Van Harten
SURVEYING INC.
LAND SURVEYORS and ENGINEERS

July 12, 2017
24553-17

Town of Pelham
P.O. Box 400
20 Pelham Town Square
Fonthill, Ontario
L0S 1E0

Attention: Kim Holland

Dear Madam:

Re: Sewage System Consultation
491 Canboro Road
Part Lot 9, Concession 9
Geographic Township of Pelham
Town of Pelham, Ontario

1.0 Introduction

Van Harten is pleased to submit this report regarding an investigation conducted at the above referenced site that is located at the intersection of Canboro Road, Centre Street and Memorial Drive as indicated on the Key Map of the attached plan. This work was authorized by Ms. Kim Holland of the Town of Pelham.

The existing facilities located at 491 Canboro Drive have experienced ongoing issues with the existing private sewage disposal system, particularly during winter months. The purpose of this engineering task is to identify the subsurface conditions at the subject property and provide comments on the existing sewage system as well as recommendations regarding future sewage disposal.

2.0 Site Investigation

An engineering site investigation was carried out by a representative from Van Harten on May 2, 2017. The purpose of the investigation was to locate water supply wells in the vicinity of the site, identify surface drainage characteristics of the property, and to carry out a subsurface investigation.

Upon arrival on-site, the contractor had revealed an existing septic tank off of the northeast corner of the building along with the header and three absorption trenches in the existing leaching bed. Further investigation revealed a cast iron lid and what is believed to be a pump chamber located off of the southwest corner of the building. An excavator was utilized to dig two test pits in the leaching bed area to a maximum depth of 1.80 m below the existing grade. The locations of the sewage system components and test pits are shown on the attached plan. Representative samples of the soils were collected from the test pits for visual examination of the density, colour, moisture content, plasticity, and gradation. Groundwater observations in the test pits were also noted at the time of the fieldwork.

The test pit locations were approximately located in the field by Van Harten referencing property lines and other site features.

3.0 Laboratory Testing

Samples of the predominant soils encountered were retained and later submitted to CMT Engineering Inc. for particle size distribution analysis. The laboratory test results are presented in Appendix A of this report.

4.0 Summarized Conditions

The subject property covers approximately 1,292 m^2 and is located at the intersection of Canboro Road, Centre Street and Memorial Drive. The site comprises the Old Pelham Town Hall as well as landscaped gardens, walkways and a cenotaph. The property is relatively level and grass covered with some trees along the boundaries.

The existing sewage system comprises what is believed to be a single chamber tank located at the southwest corner of the building that is reported by town staff to be equipped with a pump that transports waste generated in the washrooms around the west and north side of the building to an existing septic tank off of the northeast corner of the building. A sewer from the kitchen area is believed to drain by gravity into this tank which in turn is gravity fed to an inground leaching bed that comprises four runs of about 15 m length. Exposed distribution piping appears to be clogged with sludge and roots. The exposed stone trench adjacent to the walkway was observed to be saturated and black with organic growth.

Please refer to Table 1 for a detailed summary of the soil and groundwater conditions recorded by Van Harten at the time of the site investigation, and to Appendix A for the resulting particle size distribution analyses of the submitted soil samples. The general soil stratigraphy encountered in the test pits dug at the subject property comprises of surficial topsoil overlying a deposit of reddish brown silty sand with occasional seams of silt below 1.20 m. Particle size analyses testing carried out by CMT Engineering Inc. on a sample retained from each test pit reveals that the samples contain 66 to 69% sand, 24 to 25% silt and 7 to 9% clay.

No free groundwater was encountered in the test pits, dug to a maximum depth of 1.80 m; however, visibly higher moisture content would suggest that groundwater lies at a depth of about 1.50 m below grade.

5.0 Discussion and Recommendations

The project involves potential future upgrading or replacement of the existing malfunctioning sewage system located at the Old Pelham Town Hall. The purpose of this investigation is to conduct a site investigation and provide recommendations regarding future sewage disposal.

The existing sewage system is understood to malfunction primarily in winter months. Based on the heavy sludge build-up and root intrusion within the distribution pipes and observed saturated stone trench, the existing leaching bed appears to be hydraulically overloaded. While the sewage system functions during summer months and inactive periods within the building, the cleared sidewalks and cenotaph area provide less protection from frost. These areas would be susceptible to freezing. A frozen leaching bed would be expected to simply back up to the tank located off of the northeast corner of the building. It is understood that the freezing has been occurring in the leaching bed and not in the existing forcemain.

It is noteworthy that when the cast iron lid was removed from the pump chamber located off of the southwest corner of the building, sewage was observed above the top of the tank and into the riser. When hand digging adjacent to the tank, sewage was observed seeping at a joint at the top of the tank.

With any private sewage disposal system, the two primary design variables are the percolation rate of the underlying soil (T measured in minutes per centimetre) and the peak daily sewage flow volume (Q measured in litres per day). The following paragraphs of this report provide a summary of these design parameters, comments regarding the condition of the existing sewage system and recommendations for future disposal.

R.P. Magahay, B.A. J.E. Buisman, B.E.S., B.Sc., O.L.S. R.M. Mak, B.Sc., O.L.S. J.M. Laws, B.Sc., O.L.S. J.M. Duffy, P.Eng.

The percolation time of the predominant soil deposit has been assessed based on soil characteristics recorded by Van Harten at the time of the site investigation and the results of laboratory testing carried out by CMT Engineering Inc. Referring to Supplementary Standard SB-6 of the 2012 OBC, Table 1 of the current report, and the results of the particle size distribution analysis presented in Appendix A, the predominant soil is classified as "SM" under the Unified Soil Classification System with a percolation rate ranging from T = 8 to 20 min/cm. A percolation rate of T = 15 min/cm is chosen for this sewage system assessment.

In consultation with the Town, it is understood that the existing building is used sporadically for various events ranging from small meetings to licensed gatherings with food. Waste is generated in a kitchen area and in public washrooms. Considering Table 8.2.1.3.B of the OBC under the Category of 'Assembly Hall with food service' a peak flow of Q = 100 people at 36 L/person = 3,600 L/day is calculated. Other days, the building could be empty or have a meeting with 20 people. Considering the Category of 'Assembly Hall with no food service' a peak flow of Q = 20 people at 8 L/person is calculated. Typically, a site like this would be balanced such that an oversized pump tank equipped with a pump on a timer can attenuate peak events such that the leaching bed can sized for an average daily flow over the course of a week. A site like this would typically have a balanced flow in the order of Q = 2,000 L to 3,000 L/day.

Based on the witnessed condition of the existing bed and reported issues at this site, a new sewage system is considered necessary. Some thought or consideration could be given to having the existing distribution pipes cleaned and flushed; however, this will likely only provide short term relief. The following paragraphs provide a brief summary of the requirements of a new sewage system.

Class 4 Sewage System

As a conventional Class 4 'leaching bed' Sewage System, Based on anticipated peak events of no more than 3,600 L/day, a minimum 9,000 to 11,250 L septic tank would be installed in the same general area as the existing septic tank. While the size of the existing tank is not known, it is likely no more than 2,700 L to 4,500 L in size. As is standard practice, the existing tank would typically be pumped clean, crushed and backfilled.

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A new pump chamber would be installed to replace the existing chamber located at the southwest corner of the building. The new chamber could be a 1,800 L (400 gal) rectangular tank or a round manhole structure due to spatial constraints. Some consideration could be given to alternating duplex pumps. If the existing forcemain is found to be intact, it could be considered for continued use at this site. If a new line is considered necessary, directional boring beneath the building is considered to be the most viable means of transporting waste to the northeast corner of the building. The forcemain and gravity sewer would wye together at the inlet of the new septic tank.

The soil conditions encountered on-site are generally favourable for filter bed construction. Given interbedded layers of silt and relatively shallow groundwater conditions some precautionary measures would be taken in design.

Referring to Sentences 8.7.5.2 (3) and (4), the maximum loading rate at the surface of the filter media changes from 75 to 50 L/m^2/day at 3,000 L/day. When the lower loading rate is applied, a second filter bed spaced no closer than 5 m from the first filter bed is required. For example, a peak flow of 2,900 L/day would require a minimum filter bed area at the surface of 39 m^2 whereas a peak flow of 3,100 L/day would require a minimum 62 m^2 at the surface. The 62 m^2 would have to be constructed as two 31 m^2 filter beds spaced no closer than 5 m apart. The base of the filter bed or beds must cover a minimum area dictated by Sentence 8.7.5.3 (6).

Given a balanced flow of between 2,000 and 3,000 L/day, a 40 to 50 m^2 filter bed would typically be designed. Referring to the attached plan, there is inadequate area to do so. By introducing an advanced treatment unit in place of a septic tank, permitted filter bed loading rates increase to 100 L/m^2/day; however, given such variable flow rates it would be difficult to properly treat and dispose of the waste. Even with an advanced treatment unit, the available area is considered inadequate.

Class 5 Sewage System

Where a Class 4 'leaching bed' Sewage System cannot be constructed, a Class 5 'holding tank' Sewage System has to be considered. The Ontario Building Code would require the installation of 9,000 L tank at a minimum. The Town could consult with local installers and haulers to determine if a larger size is more viable.

As indicated on the plan, a potential holding tank location is shown. As with a Class 4 Sewage System, a new pump chamber would be installed off of the southwest corner of the building. The waste generated would ideally pump through the existing forcemain to the existing septic tank off of the northeast corner of the building and this tank would be provided with a new gravity sewer to the holding tank.

If the existing tank is found to be in poor conditions, it will need to be pumped clean, crushed and backfilled with a new gravity sewer extension from the kitchen extending to the holding tank. If the existing forcemain is not suitable for continued use, directional boring of a new line beneath the building may be the most viable alternative.

The new holding tank would be vented and provided with a high level alarm. The Town would be required to enter an agreement with a licensed hauler to empty the tank when it becomes full.

6.0 Water Supply

The water supply for the existing building is understood to be provided by a municipal water supply well. There are no known wells within the immediate vicinity of the subject property.

7.0 Approval and Construction Requirements

This report and drawing is considered suitable for internal discussions at the Town as well as obtaining budgetary numbers from installing contractors. Contractors may also be able to provide pricing for different pumping and control panel alternatives. Any technical questions arising from the review of the report should be directed to Van Harten for clarification.

Note that additional details and cross-sections would be required to complete a design suitable for permit application. Note also that a survey may be necessary in order to ensure that minimum setbacks are provided. The attached plan is based off of neighbouring surveys and aerial photography and is considered more of a sketch.

8.0 Closure

In conclusion, a Class 5 'holding tank' sewage system is considered the only viable servicing option for this property. Referring to the plan, a new pump tank installed at the southwest corner of the building may outlet into an existing forcemain directed to an existing tank located off of the northeast corner of the building. The outlet from this tank may be redirected to the new holding tank.

A second scenario would involve backfilling the existing tank off of the northeast corner of the building, joining the forcemain and gravity sewer and extending a new line to the holding tank.

R.P. Magahay, B.A. **J.E. Buisman**, B.E.S., B.Sc., O.L.S. **R.M. Mak**, B.Sc., O.L.S. **J.M. Laws**, B.Sc., O.L.S. **J.M. Duffy**, P.Eng.

A third scenario would involve directional boring a new forcemain beneath the existing building. This would only be considered necessary were an existing forcemain if found not to be suitable for continued use.

The completed sewage system assessment and report is specific to the subject property and cannot be applied to different properties. The conclusions and recommendations are based on witnessed conditions, results of laboratory analyses and understanding of site activities.

I trust that this report and design has been completed within our terms of reference and is suitable for your present requirements. Please contact our office if you have any questions or require further consultation.

Van Harten Surveying Inc.

LICENSED PROFESSIONAL ENGINEER
J. M. DUFFY
PROVINCE OF ONTARIO

John Duffy, P. Eng.
Consulting Engineer

Encl. Table 1 – Test Pit Logs
Encl. Preliminary Sewage System Layout
Encl. Appendix A – Laboratory Test Results

TABLE 1 – TEST PIT LOGS

491 Canboro Road
Town of Pelham
Van Harten Surveying Inc., Project #24553-17

Test Pit 1 **May 2, 2017**

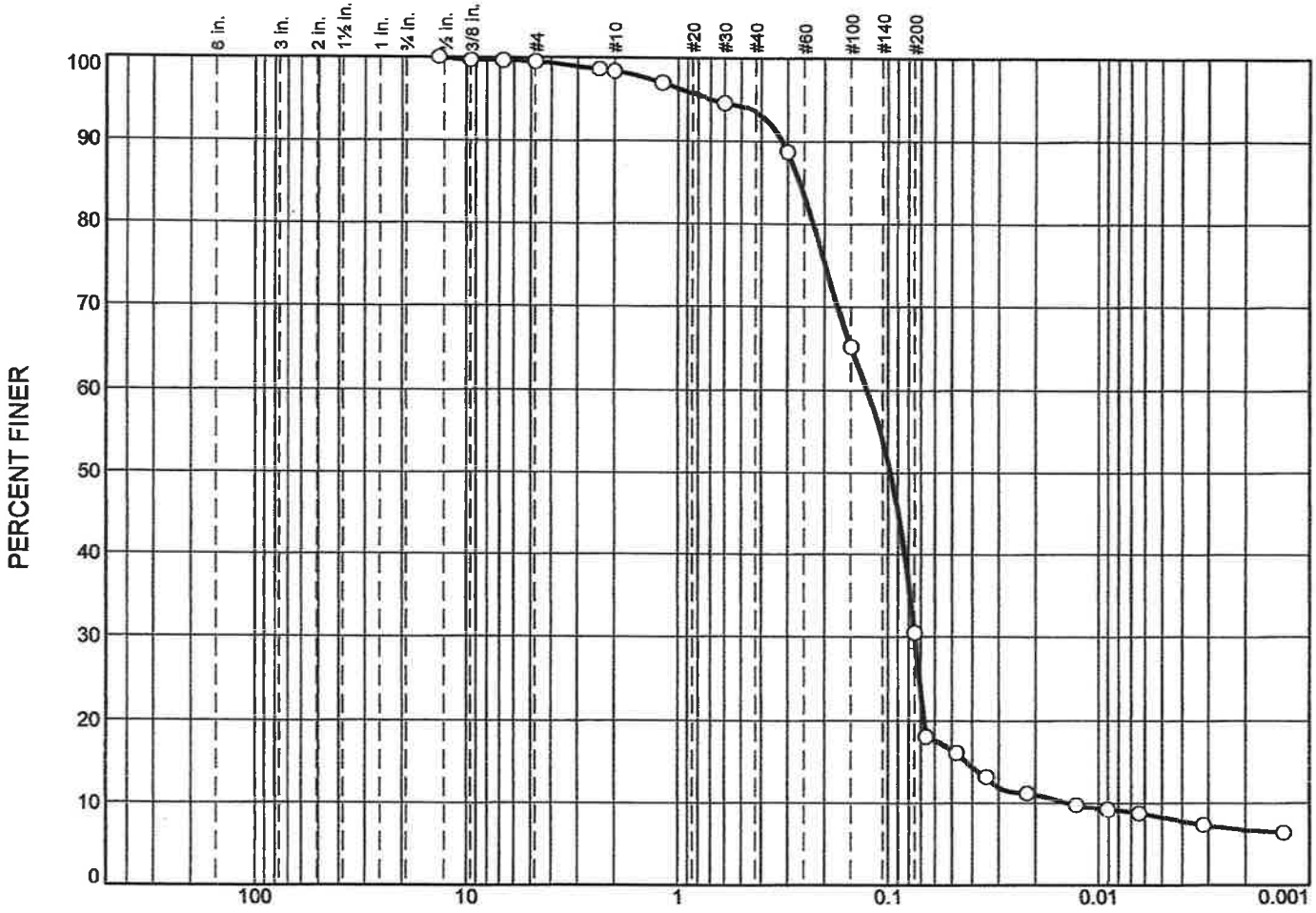
Depth (m)	Sample	Soil Description
0-0.30		**TOPSOIL:** dark brown topsoil, moist; some roots
0.30-1.20	1	**SAND:** reddish brown silty sand, trace clay, damp to moist
1.20-1.80		• Occasional seams of silt, moist to very moist
Groundwater Observations: At completion of excavation, test pit sidewalls stable. No free groundwater observed.		

Test Pit 2 **May 2, 2017**

Depth (m)	Sample	Soil Description
0-0.30		**TOPSOIL:** dark brown topsoil, moist
0.30-1.20		**SAND:** reddish brown silty sand, trace gravel and clay, damp to moist
1.20-1.60	1	• Occasional seams of silt, moist to very moist
Groundwater Observations: At completion of excavation, test pit sidewalls stable. No free groundwater observed.		

APPENDIX A
LABORATORY TEST RESULTS

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
O	0.0	0.0	0.5	1.1	4.8	63.1	23.8	6.7

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
O	V.H 24553-	1		Town of Pelham TP1	SM
	17			silty sand, trace clay, trace gravel	
				Tested by J.H of CMT Engineering Inc., May 16, 2017	

CMT Engineering Inc.

St. Clements, ON

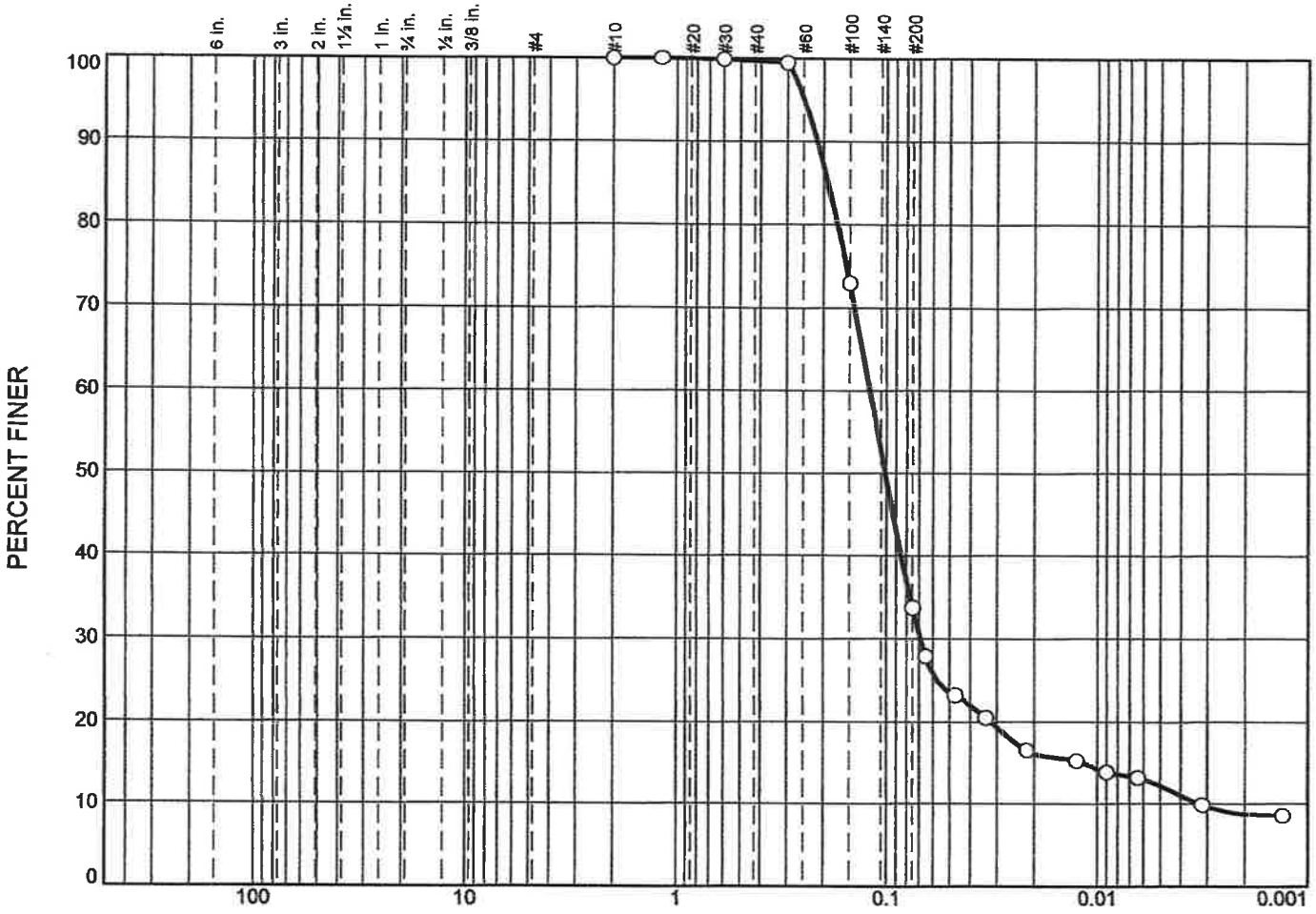
Client: Van Harten

Project: Miscellaneous Lab Testing

Project No.: 05-095

Figure 1

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.3	66.0	25.0	8.7

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	V.H 24553-	2		Town of Pelham TP2	SM
	17			silty sand, trace clay	
				Tested by J.H of CMT Engineering Inc., May 16, 2017	

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St. Clements, ON

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Project: Miscellaneous Lab Testing

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Figure 2