



July 21, 2022

Mr. Chris Jones  
Hillsborough County Division Director  
Field Maintenance Services  
Water Resources Department  
334 N. Falkenburg Road  
Tampa, FL 33619

**Re: Ground Stability Assessment – Post Stabilization  
Symmes Road Lift Station  
10837 Symmes Road, Riverview, FL 33534**

Dear Mr. Jones

Further to your recent request, Integrity Drilling & Geophysical Services, LLC (IDGS) is pleased to present you with this brief report detailing the findings of our Post-Stabilization Ground Stability Assessment for the lift station structure located close to 10837 Symmes Road in Riverview, Hillsborough County, Florida. This report updates our initial Ground Stability Assessment (provided to you under cover of our letter date June 15, 2022) and describes additional ground investigation carried out after the completion of polymer stabilization.

## **PROJECT UNDERSTANDING**

The wet well slab at the Symmes Road Lift Station subsided by about 4 inches and requires repair. The well is around 8-feet in diameter and extends to a depth of 30-feet below surface. Our initial exploration revealed that the upper 10-feet of the soil profile consisted of loose to medium dense clean sands. Below about 13.5-feet depth, the soils became looser, and our Standard Penetration Test (SPT) boring B-1 found very loose (Weight of Rod strength) sandy soils between 18.5 and 28.5-feet depth (rod drop and loss of circulation indicative of subterranean void space). The soils in SPT B-2 and in the Advanced Continuous Surface Wave (ACSW) tests outside of the lift station were also looser between 18.5 and 28.5-feet depth, but no void space was indicated.

Subsequently, a stabilization program was initiated utilizing the patented Deep Horizons Injection Grouting (DHIG) system of polymer injection offered by Polymer Technologies, Inc. and deployed by Foundation Professionals of Florida, Inc. Between June 21 and July 1, 2022, a total of 2,623 gallons of polymer were injected beneath and around the wet well through four injection points, with treatment commencing at depths of between 32 and 41-feet below surface.

## FIELDWORK

IDGS carried out a non-intrusive and intrusive post-stabilization ground investigation around the lift station on Thursday July 14, 2022. Three (3) SPT soil borings were advanced to depths of between 40 and 50-feet below surface in general accordance with the procedures of ASTM-D-1586. Hand auger excavation was carried out in the upper four feet as a precaution against utilities not marked by the utility locate company. Continuous sampling was performed to a depth of 10 feet, to detect variations in the soil profile at shallow depths, followed by sampling at 5-feet-on-center to the boring termination depths.

The basic procedure for the Standard Penetration Test is as follows: A standard split-barrel sampler is driven into the soil by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler 1-foot, after seating 6 inches, is designated the penetration resistance, or N-value; this value is an index to soil strength and consistency.

Soil samples were collected and transported in sealed glass jars to our laboratory for further classification and testing. The soil samples were visually classified in general accordance with ASTM D 2488. Samples will remain in our custody for 60 days after original exploration, after which, the samples will be discarded. Longer storage periods can be accommodated at your request. The boring logs are presented in Attachment B.

The ACSW seismic technique was used to determine the shear wave velocity characteristics of the in-situ soils around the structure. A total of seven (7) ACSW tests were completed, giving a layered profile of shear wave velocity to a depth of up to around 45-feet below surface. The test locations are indicated on the Site Plan in Attachment A to this report, which also indicates the locations of the SPT borings. ACSW tests CSW08 through CSW14 were completed using the same geophone arrays as the initial pre-stabilization tests, to allow stiffness comparisons to be made.

ACSW testing carried out by IDGS is a proprietary engineering testing system developed by Ground Stiffness Surveys LLC (GSS) based on the general methodology for Continuous Surface Wave testing set out in Heymann, 2007<sup>1</sup>. Surface Rayleigh wave velocities over a range of frequencies are accurately measured using a short array of geophones to produce a *dispersion curve* plot of Rayleigh wave velocity ( $v_r$ ) against frequency. These data can then be used to generate a reliable shear wave velocity ( $v_s$ ) with depth profile, which in turn can be converted to a stiffness profile using standard relationships.

For a layered deposit with increasing stiffness with depth (a '*normally dispersive*' profile), the form of the dispersion curve should be an even polynomial curve with a single inflection point within the lower frequencies. Changes from this form can indicate, for example, where significantly stiffer or softer layers are present (an '*inversely dispersive*' profile). Very rapid oscillations or breaks in the profile can

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<sup>1</sup> Heymann, G. (2007) Ground stiffness measurement by the continuous surface wave test. *Journal of the South African Institution of Civil Engineering*. Vol.49, No.1, p25-31.

indicate the presence of sharp stiffness contrast boundaries, which cannot be addressed by the available advanced inversion analysis methods but are reported when assessing the quality of data.

*Advanced inversion* of the ACSW data involves the generation of a layered stiffness profile from the dispersion curve data. Published algorithms, selected depending on the extent of *multimodal* data, are used to generate a *synthetic dispersion curve* from an assumed ground profile, which is then compared with the *field dispersion curve* using standard model constraints in line with guidance given in Foti *et al* 2017<sup>2</sup>. An appropriate automatic iterative search methodology is then selected, which refines the model until the minimum statistical misfit between the field and synthetic dispersion curve is achieved. Checks are made in the modelling process against the *simple inversion* profile, adjacent test locations and, where available, any information on known ground profiles.

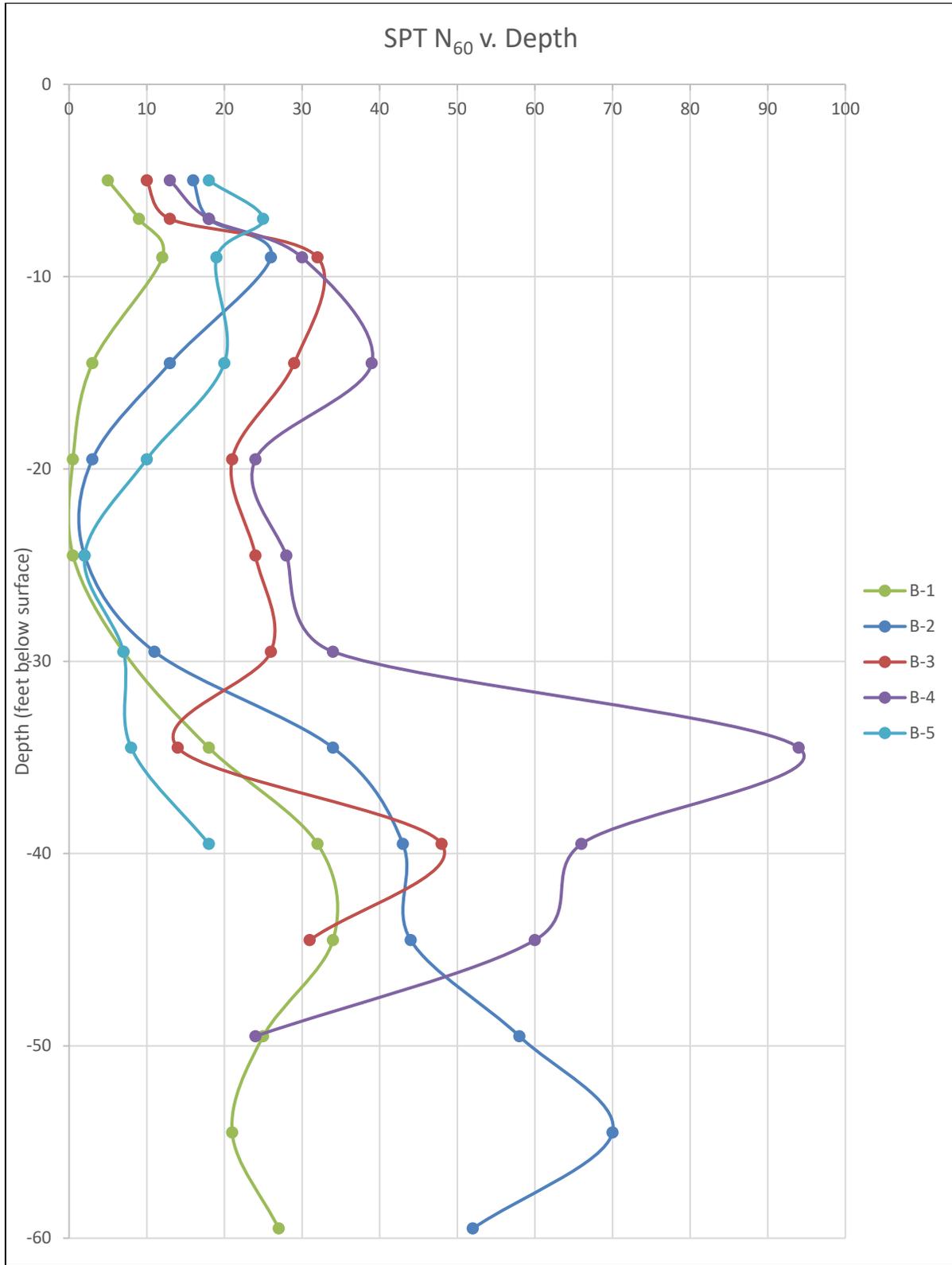
Graphs of  $v_s$  against depth for the ACSW data collected at the Symmes Road Lift Station pre- and post-stabilization are included in Attachment B.

## FINDINGS

Figure 1 below illustrates a graphical representation of SPT N-value against depth for the pre-stabilization (B-1 & B-2) and post-stabilization (B-3 through B-5) SPT borings. Note that in the former zone of rod drop found in B-1 between 18.5- and 28.5-foot depth, the post-stabilization borings B-3 and B-4 record medium dense soil conditions. Samples of polymer up to 120 mm in length were retrieved from the split spoon during sampling:

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<sup>2</sup> Foti, S. *et al.* (2017) Guidelines for the good practice of surface wave analysis: a product of the InterPACIFIC project *Bull Earthquake Eng* DOI 10.1007/s10518-017-0206-7



**Figure 1 – SPT N<sub>60</sub> vs. Depth (Pre- and Post-Treatment)**



**Plate 1 – Polymer Retrieved in Split Spoon Boring B-3 from 23.5 to 25-feet below grade  
(N=24 medium dense – previously WR)**



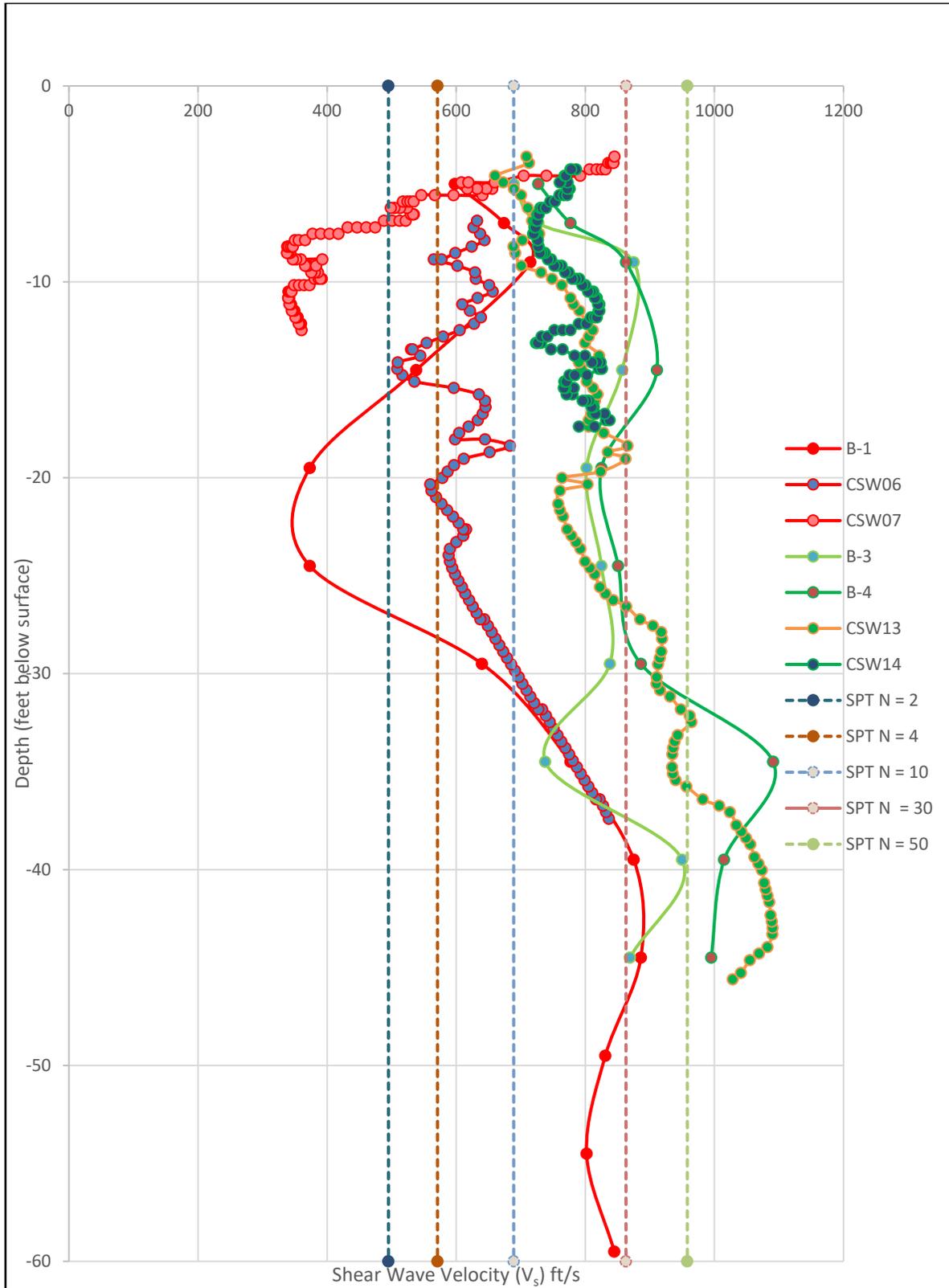
**Plate 2 – Close up of Polymer retrieved from SPT at 25-feet**

Figure 2 presents  $v_s$  values measured during ACSW testing within the area of soil stabilization plotted against depth below surface. The graph includes vertical marker bars showing  $v_s$  derived equivalent SPT  $N_{60}$  values (using the Hasancebi & Ulusay<sup>3</sup> correlation) together with  $v_s$  values derived from SPT borings B-1, B-3 and B-4 using the same correlation, allowing a relative soil density against depth profile to be visualized for both techniques. The pre-treatment results are shown in “red” while the post-treatment results are shown in “green”.

CSW13 was carried out post stabilization at the location of CSW06. Similarly, CSW14 was carried out post-stabilization at the location of CSW07. The ACSW system determines a “bulk” soil stiffness across the 10-foot-long surface geophone array, so is less sensitive to individual solid polymer layers than the SPT sampler spoon. Both CSW13 and CSW14 show an increase from a “very loose to loose” condition pre-treatment to a “medium dense to dense” condition post-treatment:

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<sup>3</sup> Hasancebi, N. and R. Ulusay, 2007. Empirical correlations between shear wave velocity and penetration resistance for ground shaking assessments. Bull. Eng. Geology and the Environment, **66**: 203 - 213.



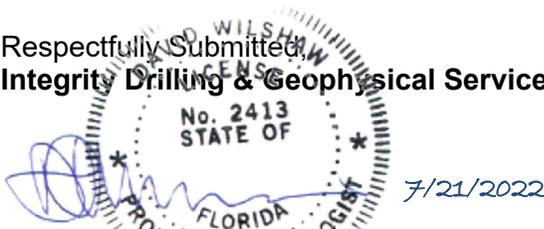
**Figure 2 Shear Wave Velocity vs. Depth (Pre- and Post-Treatment)**

Outside of the lift station footprint, there was generally negligible change in soil stiffness visible in either SPT boring B-5 or in the ACSW testing. There was some evidence of a reduction in stiffness beyond the southeast corner of the pad in CSW09 and some evidence of soil stiffening at the southwest corner in CSW12. Reductions in stiffness could be attributed to changes in stress distribution (arching stresses) and pore pressures in the soils surrounding the voided ground that has now been stabilized. Localized increases in stiffness likely represent nearby grout replacement and soil compaction during polymer injection.

Against this background, we can confirm that the very loose (WR) soil conditions found prior to soil stabilization no longer exist, based upon the findings of our post-stabilization ground investigation, and that the ground surrounding the Symmes Road Lift Station is now stable.

Please do not hesitate to contact us with any questions you may have, or if IDGS can be of additional service.

Respectfully Submitted,  
**Integrity Drilling & Geophysical Services, LLC**



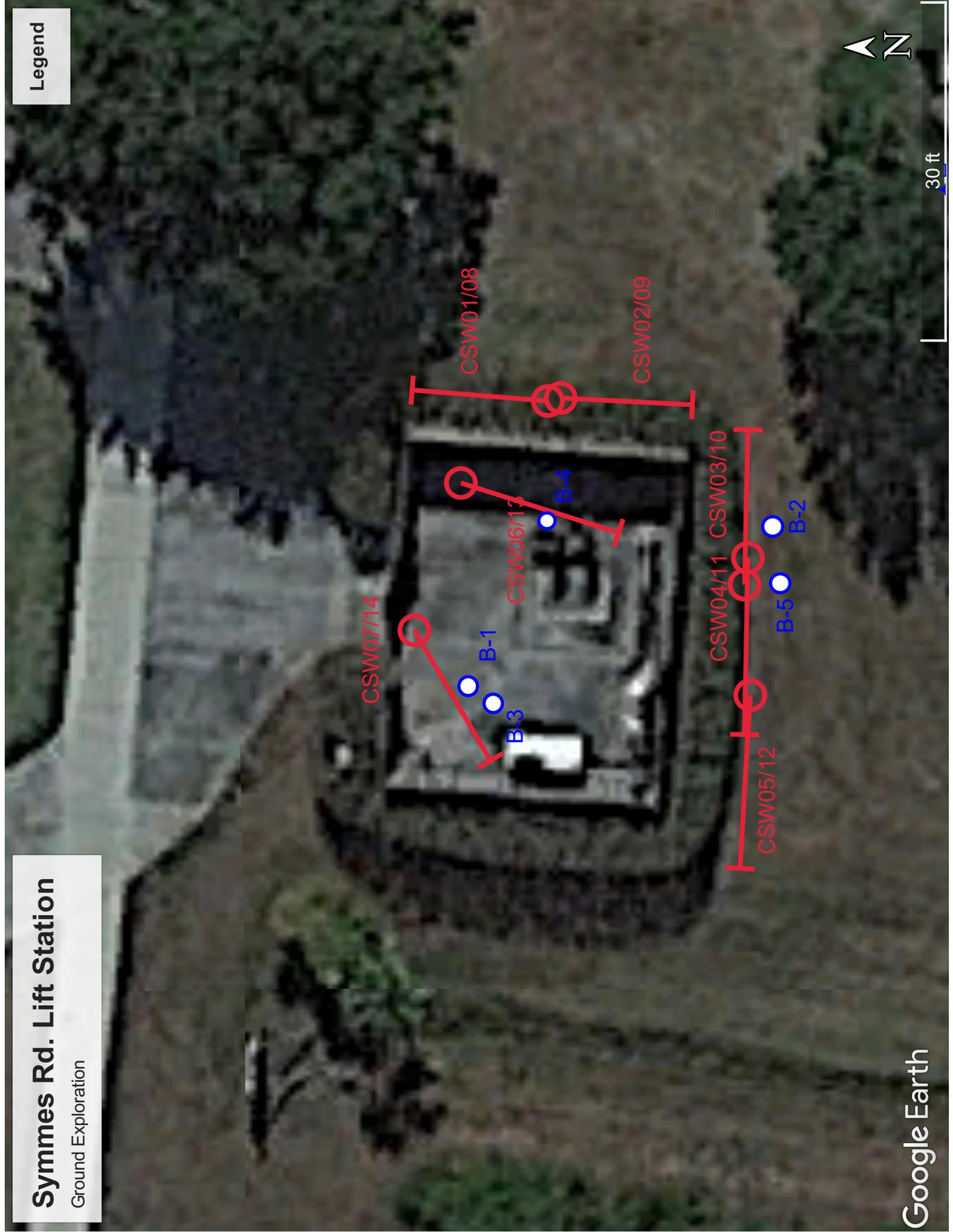
David Wilshaw, M.S., P.E.  
Principal Engineering Geologist  
Florida License No. 2413

**ATTACHMENT A**  
**ACSW Test & SPT Boring Locations**

# Symmes Rd. Lift Station

Ground Exploration

Legend



**ATTACHMENT B**

**SPT Boring Logs**

**ACSW Plots of  $v_s$  against Depth**



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1506 Max Hooks Road, Suite: C  
Groveland, FL 34736  
Telephone: 866-670-6066

# BORING NUMBER B-1

PAGE 1 OF 1

**CLIENT** Hillsborough County  
**PROJECT NUMBER** 7493  
**DATE STARTED** 6/14/22 **COMPLETED** 6/14/22  
**DRILLING CONTRACTOR** Integrity Drilling & Geophysical Services, LLC  
**DRILLING METHOD** Rotary Wash / Standard Penetration Test  
**LOGGED BY** David Wilshaw MS, PG **CHECKED BY**  
**PROJECT NAME** Symmes Road Lift Station  
**PROJECT LOCATION** 10837 Symmes Road, Riverview, FL  
**GROUND ELEVATION** \_\_\_\_\_ **HOLE SIZE** 3 inches  
**GROUND WATER LEVELS:**  
**AT TIME OF DRILLING** ---  
**NOTES** Groundwater not encountered in top 10-feet

IDGS LOG - GINT STD US LAB.GDT - 7/19/22 16:28 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\SYMMESS ROAD LIFT STATION.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	▲ SPT N VALUE ▲				REMARKS
					20	40	60	80	
0		Concrete slab cored and patched.							
0-5		Brown and dark brown fine SAND (SP)	AU-1						
5-10		Loose brown fine SAND (SP)	AU-2						
10-15		...medium dense	SPT-3	4-2-3-3	▲5				
			SPT-4	6-4-5-7	▲9				
			SPT-5	5-7-5-6	▲12				
15-20		Very loose brown and dark brown fine SAND (SP)	SPT-6	0-1-2	▲3				WH in seating drive
20-28.5			SPT-7	0-0-0-0	▲0				WR from 18.5 to 28.5 feet. Pull spoon and drill out to 28.5-ft sample. LOC at 18.5-feet
30-35		Loose dark brown and brown fine SAND with silt (SP-SM).	SPT-8	2-3-4	▲7				
35-40		...medium dense	SPT-9	5-5-13	▲18				
40-45		...dense	SPT-10	16-14-18	▲32				Run steel casing to 42-foot depth. Intermittent LOC after casing.
45-50			SPT-11	14-15-19	▲34				
50-55		...medium dense	SPT-12	9-11-14	▲25				
55-60			SPT-13	10-10-11	▲21				
60			SPT-14	11-12-15	▲27				

**LEGEND:** Auger Cuttings Standard Penetration Test at 60.0 feet. \* Equivalent N or Q<sub>u</sub> Value from Cone Penetrometer Test WH= Weight of Hammer WR= Weight of Rods



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# BORING NUMBER B-2

PAGE 1 OF 1

**CLIENT** Hillsborough County      **PROJECT NAME** Symmes Road Lift Station  
**PROJECT NUMBER** 7493      **PROJECT LOCATION** 10837 Symmes Road, Riverview, FL  
**DATE STARTED** 6/14/22      **COMPLETED** 6/14/22      **GROUND ELEVATION** \_\_\_\_\_      **HOLE SIZE** 3 inches  
**DRILLING CONTRACTOR** Integrity Drilling & Geophysical Services, LLC      **GROUND WATER LEVELS:**  
**DRILLING METHOD** Rotary Wash / Standard Penetration Test      **AT TIME OF DRILLING** ---  
**LOGGED BY** David Wilshaw MS, PG      **CHECKED BY** \_\_\_\_\_      **NOTES** Groundwater not encountered in top 10-feet

IDGS LOG - GINT STD US LAB.GDT - 7/19/22 16:28 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\SYMMESS ROAD LIFT STATION.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	▲ SPT N VALUE ▲				REMARKS
					20	40	60	80	
0		Dark brown fine SAND (SP)	AU-1						
			AU-2						
5		Medium dense dark brown and brown fine SAND (SP)	SPT-3	10-10-6-13		16			
			SPT-4	11-9-9-12		18			
10			SPT-5	12-12-14-13		26			
15		Medium dense dark brown and brown fine SAND (SP)	SPT-6	8-6-7		13			
20		...very loose	SPT-7	1-1-2		3			
25			SPT-8	1-1-1		2			
30		...medium dense	SPT-9	6-4-7		11			
35		Dense dark brown and brown fine SAND with silt (SP-SM)	SPT-10	5-16-18		34			
40			SPT-11	14-17-26		43			
45			SPT-12	17-20-24		44			
50		...very dense (hardpan)	SPT-13	19-26-32		58			
55			SPT-14	21-36-34		70			
60			SPT-15	22-25-27		52			

**LEGEND:** Auger Cuttings      Standard Penetration Test at 60.0 feet.      \* Equivalent N or Q<sub>u</sub> Value from Cone Penetrometer Test      WH= Weight of Hammer      WR= Weight of Rods



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# BORING NUMBER B-3

PAGE 1 OF 1

**CLIENT** Hillsborough County **PROJECT NAME** Symmes Road Lift Station  
**PROJECT NUMBER** 7493 **PROJECT LOCATION** 10837 Symmes Road, Riverview, FL  
**DATE STARTED** 7/14/22 **COMPLETED** 7/14/22 **GROUND ELEVATION** \_\_\_\_\_ **HOLE SIZE** 3 inches  
**DRILLING CONTRACTOR** Integrity Drilling & Geophysical Services, LLC **GROUND WATER LEVELS:**  
**DRILLING METHOD** Rotary Wash / Standard Penetration Test **AT TIME OF DRILLING** ---  
**LOGGED BY** David Wilshaw MS, PG **CHECKED BY** \_\_\_\_\_ **NOTES** Groundwater not encountered in top 10-feet

IDGS LOG - GINT STD US LAB.GDT - 7/19/22 16:28 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\SYMMESS ROAD LIFT STATION.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	▲ SPT N VALUE ▲				REMARKS
					20	40	60	80	
0		Concrete slab cored and patched							
0-4		Brown and dark brown fine SAND (SP) with fragments of white polymer	AU-1						
4-5		Loose brown fine SAND (SP)	AU-2						
5-6		...medium dense	SPT-3	6-6-4-4	▲10				
6-7			SPT-4	5-6-7-10	▲13				
7-10		Dense dark brown fine SAND (SP)	SPT-5	10-14-18-22	▲32				
10-15		Medium dense brown and dark brown fine SAND (SP) with polymer fragments up to 40mm long (full diameter of split spoon)	SPT-6	7-12-17	▲29				
15-20		Medium dense dark brown and brown fine SAND (SP)	SPT-7	5-10-11	▲21				
20-25		Medium dense dark brown fine SAND (SP) with polymer fragments up to 120mm (full diameter of split spoon)	SPT-8	10-13-11	▲24				
25-30		Medium dense dark gray brown fine SAND with silt (SP-SM) with polymer fragments up to 30mm long (full diameter of split spoon)	SPT-9	10-11-15	▲26				
30-35		Medium dense dark brown and brown fine SAND with silt (SP-SM)	SPT-10	3-3-11	▲14				
35-40		Dense dark brown silty fine SAND (SM)	SPT-11	11-21-27	▲48				
40-45			SPT-12	15-16-15	▲31				

Bottom of borehole at 45.0 feet.

**LEGEND:**



Auger Cuttings

Standard Penetration Test

\* Equivalent N or Q<sub>v</sub> Value from Cone Penetrometer Test

WH= Weight of Hammer  
WR= Weight of Rods



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# BORING NUMBER B-4

PAGE 1 OF 1

**CLIENT** Hillsborough County **PROJECT NAME** Symmes Road Lift Station  
**PROJECT NUMBER** 7493 **PROJECT LOCATION** 10837 Symmes Road, Riverview, FL  
**DATE STARTED** 7/14/22 **COMPLETED** 7/14/22 **GROUND ELEVATION** \_\_\_\_\_ **HOLE SIZE** 3 inches  
**DRILLING CONTRACTOR** Integrity Drilling & Geophysical Services, LLC **GROUND WATER LEVELS:**  
**DRILLING METHOD** Rotary Wash / Standard Penetration Test **AT TIME OF DRILLING** ---  
**LOGGED BY** David Wilshaw MS, PG **CHECKED BY** \_\_\_\_\_ **NOTES** Groundwater not encountered in top 10-feet

IDGS LOG - GINT STD US LAB.GDT - 7/19/22 16:28 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\SYMMESS ROAD LIFT STATION.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	▲ SPT N VALUE ▲				REMARKS
					20	40	60	80	
0		Concrete slab cored and patched							
0-1		Dark brown fine SAND (SP)	AU-1						
1-2		Dark brown fine SAND (SP) with abundant white polymer	AU-2						
2-3		Medium dense brown fine SAND (SP) with polymer fragments up to 80mm (full diameter of split spoon)	SPT-3	5-6-7-8	▲13				
3-4			SPT-4	6-9-9-13	▲18				
4-5			SPT-5	11-13-17-28	▲30				
5-10		...dense							
10-11			SPT-6	10-17-22	▲39				
11-20		Medium dense brown fine SAND (SP)							
20-21			SPT-7	8-10-14	▲24				
21-25		Medium dense dark gray brown fine SAND with silt (SP-SM) with gravel sized polymer fragments up to 20mm diameter							
25-26			SPT-8	8-12-16	▲28				
26-30		Dense dark gray brown fine SAND with silt (SP-SM)							
30-31			SPT-9	10-16-18	▲34				
31-35		...very dense							
35-36			SPT-10	24-44-50/5"	>>>▲50/5"				
36-40			SPT-11	18-27-39	▲66				
40-45			SPT-12	16-27-33	▲60				
45-50		Medium dense dark brown fine SAND with silt (SP-SM)							
50-51			SPT-13	9-11-14	▲25				

Bottom of borehole at 50.0 feet.

**LEGEND:** Auger Cuttings Standard Penetration Test  
 \* Equivalent N or Q<sub>u</sub> Value from Cone Penetrometer Test WH= Weight of Hammer WR= Weight of Rods



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# BORING NUMBER B-5

PAGE 1 OF 1

**CLIENT** Hillsborough County      **PROJECT NAME** Symmes Road Lift Station  
**PROJECT NUMBER** 7493      **PROJECT LOCATION** 10837 Symmes Road, Riverview, FL  
**DATE STARTED** 7/14/22      **COMPLETED** 7/14/22      **GROUND ELEVATION** \_\_\_\_\_      **HOLE SIZE** 3 inches  
**DRILLING CONTRACTOR** Integrity Drilling & Geophysical Services, LLC      **GROUND WATER LEVELS:**  
**DRILLING METHOD** Rotary Wash / Standard Penetration Test      **AT TIME OF DRILLING** ---  
**LOGGED BY** David Wilshaw MS, PG      **CHECKED BY** \_\_\_\_\_      **NOTES** Groundwater not encountered in top 10-feet

IDGS LOG - GINT STD US LAB.GDT - 7/19/22 16:28 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\SYMMES ROAD LIFT STATION.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	▲ SPT N VALUE ▲				REMARKS
					20	40	60	80	
0		Brown fine SAND (SP)	AU-1						
			AU-2						
5		Medium dense dark brown and brown fine SAND (SP)	SPT-3	6-7-11-13				18	
			SPT-4	12-14-11-11				25	
10			SPT-5	11-10-9-11				19	
15		Medium dense dark brown fine SAND (SP)	SPT-6	9-10-10				20	
20		...loose	SPT-7	4-4-6				10	
25		...very loose	SPT-8	1-1-1				2	
30		...loose	SPT-9	3-4-3				7	
35		Loose dark grayish brown fine SAND with silt (SP-SM)	SPT-10	3-3-5				8	
40		...medium dense	SPT-11	5-7-11				18	

Bottom of borehole at 40.0 feet.

**LEGEND:**

- Auger Cuttings
- Standard Penetration Test

\* Equivalent N or  $Q_u$  Value from Cone Penetrometer Test      WH= Weight of Hammer  
WR= Weight of Rods

# BORING LOG TERMINOLOGY

## KEY TO SOIL SYMBOLS & TERMS



### SOIL CLASSIFICATION CHART

	GW	Well-graded gravels (gravel sand mixtures).
	GP	Poorly graded gravels (gravel sand mixtures).
	GM	Silty gravels (gravel-sand-silt mixtures).
	GC	Clay gravels (gravel-sand-clayey mixtures).
	SW	Well-graded sands (gravel sands).
	SP	Poorly graded sands (gravelly sands).
	SM	Silty sands (sand-silt mixtures).
	SC	Clayey sands (sand-clayey mixtures).
	ML	Inorganic silts with very fine sands (rock, flour, silty or clayey fine sands or clayey silts with slight plasticity).
	CL	Inorganic clays of low to medium plasticity (gravelly clays, sandy clays, silty clays, lean clays).
	OL	Organic silts and organic silty clays of low plasticity.
	MH	Inorganic silty, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
	CH	Inorganic clays of high plasticity, fat clays.
	OH	Organic clays of medium to high plasticity, organic silts.
	PT	Peat and other highly organic soils.

### Criteria For Descriptors

#### Consistency of Fine Grained Soils

Consistency	N-Value (uncorrected)
Very Soft	<2
Soft	2-4
Medium Stiff	5-8
Stiff	9-15
Very Stiff	16-30
Hard	>30

#### Apparent Density of Coarse Grained Soils

Relative Density	N-Value (uncorrected)
Very Loose	<4
Loose	4-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

### Criteria For Descriptors

#### Grain Size

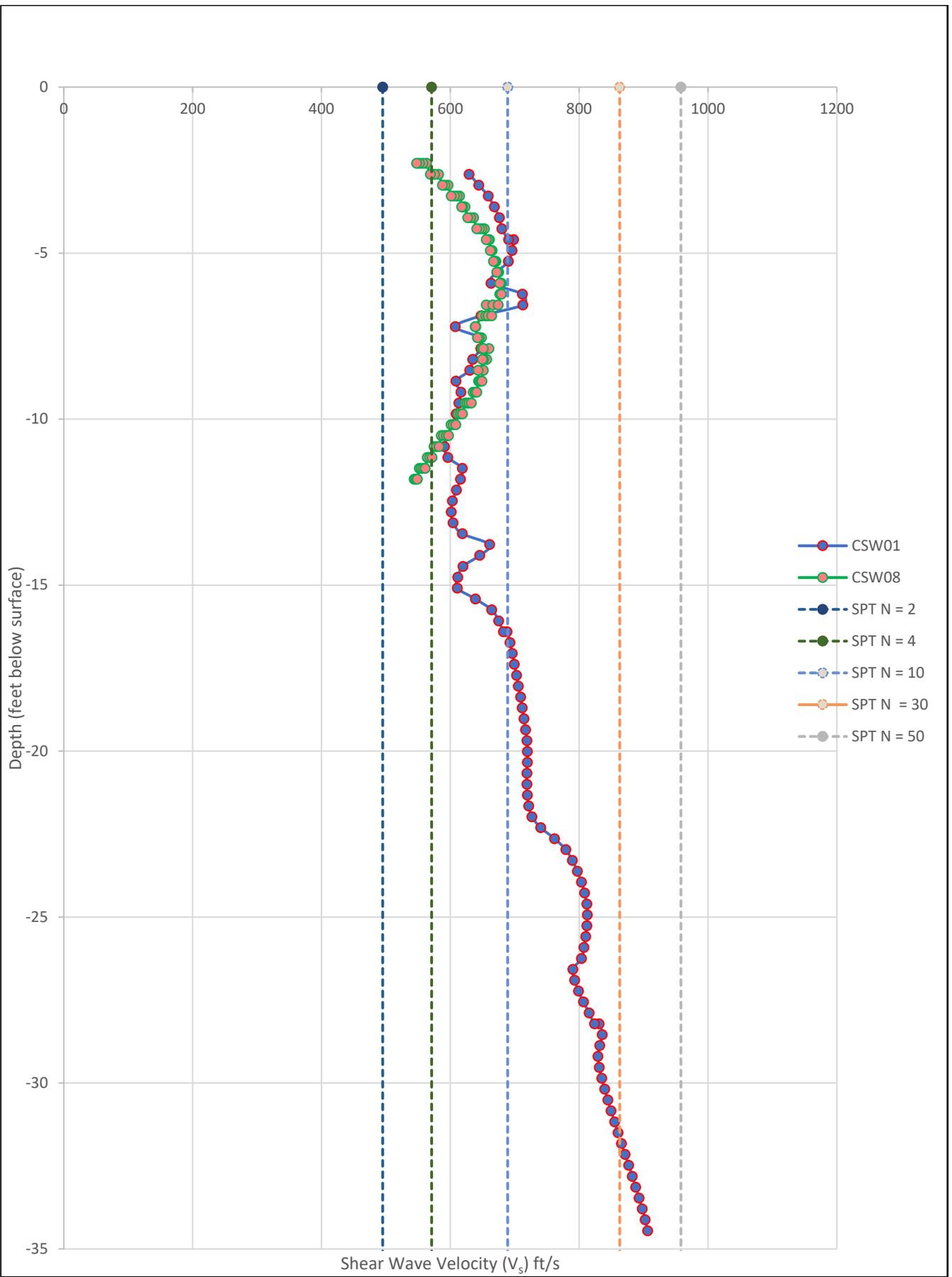
Description	Characteristic
Coarse Grained	Individual grains can be easily distinguished by eye
Fine Grained	Individual grains can be distinguished with difficulty

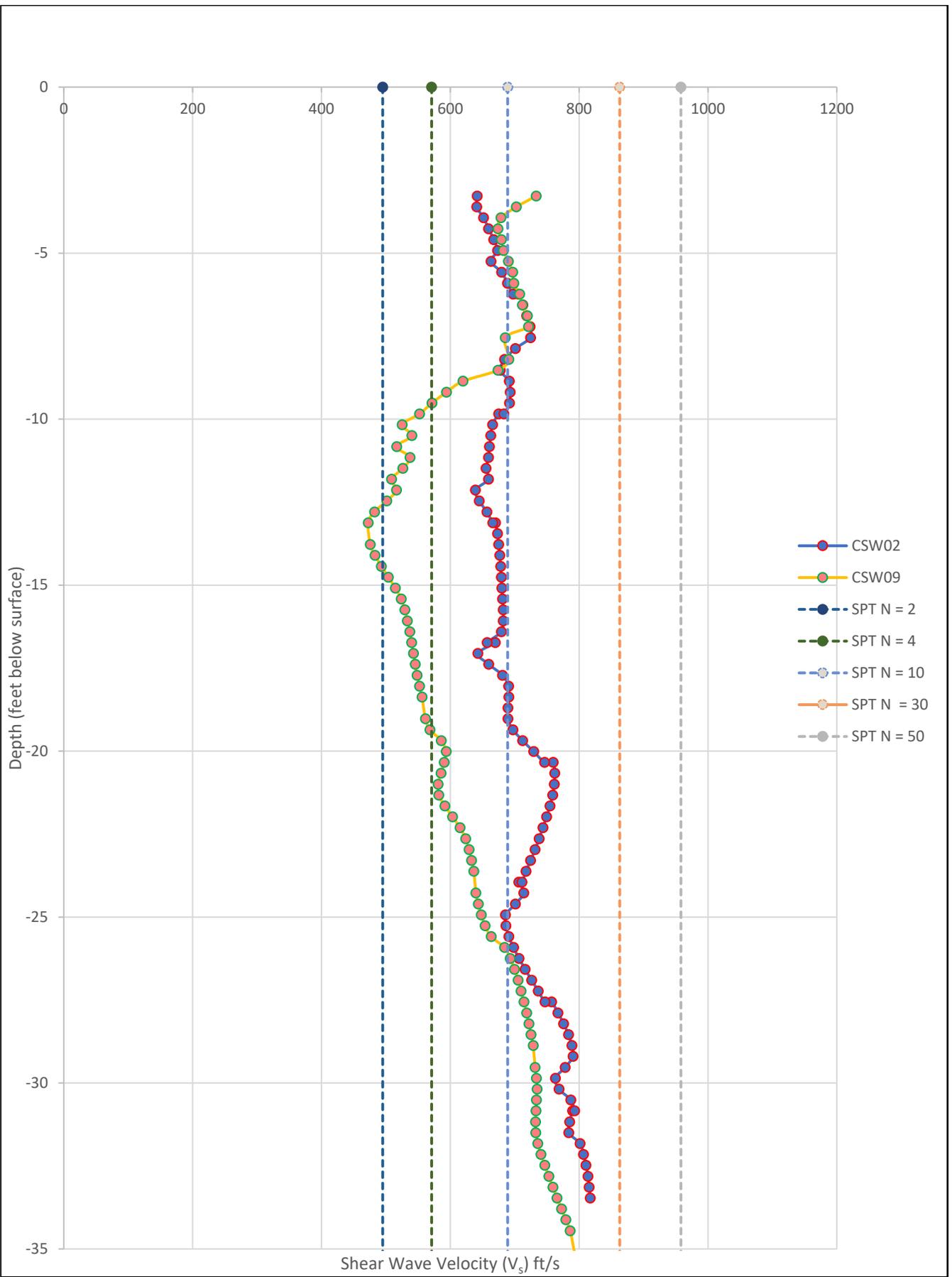
### ROCK CLASSIFICATION CHART

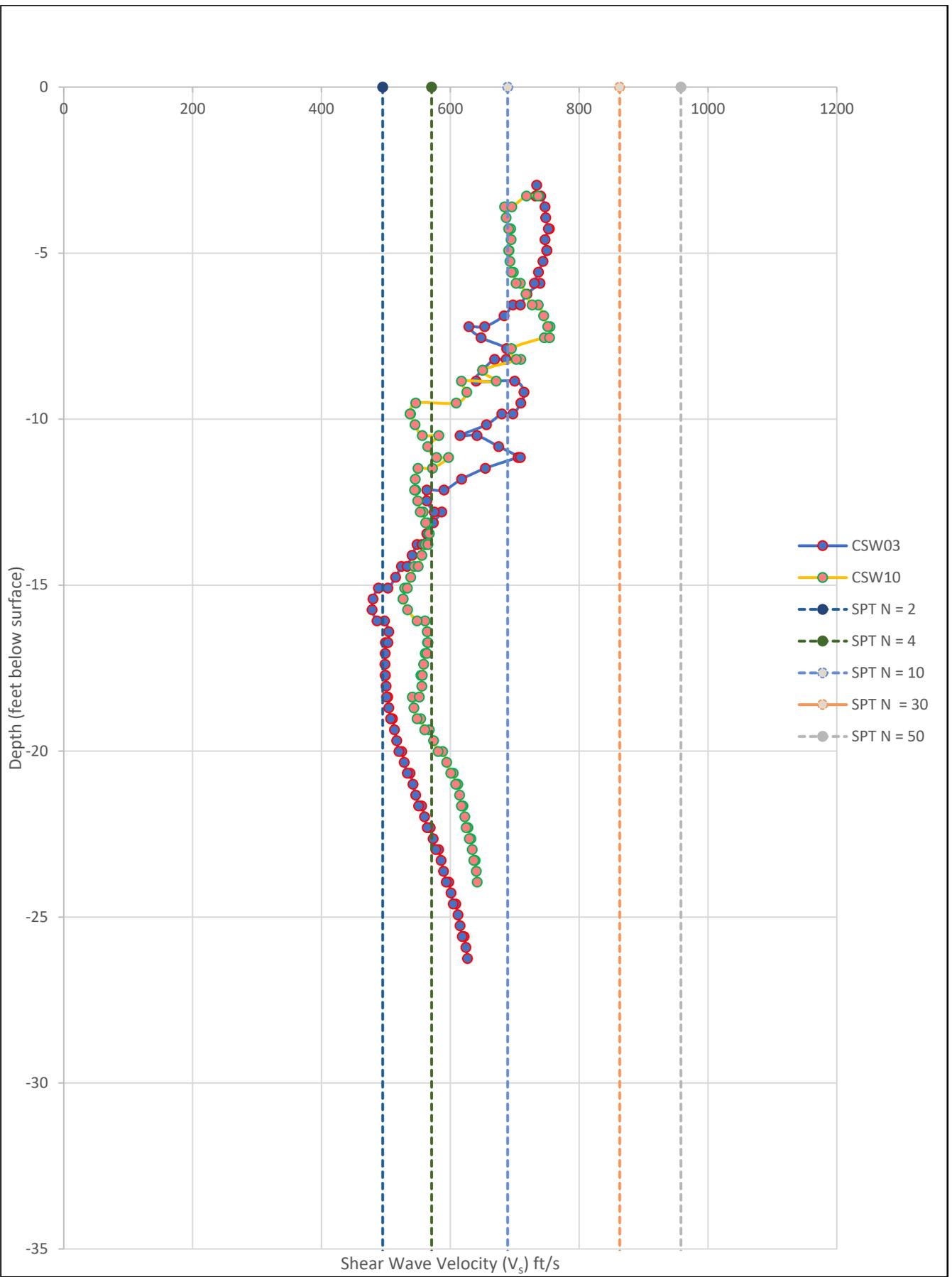
	Limestone		Concrete
	Siltstone		Fill
	Conglomerate		Topsoil
	Claystone		Asphalt

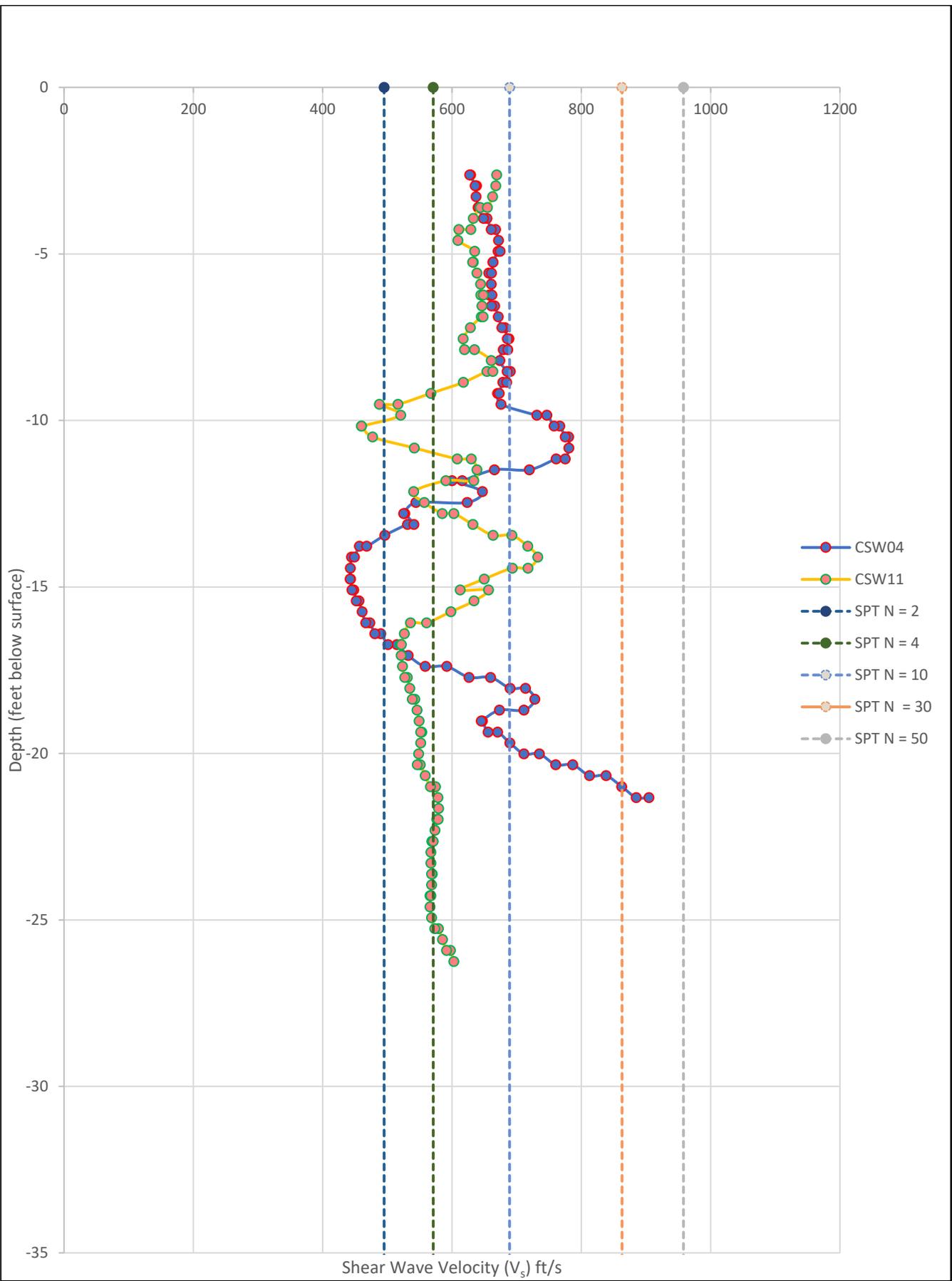
### Stratum Thickness

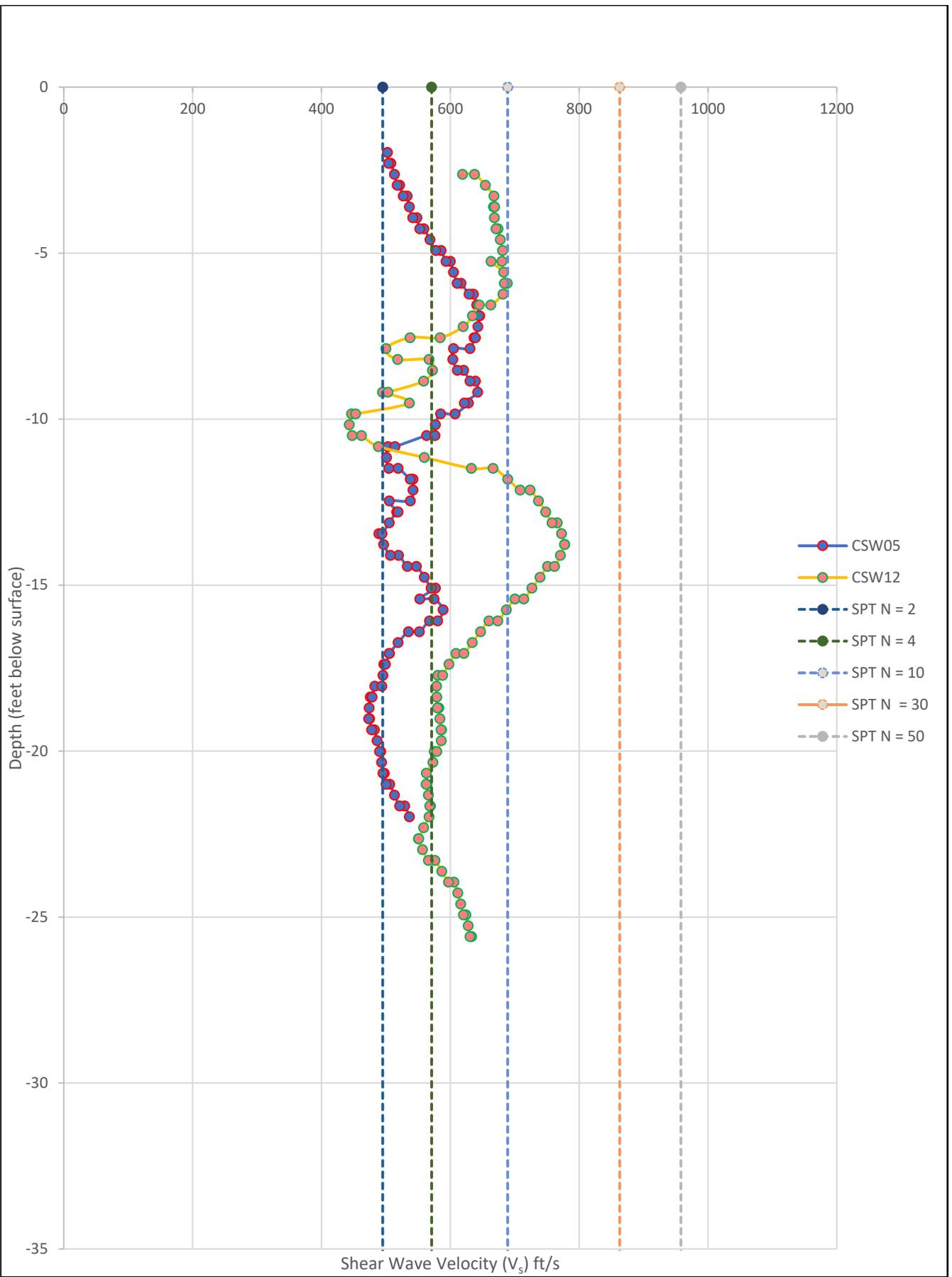
Thickly Bedded	3-10 ft
Medium Bedded	1-3 ft
Thinly Bedded	2-12 in
Very Thinly Bedded	<2 in

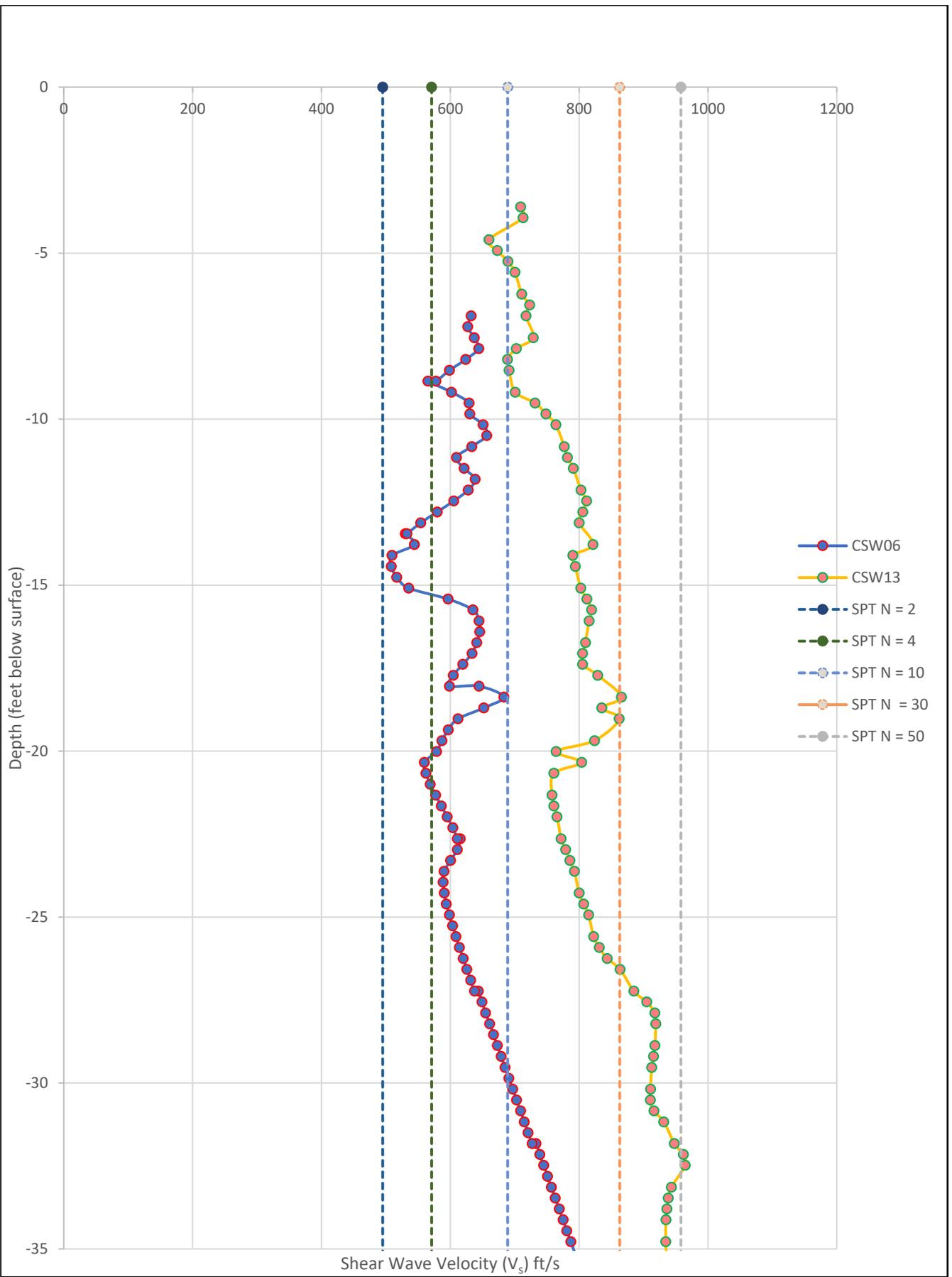


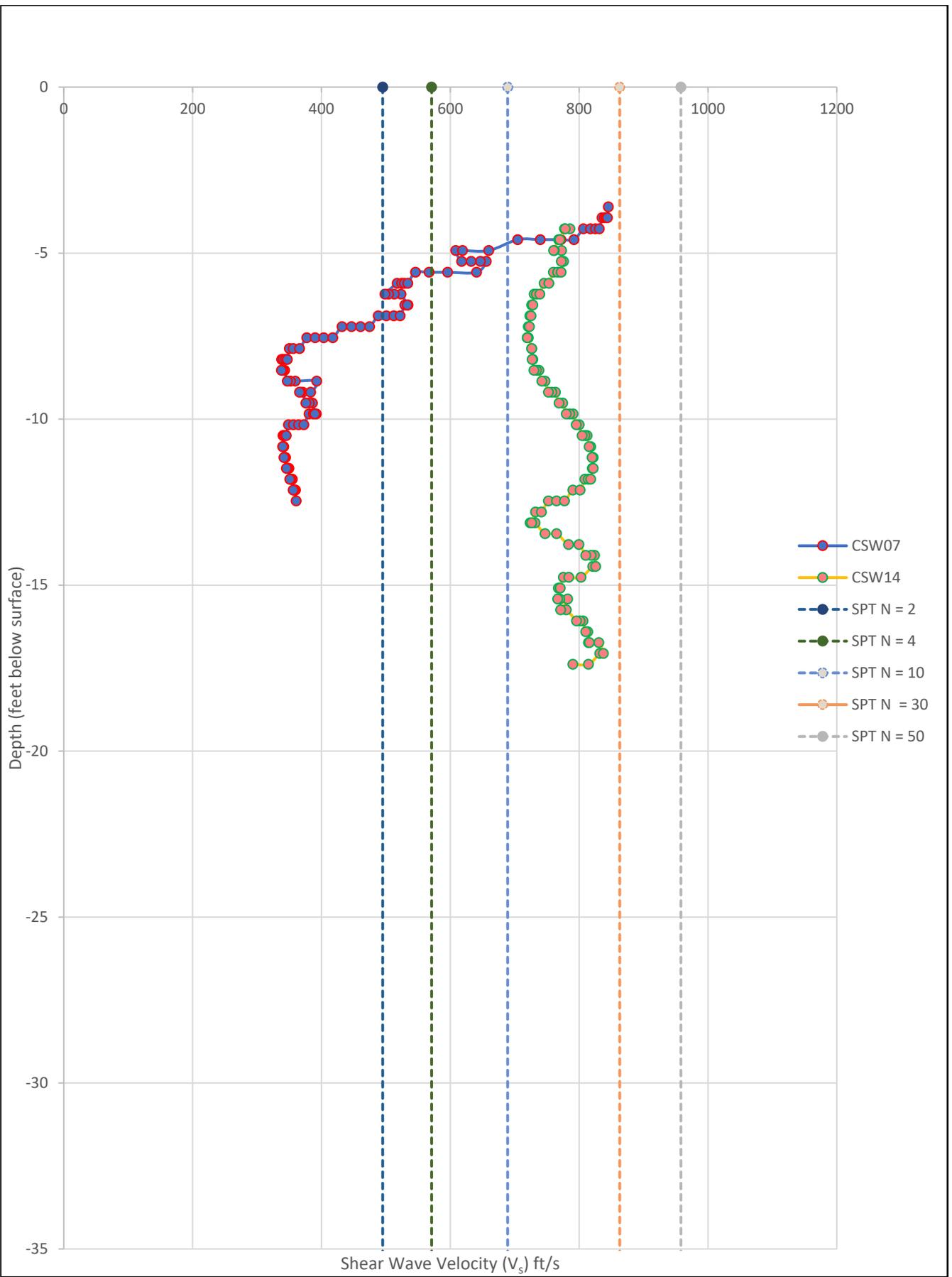












**ATTACHMENT C**  
**GBA Guidelines**  
**Standard Terms and Conditions**

# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

## Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

## Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

## You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

### Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

### This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

### This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

### Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

*conspicuously that you’ve included the material for information purposes only.* To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

### Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

### Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. **Geotechnical engineers are not building-envelope or mold specialists.**



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**INTEGRITY DRILLING & GEOPHYSICAL SERVICES, LLC - STANDARD TERMS AND CONDITIONS**

1) **ENTIRE AGREEMENT.** Upon authorization by the CLIENT and commencement of performance hereunder, these terms and Integrity Drilling & Geophysical Services, LLC's (IDGSL's) Proposal constitute the entire agreement between the parties concerning its subject matter. Any changes or additional conditions proposed by CLIENT are hereby rejected, unless expressly stated in this Agreement or incorporated by a change order.

2) **CHANGES.** Upon receipt of notice from CLIENT of a change in the scope of the work hereunder, IDGSL will promptly notify the CLIENT if there is an impact on the schedule, price or terms of the Agreement. Thereafter, an estimate of any impact on the Agreement will be prepared and submitted to the CLIENT. The parties agree to promptly negotiate and implement changes to the Agreement. CLIENT acknowledges and agrees that its use of any purchase order or other form to procure services is solely for administrative purposes and in no event shall IDGSL be bound to any terms and conditions on such form regardless of reference to or signature. CLIENT shall endeavor to reference this Agreement on any purchase order (or any other form), but CLIENT's failure to do so shall not operate to modify this Agreement.

3) **SITE INFORMATION AND ACCESS.** The CLIENT shall make available to IDGSL all relevant information and documents under his control regarding past, present and proposed conditions of the site. The information shall include, but not be limited to, plot plans, topographic surveys, hydrologic data and previous soil and geologic data including borings, field or laboratory tests and written reports. The CLIENT shall immediately transmit to IDGSL any new information that becomes available or any change in plans. The CLIENT shall also ensure uninterrupted site access for IDGSL throughout performance of this Agreement.

4) **PERMITS AND UTILITIES.** Unless otherwise stated in the Proposal, the CLIENT shall apply for and obtain all required permits and licenses and shall make all necessary arrangements for right of entry to provide IDGSL access to the site for all equipment and personnel at no charge to IDGSL. The CLIENT shall also provide IDGSL with the location of all underground utilities and structures in the exploration area. IDGSL is not responsible for location or identification of utilities.

5) **PAYMENT AND SUSPENSION.** Unless otherwise stated in the Proposal, invoices will be submitted by IDGSL either at the completion of the work or on a monthly basis and will be due and payable on the invoice date. Invoices not paid within thirty (30) days of the invoice date shall be subject to a late fee of one and one-half percent (1.5%) per month computed at 31 days from the date of invoice. In addition, any collection fees, legal fees, court costs, and other related expenses incurred by IDGSL in the collection of delinquent invoice amounts shall be paid by CLIENT. **IN THE EVENT CLIENT DISPUTES ALL OR PART OF AN INVOICE, CLIENT MUST ADVISE IDGSL IN WRITING WITHIN FIFTEEN (15) DAYS FROM INVOICE DATE. UNDISPUTED PORTIONS ARE SUBJECT TO PAYMENT WITHIN THIRTY (30) DAYS.** IDGSL may suspend performance of services under this Agreement if: 1) CLIENT fails to make payment in accordance with the terms hereof, 2) CLIENT becomes insolvent, enters bankruptcy, receivership, or other like proceeding (voluntary or involuntary) or makes an assignment for the benefit of creditors, or 3) IDGSL reasonably believes that CLIENT will be unable to pay IDGSL in accordance with the terms hereof and notifies CLIENT in writing prior to such suspension of services. If any such suspension causes an increase in the time required for IDGSL's performance, the performance schedule and/or period for performance shall be extended for a period of time equal to the suspension period.

6) **OWNERSHIP RIGHTS.** Any documents produced by IDGSL shall be the sole property of IDGSL. At the request and expense of the CLIENT, IDGSL shall provide the CLIENT with copies of any or all drawings, specifications and other documents prepared by IDGSL.

7) **STANDARD OF CARE.** In the performance of professional services, IDGSL will use that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession practicing in the same or similar localities. No warranty, either express or implied, is made or intended by this Agreement or by furnishing oral or written reports of the findings. IDGSL is to be liable only for damage proximately caused by the negligence of IDGSL. The CLIENT recognizes that subsurface conditions may vary from those encountered at the location where borings, surveys or explorations are made by IDGSL and that the data, interpretations and recommendation of IDGSL are based solely on the information available to him. IDGSL will not be responsible for the interpretation by others of the information developed.

8) **INSURANCE.** IDGSL will maintain insurance for this Agreement in the following types: 1) Comprehensive General Liability (CGL) insurance; 2) Professional Liability Coverage; and 3) Contractors Pollution Liability.

9) **ENVIRONMENTAL LIABILITY.** Because CLIENT owns and/or operates the site where work is being performed, CLIENT has and shall retain all responsibility and liability associated with the environmental conditions at the site. Unless specifically identified in IDGSL's Proposal, CLIENT'S responsibility and liability includes the handling and disposal of any samples or hazardous materials generated on the site as a result of IDGSL's performance hereunder.

10) **CONSEQUENTIAL DAMAGES.** IDGSL shall NOT be responsible for any consequential, incidental or indirect damages.

11) **LIMITATION OF LIABILITY.** *Notwithstanding any other provision of this Agreement, the total liability of IDGSL, its officers, directors and employees for liabilities, claims, judgments, demands and causes of action arising under or related to this Agreement, whether based in contract or tort, shall be limited to the total compensation actually paid to IDGSL for the services hereunder or \$50,000, whichever is less. All claims by CLIENT shall be deemed relinquished unless filed within one (1) year after substantial completion of the services hereunder.*

12) **DISPUTES.** Any dispute arising hereunder shall first be resolved by taking the following steps, where a successive step is taken if the issue is not resolved at the preceding step: 1) by the technical and contractual personnel for each party performing this Agreement, 2) by executive management of each party, 3) by mediation or 4) through the court system of the jurisdiction of the IDGSL office that entered into this Agreement. CLIENT hereby waives the right to trial by jury for any disputes arising out of this Agreement. Except as otherwise provided herein, each party shall be responsible for its own legal costs and attorneys' fees.

13) **AUTHORIZATION TO SIGN.** The person signing this Agreement warrants that he has authority to sign as, or on behalf of, the CLIENT for whom or for whose benefit IDGSL's services are rendered. If such a person does not have such authority, he agrees that he is personally liable for all breaches of this Agreement, and that in any such action against him for breach of such warranty, reasonable attorneys'

Symmes Road Lift Station, Riverview, FL  
Post-Polymer Ground Stability Assessment

fees and legal costs shall be included in a judgment rendered.

**14) ASSIGNMENT.** Neither party may delegate, assign, sublet or transfer his duties or interest in this Agreement without the written consent of the other party.

**15) CHOICE OF LAWS.** This Agreement shall be governed by the laws of the state of Florida.

**16) FORCE MAJEURE.** Should performance of services by IDGSL be affected by causes beyond its reasonable control, including but not limited to: acts of God; acts of a legislative, administrative or judicial entity; acts of contractors other than contractors engaged by IDGSL; fires; floods; labor disturbances; unusually severe weather and/or an epidemic; then CLIENT will grant IDGSL a time extension and the parties will negotiate an equitable adjustment to the price of any affected services, where appropriate.

**17) FIELD REPRESENTATION.** Unless otherwise expressly agreed in writing, IDGSL shall not be responsible for the safety or direction of the means and methods at the CLIENT's site of contractors or their employees or agents that are not hired by IDGSL, and the presence of IDGSL at the CLIENT's site will not relieve the contractor of its responsibilities for performing the work in accordance with applicable regulations, or in accordance with project plans and specifications. If necessary, CLIENT will advise any contractors that IDGSL's services are so limited. IDGSL will not assume the role of "prime contractor", "principal contractor", "constructor", "controlling employer", or their equivalents unless the scope of such services are expressly agreed in writing.

**18) TERMINATION.** This Agreement may be terminated by either party upon ten (10) days written notice to the other. In the event of a termination, Client shall pay for all reasonable charges for work performed and demobilization by IDGSL to date of notice of termination. The limitation of liability and indemnity obligations of this Agreement shall be binding notwithstanding any termination of this Agreement.