# Replacement of Bridge 49 (SR-87 Over Lauderdale County River Overflow)

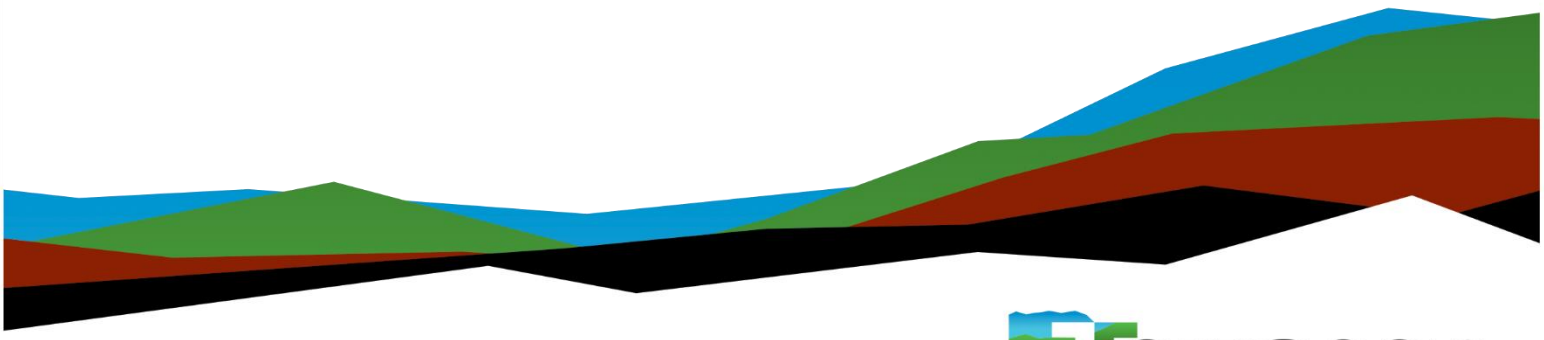
## Geotechnical Data Report

## Lauderdale County, Tennessee

August 15, 2025 | Terracon Project No. 1A255072

**Prepared for:**

American Structurepoint Inc.
600 Superior Ave East, Suite 2401
Cleveland, Ohio 44114



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- Facilities
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1922 Old Murfreesboro Pike, Bldg 900, Ste 905
Nashville, TN 37217
P (615) 333-6444
**Terracon.com**

August 15, 2025

American Structurepoint Inc.
600 Superior Ave East, Suite 2401
Cleveland, Ohio 44114

Attn: Mr. Liptak, P.E.
P: (216) 302-3694
E: gliptak@structurepoint.com

Re: Geotechnical Data Report
Replacement of Bridge 49 (SR-87 Over Lauderdale County River Overflow)
Lauderdale County, Tennessee
Terracon Project No. 1A255072

Dear Mr. Liptak:

We have completed the scope of work for the above referenced project. This Data Report presents the findings of the subsurface exploration, including field and laboratory test results.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

**Terracon**

Eric Conway, P.E.
Geotechnical Department Manager

James Vinson, P.E.
National Manager

# Table of Contents



## Attachments

# Introduction

This report presents the results of our subsurface exploration performed for the proposed bridge replacement along SR-87 in Lauderdale County, Tennessee. The geotechnical Scope of Services included the advancement of test borings, laboratory testing, geophysical testing and preparation of this data report. The exploratory locations were determined by Terracon field staff. Encountered soil and groundwater depths are provided herein.

# Site Information

The following description of site conditions is derived from our site visit in association with field exploration and our review of publicly available geologic and topographic maps.

| Item | Description |
|---|---|
| **Site Information** | The approximate coordinates for the bridge crossing are as follows:<br>▪ **Bridge No. 49**: 35.680827° N 89.706835° W<br>See **Site Location** |
| **Current Ground Cover** | Away from the existing bridge, SR-87 pavement consists of asphalt overlaying fill. |
| **Existing Topography** (Estimated using Google Earth) | The ground surface elevations at the borings are approximately 278 feet. |

# Geologic Formations

| Formation [1] | Description |
|---|---|
| **Loess** | Clayey and sandy silt, gray to brown, massive. Maximum thickness about 100 feet along bluffs of Mississippi River; thins eastward. (Minimum mapped thickness 4 feet) |

1. Geologic Map of Tennessee, published by the State of Tennessee Department of Conservation, Division of Geology (1966).

# Geotechnical Borings and Laboratory Testing

Terracon drilled two borings near the proposed bridge replacement. Each boring encountered asphalt over fill over alluvial deposits.

Subsurface conditions observed at each location are indicated on the individual logs. The individual logs can be found in the **Exploration Results**. Drawings depicting site location and boring locations relative to existing site features are attached.

Laboratory testing was performed to confirm visual descriptions and further characterize the encountered soils. Testing included the following: natural moisture, grain-size distribution, Atterberg limits, compaction, California Bearing Ratio, unconsolidated-undrained triaxial and corrosion series. Test results are attached with the boring logs.

# Seismic Survey

Terracon performed a limited seismic survey consisting of twenty-two Multi-Channel Analysis of Surface Waves (MASW) arrays at the subject bridge site to obtain shear wave velocities of the soil within the upper 100 feet. Results of the seismic survey as well as location map for the arrays are attached.

# General Comments

This geotechnical data report does not include any analysis or recommendations. The data presented in this report are based upon the borings and geophysical data at the indicated locations. This report does not reflect variations that may occur across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until, during, or after construction.

No warranties, either expressed or implied, are intended or made. The scope of geotechnical services does not include either specifically or by implication any environmental assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions.

# Attachments

# Exploration and Testing Procedures

## Field Exploration

| Number of Exploration Points | Approximate Exploration Depth (feet) | Location |
|---|---|---|
| 2 | 100 | Bridge Abutments |
| 2 MASW Arrays | 100 | Bridge Abutments |

**Boring Layout and Elevations:** Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. Approximate ground surface elevations were estimated using Google Earth™.

**Subsurface Exploration Procedures:** We advanced the borings with a truck-mounted rotary drill rig using continuous flight solid stem augers and rotary wash boring techniques as necessary depending on soil conditions. Three samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

We also observed the boreholes while drilling with augers for the presence of groundwater. The measured groundwater levels are shown on the attached boring logs.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

**Multi-Channel Analysis of Surface Waves:** Our method of investigation utilized a standard fixed-array set of MASW geophones. Each array consisted of 24 4.5Hz

geophones, spaced 10 feet apart along a sensor cable. For the passive surveys, ambient noise (such as nearby traffic or construction) on the site was recorded by a seismograph. For the active surveys, three sledgehammer strikes were performed every 10 feet against a polyethylene plate from 20 feet before the start of the array through geophone 12.

The data was returned to our office and processed using dispersion analysis software (SurfSeis, engineered by the Kansas Geological Survey) that extracts the fundamental-mode dispersion curve(s). The active and passive surveys performed at each line were combined to produce a broader-band overtone image to better identify the dispersion trends. The resulting curves were inverted and modeled to yield a 1D shear-wave velocity profile along the array to 100 feet below ground surface. The velocity models from the MASW surveys are presented on **Exhibit 2**.

## Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Unconfined Compression
- Atterberg Limits
- Triaxial Compression
- Corrosion Suite
- Standard Proctor
- California Bearing Ratio

Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

# Site Location and Exploration Plans

**Contents:**

## Site Location

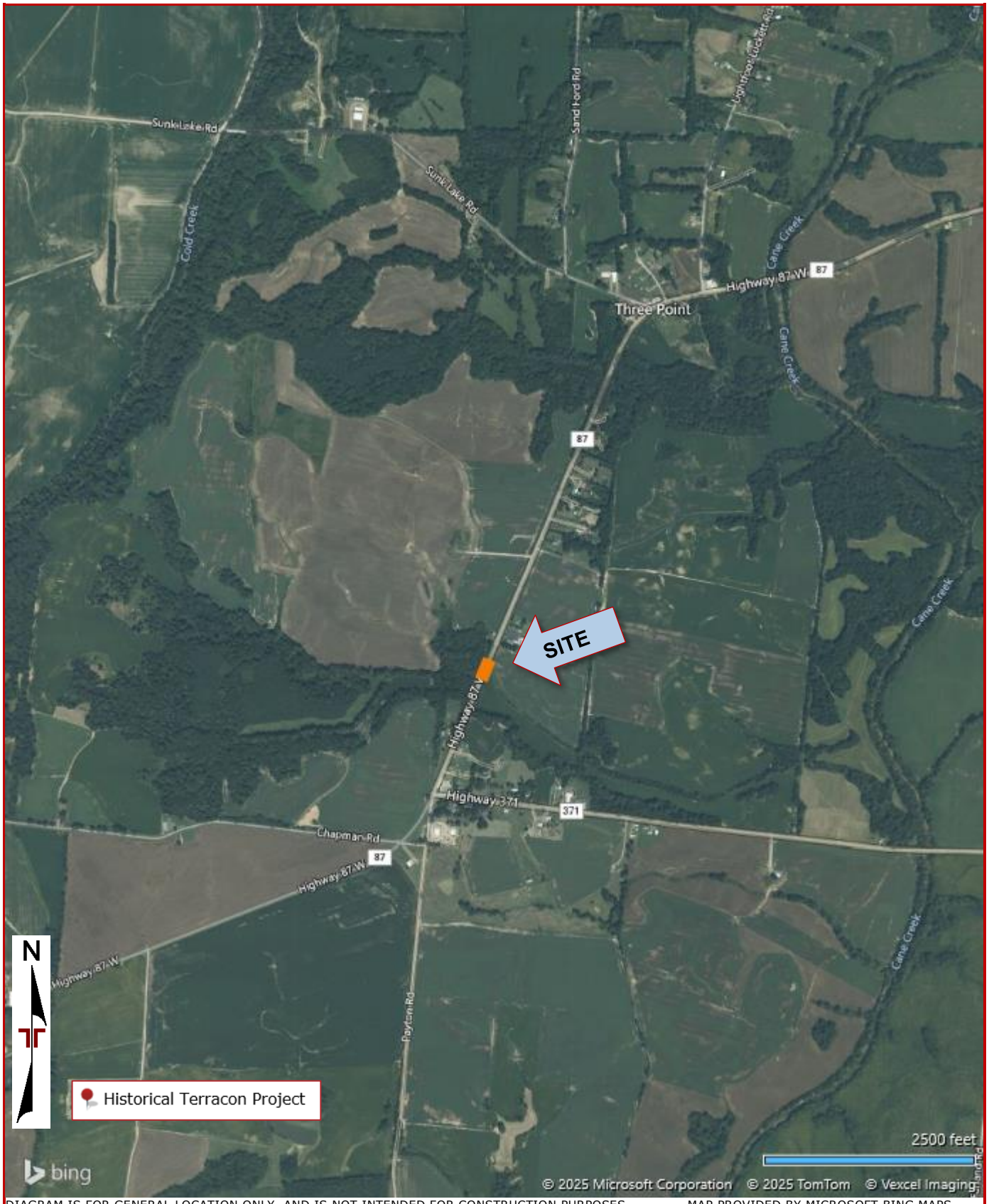



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

## Exploration Plan


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

# Exploration and Laboratory Results

**Contents:**

Replacement of Bridge 49 (SR-87 Over Lauderdale County River Overflow)
SR-87 | Lauderdale County, TN
Terracon Project No. 1A255072

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Boring Log No. B-49-1

Location: See Exploration Plan

Latitude: 35.6810° Longitude: -89.7068°

Depth (Ft.) Approximate Elevation: 278 (Ft.)

| Depth (Ft.) | Material Description | Field Test Results | Strength Test: Test Type | Strength Test: Compressive Strength (psf) | Strength Test: Strain (%) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits: LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| 0.3 | **ASPHALT** 277.75 | | | | | | | | |
| | **FILL - SILT (ML)**, trace gravel, brown, moist | | | | | | | 31-23-8 | 97.9 |
| | | 1-2-2 N=4 | | | | | | | |
| 4.5 | 273.5 | | | | | | | | |
| 5 | **LEAN CLAY (CL)**, trace gravel, gray, moist, very soft to medium stiff | WOH-2-3 N=5 | | | | 26.7 | | 36-23-13 | |
| | | WOH-WOH-1 N=1 | | | | | | | |
| 10 | | WOH-WOH-1 N=1 | | | | | | | |
| | | WOH-WOH-3 N=3 | | | | 28.8 | | | |
| 15 | | 2-2-3 N=5 | | | | 28.8 | | | |
| 17.0 | 261 | | | | | | | | |
| | **SILT (ML)**, brownish gray, wet, medium stiff | 1-3-3 N=6 | | | | | | | |
| 20 | | | UC | | | 30.0 | 92 | NP | 98.5 |
| 21.0 | 257 | | | | | | | | |
| | **LEAN CLAY (CL)**, gray, wet, medium stiff to stiff | WOH-2-3 N=5 | | | | | | | |
| 25 | | 1-2-3 N=5 | | | | | | | |
| | | 2-2-4 N=6 | | | | 30.4 | | | |
| 30 | | | | | | | | | |
| | | 1-4-5 N=9 | | | | | | | |
| 35 | | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were interpolated from Google Earth

**Water Level Observations**
While drilling

**Drill Rig**
CME 75

**Hammer Type**
Automatic

**Driller**
Terracon

**Notes**

**Advancement Method**
Continuous Flight Auger/Mud Rotary

**Abandonment Method**
Boring backfilled with auger cuttings upon completion.

**Logged by**
P Van Winkle

**Boring Started**
06-17-2025

**Boring Completed**
06-17-2025

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Boring Log No. B-49-1

Location: See Exploration Plan

Latitude: 35.6810° Longitude: -89.7068°

Depth (Ft.) Approximate Elevation: 278 (Ft.)

| Depth (Ft.) | Graphic Log | Material Description | Field Test Results | Strength Test: Test Type | Strength Test: Compressive Strength (psf) | Strength Test: Strain (%) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits: LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **LEAN CLAY (CL)**, gray, wet, medium stiff to stiff *(continued)* | | | | | | | | |
| 36.8 | | 241.2 | | | | | | | | |
| | | **SILTY CLAY (CL-ML)**, greenish gray, wet, stiff | 3-4-5 N=9 | | | | 23.8 | | 25-19-6 | |
| 41.8 | | 236.2 | | | | | | | | |
| | | **CLAYEY SAND (SC)**, greenish gray, wet, medium dense | 10-14-15 N=29 | | | | 19.2 | | | 40.8 |
| 46.8 | | 231.2 | | | | | | | | |
| | | **LEAN CLAY (CL)**, trace fine sand, greenish gray, moist, medium stiff | 1-3-2 N=5 | | | | 28.5 | | | 96.4 |
| 51.8 | | 226.2 | | | | | | | | |
| | | **CLAYEY SAND (SC)**, fine grained sand, greenish gray, moist, medium dense | 9-12-13 N=25 | | | | 24.7 | | | 16.1 |
| 56.8 | | 221.2 | | | | | | | | |
| | | **POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained sand, light gray, moist, medium dense to dense | 12-16-19 N=35 | | | | 23.6 | | | 7.5 |
| | | | 9-15-14 N=29 | | | | 27.8 | | | 5.8 |
| 66.8 | | 211.2 | | | | | | | | |
| | | **CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained sand, gray, wet, medium dense to dense | 13-15-19 N=34 | | | | 16.0 | | | 30.7 |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were interpolated from Google Earth

**Water Level Observations**
While drilling

**Drill Rig**
CME 75

**Hammer Type**
Automatic

**Driller**
Terracon

**Logged by**
P Van Winkle

**Boring Started**
06-17-2025

**Boring Completed**
06-17-2025

**Notes**

**Advancement Method**
Continuous Flight Auger/Mud Rotary

**Abandonment Method**
Boring backfilled with auger cuttings upon completion.

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Boring Log No. B-49-1

Location: See Exploration Plan

Latitude: 35.6810° Longitude: -89.7068°

Depth (Ft.) Approximate Elevation: 278 (Ft.)

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Strength Test: Test Type | Strength Test: Compressive Strength (psf) | Strength Test: Strain (%) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits: LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | 75 | | X | 7-5-5 N=10 | | | | 20.1 | | | 30.4 |
| | | | | | | | | | | | |
| | 80 | | X | 11-12-19 N=31 | | | | 27.8 | | | 19.0 |
| | | | | | | | | | | | |
| | 85 | | X | 9-16-17 N=33 | | | | 28.5 | | | 27.8 |
| | | | | | | | | | | | |
| | 90 | | X | 6-21-25 N=46 | | | | 32.7 | | NP | |
| | | | | | | | | | | | |
| | 95 | | X | 11-17-22 N=39 | | | | | | | |
| | | | | | | | | | | | |
| | 100 | | X | 9-18-8 N=26 | | | | 29.1 | | | |

**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained sand, gray, wet, medium dense to dense *(continued)*

76.8 201.2

**CLAYEY SAND (SC)**, fine grained sand, gray, wet, dense

96.8 181.2

**LEAN CLAY WITH SAND (CL)**, very dark grayish brown, wet, very stiff

100.0 178

***Boring Terminated at 100 Feet***

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were interpolated from Google Earth

**Water Level Observations**
▽ While drilling

**Drill Rig**
CME 75

**Hammer Type**
Automatic

**Driller**
Terracon

**Logged by**
P Van Winkle

**Boring Started**
06-17-2025

**Boring Completed**
06-17-2025

**Notes**

**Advancement Method**
Continuous Flight Auger/Mud Rotary

**Abandonment Method**
Boring backfilled with auger cuttings upon completion.

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Boring Log No. B-49-2

Location: See Exploration Plan

Latitude: 35.6808° Longitude: -89.7069°

Depth (Ft.) Approximate Elevation: 278 (Ft.)

| Depth (Ft.) | Graphic Log | Water Level Observations | Sample Type | Field Test Results | Strength Test: Test Type | Strength Test: Compressive Strength (psf) | Strength Test: Strain (%) | Strength Test: Confining Pressure (psi) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits: LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.3 | | | | | | | | | | | | |
| | **ASPHALT** 277.75 | | | | | | | | | | | |
| | **FILL - SILT (ML)**, trace gravel, brown, moist | | | | | | | | | | | |
| | | | | 1-2-3 N=5 | | | | | | | | |
| 4.5 | 273.5 | | | | | | | | | | | |
| | **SILT (ML)**, trace gravel, grayish brown to dark gray, moist, very soft to stiff | | | | | | | | | | | |
| 5 | | | | WOH-WOH-1 N=1 | | | | | 27.3 | | NP | |
| | | ▽ | | 1-1-1 N=2 | | | | | | | | |
| 10 | | | | WOH-WOH-3 N=3 | | | | | | | | |
| | | | | 1-3-4 N=7 | | | | | 29.7 | | | |
| 15 | | | | 1-3-4 N=7 | | | | | | | | |
| | | | | 2-3-4 N=7 | | | | | | | | |
| 20 | | | | | UC | 3191 | 15 | 15 | 28.3 | 99 | NP | |
| | | | | 2-3-4 N=7 | | | | | | | | |
| | | | | 1-2-4 N=6 | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26.8 | 251.2 | | | | | | | | | | | |
| | **LEAN CLAY (CL)**, trace fine sand, dark gray to gray, moist, medium stiff to stiff | | | | | | | | | | | |
| | | | | 2-4-4 N=8 | | | | | | | | |
| 30 | | | | | | | | | | | | |
| | | | | 2-2-5 N=7 | | | | | | | | |
| 35 | | | | | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were interpolated from Google Earth

**Water Level Observations**
▽ While drilling

**Drill Rig**
CME 75

**Hammer Type**
Automatic

**Driller**
Terracon

**Logged by**
P Van Winkle

**Boring Started**
06-17-2025

**Boring Completed**
06-18-2025

**Notes**

**Advancement Method**
Continuous Flight Auger/Mud Rotary

**Abandonment Method**
Boring backfilled with auger cuttings upon completion.

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Boring Log No. B-49-2

Location: See Exploration Plan

Latitude: 35.6808° Longitude: -89.7069°

Depth (Ft.) Approximate Elevation: 278 (Ft.)

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Strength Test: Test Type | Strength Test: Compressive Strength (psf) | Strength Test: Strain (%) | Strength Test: Confining Pressure (psi) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits: LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LEAN CLAY (CL)**, trace fine sand, dark gray to gray, moist, medium stiff to stiff *(continued)* | 40 | | | 4-4-8 N=12 | | | | | 23.5 | | | |
| | 45 | | | 4-8-3 N=11 | | | | | | | | |
| | 50 | | | 3-4-6 N=10 | | | | | 24.6 | | 35-17-18 | |
| 51.8 226.2 **POORLY GRADED SAND WITH CLAY (SP-SC)**, trace gravel, fine grained sand, light gray, wet, dense to very dense | 55 | | | 5-11-21 N=32 | | | | | 22.5 | | | 10.5 |
| | 60 | | | 15-19-23 N=42 | | | | | 21.8 | | | 12.0 |
| 66.8 211.2 **CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained sand, dark gray, wet, medium dense to dense | 65 | | | 17-24-36 N=60 | | | | | | | | |
| | 70 | | | 13-16-21 N=37 | | | | | 15.0 | | | 16.1 |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were interpolated from Google Earth

**Water Level Observations**
While drilling

**Drill Rig**
CME 75

**Hammer Type**
Automatic

**Driller**
Terracon

**Logged by**
P Van Winkle

**Boring Started**
06-17-2025

**Boring Completed**
06-18-2025

**Notes**

**Advancement Method**
Continuous Flight Auger/Mud Rotary

**Abandonment Method**
Boring backfilled with auger cuttings upon completion.

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Boring Log No. B-49-2

Location: See Exploration Plan

Latitude: 35.6808° Longitude: -89.7069°

Depth (Ft.) Approximate Elevation: 278 (Ft.)

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Strength Test: Test Type | Strength Test: Compressive Strength (psf) | Strength Test: Strain (%) | Strength Test: Confining Pressure (psi) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits: LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained sand, dark gray, wet, medium dense to dense *(continued)* | 75 | | | 5-9-8 N=17 | | | | | 13.0 | | | 16.0 |
| 76.8 201.2 | | | | | | | | | | | | |
| **POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC)**, fine to medium grained sand, gray, wet, medium dense | 80 | | | 7-10-17 N=27 | | | | | 19.9 | | | 11.8 |
| 81.8 196.2 | | | | | | | | | | | | |
| **CLAYEY SAND WITH GRAVEL (SC)**, trace silt, fine to medium grained sand, gray, wet, dense | 85 | | | 12-17-25 N=42 | | | | | 28.2 | | NP | |
| 86.8 191.2 | | | | | | | | | | | | |
| **SANDY LEAN CLAY (CL)**, gray, wet, very stiff | 90 | | | 6-11-14 N=25 | | | | | | | | |
| 91.8 186.2 | | | | | | | | | | | | |
| **LEAN CLAY WITH SAND (CL)**, gray, wet, very stiff | 95 | | | 7-7-11 N=18 | | | | | | | | |
| 100.0 178 | | | | 8-5-14 N=19 | | | | | 31.3 | | | |
| ***Boring Terminated at 100 Feet*** | 100 | | | | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were interpolated from Google Earth

**Water Level Observations**
While drilling

**Drill Rig**
CME 75

**Hammer Type**
Automatic

**Driller**
Terracon

**Logged by**
P Van Winkle

**Boring Started**
06-17-2025

**Boring Completed**
06-18-2025

**Notes**

**Advancement Method**
Continuous Flight Auger/Mud Rotary

**Abandonment Method**
Boring backfilled with auger cuttings upon completion.

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Summary of Laboratory Results

| Boring ID | Depth (Ft.) | Liquid Limit | Plastic Limit | Plasticity Index | % Fines | Water Content (%) |
|---|---|---|---|---|---|---|
| B-49-1 | 0-3 | 31 | 23 | 8 | 97.9 | |
| B-49-1 | 5-6.5 | 36 | 23 | 13 | | 26.7 |
| B-49-1 | 14.5 | | | | | 28.8 |
| B-49-1 | 15-16.5 | | | | | 28.8 |
| B-49-1 | 19-21 | NP | NP | NP | 98.5 | 30.0 |
| B-49-1 | 28.5-30 | | | | | 30.4 |
| B-49-1 | 38.5-40 | 25 | 19 | 6 | | 23.8 |
| B-49-1 | 43.5-45 | | | | 40.8 | 19.2 |
| B-49-1 | 48.5-50 | | | | 96.4 | 28.5 |
| B-49-1 | 53.5-55 | | | | 16.1 | 24.7 |
| B-49-1 | 58.5-60 | | | | 7.5 | 23.6 |
| B-49-1 | 63.5-65 | | | | 5.8 | 27.8 |
| B-49-1 | 68.5-70 | | | | 30.7 | 16.0 |
| B-49-1 | 73.5-75 | | | | 30.4 | 20.1 |
| B-49-1 | 78.5-80 | | | | 19.0 | 27.8 |
| B-49-1 | 83.5-85 | | | | 27.8 | 28.5 |
| B-49-1 | 88.5-90 | NP | NP | NP | | 32.7 |
| B-49-1 | 98.5-100 | | | | | 29.1 |
| B-49-2 | 5-6.5 | NP | NP | NP | | 27.3 |

Terracon
10841 S Ridgeview Rd
Olathe, KS

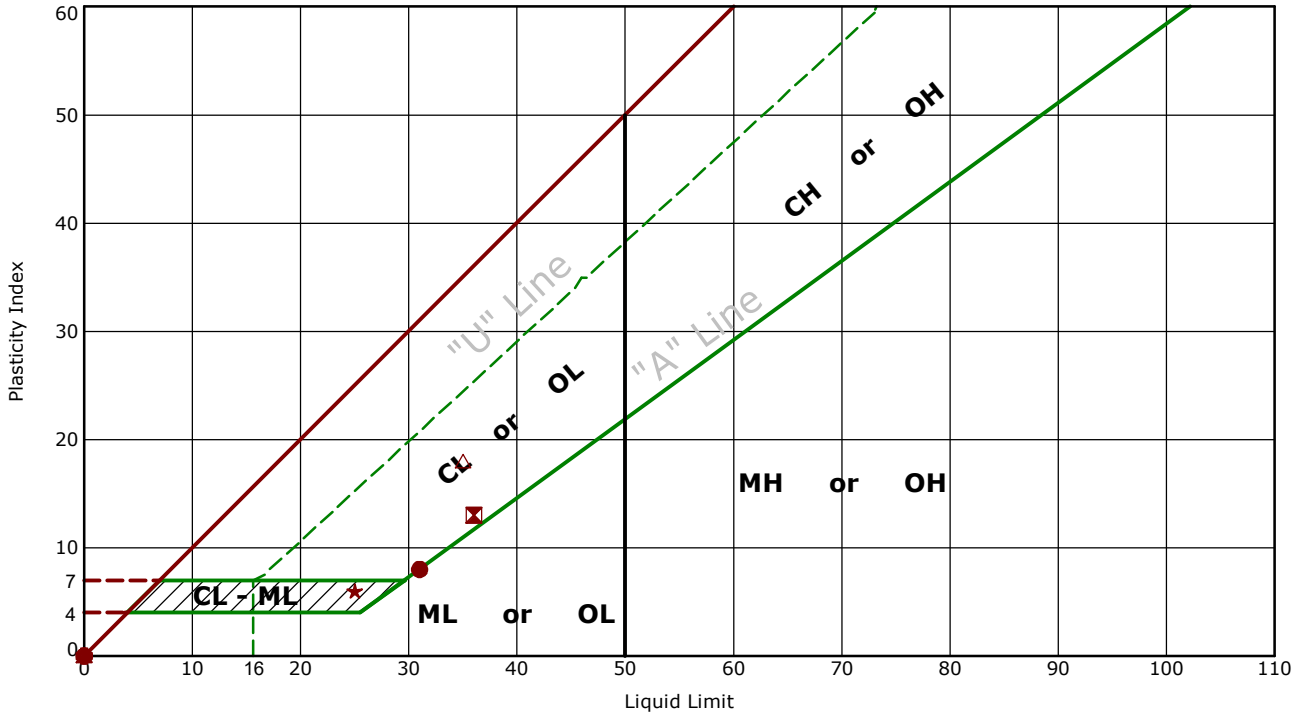
# Summary of Laboratory Results

| Boring ID | Depth (Ft.) | Liquid Limit | Plastic Limit | Plasticity Index | % Fines | Water Content (%) |
|---|---|---|---|---|---|---|
| B-49-2 | 12.5-14 | | | | | 29.7 |
| B-49-2 | 19-21 | NP | NP | NP | | 28.3 |
| B-49-2 | 38.5-40 | | | | | 23.5 |
| B-49-2 | 48.5-50 | 35 | 17 | 18 | | 24.6 |
| B-49-2 | 53.5-55 | | | | 10.5 | 22.5 |
| B-49-2 | 58.5-60 | | | | 12.0 | 21.8 |
| B-49-2 | 68.5-70 | | | | 16.1 | 15.0 |
| B-49-2 | 73.5-75 | | | | 16.0 | 13.0 |
| B-49-2 | 78.5-80 | | | | 11.8 | 19.9 |
| B-49-2 | 83.5-85 | NP | NP | NP | | 28.2 |
| B-49-2 | 98.5-100 | | | | | 31.3 |

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Atterberg Limit Results

## ASTM D4318



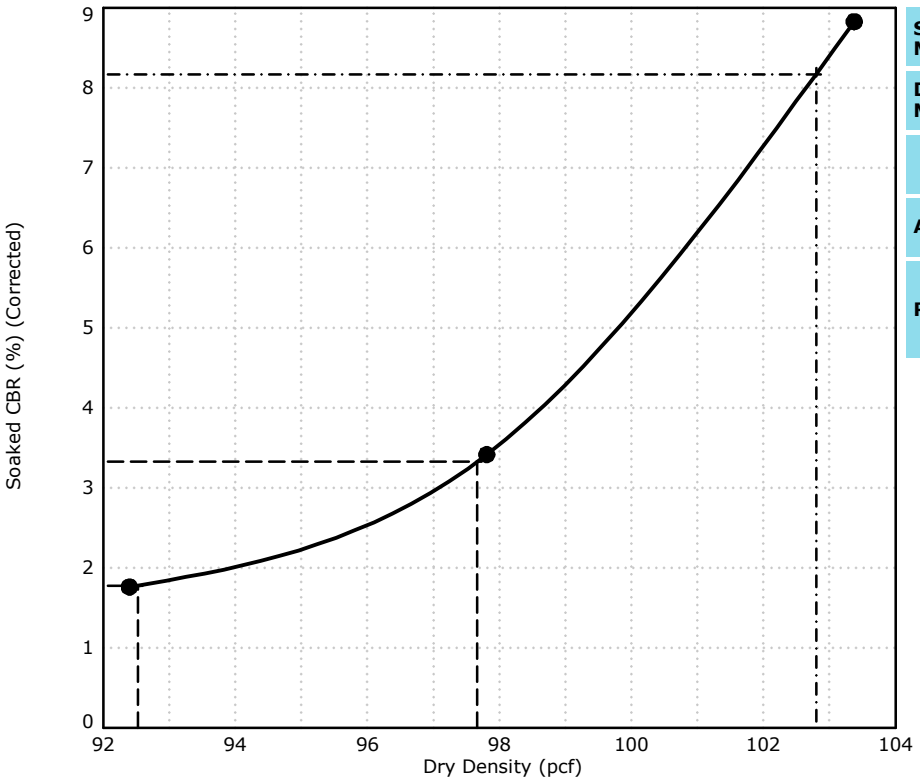

| | Boring ID | Depth (Ft) | LL | PL | PI | Fines | USCS | Description |
|---|---|---|---|---|---|---|---|---|
| ● | B-49-1 | 0 - 3 | 31 | 23 | 8 | 97.9 | ML | SILT |
| ⊠ | B-49-1 | 5 - 6.5 | 36 | 23 | 13 | | | |
| ▲ | B-49-1 | 19 - 21 | NP | NP | NP | 98.5 | ML | SILT |
| ★ | B-49-1 | 38.5 - 40 | 25 | 19 | 6 | | | |
| ⊙ | B-49-1 | 88.5 - 90 | NP | NP | NP | | | |
| ✿ | B-49-2 | 5 - 6.5 | NP | NP | NP | | | |
| ○ | B-49-2 | 19 - 21 | NP | NP | NP | | | |
| △ | B-49-2 | 48.5 - 50 | 35 | 17 | 18 | | | |
| ⊗ | B-49-2 | 83.5 - 85 | NP | NP | NP | | | |

Replacement of Bridge 49 (SR-87 Over Lauderdale County River Overflow)
SR-87 | Lauderdale County, TN
Terracon Project No. 1A255072

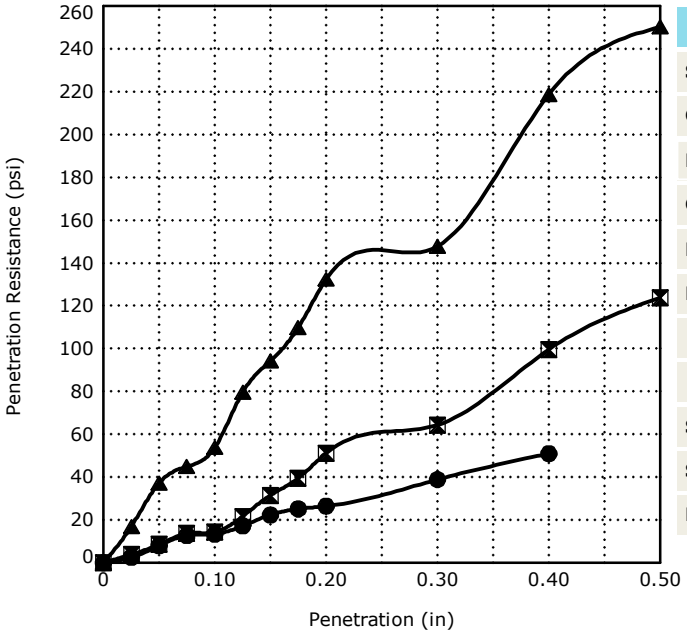
Terracon
10841 S Ridgeview Rd
Olathe, KS

# California Bearing Ratio

## ASTM D1883-07[2]




| | |
|---|---|
| **Source of Material** | B-49-1 0.0-3.0 |
| **Description of Material** | SILT(ML) |
| **Percent Fines** | 97.9 |
| **Atterberg Limits** | LL 31 / PL 23 / PI 8 |
| **Remarks:** | |




| Sample No. | 1 | 2 | 3 |
|---|---|---|---|
| **Sample Condition** | Soaked | | |
| **Compaction Method** | ASTM 698B | | |
| **Maximum Dry Density (pcf)** | 102.8 | 102.8 | 102.8 |
| **Optimum Moisture Content (%)** | 16.3 | 16.3 | 16.3 |
| **Dry Density before Soaking, (pcf)** | 92.39 | 97.81 | 103.38 |
| **Moisture Content, (%)** | | | |
| **After Compaction** | 16.3 | 15.3 | 16.9 |
| **Top 1" After Soaking** | 25.5 | 22.7 | 20.9 |
| **Surcharge, (lbs)** | 9.98 | 9.99 | 10.00 |
| **Swell, (%)** | 1.08 | 1.36 | 1.16 |
| **Bearing Ratio, (%)** | 1.8 | 3.4 | 8.8 |

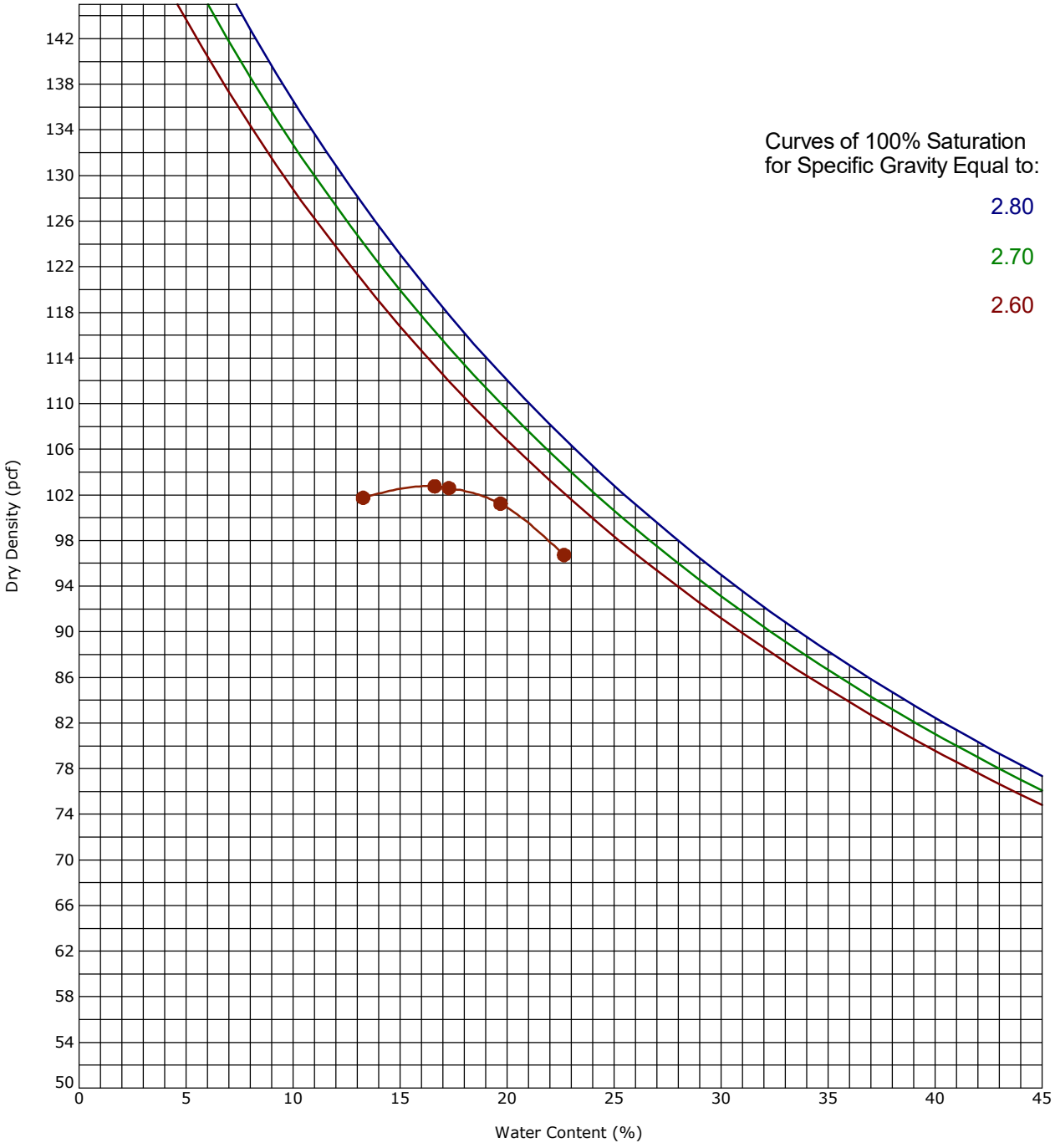
Dry Density @ 90% 92.5 pcf
Dry Density @ 95% 97.7 pcf
Dry Density @ 100% 102.8 pcf

CBR @ 90% Density 1.8
CBR @ 95% Density 3.3
CBR @ 100% Density 8.2

Terracon
10841 S Ridgeview Rd
Olathe, KS

# Moisture-Density Relationship

## ASTM D698-Method B



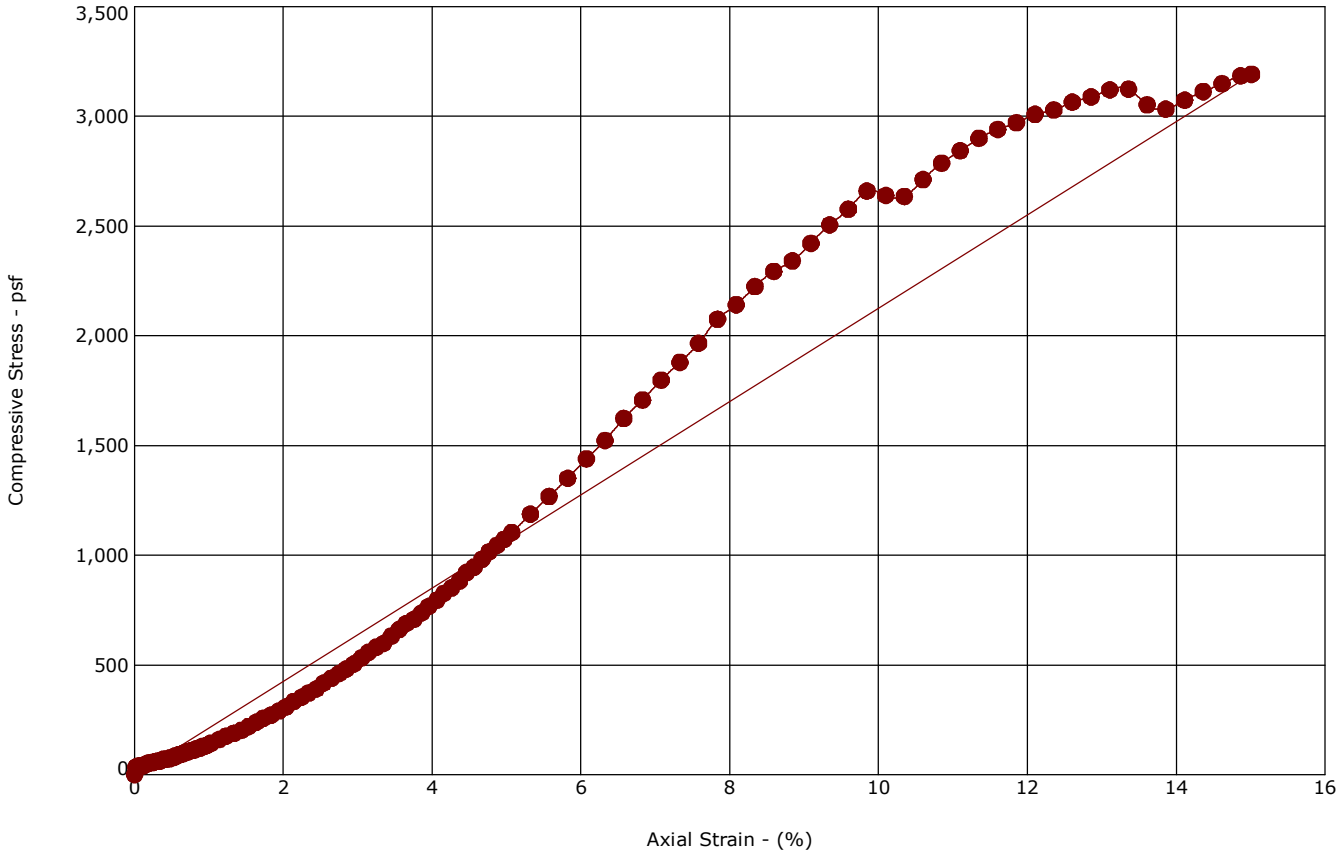

| Boring ID | Depth (Ft) | Description of Materials |
|---|---|---|
| B-49-1 | 0 - 3 | SILT(ML) |

| Fines (%) | Fraction > mm size | LL | PL | PI | Test Method | Maximum Dry Density (pcf) | Optimum Water Content (%) |
|---|---|---|---|---|---|---|---|
| 98 | 0.0 | 31 | 23 | 8 | ASTM D698-Method B | 102.8 | 16.3 |

Terracon
10841 S Ridgeview Rd
Olathe, KS

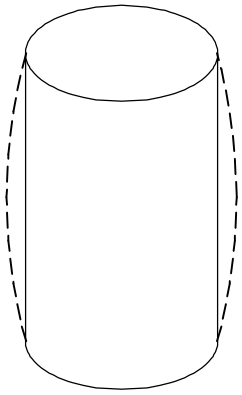
# Unconsolidated-Undrained Test

## ASTM D2850




| Boring ID | Depth (Ft) | Sample type | LL | PL | PI | Fines (%) | Description |
|---|---|---|---|---|---|---|---|
| B-49-2 | 19 - 21 | Shelby Tube | NP | NP | NP | | |

**Specimen Failure Mode**



Failure Mode: Bulge (dashed)

**Specimen Test Data**

| | |
|---|---|
| Moisture Content (%): | 28.3 |
| Dry Density (pcf) | 99.2 |
| Diameter (in): | 2.80 |
| Height (in): | 5.38 |
| Height / Diameter Ratio: | 1.92 |
| Calculated Saturation (%) | 109.26 |
| Calculated Void Ratio: | 0.70 |
| Assumed Specific Gravity: | 2.7 |
| Failure Strain (%): | 15.00 |
| Compressive Strength (psf): | 3191 |
| Undrained Shear Strength (psf): | 1596 |
| Strain Rate (in/min): | 0.0537 |
| Cell Pressure (psi): | 15.0 |
| Remarks: | |

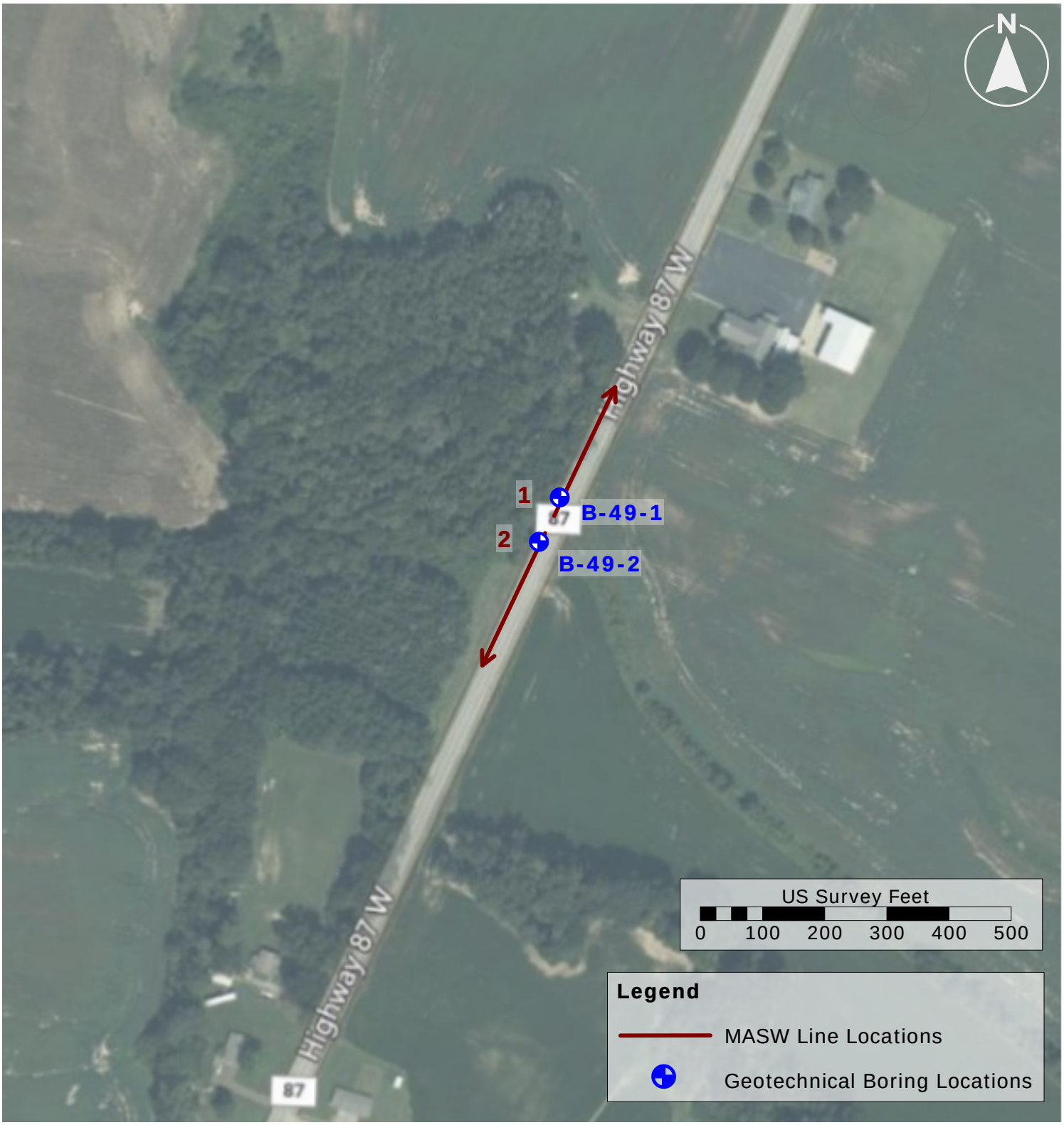
**Client**
American Structurepoint Inc
Cleveland, OH

**Project Number**
1A255072

## Corrosivity Suite - *Results*

| | | | | | |
|---|---|---|---|---|---|
| **Sample Location** | | B-49-1 | | | |
| **Sample Depth (ft.)** | | 7.5-9.0' | | | |
| **Acidity (pH)** | **AASHTO T289** | 5.9 | | | |
| **Water Soluble Sulfate Ion Content (mg/Kg)** | **ASTM C1580** | 451 | | | |
| **Water Soluble Sulfide Content (mg/Kg)** | **AWWA 4500-S,D** | Nil | | | |
| **Water Soluble Chloride Ion Content (mg/Kg)** | **ASTM D512** | <20 | | | |
| **Oxidation-Reduction Potential (RmV)** | **ASTM G200** | 89.2 | | | |
| **Total Dissolved Salts (mg/Kg)** | **AWWA 2520 B** | 380 | | | |
| **Electrical Resistivity (Ω·cm)** | **ASTM G57** | 4000 | | | |

**Verified By:** *Myles Warner*
*8/12/2025*




Notes

1) The MASW arrays performed by Terracon on June 2, 2025 are shown above in **RED**. Label locations indicate the start, or "0-foot," mark of the arrays. Several geophone locations were collected using a sub-meter accurate GPS receiver.

2) Geotechnical boring locations were collected using a handheld GPS and are shown above in **BLUE**.

3) Aerial imagery provided by Bing.

| | |
|---|---|
| PROJECT MANAGER: | ECC |
| DRAWN BY: | AGW |
| CHECKED BY: | NBR |
| APPROVED BY: | DAB |

| | |
|---|---|
| PROJECT NUMBER: | 1A255072 |
| DRAWING SCALE: | AS SHOWN |
| FILE NAME: | Loc-49.srf |
| DATE DRAWN: | 6/6/2025 |

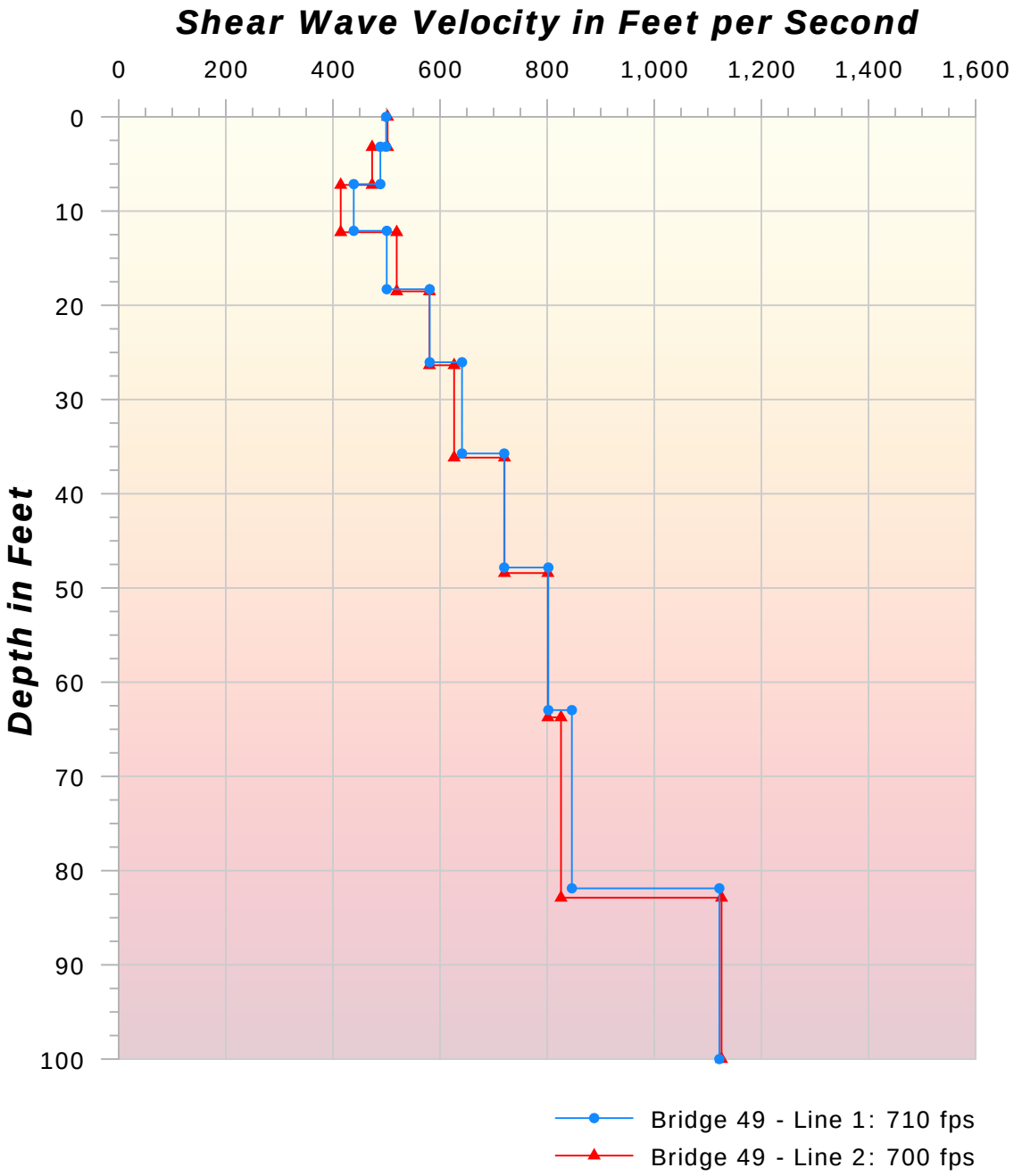
Terracon
1922 Old Murfreesboro Pike, Suite 905
Nashville, TN 37217

**Geophysical Exploration Plan**

Replacement of Bridge 49
(SR-87 Over Lauderdale Co. River Overflow)
Lauderdale County, TN

EXHIBIT 1

# Vs100' Model
# TDOT Bridge 49




Notes:

1) Seismic testing was conducted by Terracon on June 02, 2025.

2) Shear wave velocity testing and calculations were conducted in general accordance with ASCE 7-16 and IBC 2018.

| | |
|---|---|
| PROJECT MANAGER: | ECC |
| DRAWN BY: | AGW |
| CHECKED BY: | NBR |
| APPROVED BY: | DAB |
| PROJECT NUMBER: | 1A255072 |
| PROJECT TASK: | 1 |
| FILE NAME: | Vs100.gpj |
| DATE: | 6/6/2025 |


Terracon
1922 Old Murfreesboro Pike #905
Nashville, TN 37217


**Site Classification Data**

Replacement of Bridge 49
(SR-87 Over Lauderdale Co. River Overflow)
Lauderdale County, TN

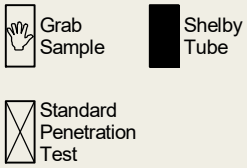
EXHIBIT 2

# Supporting Information

**Contents:**

Terracon
10841 S Ridgeview Rd
Olathe, KS

# General Notes

| Sampling | Water Level | Field Tests |
|---|---|---|
|   |   Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations. | N Standard Penetration Test Resistance (Blows/Ft.)<br>(HP) Hand Penetrometer<br>(T) Torvane<br>(DCP) Dynamic Cone Penetrometer<br>UC Unconfined Compressive Strength<br>(PID) Photo-Ionization Detector<br>(OVA) Organic Vapor Analyzer |

## Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

## Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

## Strength Terms

| Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance | | Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance | | |
|---|---|---|---|---|
| **Relative Density** | **Standard Penetration or N-Value (Blows/Ft.)** | **Consistency** | **Unconfined Compressive Strength Qu (psf)** | **Standard Penetration or N-Value (Blows/Ft.)** |
| Very Loose | 0 - 3 | Very Soft | less than 500 | 0 - 1 |
| Loose | 4 - 9 | Soft | 500 to 1,000 | 2 - 4 |
| Medium Dense | 10 - 29 | Medium Stiff | 1,000 to 2,000 | 5 - 8 |
| Dense | 30 - 50 | Stiff | 2,000 to 4,000 | 9 - 15 |
| Very Dense | > 50 | Very Stiff | 4,000 to 8,000 | 16 - 30 |
| | | Hard | > 8,000 | > 30 |

## Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

# Unified Soil Classification System

| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A] | | | | Soil Classification | |
|---|---|---|---|---|---|
| | | | | Group Symbol | Group Name [B] |
| **Coarse-Grained Soils:** More than 50% retained on No. 4 sieve | **Gravels:** More than 50% of coarse fraction retained on No. 4 sieve | **Clean Gravels:** Less than 5% fines [C] | Cu≥4 and 1≤Cc≤3 [E] | GW | Well-graded gravel [F] |
| | | | Cu<4 and/or [Cc<1 or Cc>3.0] [E] | GP | Poorly graded gravel [F] |
| | | **Gravels with Fines:** More than 12% fines [C] | Fines classify as ML or MH | GM | Silty gravel [F, G, H] |
| | | | Fines classify as CL or CH | GC | Clayey gravel [F, G, H] |
| | **Sands:** 50% or more of coarse fraction passes No. 4 sieve | **Clean Sands:** Less than 5% fines [D] | Cu≥6 and 1≤Cc≤3 [E] | SW | Well-graded sand [I] |
| | | | Cu<6 and/or [Cc<1 or Cc>3.0] [E] | SP | Poorly graded sand [I] |
| | | **Sands with Fines:** More than 12% fines [D] | Fines classify as ML or MH | SM | Silty sand [G, H, I] |
| | | | Fines classify as CL or CH | SC | Clayey sand [G, H, I] |
| **Fine-Grained Soils:** 50% or more passes the No. 200 sieve | **Silts and Clays:** Liquid limit less than 50 | **Inorganic:** | PI > 7 and plots above "A" line [J] | CL | Lean clay [K, L, M] |
| | | | PI < 4 or plots below "A" line [J] | ML | Silt [K, L, M] |
| | | **Organic:** | $\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$ | OL | Organic clay [K, L, M, N] |
| | | | | | Organic silt [K, L, M, O] |
| | **Silts and Clays:** Liquid limit 50 or more | **Inorganic:** | PI plots on or above "A" line | CH | Fat clay [K, L, M] |
| | | | PI plots below "A" line | MH | Elastic silt [K, L, M] |
| | | **Organic:** | $\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$ | OH | Organic clay [K, L, M, P] |
| | | | | | Organic silt [K, L, M, Q] |
| **Highly organic soils:** | Primarily organic matter, dark in color, and organic odor | | | PT | Peat |

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.