

Geotechnical Investigation Report

Proposed Ambulance Base Jack Davey Drive, Loyalist Township ON

Prepared for: Jewell Engineering Inc.

March 3, 2025

File: 1922.00-102



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Jewell Engineering Inc. – 1 PDF copy
Malroz Engineering Inc. – 1 PDF copy

Notice to Reader

This document contains the professional opinion of Malroz Engineering Inc. (Malroz), as to the matters set out herein, based on professional judgement and reasonable care. It is to be read in the context of the agreement (the Agreement) between Malroz and Jewell Engineering Inc. (the Client), the methodology, procedures and techniques used, Malroz's assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should not be read or relied upon out of context.

Malroz has, in preparing the geotechnical parameters and recommendations, followed accepted methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgement and reasonable care, and is thus of the opinion that there is a high probability that actual geotechnical conditions will fall within the predicted range. However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories, equipment suppliers, etc.) upon which Malroz's opinions are based, have not been verified by Malroz; Malroz makes no representation as to their accuracy and disclaims all liability with respect thereto.

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Respectfully submitted,

Malroz Engineering Inc.

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1.0 Introduction

Malroz Engineering Inc. (Malroz) was retained by Jewell Engineering Inc. (the Client) to conduct a geotechnical investigation in support of the construction of a new ambulance base to be located on a presently vacant lot (identified as Lot 10) in the Loyalist East Business Park located on Jack Davey Drive in Loyalist Township, Ontario (the Site).

The purpose of the investigation is to characterize subsurface conditions around the Site to inform the design and construction of the proposed new single storey ambulance base building. No concept plans were provided to Malroz at the time this investigation was undertaken, however we assume that it will consist of a typical single storey building with no below grade levels and paved surface parking and laneway areas.

This report summarizes the results of the investigation completed by Malroz in support of the proposed development. Work for this investigation was completed in general accordance with Malroz's approved proposal dated December 2, 2024 (file 1922.00-100). The agreed scope of work consisted of the following:

1. Conducting a Phase I Environmental Site Assessment in accordance with Canadian Standards Association standard Z-768-01 (this assessment report is detailed under separate cover in Malroz report ref. 1922.00-101);
2. Advancement of a total of four test pits in the vicinity of the proposed development;
3. Submittal of all retrieved samples with sufficient quantity for moisture contents testing, as well as three full particle size analyses (hydrometer) and one Atterberg limits test, or other index tests as substituted by Malroz at its discretion; and
4. Reporting of field and laboratory results.

The recommendations and comments contained herein are based on factual information obtained during the investigation and are intended only for the use of project designers and engineers. They have been prepared with the understanding that the design will be carried out in accordance with applicable codes and standards. The General Conditions and Limitations (Section 7.0 of this report) form an integral part of this report.

2.0 Site Description

The Site is presently a vacant lot in the Loyalist East Business Park. Long grasses and light brush cover was observed throughout the Site. The Site is surrounded by undeveloped land to the north, Jack Davey Drive and other business park lots to the west, County Road 6 and light commercial development to the east, and a stormwater management pond and Taylor Kidd Boulevard to the south.



Photograph 1 – Site, looking northeast (January 2025)

Topography at the Site was locally generally flat, with a slight slope downward toward the southeast. Regional topography slopes downward toward the southwest, towards Parrotts Bay and Lake Ontario.

3.0 Method of Investigation

3.1 Fieldwork – Test Pit Investigation

A total of four test pits, identified as TP101 through TP104 were advanced on January 7, 2025 in the vicinity of the proposed development. A Test Pit Location Plan (Figure 1) is presented in Appendix A. All test pits were excavated using a tracked excavator provided by the Client. Hand grab samples were collected from major soil horizons in each test pit, and stratigraphy was recorded by hand. Vane shear testing was conducted at test pit TP103 in cohesive soils.

Locations and ground surface elevations at each test pit were surveyed with a Trimble R10 Global Navigation Satellite System survey system, connected to the Can-Net Virtual Reference Station network, and are assumed to be accurate within the operating limits of the device. Locations are reported in the Universal Transverse Mercator (UTM) coordinate system, North American Datum of 1983 (NAD 83) and are in Zone 18T. Survey information is summarized in the following table.

Table 1 – Borehole Locations and Ground Surface Elevations

Test Location	Northing	Easting	Elevation (mASL)
TP101	4898748.4	366097.3	95.3
TP102	4898716.2	366114.5	94.9
TP103	4898712.9	366145.1	94.2
TP104	4898741.4	366140.8	94.7

Input By: DPH
Validated By: TB

Test pits were backfilled with excavated spoils and bucket packed to the extent possible. Samples were retained in plastic sample bags.

Test pit logs are attached in Appendix B.

4.0 Subsurface Assessment

Details of the subsurface conditions encountered are presented in the test pit records presented in Appendix B of this report. We strongly emphasize, however, that the soil types, their sequence, thickness, and physical properties may vary between boreholes, sample and test locations, both vertically and horizontally. This information is solely for general planning purposes and should not be used for detailed quantity take-offs.

Our assessment of subsurface conditions and borehole observations are summarized in the following sections.

4.1 Local Geology / Physiography

The Ontario Geological Survey (OGS) mapped the Quaternary geology of the Phase I Property as bedrock covered by a thin layer of drift and as glaciolacustrine deep water deposits consisting of varved to laminated silts and clays and/or bedrock with generally less than 1 m of overburden cover (OGS, 2000 & 2010). The bedrock geology was mapped by the OGS as limestone, dolostone, shale, arkose, or sandstone associated with the Simcoe Group/Shadow Lake Formation (OGS, 2011). The physiography was described by OGS as limestone plains with clay plains identified nearby to the north and east (Chapman and Putnam, 2007).

4.2 Surficial Materials

4.2.1 Topsoil

A surficial covering of topsoil was observed at all test pit locations, approximately 100 mm in thickness. It should be noted that in our experience, topsoil thicknesses can vary greatly between and beyond test locations. Root balls should be expected in areas with previous tree growth, with increased disturbance of surrounding native soils.

4.3 Native Sand and Silt to Silty Sand

A brown native sand and silt to silty sand with some gravel, some clay and some cobbles and boulders was observed at test pits TP101, TP102 and TP104. This material extended to the termination of all test pits on inferred bedrock. This material was

visually described as being generally moist, with moisture contents measured between 22 and 51% by dry weight.

4.4 Native Silt and Clay

A brown native silt and clay with traces of sand was observed at test pit TP103. This material extended to termination of the test pit on inferred bedrock. This material was visually described as being moist, with a moisture content of 38% by dry weight. Undrained shear strength measured in this material with a field shear vane was approximately 120 kPa.

4.5 Bedrock

Inferred limestone bedrock was encountered at the base of all test pits at depths ranging from 0.5 to 0.9 m below existing site grades (mbg).

4.6 Groundwater

All test pits were observed to be dry upon completion (e.g. no seepage from test pit sidewalls or at their base).

Groundwater levels should be expected to fluctuate based on seasonal atmospheric conditions and heavy precipitation events.

5.0 Laboratory Testing

Samples recovered during drilling were transported to Malroz's geotechnical laboratory in Kingston, Ontario. Three samples were submitted for hydrometer grain size analysis. All samples with sufficient quantity available to test were submitted for moisture contents.

Table 2 – Summary of Hydrometer Test Results

Sample ID	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
TP101-GS1	12	41	36	11
TP103-GS1	0	9	50	41
TP104-GS1	20	37	31	12

Input By: DPH
Validated By: TB

Laboratory test reports are included in Appendix C of this report, and moisture contents are summarized in test pit logs in Appendix B.

6.0 Discussion and Recommendations

We expect that conventional shallow foundations will be constructed directly over bedrock at this Site, based on the results of this investigation.

Existing native soils would be suitable to support new pavements, subject to a visual examination, removal of appreciable quantities of organics or deleterious material from upper soils, and successful proof rolling. However, subgrades subject to excess moisture during construction may require some subexcavation and replacement.

6.1 Excavation and Temporary Shoring

Excavations up to a depth of approximately 2 m from the existing site grades could be required for construction of buried utilities depending on final site grading. Use of shoring on this Site is not expected to be required, given the generally open area. Parameters for use in the design of shoring systems can be provided if required. No excavations should extend within a zone extending 10 horizontal to 7 vertical from the bottom outside edge of any new foundations without the provision of proper support, to prevent them from becoming undermined.

All excavations and construction of any shoring should be carried out in accordance with the latest edition of the OHSA and Regulations for Construction Projects. The OHSA regulations require that if workers must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced in accordance with OHSA requirements. OHSA specifies the maximum slope of excavations into four broad soil types, summarized as follows:

Table 3 – OHSA Soil Types

Soil Type	Maximum Slope Inclination	Base of Slope Location
Type 1	1 horizontal to 1 vertical	Within 1.2 m of base of excavation
Type 2	1 horizontal to 1 vertical	Within 1.2 m of base of excavation
Type 3	1 horizontal to 1 vertical	From bottom of excavation
Type 4	3 horizontal to 1 vertical	From bottom of excavation

At this Site, both the native soils should generally be able to be considered Type 3, provided they are unaffected by seepage. Any soils affected by seepage must be

considered as Type 4, and the highest soil type in any given excavation shall govern its side slopes.

Excavations into overburden soils should be relatively easy using conventional excavating equipment; however, contractors should be prepared to manage erratic large particles up to boulder sized material that could be found within native soils. The use of breakers or blasting techniques would be necessary for rock at this Site. Use of rippers in this formation is not anticipated to be feasible. Some upper weathered bedrock may be able to be removed with conventional excavating equipment. For planning purposes, weathered bedrock within 1 m of the rock surface should be backsloped at 1:1, while bedrock below this depth should be able to remain near vertical in the short term (e.g. for the duration of construction activities). Note that zone of potential weathering is estimated only based on our experience in the area – coring would be required to confirm.

Stockpiles of excavated materials should be kept away from the edges of open excavations by a distance at least equivalent to the depth of the excavation to avoid slope instability. Care should be taken to avoid overloading any underground services/structures from any construction stockpiles. It should be noted that this distance is also applicable to the passage of heavy machinery near excavations. This condition should be respected at all times, unless specific studies are conducted for individual cases.

6.2 Dewatering

Based on the observations in the test pits, groundwater in excavations into overburden to the bedrock surface should be controllable using one or more conventional filtered sumps and construction pumps and/or passive relief wells installed below the lowest point of the excavation. Carrying out excavations in dry seasonal conditions will reduce dewatering requirements. Groundwater quality assessment may be required if discharge to municipal storm sewers is expected to be required. Investigation of groundwater below the bedrock surface was outside of the scope of this investigation.

6.3 Foundations

6.3.1 Conventional Shallow Foundations

Conventional spread, strip or pad foundations constructed over a sound limestone bedrock subgrade, or on lean mix concrete poured over limestone bedrock (f'_c of at least 5 MPa) can be designed for a factored geotechnical bearing reaction at the ultimate limit state (ULS) of 1 MPa. This assumes that there will be no load eccentricities and the foundations will be constructed on flat and level ground. There would be no corresponding bearing reaction at the serviceability limit state (SLS), as loads required to cause any appreciable deformation would exceed the ultimate strength of the rock mass. Higher bearing reactions may be available if cores are retrieved and tested in the laboratory.

If granular fill is considered to raise foundation subgrade elevations above bedrock subgrade, a factored geotechnical bearing reaction of 450 kPa at ULS and a geotechnical bearing reaction of 350 kPa at SLS could be considered.

6.3.2 Design for Earthquakes

In accordance with the Ontario Building Code 2024 (OBC), foundations must be designed to withstand a minimum earthquake force. The Site Designation, X , may be determined by the measurement of in-situ shear wave velocity, from site grades to a depth of 30 mbg. In the absence of shear wave velocity data, the Site Designation (X_s in this case) may be determined using the energy-corrected average standard penetration resistance or average undrained shear strength of the soil. Assuming a high value for the SPT 'N' value / shear strength of the limestone bedrock at this Site, a site designation of X_c can be considered for design.

6.3.3 Foundation Dewatering

Generally, provided surficial slabs are located 0.2 m above existing site grades, we would not consider under slab drainage a necessity. Provided there are no below grade levels or pits, perimeter drainage around the structure would not be required.

6.3.4 Frost Protection

Design frost depth in the Kingston and Amherstview area should be considered 1.5 m below unprotected surface grades. If thermal insulation is utilized as opposed to soil cover, it should be noted that some manufacturers recommend placement of foundations directly over top of insulating boards. Foundations constructed over sound limestone at this Site would not be considered frost susceptible.

6.4 Backfilling

Backfill around the new structures should consist of non-frost susceptible, free draining granular material. Below hardscaped areas, all backfill material should be compacted to a minimum of 98% of its Standard Proctor Maximum Dry Density (SPMDD) to 1 m below the hardscape base or pavement subbase, and 100% thereafter. Elsewhere, all backfill should be compacted to 95% of its SPMDD.

6.5 Slabs on Grades

The existing native soil would be suitable to support typically loaded slabs on grade at this Site, following stripping and grubbing of the overburden and a successful proof rolling under heavy construction equipment. A minimum of 150 mm of Ontario Provincial Standard Specifications (OPSS) Granular 'A' should be placed under all slabs on grade.

6.6 Pavement Design

Based on the proposed development's use we recommend considering a pavement section consisting of 50 mm of HL3 (or SP12.5 Cat. A) and 60 mm of HL8 (or SP19.0 Cat. A), 200 mm of OPSS Granular 'A' and 300 mm of OPSS Granular 'B'.

6.6.1 Materials and Construction Considerations

For Site preparation, the Site should be stripped and grubbed, and any appreciable quantity of organics/root balls removed. The underlying subgrade surface proof rolled following subexcavation to the appropriate underside of pavement elevation. New fill under pavement areas should be placed as an Engineered Fill operation as described in the section below.

Paving work should be completed in accordance with the requirements of applicable OPSS and municipal standards. All asphalt mix designs should be reviewed prior to the commencement of construction.

HMA used in this project should meet the minimum requirements of OPSS 1150/1151 (depending on whether Marshall or Superpave mixes are utilized). Asphalt cements should be minimum grade of PG 58-28 and meet the requirements of OPSS 1101. Tack coat should be applied between any vertical surfaces or joints including curbs, abutting and walls, etc., butt and lap joints and at all tie-ins to other existing asphalt. SS-1 emulsified asphalts used for this purpose should meet requirements of applicable OPSS.

6.7 Engineered Fill

Engineered Fill application may be required on this project to raise subgrade elevations under foundations and/or during construction of slabs on grade, or in construction of new pavements. For any operation to be considered Engineered Fill, the following criteria must be satisfied:

- Materials used as Engineered Fill must be uniform and homogenous. The material should be free of deleterious materials and organics;
- Prior to the placement of Engineered Fill, it must be assessed in a geotechnical laboratory for, at a minimum, gradation and Standard Proctor analyses;
- The material must be within +/- 2% of its optimum moisture content, as determined through laboratory testing;
- Engineered Fill operations must take place under the supervision of a geotechnical engineer or their designate;
- Suitable compaction equipment must be selected for the operation, based on the material to be compacted;
- Materials should be placed in lifts which are suitable for the compaction equipment utilized, but generally not greater than 0.2 m loose lifts;
- Density testing must be taken on each lift of Engineered Fill. Any Engineered Fill which is tested and found to be outside of the specified density range shall be either removed, reworked, or retested; and

- Under no circumstances shall frozen material be placed in any Engineered Fill operation.
- Site activities may be carried out in the winter months and periods of cold weather. The following procedures are recommended for the placement of engineered or structural fill during cold weather conditions:
 - The fill placement must be inspected by qualified field personnel on a full time basis under the supervision of a geotechnical engineer, with the authority to stop the fill operations at any time when conditions are considered to be unfavorable.
 - The intended area of fill must be clearly identified in the field prior to commencing the work.
 - Ramps for access must be constructed outside of the limits of intended fill.
 - The fill material must be comprised of OPSS Granular 'B' - Type 1 or 2, or other approved equivalent granular material when temperatures are below 0° C.
 - Imported fill containing ice, snow or any frozen material cannot be accepted for use and should be returned to the source.
 - Overnight frost penetration into the fill mantle in areas below intended structure construction, parking lots, and on side slopes of the fill mantle within this area must be prevented by using insulation blankets. Any frozen fill must be completely removed prior to placing subsequent lifts. Breaking the frost and frozen fill in situ will not be accepted. Following removal of frozen materials, the remaining exposed surface should be compacted to a minimum of 98% of SPMDD prior to placement of new fill.
 - During periods of cold where ambient temperatures are -5° C or less, placement of engineered fill shall stop, and the existing fill materials must be protected from frost penetration.

It should be noted that the placement of engineered or structural fill materials during cold weather conditions requires extra effort beyond that typical in better climatic conditions. At any time where conditions are deemed unfavourable, the Engineered Fill operation must be suspended.

Existing native site soils that are free of organics and deleterious materials may be able to be used as Engineered Fill, however it should be noted that due to their clayey nature, controlling their moisture content and compaction may be problematic. Further assessment at the time of construction and bulk sampling should be conducted to verify suitability.

7.0 General Conditions and Limitations

This report was completed for the specific needs of the Jewell Engineering Inc. and is based on a specific scope of work which is defined in the mutually agreed upon workplan. The scope of work has limitations as described throughout the report and in the notice to reader. Data, tables, charts, and interpretive illustrations presented in this document are instruments of service for this mandate and can only be properly evaluated when reviewed together with the accompanying report. Reference to this report should only be made to the complete signed document.

By issuing this report, Malroz is the Geotechnical Engineer of Record for this project. It is recommended that Malroz be retained during construction of all foundations, for earthwork operations and for paving. The intent of this requirement is to verify conditions encountered during construction are consistent with the findings in the report and, that inherent knowledge developed as a part of our study is correctly carried forward to construction phases. We should be retained to review whether our recommendations have been applied appropriately, once drawings and specifications are complete. Without this review, Malroz will not be liable for any misunderstanding of our recommendations or their application and adaptation into final designs.

The work performed in this report was carried out in accordance with the terms and conditions made as a part of our proposal and/or contract pursuant to which this report was issued, in a manner consistent with that level of care and skill ordinarily exercised by members of the Geotechnical Engineering profession currently practicing under similar conditions in the same locality. The conclusions presented in the report are based solely upon the scope of services, governed by the time and budgetary considerations to which this work was subject.

The factual data, recommendations and comments in this report pertain to the specific project as described in the report, and are not applicable to any other project or location. If the project is conceptually modified or changes location, or if it is not initiated within twelve months of the date of this report, Malroz should be given an opportunity to confirm that the information in this report is still valid and/or applicable.

The comments in this report are intended only for the guidance of project designers and engineers. Contractors bidding on or undertaking the work should rely on their own

investigations, as well as their own interpretations of the factual borehole and in-situ test information, and how subsurface conditions may affect their work.

This report must be read as a whole, as sections taken out of context can be misleading. Drafts and working copies, whether or not marked as “draft”, “for discussion purposes” or otherwise, do not necessarily reflect Malroz’s final opinion following consideration of all matters which are subject to the study giving rise thereto; they are issued for comment and information purposes only, and are subject to change and should not be relied upon in any way or for any purpose.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based solely on the results obtained at the borehole locations only. Soil and groundwater conditions between and beyond the borehole locations may differ both horizontally and vertically from those encountered at the borehole locations and may become apparent during construction, which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found during this investigation, we request that we be notified immediately in order to permit a reassessment of our comment and recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by Malroz has been completed.

8.0 Closure

We trust that this report meets your present requirements. Please do not hesitate to contact us should there be any further questions or comments.

Respectfully Submitted,

Malroz Engineering Inc.,



per: Dylan Hill, P. Eng.
Geotechnical Engineer, Project Manager



reviewed: David Hodgson, P.Eng.
Senior Engineer, Principal

9.0 References

Canadian Geotechnical Society, 2023. Canadian Foundation Engineering Manual, 5th Edition.

Chapman, L.J. and Putnam, D.F., 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 228.

Leyland, J.G., and Russell, T.S. 1983. Quaternary Geology of the Bath-Yorkshire Island Area, Southern Ontario; Ontario Geological Survey, Preliminary Map P. 2588, Geological Series-Preliminary Map, scale 1:50 000. Geology 1982

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Appendix A

Figures



Legend

-  approximate property boundary (Lot 10)
-  approximate test pit location

D0	2025-01-17	for issue	TB	DPH
Rev	Date	Description	By	Chkd
Test Pit Location Plan				
Geotechnical Investigation and Phase I Environmental Site Assessment for Proposed Ambulance Base Jack Davey Drive, Loyalist Township, ON				
File: 1922.00		Figure 1		

Appendix B
Record of Test Pits



TEST PIT LOG

Enclosure No.: 1

Project Name: Geotechnical Investigation and P1 ESA for Proposed Ambulance Base					Project Number: 1922.00				
Client: Jewell Engineering					Test Pit Number: TP101			Page: 1 of 1	
Location: Jack Davey Drive, Loyalist Township, ON					Date Started: 2024 January 7			Datum: NAD83 UTM - Zone 18N	
Drilling Contractor: NHT Excavating					Date Finished: 2024 January 7			Elevation: 95.3 m	
Drilling Equipment: Tracked Excavator					Easting: 366097.3 m			Northing: 4898748.4 m	
Drilling and Sampling Method: Hand grab sampling					Logged By: T. Brundridge			Checked By: D. Hill	

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	Shear Strength (kPa)	✕ Combustible Vapours (%LEL)
								50100150200	1030507090
								DCPT ● SPT-N MC PL20406080LL	✱ PID (ppm) 1030507090
	95.3		TOPSOIL Brownish black, moist.						
0.2			SAND AND SILT / SILT AND SAND Some gravel, some clay, some cobbles and boulders, brown, moist g: 12%, sa: 41%, si: 36%, cl: 11%.		GS1			 110  27  S=	 nr
0.6	94.8		Test pit terminated with practical refusal on inferred limestone bedrock at 0.6 mbg.						
0.8									
1.0									
1.2									
1.4									
1.6									
1.8									

NOTES: nr: no response on the instrument or below 1% of the lower explosive limit



TEST PIT LOG

Enclosure No.: 2

Project Name: Geotechnical Investigation and P1 ESA for Proposed Ambulance Base				Project Number: 1922.00			
Client: Jewell Engineering			Test Pit Number: TP102		Page: 1 of 1		
Location: Jack Davey Drive, Loyalist Township, ON			Date Started: 2024 January 7		Datum: NAD83 UTM - Zone 18N		
Drilling Contractor: NHT Excavating			Date Finished: 2024 January 7		Elevation: 94.9 m		
Drilling Equipment: Tracked Excavator			Easting: 366114.5 m		Northing: 4898716.2 m		
Drilling and Sampling Method: Hand grab sampling			Logged By: T. Brundridge		Checked By: D. Hill		

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	Shear Strength (kPa)	☒ Combustible Vapours (%LEL)				
								50 100 150 200	10 30 50 70 90	✱ PID (ppm)			
	94.8		TOPSOIL Brownish black, moist. SAND AND SILT / SILT AND SAND Some gravel, some clay, some cobbles and boulders, brown, moist.										
0.2													
0.4													
94.3			Test pit terminated with practical refusal on inferred limestone bedrock at 0.5 mbg.										
0.6													
0.8													
1.0													
1.2													
1.4													
1.6													
1.8													

NOTES: nr: no response on the instrument or below 1% of the lower explosive limit

BOREHOLE LOG 1922.00 TP LOGS.GPJ MALROZ ENGINEERING.GDT 25-1-17



TEST PIT LOG

Enclosure No.: 3

Project Name: Geotechnical Investigation and P1 ESA for Proposed Ambulance Base					Project Number: 1922.00				
Client: Jewell Engineering					Test Pit Number: TP103			Page: 1 of 1	
Location: Jack Davey Drive, Loyalist Township, ON					Date Started: 2024 January 7			Datum: NAD83 UTM - Zone 18N	
Drilling Contractor: NHT Excavating					Date Finished: 2024 January 7			Elevation: 94.2 m	
Drilling Equipment: Tracked Excavator					Easting: 366145.1 m			Northing: 4898712.9 m	
Drilling and Sampling Method: Hand grab sampling					Logged By: T. Brundridge			Checked By: D. Hill	

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	Shear Strength (kPa)		☒ Combustible Vapours (%LEL)							
								50	100	150	200	10	30	50	70	90	
								● DCPT ● SPT-N ○ MC		PL		MC		LL		✱ PID (ppm)	
								20	40	60	80	10	30	50	70	90	
	94.2		TOPSOIL Brownish black, moist. CLAY AND SILT / SILT AND CLAY Trace sand, brown, moist g: 0%, sa: 9%, si: 50%, cl: 41%.														
0.2																	
0.4																	
0.6					GS1							120 32.5					
0.8																	
0.9	93.3		Test pit terminated with practical refusal on inferred limestone bedrock at 0.9 mbg.														
1.0																	
1.2																	
1.4																	
1.6																	
1.8																	

NOTES: nr: no response on the instrument or below 1% of the lower explosive limit

BOREHOLE LOG 1922.00 TP LOGS.GPJ MALROZ ENGINEERING GDT 25-1-17



TEST PIT LOG

Enclosure No.: 4

Project Name: Geotechnical Investigation and P1 ESA for Proposed Ambulance Base					Project Number: 1922.00				
Client: Jewell Engineering					Test Pit Number: TP104			Page: 1 of 1	
Location: Jack Davey Drive, Loyalist Township, ON					Date Started: 2024 January 7			Datum: NAD83 UTM - Zone 18N	
Drilling Contractor: NHT Excavating					Date Finished: 2024 January 7			Elevation: 94.7 m	
Drilling Equipment: Tracked Excavator					Easting: 366140.8 m			Northing: 4898741.4 m	
Drilling and Sampling Method: Hand grab sampling					Logged By: T. Brundridge			Checked By: D. Hill	

Depth BGS (m)	Elevation (m)	Stratigraphy	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	Shear Strength (kPa)		✕ Combustible Vapours (%LEL)								
								50	100	150	200	10	30	50	70	90		
								■ DCPT ● SPT-N ○ MC		✱ PID (ppm)								
								PL	MC	LL								
								20	40	60	80							
								△ S=	22									
																		</

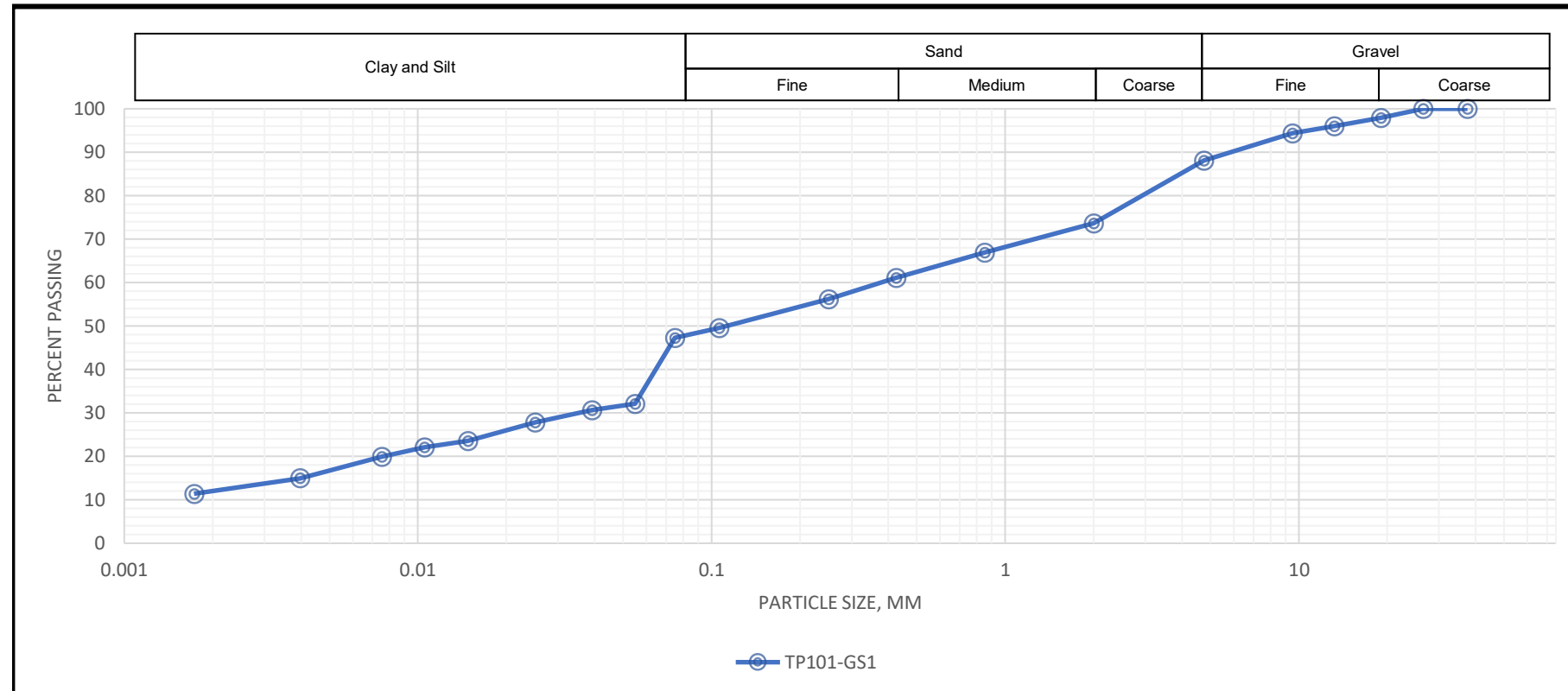
NOTES: nr: no response on the instrument or below 1% of the lower explosive limit

BOREHOLE LOG 1922.00 TP LOGS.GPJ MALROZ ENGINEERING GDT 25-1-17

Appendix C

Geotechnical Laboratory Results

Particle Size Analysis (LS-702)



Clay (%)	Silt (%)	Sand (%)	Gravel (%)
11	36	41	12
SAND and SILT, some gravel, some clay			

Lab No.: SA25-003A

Tested: TB

Project No.: 1922

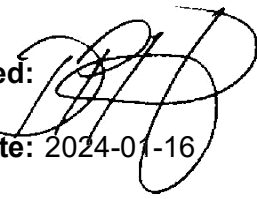
Date: 2024-01-09

Sample ID: TP101-GS1

Location: L&A Ambulance Base

Client: Jewell Engineering

Notes: Additional information available upon request

Validated: 

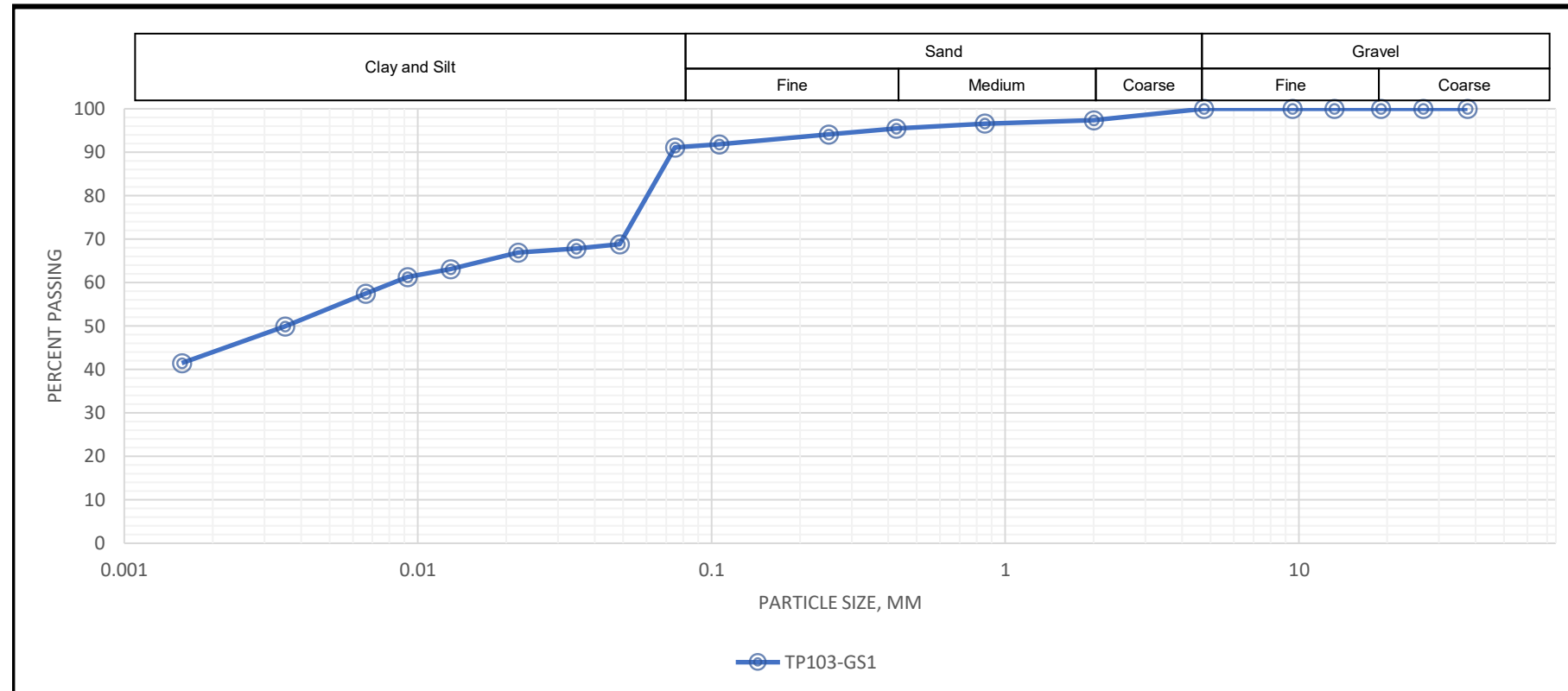
Date: 2024-01-16

Supplementary Data:

Volume of bulb, V_B (cm³) 57
Length of Bulb, L_2 (cm) 13.60
Scale Dimension, h_s (cm/Div.) 0.18
Maximum Particle Size (mm): 19

Specific Gravity, GS (assumed): 2.7
Dispersing Agent (g/L): 40
Area of Cylinder, A (cm²) 28.3
0' to Top of Bulb, L_1 (cm) 11.0

Particle Size Analysis (LS-702)



Clay (%)	Silt (%)	Sand (%)	Gravel (%)
41	50	9	0
SILT and CLAY, trace sand			

Lab No.: SA25-003B

Tested: TB

Project No.: 1922

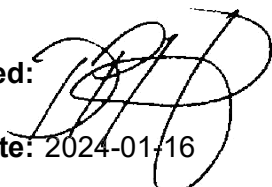
Date: 2024-01-09

Sample ID: TP103-GS1

Location: L&A Ambulance Base

Client: Jewell Engineering

Notes: Additional information available upon request

Validated: 

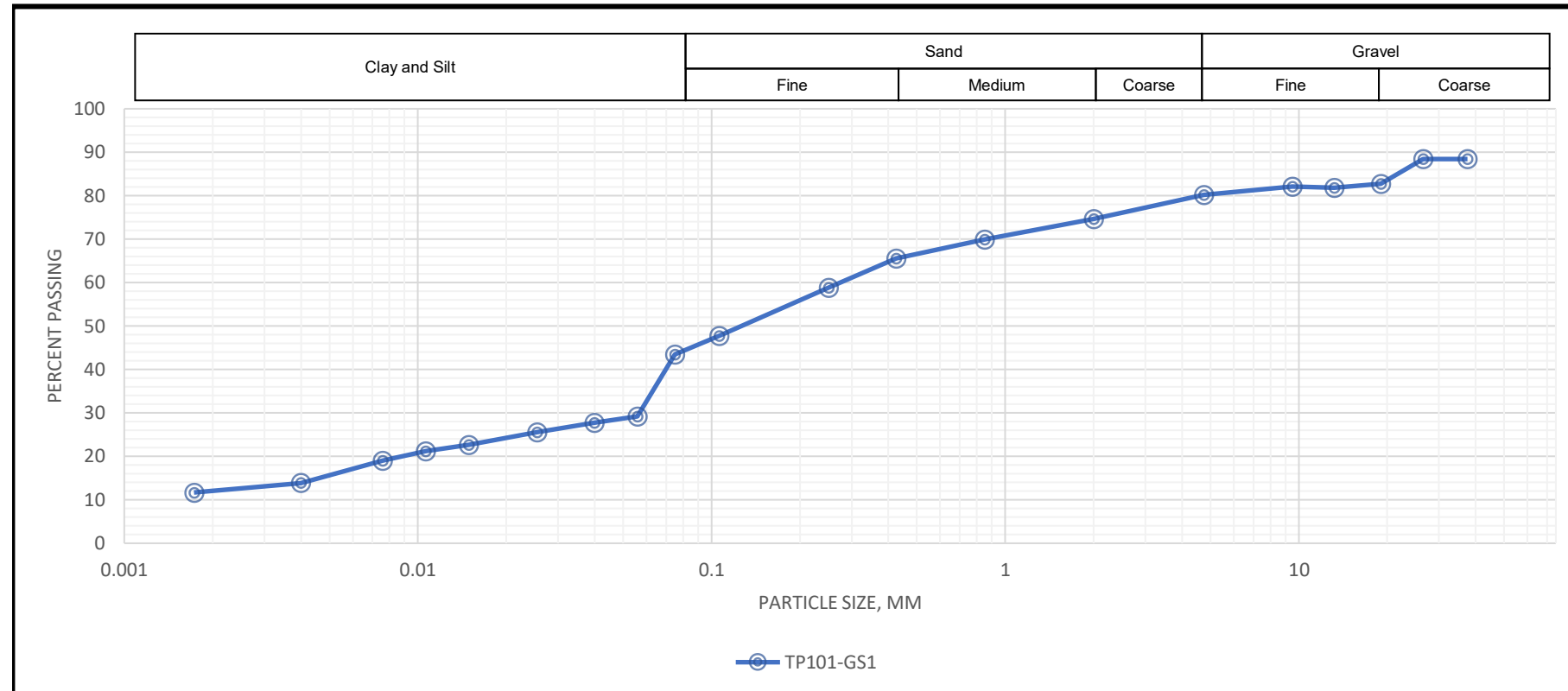
Date: 2024-01-16

Supplementary Data:

Volume of bulb, V_B (cm³) 57
Length of Bulb, L_2 (cm) 13.60
Scale Dimension, h_s (cm/Div.) 0.18
Maximum Particle Size (mm): 19

Specific Gravity, GS (assumed): 2.7
Dispersing Agent (g/L): 40
Area of Cylinder, A (cm²) 28.3
0' to Top of Bulb, L_1 (cm) 11.0

Particle Size Analysis (LS-702)



Clay (%)	Silt (%)	Sand (%)	Gravel (%)
12	31	37	20
silty SAND, some gravel, some clay			

Lab No.: SA25-003C

Tested: TB

Project No.: 1922

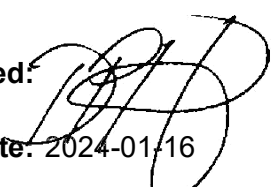
Date: 2024-01-09

Sample ID: TP101-GS1

Location: L&A Ambulance Base

Client: Jewell Engineering

Notes: Additional information available upon request

Validated: 

Date: 2024-01-16

Supplementary Data:

Volume of bulb, V_B (cm³) 57
Length of Bulb, L_2 (cm) 13.60
Scale Dimension, h_s (cm/Div.) 0.18
Maximum Particle Size (mm): 19

Specific Gravity, G_S (assumed): 2.7
Dispersing Agent (g/L): 40
Area of Cylinder, A (cm²) 28.3
0' to Top of Bulb, L_1 (cm) 11.0