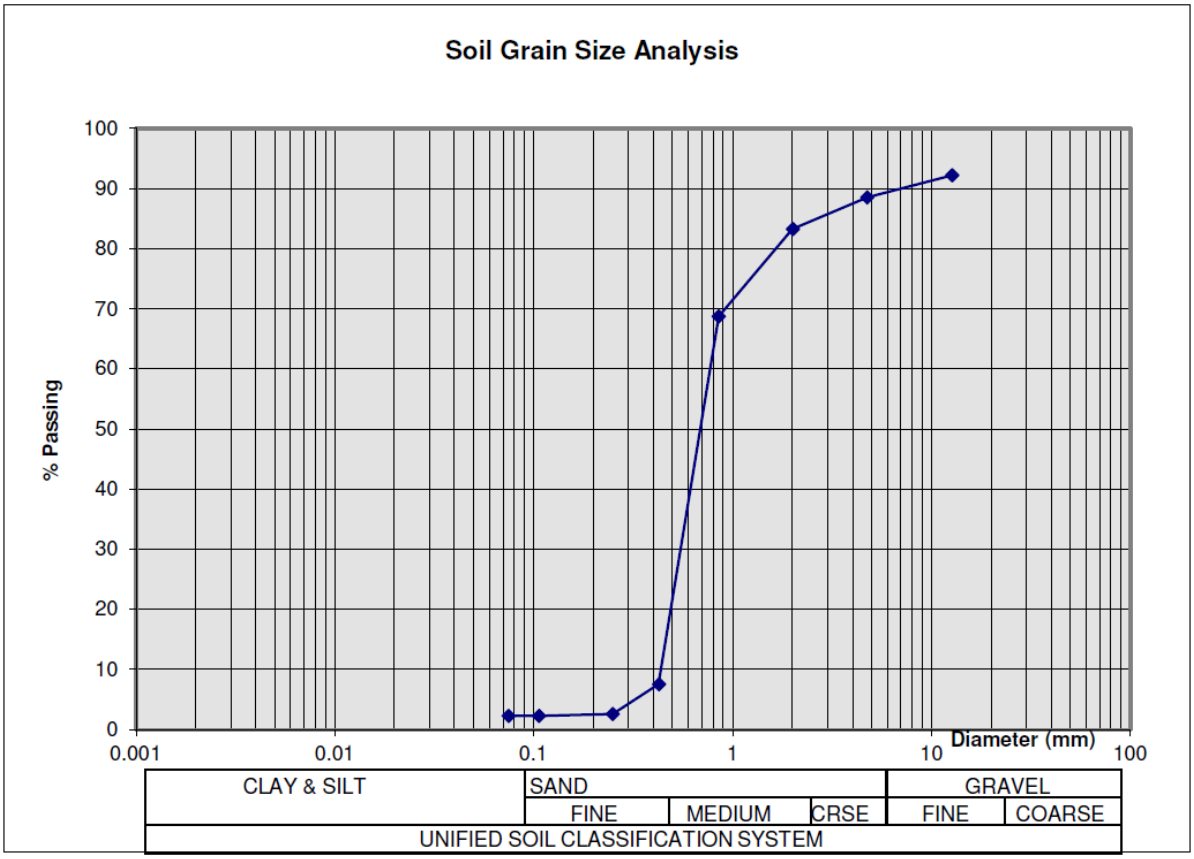
Unified System Classification:
SP Poorly Graded Fine SAND (3% Finer than No. 200 sieve)
Est. Percolation Time: T = 8 min/cm

BOS Engineering Environmental Services

Project :	131 Harris Rd	***Client :***	Phil Pattyn
Test Pit :	TP 3	***RE:***	Wastewater Treatment System
Depth :	61 to 183 cm	***Proj. No .***	2011-03
Dry Mass:	200.2 g	***Date:***	Jan 17-21

CHART DATA

Sieve No.	Mass	Cum. Mass	Diam. (d)	% Passing
	15.6	15.6	12.7	92
4	7.3	22.9	4.75	89
10	10.6	33.5	2	83
20	29.1	62.6	0.85	69
40	122.5	185.1	0.425	8
60	10.0	195.1	0.25	3
140	0.6	195.7	0.106	2
200	0.0	195.7	0.075	2



Unified System Classification:
SP Poorly Graded Fine SAND (2% Finer than No. 200 sieve)
Est. Percolation Time: T = 8 min/cm

APPENDIX B

BACKGROUND GROUNDWATER QUALITY TEST RESULTS

PARACEL LABORATORIES LTD.
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1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Elgin Pure Water

261 Edward Street
St. Thomas, ON N5P 4A9
Attn: Dan Lake

Client PO:
Project:
Custody: 4039

Report Date: 22-Nov-2017
Order Date: 10-Nov-2017

Revised Report

Order #: 1745603

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1745603-01	145 Harris Rd - Hayden

Approved By:

Dale Robertson, BSc
Laboratory Director

PARACEL LABORATORIES LTD.

Order #: 1745603

Certificate of Analysis
Client: Elgin Pure Water
Client PO:

Report Date: 22-Nov-2017
Order Date: 10-Nov-2017
Project Description:

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	13-Nov-17	13-Nov-17
Anions	EPA 300.1 - IC	14-Nov-17	14-Nov-17
Colour	SM2120 - Spectrophotometric	14-Nov-17	14-Nov-17
Conductivity	EPA 9050A- probe @25 °C	13-Nov-17	13-Nov-17
General Water Quality Package (less bacteria)	Hardness as CaCO3	13-Nov-17	13-Nov-17
Metals, ICP-MS	EPA 200.8 - ICP-MS	13-Nov-17	13-Nov-17
pH	EPA 150.1 - pH probe @25 °C	13-Nov-17	13-Nov-17
Total Dissolved Solids	SM 2540C - gravimetric, filtration	15-Nov-17	16-Nov-17
Total Organic Carbon	MOE 3247B - Combustion IR	14-Nov-17	15-Nov-17
Turbidity	SM 2130B - Turbidity meter	14-Nov-17	14-Nov-17

PARACEL LABORATORIES LTD.

Order #: 1745603

Certificate of Analysis
Client: Elgin Pure Water
Client PO:

Report Date: 22-Nov-2017
Order Date: 10-Nov-2017
Project Description:

	Client ID:	145 Harris Rd - Hayden	-	-	-
	Sample Date:	10-Nov-17	-	-	-
	Sample ID:	1745603-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	324	-	-	-
Colour	2 TCU	<2 [1]	-	-	-
Conductivity	5 uS/cm	1070	-	-	-
Hardness	mg/L	332	-	-	-
pH	0.1 pH Units	7.6	-	-	-
Total Dissolved Solids	10 mg/L	612	-	-	-
Turbidity	0.1 NTU	0.6 [1]	-	-	-
Total Organic Carbon	0.5 mg/L	1.2	-	-	-
Anions					
Bromide	0.1 mg/L	<0.1	-	-	-
Chloride	1 mg/L	156	-	-	-
Fluoride	0.1 mg/L	<0.1	-	-	-
Nitrate as N	0.1 mg/L	2.7	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Phosphate as P	0.2 mg/L	<0.2	-	-	-
Sulphate	1 mg/L	23	-	-	-
Metals					
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	0.047	-	-	-
Beryllium	0.0005 mg/L	<0.0005	-	-	-
Boron	0.01 mg/L	0.02	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-
Calcium	0.1 mg/L	110	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-
Cobalt	0.0005 mg/L	<0.0005	-	-	-
Copper	0.0005 mg/L	<0.0005	-	-	-
Iron	0.1 mg/L	<0.1	-	-	-
Lead	0.0001 mg/L	0.0009	-	-	-
Magnesium	0.2 mg/L	13.6	-	-	-
Manganese	0.005 mg/L	<0.005	-	-	-
Molybdenum	0.0005 mg/L	<0.0005	-	-	-
Nickel	0.001 mg/L	<0.001	-	-	-

PARACEL LABORATORIES LTD.

Order #: 1745603

Certificate of Analysis
Client: Elgin Pure Water
Client PO:

Report Date: 22-Nov-2017
Order Date: 10-Nov-2017
Project Description:

	Client ID:	145 Harris Rd - Hayden	-	-	-
	Sample Date:	10-Nov-17	-	-	-
	Sample ID:	1745603-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Potassium	0.1 mg/L	1.5	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-
Silver	0.0001 mg/L	<0.0001	-	-	-
Sodium	0.2 mg/L	105	-	-	-
Thallium	0.001 mg/L	<0.001	-	-	-
Tin	0.01 mg/L	<0.01	-	-	-
Uranium	0.0001 mg/L	0.0003	-	-	-
Vanadium	0.0005 mg/L	<0.0005	-	-	-
Zinc	0.005 mg/L	0.021	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Bromide	ND	0.1	mg/L						
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						
Phosphate as P	ND	0.2	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Total Dissolved Solids	ND	10	mg/L						
Turbidity	ND	0.1	NTU						
Total Organic Carbon	ND	0.5	mg/L						
Metals									
Aluminum	ND	0.001	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						
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						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Selenium	ND	0.001	mg/L						
Thallium	ND	0.001	mg/L						
Tin	ND	0.01	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									
Bromide	ND	0.1	mg/L	ND				20	
Chloride	158	1	mg/L	156			1.3	10	
Fluoride	ND	0.1	mg/L	ND			0.0	10	
Nitrate as N	2.74	0.1	mg/L	2.71			0.9	20	
Nitrite as N	ND	0.05	mg/L	ND				20	
Phosphate as P	ND	0.2	mg/L	ND				20	
Sulphate	22.5	1	mg/L	22.6			0.3	10	
General Inorganics									
Alkalinity, total	262	5	mg/L	265			1.2	14	
Colour	ND	2	TCU	ND				12	
Conductivity	1590	5	uS/cm	1630			2.6	11	
pH	8.0	0.1	pH Units	8.0			0.6	10	
Total Dissolved Solids	586	10	mg/L	612			4.3	10	
Turbidity	0.6	0.1	NTU	0.6			0.0	10	
Total Organic Carbon	2.0	0.5	mg/L	2.7			30.1	33	
Metals									
Aluminum	0.034	0.001	mg/L	0.034			1.3	20	
Arsenic	ND	0.001	mg/L	ND			0.0	20	
Barium	0.017	0.001	mg/L	0.017			0.7	20	
Boron	ND	0.01	mg/L	0.02			0.0	20	
Cadmium	ND	0.0001	mg/L	ND			0.0	20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	ND	0.0005	mg/L	ND			0.0	20	
Copper	0.153	0.0005	mg/L	0.153			0.1	20	
Iron	ND	0.1	mg/L	ND			0.0	20	
Lead	0.0064	0.0001	mg/L	0.0064			0.1	20	
Manganese	ND	0.005	mg/L	ND			0.0	20	
Molybdenum	ND	0.0005	mg/L	ND			0.0	20	
Selenium	ND	0.001	mg/L	ND			0.0	20	
Thallium	ND	0.001	mg/L	ND			0.0	20	
Tin	ND	0.01	mg/L	ND			0.0	20	
Uranium	ND	0.0001	mg/L	ND			0.0	20	
Vanadium	ND	0.0005	mg/L	ND			0.0	20	
Zinc	0.042	0.005	mg/L	0.042			0.2	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Bromide	1.01	0.1	mg/L	ND	101	72-106			
Chloride	166	1	mg/L	156	93.8	78-112			
Fluoride	1.03	0.1	mg/L	ND	103	73-113			
Nitrate as N	3.71	0.1	mg/L	2.71	99.8	81-112			
Nitrite as N	0.991	0.05	mg/L	ND	99.1	76-107			
Phosphate as P	6.27	0.2	mg/L	ND	125	72-131			
Sulphate	32.8	1	mg/L	22.6	103	75-111			
General Inorganics									
Total Dissolved Solids	102	10	mg/L		102	75-125			
Total Organic Carbon	13.0	0.5	mg/L	2.7	104	61-128			
Metals									
Aluminum	82.3		ug/L	34.4	95.8	80-120			
Arsenic	52.7		ug/L	0.220	105	80-120			
Barium	64.5		ug/L	17.2	94.7	80-120			
Boron	56.2		ug/L	17.7	76.9	80-120			QM-07
Cadmium	48.1		ug/L	0.0135	96.2	80-120			
Chromium	48.9		ug/L	0.111	97.6	80-120			
Cobalt	47.6		ug/L	0.0274	95.1	80-120			
Copper	194		ug/L	153	81.9	80-120			
Iron	969		ug/L	22	94.7	80-120			
Lead	53.4		ug/L	6.40	94.0	80-120			
Manganese	50.0		ug/L	1.31	97.3	80-120			
Molybdenum	45.4		ug/L	0.315	90.2	80-120			
Selenium	51.5		ug/L	0.136	103	80-120			
Thallium	48.6		ug/L	0.008	97.1	80-120			
Tin	47.9		ug/L	0.06	95.6	80-120			
Uranium	46.2		ug/L	0.0109	92.4	80-120			
Vanadium	49.8		ug/L	0.0487	99.6	80-120			
Zinc	91.9		ug/L	42.1	99.6	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:

Revision - Turbidity and Colour analysis conducted after the accepted holding time had been exceeded. This is noted as sample qualifier [1].

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.

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Paracel ID: 1745603

Chain Of Custody
Ontario Drinking Water Samples
Nº 4039

Client Name:	Elgin Pure Water	Project Ref:		Waterworks Name:	Samples Taken By:
Contact Name:	Dan Lake	Quote #:		Waterworks Number:	Name: Dan Lake
Address:	261 Edward St.	PO #:		Address:	Signature:
After Hours Contact:		E-mail:			Page 1 of 1
Telephone:	519-633-1861	Fax:	519-633-1910	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 318/08 ☒ Private Well
☐ ON REG 243/07 ☐ ON REG 319/08 ☐ Other:

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	DATE	TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S/F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	general well water			
1	145 Ham's Rd.	Hayden	R	G	N		Nov 10/17	11:00am	4							+			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: dual

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Dan Lake	Date/Time: 11 10 17	Date/Time: 10/11/17 11:20	Date/Time: 10/11/17 11:20
Date/Time: NOV 10/17	Temperature: 9.3 °C	Temperature: 5.6 °C	pH Verified: ☐ By:

Chain of Custody (Drinking Water) - Rev 1.14 Jan. 2015.xlsx

APPENDIX C

SPREADHEETS
NITRATE IMPACT ANALYSIS

TABLE 1: 131 Harris Road D5-4 Nitrate Calculations - Varying Infiltration Rates (Background = groundwater Nitrate Concentration)

Feb 1,2021

WITH CONVENTIONAL PRETREATMENT - 55% natural infiltration

	Lot Size (m^2)	Mean Annual Precip. (mm/yr) [1]	Evapo. (mm/yr) [2]	Infiltration (%) [3]	Dilution Volume (L/yr)	Background $NO_3 + NO_2$ (mg/L)	Septage Conc. (mg/L)	Reduction Effic. (%)	Treated Conc. (mg/L)	No. of Houses (#)	Sewage Volume (L/yr)	Concentration at Lot Boundary (mg/L)	OWQG (mg/L)
Single Lot	3610	990	570	55	833910	2.75	40	0	40	1	365000	**14.09**	**10**

WITH CONVENTIONAL PRETREATMENT -100% enhanced infiltration

	Lot Size (m^2)	Mean Annual Precip. (mm/yr) [1]	Evapo. (mm/yr) [2]	Infiltration (%) [3]	Dilution Volume (L/yr)	Background $NO_3 + NO_2$ (mg/L)	Septage Conc. (mg/L)	Reduction Effic. (%)	Treated Conc. (mg/L)	No. of Houses (#)	Sewage Volume (L/yr)	Concentration at Lot Boundary (mg/L)	OWQG (mg/L)
Single Lot	3610	990	570	100	1516200	2.75	40	0	40	1	365000	**9.98**	**10**

1. Note that mean annual precipitation is based on London Airport weather station
2. Evaporation is based on regional stormwater balance calculations in this area.
3. Natural (un-enhanced) Infiltration was estimated to be 55% of surplus water in conformance to Conservation Authority practices.
4. Background Nitrate concentration is estimated at 2.75 mg/L based on easterly well

TABLE 2: 131 Harris Road D5-4 Nitrate Calculations - Varying Infiltration Rates (Background Nitrate Concentration = 0)

Feb 1,2021

WITH NO PRETREATMENT - 55% natural infiltration

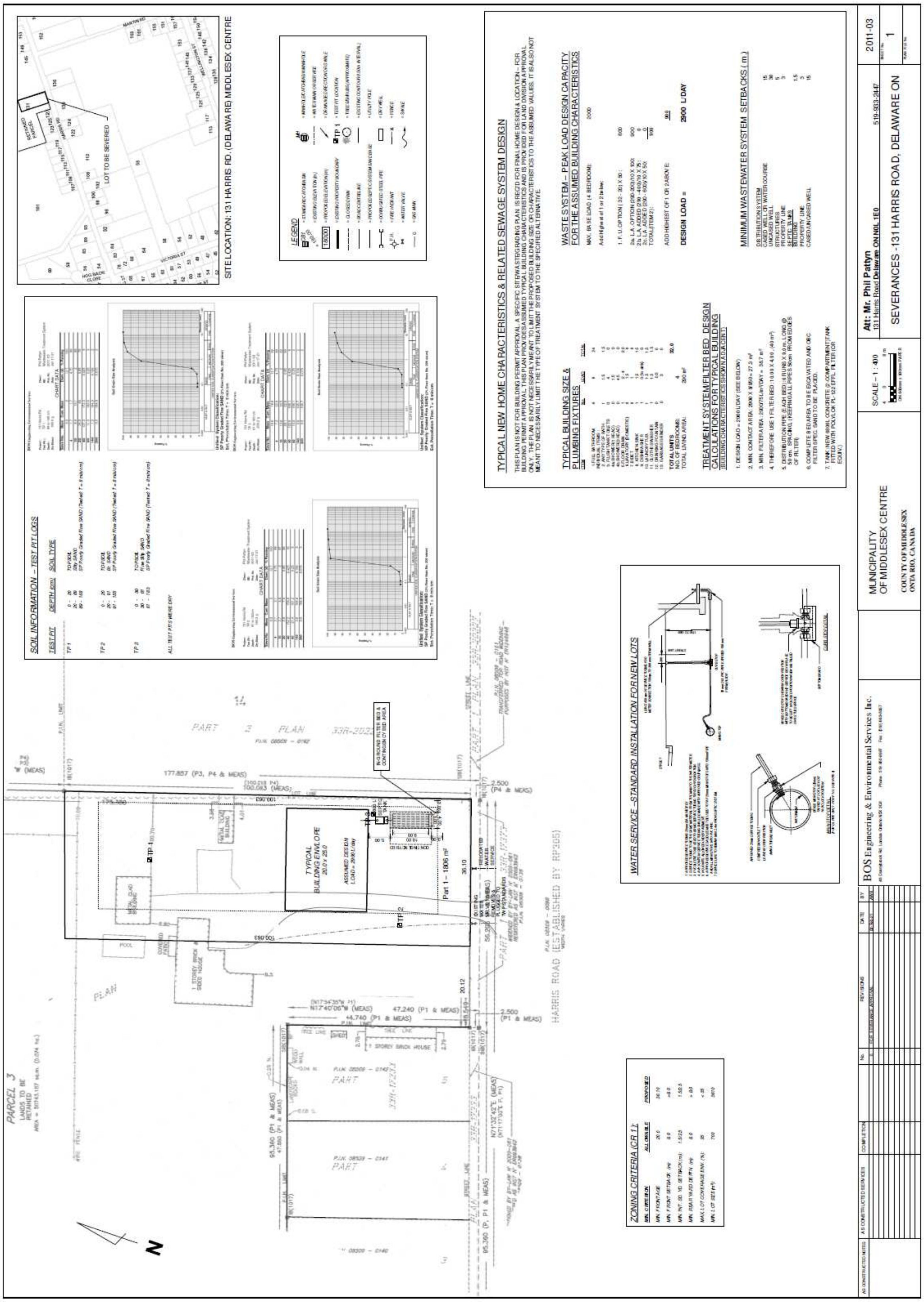
	Lot Size (m^2)	Mean Annual Precip.[1] (mm/yr)	Evapo.[2] (mm/yr)	Infiltration[3] (%)	Dilution Volume (L/yr)	Background $NO_3 + NO_2$ (mg/L)	Septage Conc. (mg/L)	Reduction Effic. (%)	Treated Conc. (mg/L)	No. of Houses (#)	Sewage Volume (L/yr)	Concentration at Lot Boundary (mg/L)	OWQG (mg/L)
Single Lot	3610	990	570	55	833910	0	40	0	40	1	365000	**12.18**	**10**

WITH NO PRETREATMENT -100% enhanced infiltration

	Lot Size (m^2)	Mean Annual Precip.[1] (mm/yr)	Evapo.[2] (mm/yr)	Infiltration[3] (%)	Dilution Volume (L/yr)	Background $NO_3 + NO_2$ (mg/L)	Septage Conc. (mg/L)	Reduction Effic. (%)	Treated Conc. (mg/L)	No. of Houses (#)	Sewage Volume (L/yr)	Concentration at Lot Boundary (mg/L)	OWQG (mg/L)
Single Lot	3610	990	570	73	1106826	0	40	0	40	1	365000	**9.92**	**10**

1. Note that mean annual precipitation is based on London Airport weather station
2. Evaporation is based on regional stormwater balance calculations in this area.
3. Natural (un-enhanced) Infiltration was estimated to be 55% of surplus water in conformance to Conservation Authority practices.
4. Background Nitrate concentration is estimated at 0 mg/L for precipitation

Appendix D
SITE PLAN


SITE LOCATION: 131 HARRIS RD. (DELAWARE RD) MIDDLESEX CENTRE
LOT TO BE SEVERED
SOIL INFORMATION – TEST PIT LOGS
TYPICAL NEW HOME CHARACTERISTICS & RELATED SEWAGE SYSTEM DESIGN
TYPICAL BUILDING SIZE & PLUMBING FIXTURES
WASTE SYSTEM – PEAK LOAD DESIGN CAPACITY FOR THE ASSUMED BUILDING CHARACTERISTICS
DESIGN LOAD = 2900 L/DAY
MINIMUM WASTEWATER SYSTEM SETBACKS (m)
TREATMENT SYSTEM/FILTER BED DESIGN CALCULATIONS FOR TYPICAL BUILDING
WATER SERVICE –STANDARD INSTALLATION FOR NEW LOTS
ZONING CRITERIA (CR 1)
PARCEL 3
TYPICAL BUILDING ENVELOPE
HARRIS ROAD (ESTABLISHED BY RP305)
BOS Engineering & Environmental Services Inc.
MUNICIPALITY OF MIDDLESEX CENTRE
COUNTY OF MIDDLESEX ONTARIO, CANADA
SCALE – 1 : 400
Att: Mr. Phil Pattyn
131 Harris Road Delaware ON N0L 1E0
519-933-2847
SEVERANCES - 131 HARRIS ROAD, DELAWARE ON
2011-03
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