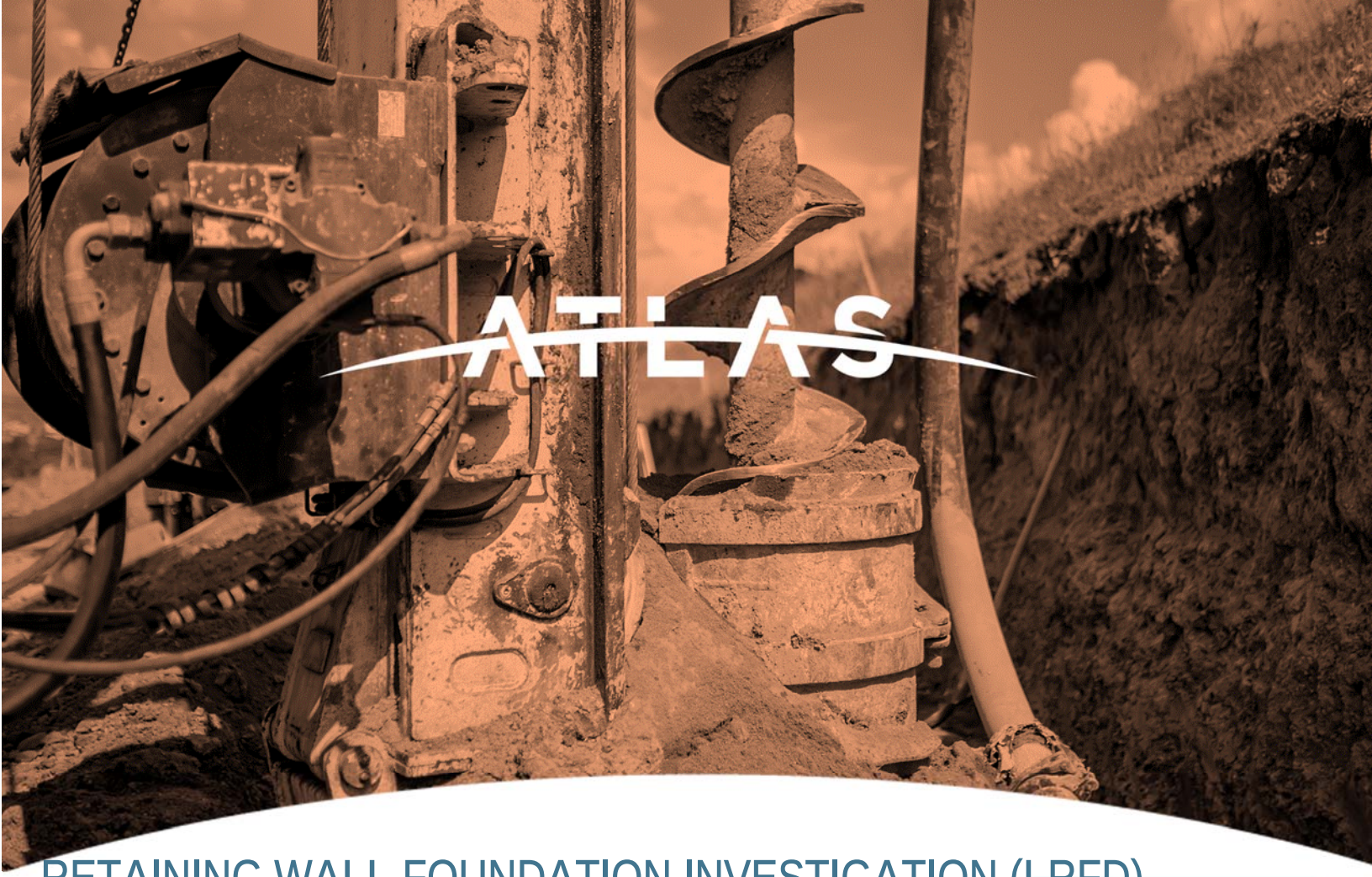


RETAINING WALL FOUNDATION INVESTIGATION (LRFD)

McGinnis Ferry Road over Big Creek – Wall No. 23
Forsyth and Fulton Counties, Georgia

PI NO. 0004634
Initial Submittal, October 29, 2021
Revision 1, January 28, 2022

PREPARED BY:
Atlas Technical Consultants, LLC
2450 Commerce Avenue
Suite 100
Duluth, Georgia 30096

Atlas Project No. FOR095

Wall Foundation Investigation (LRFD)
McGinnis Ferry Road, Wall 23
PI No. 0004634, Forsyth and Fulton Counties
Revision 1, January 28, 2022

LOCATION (See Map) McGinnis Ferry Road, Wall No. 23

GENERAL INFORMATION

GEOLOGIC FORMATION This project is geologically sited in the Biotitic Gneiss / Mica Schist / Amphibolite Formation of the Georgia Piedmont Region.

SUBSURFACE FEATURES Subsurface soils consist of brown micaceous sandy silt/silty sand over grey alluvial fine sand. Groundwater was encountered from Elevations 980.5' to 991.5', and hard solid rock was encountered from elevations 973' to 983.5'. For additional information see the boring layout and boring logs.

SITE CLASSIFICATION We recommend a site class of "D" per AASHTO LRFD 3.10.3.1.

WALL DESCRIPTION This project consists of an MSE wall with a height range of 2.72ft to 20.17ft. The wall begins at station 128+85.00 and ends at station 131+70.91 for a total length of 290.41ft. The purpose of the wall is to retain the widened portion of the McGinnis Ferry Road to accommodate ROW constraints.

1.1 – RETAINED SOIL PARAMETERS

Wall # (Station Range)	Unit Weight (pcf)	Internal Friction Angle (degrees)	Cohesion (psf)
Entire length	115	32	0

Note: Retained soil is new fill beyond the reinforced zone

1.2 – FOUNDATION SOIL PARAMETERS

Wall # (Station Range)	Unit Weight (pcf)	Internal Friction Angle (degrees)	Cohesion (psf)
Entire length	115	30	0

1.4 -- DESIGN DATA

Wall #	Design Height (ft)	Wall Location Description (Station ranges)	Base Width / Strap Length, B (ft)	Strength Limit State		Service Limit State	
				Bearing Pressure (ksf)	Effective Base Width/Strap Length, B' (ft)	Bearing Pressure (ksf)	Effective Base Width/Strap Length, B' (ft)
23	10	128+85.00 to 129+56.50	10	2.16	8.26	1.82	8.78
23	12	129+56.50 to 129+65.20	10	2.72	7.58	2.25	8.32
23	14	129+65.20 to 129+74.00 131+41.16 to 131+70.91	10	3.43	6.79	2.75	7.79

23	16	129+74.00 to 129+83.40	12	3.64	8.57	3.00	9.65
23	18	129+83.40 to 129+95.00 130+25.00 to 130+67.00	13	4.11	9.07	3.38	10.31
23	20.17	129+95.00 to 130+25.00 130+67.00 to 131+41.16	15	4.39	10.79	3.67	12.13

2.0 -- FOUNDATION RECOMMENDATIONS

2.1 – BEARING RESISTANCE AND SETTLEMENT

Design Section	Wall Location (Station ranges)	Wall Height (ft)	Base Width/Strap Length, B (ft)	Nominal Bearing Resistance (ksf)	Factored Bearing Resistance (ksf)	Total Settlement (inches)
1	128+85.00 to 129+56.50	10	10	6.00 (W-21)	2.40 (W-21)	0.9
2	129+56.50 to 129+65.20	12	10	6.98 (W-21)	2.79 (W-21)	0.7
3	129+65.20 to 129+74.00	14	10	8.70 (W-21)	3.48 (W-21)	0.8
4	129+74.00 to 129+83.40	16	12	9.10 (W-21)	3.64 (W-21)	1.0
5	129+83.40 to 129+95.00	18	13	10.45 (W-21)	4.18 (W-21)	1.2
6	129+95.00 to 130+25.00	20.17	15	11.50 (W-21)	4.60 (W-21)	1.9
7	130+25.00 to 130+67.00	18	13	10.53 (W-21)	4.21 (W-21)	1.6
8	130+67.00 to 131+41.16	20.17	15	11.25 (W-22)	4.50 (W-22)	3.4
9	131+41.16 to 131+70.91	14	10	8.95 (W-22)	3.58 (W-22)	2.1

Note: (*) Indicate the boring used for bearing analysis

3.0 -- GENERAL NOTES

Elevations All elevations are based on an Elevation 1001.02 of a rebar set into the ground at station 131+46.46, 4.94’ Lt.

As Built Foundation Information The as built foundation information should be forwarded to the Geotechnical Engineering Bureau upon completion of the foundation system.

3.1 – SHALLOW FOUNDATION NOTES

Bearing Resistance and Settlement Bearing Resistance and Settlement have been computed in accordance with AASHTO LRFD 2017 and GDOT Research Project 14-26 – Implementation of AASHTO LRFD Specifications: Bearing Capacity and Settlement Calculations for Shallow Foundations of Bridges and Walls. A LRFD Shallow Foundations Spreadsheet developed by Georgia Institute of Technology and GDOT’s Geotechnical Bureau was used to evaluate these parameters. The factored bearing resistance vs. footing width vs. settlement curves generated using this spreadsheet are attached to this report.

Bearing Resistance Factor of Footings at the Strength Limit State

Bearing resistance factors recommended by Paikowsky et al. (2010) were used in lieu of those recommended by AASHTO LRFD 2017. This was done to overcome the wide applicability of the AASHTO values since they do not properly represent all grades of soil types, the loading conditions or the strength characteristics. The following table shows the recommended resistance factors for shallow foundations on natural deposits of granular soil (after Paikowsky et al., 2010):

<table>
<tr><th rowspan="2">Soil Friction Angle, ϕ'</th><th colspan="3">Loading Conditions</th></tr>
<tr><th>Vertical – Centric or Eccentric</th><th>Inclined - Centric</th><th colspan="2">Inclined - Eccentric</th></tr>
<tr><th></th><th></th><th></th><th>Positive</th><th>Negative</th></tr>
<tr><td>30° - 34°</td><td>0.40</td><td rowspan="3">0.40</td><td rowspan="2">0.35</td><td>0.65</td></tr>
<tr><td>35° - 36°</td><td>0.45</td><td rowspan="2">0.70</td></tr>
<tr><td>37° - 39°</td><td>0.50</td><td rowspan="2">0.40</td></tr>
<tr><td>40° - 44°</td><td>0.55</td><td>0.45</td><td rowspan="2">0.75</td></tr>
<tr><td>> 45°</td><td>0.65</td><td>0.50</td><td>0.45</td></tr>
</table>

MSE Wall Backfill Material

Lightweight backfill material should not be used for this MSE Wall so that the factors of safety against sliding and overturning are not affected negatively.

Ground Improvement

Due to the presence of a 10+/- feet of loose/soft materials beneath the wall footing, we recommend undercutting 4 feet of these soils and replacing with the geogrid reinforced grade aggregate in accordance with the attached detail provided. This improvement will also help meet AASHTO LRFD global stability requirements.

Differential Settlement Analyses

Differential settlement analyses have been performed in accordance with AASHTO LRFD 2017 requirements – C11.10.4.1-1 for MSE Walls.

The wall system meets the AASHTO LRFD requirements. The results of these analyses are attached to this report.

Global Stability Analyses

Global stability analyses have been performed in accordance with AASHTO LRFD 2017, 11.6.2.3 requirements. The software used for the analyses is Slope/W by GeoStudio Software. Factor of safety was evaluated using the Bishop and Morgenstern-Price methods, and both circular and non-circular failure analyses were performed.

Location (Station)	Strap Length (ft)	Required Resistance Factor	Required Minimum FoS	Calculated FoS*
129+50	10	0.65	1.54	1.77
131+00	15	0.65	1.54	1.56**

* Calculated FoS is the least values from all methods.
** FoS with 4ft graded aggregate ground improvement

5.0 – QA / QC

Prepared By: Jay Shah, Staff Engineer

Signature: _____

Reviewed By: Yong Shao, PhD, PE.

Signature: _____

GEORGIA REGISTERED No. 26340 PROFESSIONAL ENGINEER YONG C. SHAO

APPENDICES

A. **Site Location Map**

B. **Special provisions and details**

   a. **SP 457 – Geogrid reinforcement**

   b. **SP 809 – Geogrid materials**

   c. **Geogrid reinforcement detail**

C. **Boring locations and logs**

D. **Drilling calibration report**

E. **Soil laboratory tests**

F. **Seismic site class determination**

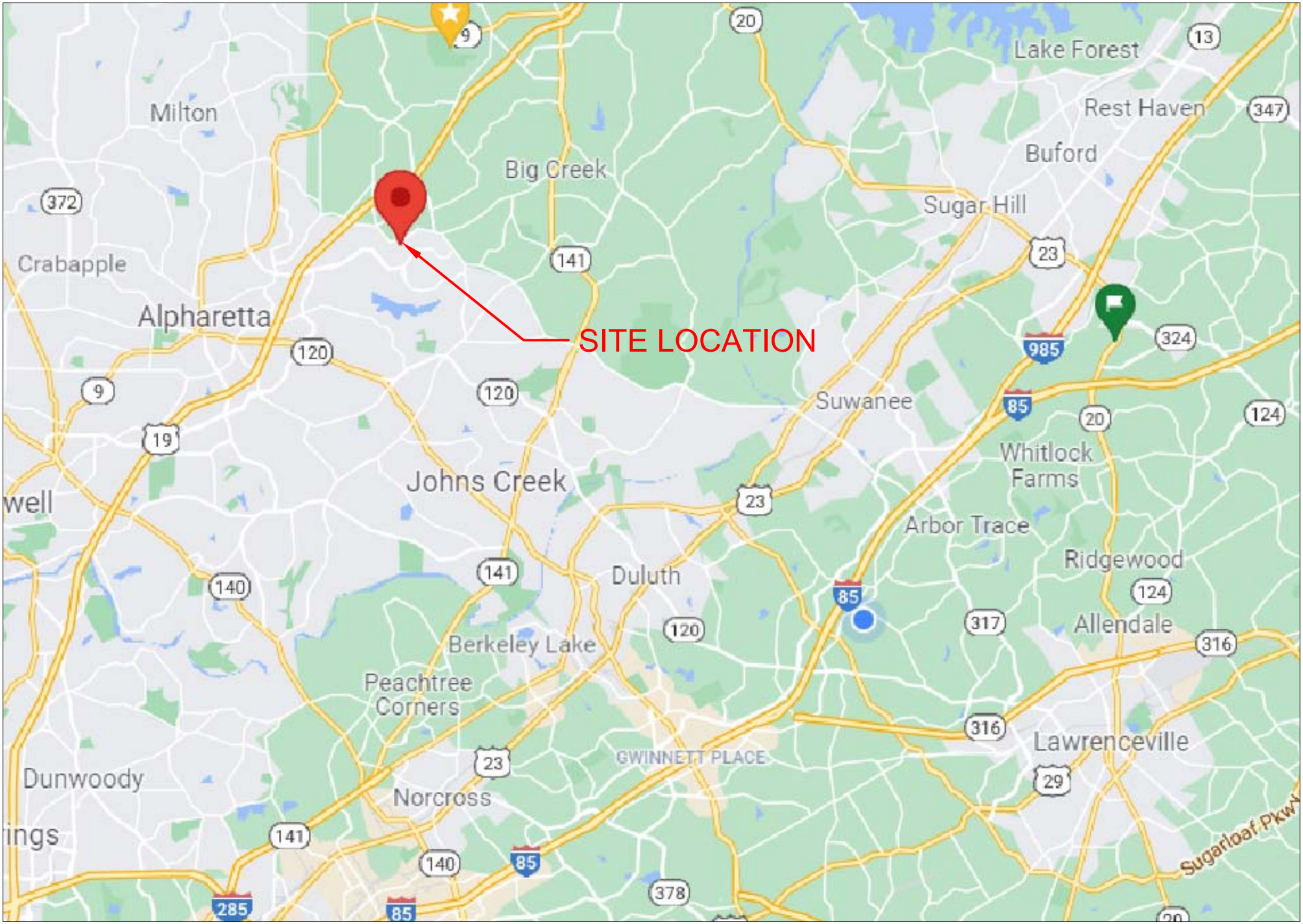
G. **Wall foundation design data**

H. **Bearing resistance calculations**

I. **Limiting differential settlement check**

J. **Global stability analysis graphical outputs**

Appendix A – Site Location Map



TITLE: SITE LOCATION MAP	PROJECT NO: FOR095	ATLAS	ATLAS TECHNICAL CONSULTANTS
PROJECT: MCGINNIS FERRY ROAD OVER BIG CREEK FORSYTH/FULTON COUNTIES, GEORGIA	DRAWN BY: YCS		2450 COMMERCE AVE, SUITE 100 DULUTH, GEORGIA 30096 TEL: 770-2635945; FAX: 770-2635954
	DATE: 1/13/2021		

12/20/2018
CVE-Darla

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2016217_01-0001.dgn
GRMCOV

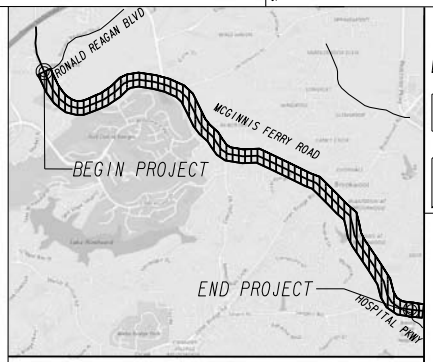
GDOT | P. I. No. 0004634

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

PLAN AND PROFILE OF PROPOSED

MCGINNIS FERRY ROAD WIDENING

FROM RONALD REAGAN BLVD/UNION HILL RD TO HOSPITAL PARKWAY
FORSYTH AND FULTON COUNTIES



LOCATION SKETCH

DESIGN DATA:
TRAFFIC A.D.T.: 26,200 (2020)
TRAFFIC A.D.T.: 37,700 (2040)
TRAFFIC D.H.V.: 3580 (2040)
DIRECTIONAL DIST: 51/49
% TRUCKS: 2%
24 HR. TRUCKS %: 4%
SPEED DESIGN: 45 mph

LOCATION & DESIGN APPROVAL DATE:

FUNCTIONAL CLASS:
URBAN ARTERIAL

THIS PROJECT IS 50 % IN FULTON COUNTY NO.006, AND IS 50 % IN FORSYTH COUNTY CONG. DIST. NO. 007

PROJECT DESIGNATION: EXEMPT

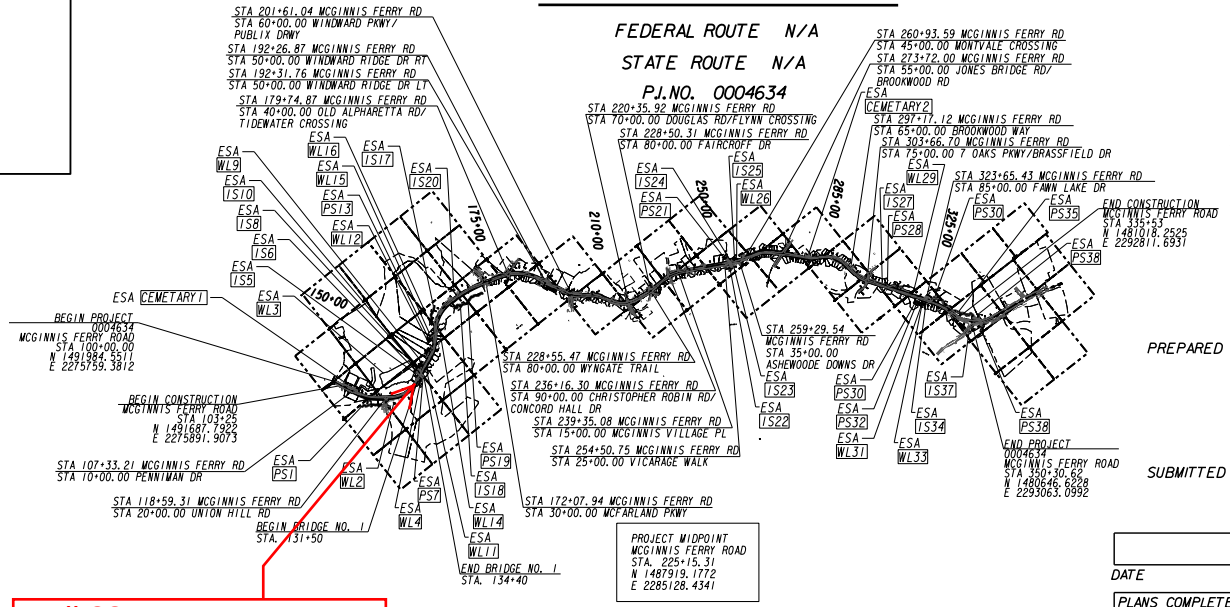
THIS PROJECT HAS BEEN PREPARED USING THE HORIZONTAL GEORGIA COORDINATE SYSTEM OF 1984 (NAD 1983)/94 WEST ZONE, AND THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

0004634

FEDERAL ROUTE N/A

STATE ROUTE N/A

P.I.NO. 0004634



PROJECT MIDPOINT
MCGINNIS FERRY ROAD
STA. 225+15.31
N 1487919.1772
E 2285128.4341

SCALE IN FEET
0 2000 4000 8000

Wall 23
Sta. 128+85 - 131+70.91

LENGTH OF PROJECT	COUNTY No. 121 AND 117 Project No. 0004634
	MILES
NET LENGTH OF ROADWAY	4.686
NET LENGTH OF BRIDGES	0.055
NET LENGTH OF PROJECT	4.741
NET LENGTH OF EXCEPTIONS	N/A
GROSS LENGTH OF PROJECT	4.741

THE DATA, TOGETHER WITH ALL OTHER INFORMATION SHOWN ON THESE PLANS OR IN ANYWAY INDICATED THEREBY, WHETHER BY DRAWINGS OR NOTES, OR IN ANY OTHER MANNER, ARE BASED UPON FIELD INVESTIGATIONS AND ARE BELIEVED TO BE INDICATIVE OF ACTUAL CONDITIONS. HOWEVER, THE SAME ARE SHOWN AS INFORMATION ONLY, ARE NOT GUARANTEED, AND DO NOT BIND THE DEPARTMENT OF TRANSPORTATION IN ANY WAY. THE ATTENTION OF BIDDER IS SPECIFICALLY DIRECTED TO SUBSECTIONS 102.04, 102.05, AND 104.03 OF THE SPECIFICATIONS.

NOTE :
ALL REFERENCES IN THIS DOCUMENT, WHICH INCLUDES ALL PAPERS, WRITINGS, DOCUMENTS, DRAWINGS, OR PHOTOGRAPHS USED, OR TO BE USED IN CONNECTION WITH THIS DOCUMENT, TO "STATE HIGHWAY DEPARTMENT OF GEORGIA", "STATE HIGHWAY DEPARTMENT", GEORGIA STATE HIGHWAY DEPARTMENT", "HIGHWAY DEPARTMENT", OR "DEPARTMENT" WHEN THE CONTEXT THEREOF MEANS THE STATE HIGHWAY DEPARTMENT OF GEORGIA, AND SHALL BE DEEMED TO MEAN THE DEPARTMENT OF TRANSPORTATION.

PE STAMP

MORELAND ALTOBELLI
AN ATLAS COMPANY
2450 Commerce Avenue
Suite 100
Duluth, Georgia 30096
770.263.5945

PREPARED BY: _____
DESIGN

SUBMITTED BY: _____
STATE PROGRAM DELIVERY ADMINISTRATOR

DATE CHIEF ENGINEER

PLANS COMPLETED - -	
REVISIONS	

DRAWING No.
01-0001

Appendix B – Special provisions and details

July 13, 2005

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

McGinnis Ferry Road, Wall 23, Forsyth and Fulton Counties
P. I. NO. 0004634

SECTION 457 – GEOGRID REINFORCEMENT

Delete Section 457 as written and substitute the following:

457.1 Description

This Work consists of placing geogrid reinforcement under new embankments at the locations and to the elevations or depths indicated on the Plans or as directed by the Engineer.

457.2 Materials

Use geogrid materials that meet the requirements of Special Provision Section 809– Geogrid Materials.

457.3 Construction

Place the geogrid reinforcement in accordance with the following requirements:

1. Preparation For Placement:

    a. Clearing and Grubbing: Clear and grub the areas of the proposed reinforcement in accordance with the applicable portions of Section 201.

    b. Benching: Bench into existing embankments in accordance with the applicable portions of Section 208 and the Plans.

    c. Embankments: Construct embankments in accordance with the applicable sections of Section 208.

    d. Attach weights to any geogrids that are to be placed in inundated areas to allow for placement to the required elevations or depths.

2. Placement of Geogrids: Place geogrids in a manner and at the locations shown on the Plans. Place the grids with the machine direction perpendicular to the roadway unless specified

otherwise on the Plans. Place the geogrids level or sloping away from the existing embankment at an inclination that is no greater than 5°. Spread the geogrids out free of wrinkles, bends or undulation and hold the geogrids taut by wooden stakes or other mechanical means while the embankment material is being placed.

3. Fill Placement Over Geogrid: Place fill over the geogrid in accordance with the Plans and applicable portions of Section 208. Maintain at least 4 inches (102 mm) of soil between the grid and any rubber-tired construction equipment. Maintain at least 8 inches (203 mm) of soil between the grid and any track construction equipment.

4. Degree of Compaction: Compact embankment fills to at least 95 percent of the maximum laboratory dry density for the full depth of the embankment, unless otherwise specified. The Engineer may adjust compaction requirements for initial lifts of fill over unstable soils until a stable mat is formed. Determine the maximum laboratory dry density and in place density of the compacted fill in accordance with Sub-Section 208.3.05.B.2.

5. Joints or Splices: Place grids in continuous strips in the direction of main reinforcement. Do not use joints or splices in the machine direction unless the joint or splice can be shown by laboratory tests to carry 100% of the required ultimate tensile strength of the grid.

6. Damaged Material: Remove any geogrid material damaged in shipping, storage or placement from the project and replace it at no additional expense to the Department.

457.4 Measurement

Geogrid reinforcement is measured for payment in square yards (meters) of accepted geogrid materials in place for Type C. Measurement is to the nearest square yard (meters).

457.5 Payment

Geogrid reinforcement is paid for at the Contract Price per square yard (meters), for geogrid Types A, B and C, complete and in place. Payment is full compensation for furnishing materials, placing materials, and for all labor, equipment, tools and incidentals necessary to perform the Work.

Payment for work under Section 457 will be made under:

Item No. 457-1015. Geogrid Reinforcement, Type C……. Per Square Yard (Meters)

Office of Materials and Testing

Revised June 14, 2012

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

McGinnis Ferry Road, Wall 23, Forsyth and Fulton Counties
P. I. NO. 0004634

Section 809— GEOGRID MATERIALS

Delete Subsection 809.2.A.1 and add the following:

1. Geogrid for Reinforced Slopes

   Use geogrid materials for reinforced slope construction that consist of the following:

   - Either a biaxial or uniaxial grid of polymer tensile elements manufactured into a regular network with apertures of sufficient size to allow for soil interlock.
   - A commercially prepared material of high tenacity polyester, high density polyethylene (HDPE) or polypropylene that is formed by stretching, heat welding, chemical welding, knitting, weaving or combinations of these methods.

   a. Determine the long-term design strengths listed in Sub-Section 809.03 that are required for the Project using reduction factors noted herein to reduce the ultimate strength of the geogrid to account for creep, site damage and durability. Calculate the long-term design strength using the following formula:

$$T_{al} = \frac{T_{ULT}}{RF_D * RF_{ID} * RF_{CR}}$$

where T_{al} = Long-Term strength

T_{ULT} = Geogrid ultimate tensile strength
RF_{CR} = Creep Reduction Factor
RF_{ID} = Installation Damage Reduction Factor
RF_D = Durability Reduction Factor

   b. Determine T_{ULT} using wide strip tensile testing as noted in Sub-Section 809.04.

   c. Determine the reduction factors by the methods described in paragraphs 1 - 4 as follows:

      1. Creep: Provide evidence from the manufacturer that the geogrid has been tested in laboratory creep tests conducted for a minimum duration of 10,000 hours for a range of load levels, including loads that the geogrid will be subject to on this Project. Conduct these tests as specified in Sub-Section 809.04. Extrapolate the results to a minimum design life of 75 years. Determine the tension level at which the total strain of the geogrid will not exceed 10% within the design life of 75 years (designated Tw), and calculate the creep reduction factor as follows:

$$RF_{CR} = \frac{T_{ULT}}{\text{Creep limit Strength}}$$

In the absence of such test data, use the following creep reduction factors for the geogrid type used on the Project:

Geogrid Type	Creep Reduction Factor
Polyester	2.5
Polypropylene	5.0
Polyethylene	5.0

2. Installation Damage: Provide evidence from the manufacturer that the geogrid has been subjected to full scale construction damage tests using fill materials and construction procedures that are representative of those on the Project. Provide evidence the grid has been excavated and tested according to Sub-Section 809.04.

   Use a minimum value of RF_{ID} of 1.1, and if no damage installation testing has been conducted use a value for RF_{ID} of 3.0.

3. Product Durability: Provide evidence from the manufacturer that the geogrid has been subjected to a series of durability tests to examine the effects of chemical and biological exposure on the grid, as described in the FHWA NHI-00-043 MSE and RSS Design and Construction guidelines.

   Include the effect on short-term and long-term mechanical properties as well as change to the reinforcement microstructure, dimensional changes, changes in mass, oxidation, environmental stress cracking, hydrolysis, temperature, plasticization, and changes in surface micrology together with any variation in the infrared spectrum analysis in the durability studies. Investigate the synergetic effects of different environments, particularly temperature, and subject the geogrid to a working stress during the environmental test.

   Perform the environmental testing protocol outlined in FHWA RD-97-144, which include but are not limited to the following:

   a) Thermo-Oxidation Resistance - ENV ISO 13438: 1999

   b) UV Oxidation Resistance – ASTM D-4355

   c) Hydrolysis – GSI Test Method – GG7

   Test the geogrids that have been subjected to these conditions according to Sub-Section 809.04.

   In the absence of such test data, use the following durability reduction factors for the geogrid type that meet the requirements of Table 3-12 of FHWA GEC 11, used on the Project:

Geogrid Type	Durability Reduction Factor
Polypropylene	1.1
Polyethylene	1.1
Polyester with:	
- Installation environment pH between 4.99 and 8	1.15
- Installation environment pH between 3 and 4.98 or 8.01 and 9	1.3

4. Pullout Resistance: Provide evidence from the manufacturer that the geogrid has been subjected to full scale pullout tests using backfill materials representative of those on the Project, as described in the FHWA NHI-00-043 MSE and RSS Design and Construction guidelines.

Calculate pullout resistance for design based on a maximum elongation of the embedded geogrid of ¾-inch (19 mm) as measured at the leading edge of the compressive zone within the soil mass and not the ultimate pullout capacity. For geogrids where insufficient data exists to evaluate pullout resistance as a function of soil type, perform pullout tests on a specific basis until such time that the engineering behavior of the soil-reinforcement system is clearly defined.

Perform the pullout tests using vertical stress variations (σ_v') and geogrid element configurations simulating actual project conditions.

Perform the pullout tests in accordance with Section 809.04 on samples with a minimum embedded length of 2 feet (610 mm). Perform the tests on samples with a minimum width of 1 foot (305 mm), or a width equal to a 4-longitudinal grid element, whichever is greater. Conduct these tests at 70°F ± 4ºF (21ºC ± 2°C) at constant strain rates of 0.5mm per minute.

Evaluate the pullout resistance by the following relation:

$$P_r = F^* \alpha \sigma_v' L_e C$$

where

P_r = pullout capacity of tensile reinforcement

$L_c C$ = the total surface area per unit width of the reinforcement in the resistive zone behind the failure surface

L_c = the embedment or adherence length in the resisting zone behind the failure surface

C = the reinforcement effective unit perimeter

F^* = the pullout resistance (or friction-bearing-interaction) factor

α = a scale effect correction factor to account for a non linear stress reduction over the embedded length of highly extensible reinforcements, based on laboratory data

σ_v' = the effective vertical stress at the soil- reinforcement interfaces

Ensure that the pullout resistance, P_r, meets the following minimum strength requirement:

P_r = FPO **x** T_{al} with a displacement less than or equal to ¾-inch (19 mm), where:

FPO = Factor of safety against pullout, equal to 1.5

T_{al} = Long-term design load

Delete Subsection 809.2.C and add the following:

C. Acceptance

Test geogrid according to the following:

Test Property	Test Method
Reinforced Slopes	
Tensile Strength—Wide Width	ASTM D 4595
Tensile Strength—Single Rib Strand	ASTM D 6637
Tensile Creep Testing	ASTM D 5262
Geogrid Pullout	ASTM D 6706
Installation Damage Testing	ASTM D-5818
Interface Friction Coefficient	ASTM D-5321

MSE Wall Backfill Stabilizing Geogrid	
Melt Index	ASTM D 1238
Density	ASTM D 1505
Tensile Strength	ASTM D 638
Ultimate Elongation	ASTM D 638
Vicat Softening Point	ASTM D 1525
Brittleness	ASTM D 746

Supply a certification from the manufacturer showing the physical properties of the material used and conformance with the Specifications as directed by Sub-Section 106.05 of the Specifications. In addition, provide evidence from the manufacturer that the geogrid has been used successfully in installations with similar environmental and project conditions. Submit certifications and test results to the Engineer for review and approval at least 45 days prior to intended use. Do not begin placement of geogrids until the test results have been reviewed and approved by the Engineer.

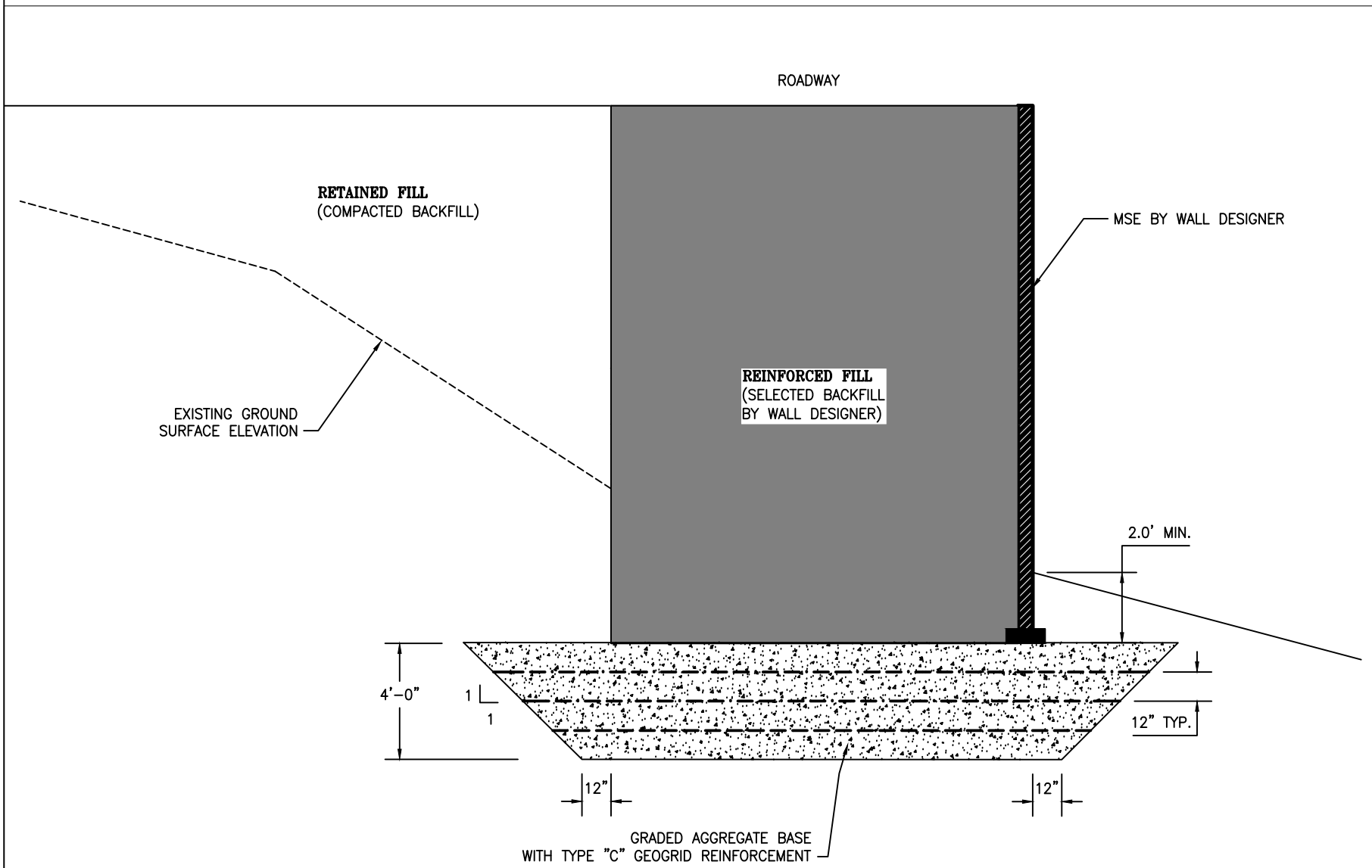
Add the following:

809.3 Design Properties

Ensure the geogrids meet the following minimum long-term design strengths (T_{al}) in the machine direction:

Geogrid Type	Minimum Long-Term Design Strength, T_{al}
Type C	3500 lb/ft

Provide the ultimate tensile strengths of the grids (T_{ULT}) to the Engineer in writing to verify the calculation in obtaining the long-term design loads (T_{al}).



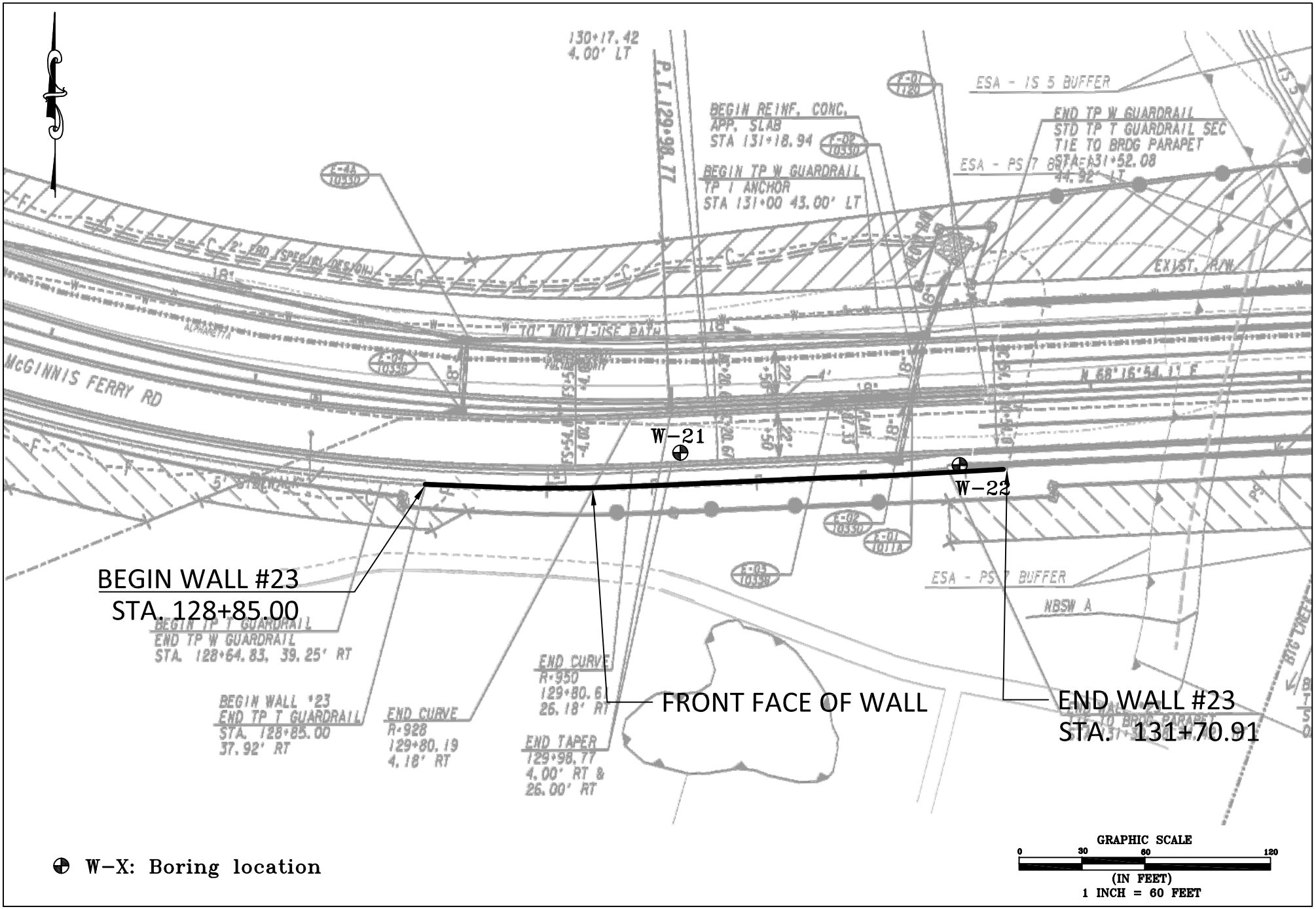
Not to Scale

GENERAL NOTES:

1) DETAILS APPLIES TO STATION 129+95 TO 131+70.91
2) UNDERCUT THE EXISTING FOUNDATION SOILS AS INDICATED, BACKFILL WITH GRADED AGGREGATE BASE AND PLACE LAYERS OF TYPE C GEOGRID 12" APART

PROJECT: McGinnis Ferry Road over Big Creek – Wall #23 Forsyth and Fulton Counties, GA P.I.No. 0004634	PROJECT NO: FOR095 DRAWN BY: YCS DATE: 1/28/2022	TITLE: GROUND IMPROVEMENT DETAIL	ATLAS TECHNICAL CONSULTANTS 2450 Commerce Avenue, STE 100, Duluth, GA 30096 (770)-2635945

Appendix C - Boring locations and logs



⊕ W–X: Boring location

PROJECT: McGinnis Ferry Road over Big Creek Forsyth and Fulton Counties, GA P.I.No. 0004634	PROJECT NO:	FOR095	TITLE: BORING LOCATION MAP WALL #23	ATLAS TECHNICAL CONSULTANTS 2450 Commerce Avenue, STE 100, Duluth, GA 30096 (770)-2635945
	DRAWN BY:	YCS		
	DATE:	1/31/2021		

ATLAS
TECHNICAL CONSULTANTS
2450 Commerce Avenue, STE 100, Duluth, GA 30096
(770)-2635945

W-21: Sta. 130+07, 30' Rt

McGinnis Ferry Road over Big Creek
Forsyth/Fulton Counties, Georgia
PI No. 0004634

ATLAS Proj. No.: FOR095

Wall No. 23

DATE COMPLETED	: 12/19/2020	GROUND SURF. ELE.	: 999.5'
ENERGY RATING	: 94%	DEPTH OF BORING	: 16'
DRILL RIG	: CME 550 (SN 380)	DEPTH OF WATER	: 8'
DRILLING METHOD	: HSA + SPT	LOGGED BY	: Jay Shah
DRILLER	: Drilling Solutions	BOTTOM OF FTG	: 995'

Sample Condition: Remoulded; Undisturbed; Lost; Rock Core

Sampler Type: SS Split Spoon; ST Shelby Tube; PS Piston Sampler; DC Diamond Core Bar.

Depth in Feet	Surf. Elev. 999.5	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0											
2	998	ML		Brown, sandy silt, firm	2-2-2	6		SS			
4	996	CL		Dark brown, sandy lean clay,firm Bottom of Wall	2-2-2	6		SS			
6	994	SC		Dark brown,clayey sand, loose, wet	2-2-3	8		SS			
8	992	SM		Brown/grey, silty sand, fragments of rock, medium dense	3-5-13	28		SS			▼
10	990										
12	988	SM		Grey, silty sand, with fragments of rock, very dense, PWR							
14	986				50/2"	50/2"		SS			
16	984										
18	982										
20	980										
22	978										
24	976										
26	974										
28	972										
30	970										

Auger refused at depth of 16' B.G.S.

NOTE: SPT-N Values have been corrected with 94% ER

10-24-2021 C:\Users\yshao\Desktop\Yong Shao GDOT\TEMP\McGinnis Ferry\Boring Log\W-21(W-14A).bor

ATLAS
TECHNICAL CONSULTANTS
2450 Commerce Avenue, STE 100, Duluth, GA 30096
(770)-2635945

W-22 : Sta.131+40, 40' Rt

McGinnis Ferry Road over Big Creek
Forsyth/Fulton Counties
PI No. 0004634

ATLAS Proj. No.: FOR095

Wall No. 23

DATE COMPLETED	: 12/19/2020	SURFACE ELE.	: 990.5'
ENERGY RATING	: 94%	DEPTH OF BORING	: 18'
DRILL RIG	: CME 550 (SN 380)	DEPTH TO WATER	: 10'
DRILLING METHOD	: HSA + SPT	LOGGED BY	: Jay
DRILLER	: Drilling Solutions	BOTTOM OF FTG	: 898'+/-

Sample Condition: Remoulded; Undisturbed; Lost; Rock Core

Sampler Type: SS Split Spoon; ST Shelby Tube; PS Piston Sampler; DC Diamond Core Bar.

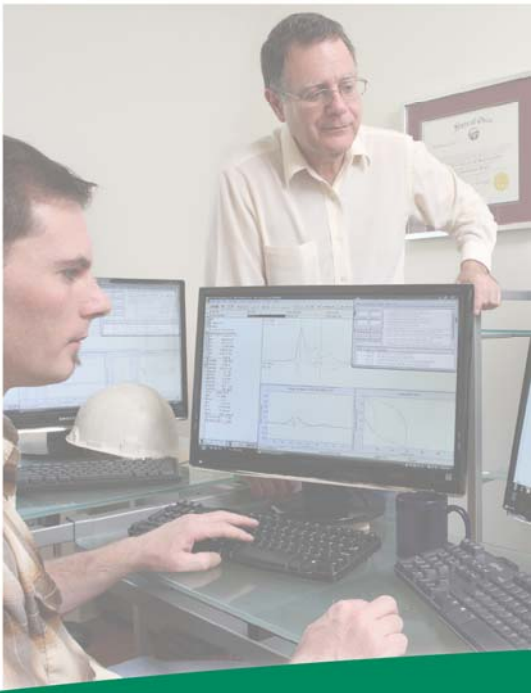
Depth in Feet	Surf. Elev. 990.5	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0	990	SM		Brown, micaceous, SILTY SAND, loose Bottom of Wall	1-2-1	5		SS			
2	988										
4	986	SM		Brown/orange, SILTY SAND, loose	2-3-3	9		SS			
6	984	SP		Grey, SAND, loose, alluvial	2-2-3	8		SS			
8	982				WOH	WOH		SS			
10	980										
12	978										
14	976				WOH-1-1	3		SS			
16	974										
18	972	RC		Auger refused at depth of 18ft B.G.S. Rock coring from 18' to 28' Grey to off-white biotite gneiss, hard REC=77%; RQD=58% UCS=4,050 psi				DC			
20	970										
22	968										
24	966										
26	964										
28	962			Rock coring terminated at depth of 28' B.G.S.							
30											

NOTE: SPT N-Values have been corrected with 94% Energy Rating

10-24-2021 C:\Users\yshao\Desktop\Yong Shao GDOT\TEMP\McGinnis Ferry\Boring Log\W-22.bor

Rock Core From Boring W-22
(Depth 18’ – 28’)
REC = 77%, RQD = 58%

Appendix D - Drilling calibration report



GRL engineers, inc.

Dynamic Measurements and Analyses

Job No. 179031-1

Report on: Standard Penetration Test Energy Measurements
Jonesboro, GA

Prepared for Drilling Solutions

By Thomas G. Hyatt, P.E. and Joel S. Webster, E.I.

June 20, 2018

June 20, 2018

Tony Trettel
Drilling Solutions, LLC
180 Gateway Dr.
Canton, GA 30115

Re: Standard Penetration Test Energy Measurements
Jonesboro, GA GRL Job No. 179031-1

Dear Mr. Trettel,

This report presents results of energy measurements obtained on June 8, 2019 during Standard Penetration Tests (SPT) sampling. Two automatic hammers mounted on two separate CME550 dill rigs that were tested generally following ASTM D4633-10 standards. All dynamic tests were performed on AWJ drill rods. GRL Engineers, Inc. obtained the dynamic measurements with an instrumented AW subsection that had AWJ adapters and a Model 8G Pile Driving Analyzer®. This report describes the testing procedures and summarizes the test results. Appendix A describes our measurement and analysis methods, Appendix B contains calibration information for the gages and equipment used, and Appendix C is a summary of the field data.

PURPOSE AND SCOPE OF WORK

At the request of Drilling Solutions, LLC., GRL conducted SPT energy measurements in Jonesboro, GA according to ASTM D4633-10. Specifically, we recorded SPT energy measurements at five-foot sample intervals between 18.5 and 43.5 feet below the existing ground surface. SPT samples were taken every five feet from the ground surface until a boring depth of about 43.5 feet was reached. All SPT samples were driven for a total of 3 six-inch increments, or 1.5 feet.

EQUIPMENT

Drilling and SPT Hammer Equipment

CME-550 (Serial # 380)

SPT energy measurements were made on an automatic hammer mounted on a CME-550 drill rig. The drilling method used to advance the boring was hollow stem auger. Energy measurements for this drill rig were collected at a borehole located in Jonesboro, GA. SPT energy measurements were performed at 5-foot sampling intervals between 18.5 and 40.0 feet. A total of five energy measurement events were performed for this drill rig.

CME-550 (Serial # 404)

SPT energy measurements were made on an automatic hammer mounted on a CME-550 drill rig. The drilling method used to advance the boring was hollow stem auger. Energy measurements for this drill rig were collected at a borehole located in Jonesboro, GA. SPT energy measurements were performed at 5-foot sampling intervals between 18.5 and 43.5 feet. A total of six energy measurement events were performed for this drill rig. The SPT energy measurements performed from 33.5 to 40 feet did not meet the ASTM D4633-10 specifications for blow counts and were not considered in the calibration of this drill rig.

Instrumentation

A Model 8G Pile Driving Analyzer (PDA) data acquisition system (SN# 4613LE) was used to collect and process the dynamic measurements of force and velocity. The data was collected using a two foot long section of AW rod subsection (SN# 246AW) with a cross sectional area of 1.21 square inches and instrumented with two full bridge foil resistance strain gages and two piezoresistive accelerometers mounted in the midpoint location of the instrumented rod. Couplings were used to convert the threads from the AW rod subsection to the AWJ rod string.

Analog signals from the strain gages and accelerometers were conditioned, digitized, stored and processed with the PDA. The sampling frequency used during the SPT testing was 50 kHz. Selected output from the PDA for each recorded impact included the energy transfer ratio (ETR), maximum rod top velocity (VMX), maximum energy transfer (EFV), maximum rod top force (FMX), and the hammer operating rate (BPM).

MEASUREMENTS AND CALCULATIONS

FV Method (EFV)

Energy transfer to the PDA gage location, EFV, was computed by the PDA using force, F(t), and velocity, v(t), records as follows:

$$EFV = \int_a^b F(t) \cdot v(t) dt$$

The time "a" corresponds to the start of the record when the energy transfer begins, and "b" is the time at which energy transferred to the rod reaches a maximum value. The FV Method is currently recognized in ASTM D4633-10, and is the theoretically correct result; therefore, no other energy calculation methods are reported.

Corrected SPT number (N_{60})

While the primary purpose of SPT energy testing is to calculate the maximum transferred energy (ETR) of each hammer blow, the overall average EFV value can be used to calculate the corrected SPT number (N_{60}). To adjust the SPT N-values for hammer performance, the following correction as suggested by Seed for N-value adjustment to 60% transfer efficiency (e.g. 210 ft-pounds) was used:

Where:

N_{60} = Corrected N-value
E_m = overall average measured energy transfer (EFV)
N_m =number of blows for last 12 inches of sampler penetration

$$N_{60} = \left(\frac{E_m}{210}\right) N_m$$

A general introduction to dynamic SPT testing methods is included in this report as Appendix A. References for more detailed descriptions of our testing and analysis methods are available upon request.

Any cross-sectional area difference between the GRL rod subsection and the drill rods, any loose connections or changes in area at section joints, or any cross-sectional area differences between the individual drill rod sections will result in stress wave reflections that can potentially influence the energy transfer. The EFV transferred energy calculation method, utilizing both force and velocity records, is theoretically correct and gives energy transfer results that are not adversely affected by cross-sectional area changes or loose connectors. The EFV results are included in Appendix C for all records collected and accepted after checking them for consistency.

RESULTS

Upon return to the office, the records collected by the PDA were checked for consistency and accuracy. For example, records from very weak startup or final impacts were not included in average results. Appendix C contains a representative plot of force and normalized velocity versus time, as well as tables of PDA results for all hammer blows at each dynamically monitored sampling depth. The results include the EFV (transferred energy by the FV method, as recommended by ASTM D4633-10), ETR (energy transfer efficiency for the EFV method), BPM (hammer operating rate), FMX (maximum rod top force) and VMX (maximum rod top velocity). The tables show statistical summaries for the final two 6 inch increments over which the SPT N value is calculated. At the end of each table is a statistical evaluation of these results which include the average and standard deviation.

The table below and the summary tables in Appendix C summarize the average transferred energy values calculated by the EFV method. The records consist of averaged hammer blows from the last 12 inches (i.e. N value) at each dynamically monitored sampling depth. The "energy transfer ratio" (ETR) is defined as the ratio of maximum transferred energy EFV divided by the theoretical hammer potential energy of 350 ft-lbs (i.e., computed per the 140 lb SPT hammer and the standard 30 inch drop as specified by ASTM D1586-08). The average hammer operating rate is reported in blows per minute (BPM). A summary of the dynamic measurements of the energy transfer to the drill rods using the EFV equation is provided in the table below.

Drill Rig	Avg. EFV (ft-lbs)	Avg ETR (%)	Range of EFV (ft-lbs)	Range of ETR (%)
CME-550 SN 380	330	94	309 – 367	88 – 105
CME-550 SN 404	325	78	302 – 343	66 – 88

CONCLUSIONS

Based upon the dynamic test data obtained, the following conclusions are presented:

1. Loose connections in the drill string were sometimes observed in the force and velocity records. However, energy transfer values calculated using the EFV equation are not adversely affected by the connectors and therefore are considered a better indication of transferred energy.

2. Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 309 to 367 ft-lbs for the CME-550, SN 380 drill rig. This corresponds to a transfer efficiency ranging from 88 to 105% of the SPT hammer energy of 350 ft-lbs.

3. Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 302 to 343 ft-lbs for the CME-550, SN 404 drill rig. This corresponds to a transfer efficiency ranging from 66 to 88% of the SPT hammer energy of 350 ft-lbs.

4. The average transferred energy (EFV) and energy transfer ratio (ETR) for the CME-550 drill rigs tested was as follows:

   CME-550, SN 380: Average EFV = 330 ft-lbs; Average ETR = 94%

   CME-550, SN 404: Average EFV = 325 ft-lbs; Average ETR = 78%

Please review both ASTM D4633-10 and ASTM D1586-08 prior to applying these test results. The energy calibrations reported herein are valid for the same hammer/drill rig, with the same drill operator, same anvil dimensions, and same drilling methods.

We appreciate the opportunity to be of assistance to you on this project. Please contact our office should you have any questions regarding this submittal, require additional information, or if we may be of further service.

Sincerely,

GRL Engineers, Inc.

Thomas G. Hyatt, P.E.

Joel S. Webster, E.I.

TGH:JSW:dms

Appendix E - Soil laboratory tests

2450 Commerce Avenue
Suite 100
Duluth, Georgia 30096
Tel: 770-2635945
Fax: 770-263-0166

Soil Classification

Project Name:	*McGinnis Ferry Road*			P I No.:	*0004634*
Sample Location:	*Wall 23*	Sample Number:	W-21	Sample Depth:	*3.5'-5'*
Date Sampled:	*12/19/2020*	Sampled By:	*JS*	*Lab No.:*	
Date Tested:	*3/17/2021*	Tested By:	*JS*	*Atlas Project Number:*	*FOR095*
Sample Description:	*Dark brown sandy clay*				

Sieve Analysis

US Sieve Size	Sieve Opening		% Passing
	(inch)	(mm)	
3 Inch	3.0000	76.2	
1.5 Inch	1.5000	38.1	
1 Inch	1.0000	25.4	
No.4	1.8701	4.75	*100.0*
No.10	0.7874	2.00	*100.0*
No.20	0.3346	0.85	*97.2*
No.40	0.1673	0.425	*92.4*
No.60	0.0984	0.25	*89.8*
No.100	0.0591	0.15	*66.4*
No.200	0.0295	0.075	*51.2*
% Clay	0.0079	0.02	50.6

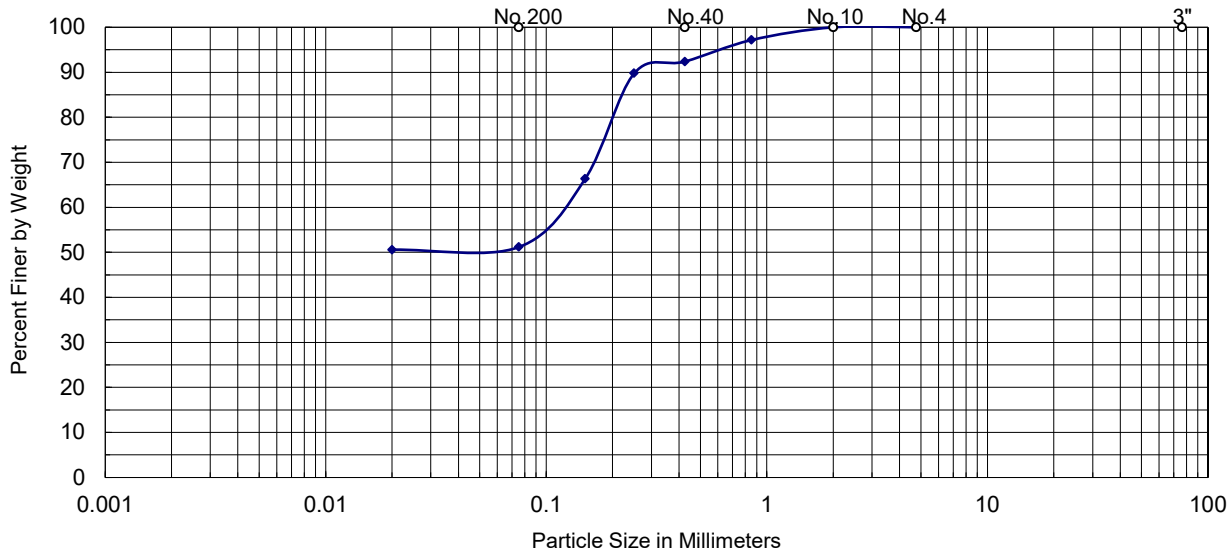
Atterberg Limits

Liquid limit (LL)	*25*
Plastic Limit (PL)	*16*
Plasticity Index (PI)	*9*

D_{10} (mm) =	
D_{30} (mm) =	
D_{75} (mm) =	
Coefficient of Uniformity, C_u =	
Coefficient of ccurvature, C_c =	

Organic Content, %	
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	CL - Sandy lean clay
GDOT	

2450 Commerce Avenue
Suite 100
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Tel: 770-2635945
Fax: 770-263-0166

Soil Classification

Project Name:	*McGinnis Ferry Road*			P I No.:	*0004634*
Sample Location:	*Wall 23*	Sample Number:	W-21	Sample Depth:	*6-7.5'*
Date Sampled:	*12/19/2020*	Sampled By:	*JS*	*Lab No.:*	
Date Tested:	*3/17/2021*	Tested By:	*JS*	*Atlas Project Number:*	*FOR095*
Sample Description:	*Dark brwon clayey sand*				

Sieve Analysis

US Sieve Size	Sieve Opening		% Passing
	(inch)	(mm)	
3 Inch	3.0000	76.2	
1.5 Inch	1.5000	38.1	
1 Inch	1.0000	25.4	
No.4	1.8701	4.75	*100.0*
No.10	0.7874	2.00	*100.0*
No.20	0.3346	0.85	*99.0*
No.40	0.1673	0.425	*95.4*
No.60	0.0984	0.25	*84.8*
No.100	0.0591	0.15	*72.6*
No.200	0.0295	0.075	*49.5*
% Clay	0.0079	0.02	38.5

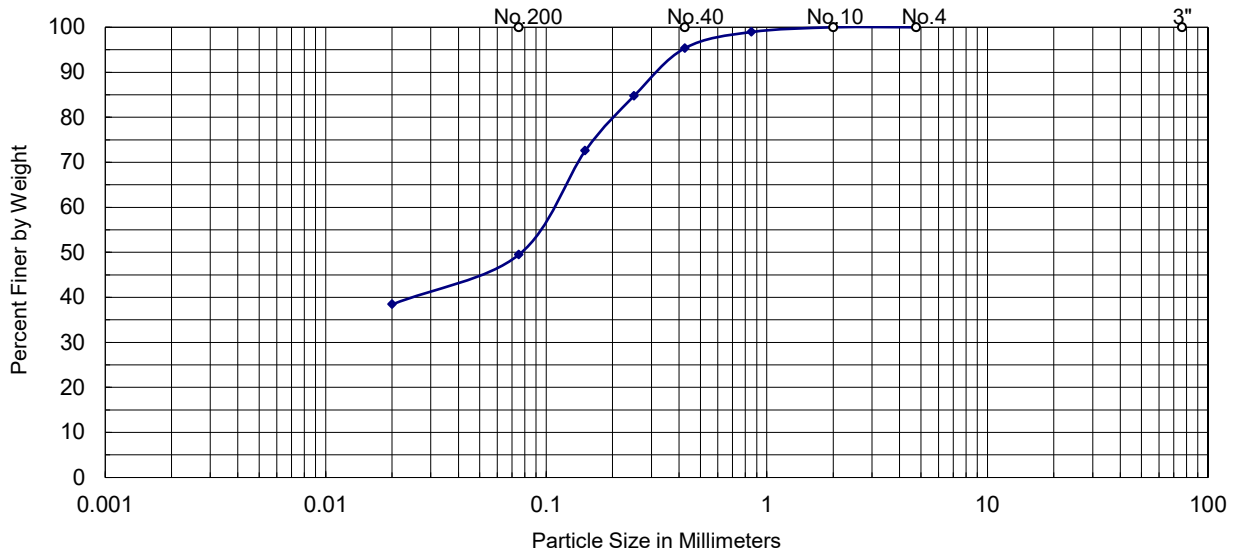
Atterberg Limits

Liquid limit (LL)	*41*
Plastic Limit (PL)	*25*
Plasticity Index (PI)	*16*

D_{10} (mm) =	
D_{30} (mm) =	
D_{75} (mm) =	
Coefficient of Uniformity, C_u =	
Coefficient of ccurvature, C_c =	

Organic Content, %	
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SC - Clayey sand
GDOT	

2450 Commerce Avenue
Suite 100
Duluth, Georgia 30096
Tel: 770-2635945
Fax: 770-263-0166

Soil Classification

Project Name:	*McGinnis Ferry Road*			P I No.:	*0004634*
Sample Location:	*Wall 23*	Sample Number:	W-22	Sample Depth:	*3.5'-5'*
Date Sampled:	*12/19/2020*	Sampled By:	*JS*	*Lab No.:*	
Date Tested:	*3/17/2021*	Tested By:	*Randy*	*Atlas Project Number:*	*FOR095*
Sample Description:	*Brown silty sand*				

Sieve Analysis

US Sieve Size	Sieve Opening		% Passing
	(inch)	(mm)	
3 Inch	3.0000	76.2	
1.5 Inch	1.5000	38.1	
1 Inch	1.0000	25.4	
No.4	1.8701	4.75	*100.0*
No.10	0.7874	2.00	*85.2*
No.20	0.3346	0.85	*68.0*
No.40	0.1673	0.425	*51.0*
No.60	0.0984	0.25	*44.0*
No.100	0.0591	0.15	*27.0*
No.200	0.0295	0.075	*18.0*
% Clay	0.0079	0.02	17.5

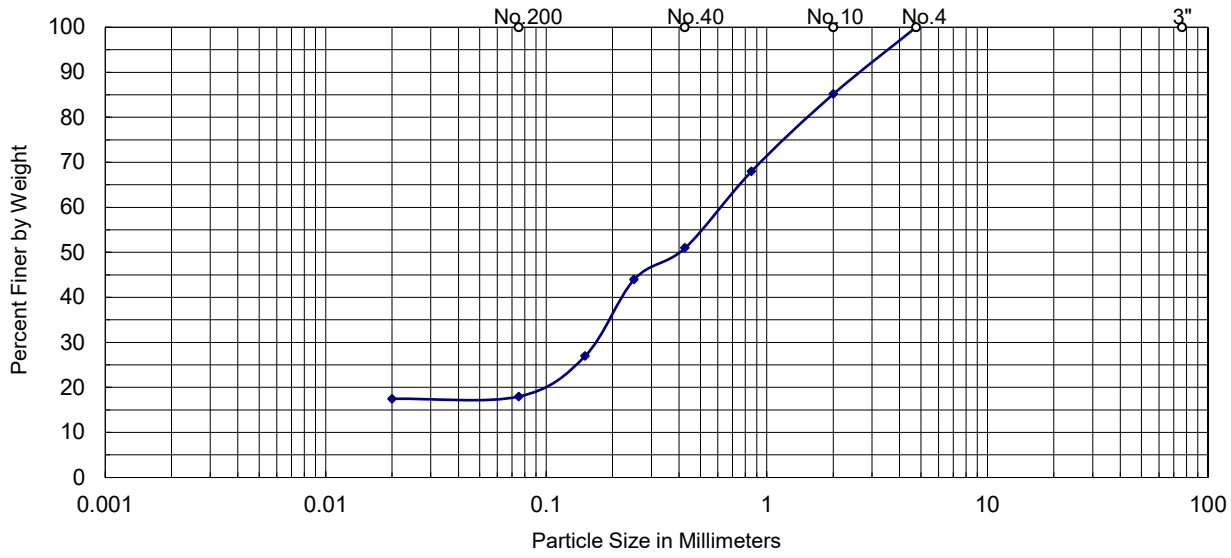
Atterberg Limits

Liquid limit (LL)	*35*
Plastic Limit (PL)	*30*
Plasticity Index (PI)	*5*

D_{10} (mm) =	
D_{30} (mm) =	
D_{75} (mm) =	
Coefficient of Uniformity, C_u =	
Coefficient of ccurvature, C_c =	

Organic Content, %	
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

2450 Commerce Avenue
Suite 100
Duluth, Georgia 30096
Tel: 770-2635945
Fax: 770-263-0166

Soil Classification

Project Name:	*McGinnis Ferry Road*			P I No.:	*0004634*
Sample Location:	*Wall 23*	Sample Number:	W-22	Sample Depth:	*8.5-10'*
Date Sampled:	*12/19/2020*	Sampled By:	*JS*	*Lab No.:*	
Date Tested:	*3/17/2021*	Tested By:	*JS*	*Atlas Project Number:*	*FOR095*
Sample Description:	*Grey sand*				

Sieve Analysis

US Sieve Size	Sieve Opening		% Passing
	(inch)	(mm)	
3 Inch	3.0000	76.2	
1.5 Inch	1.5000	38.1	
1 Inch	1.0000	25.4	
No.4	1.8701	4.75	*100.0*
No.10	0.7874	2.00	*100.0*
No.20	0.3346	0.85	*98.6*
No.40	0.1673	0.425	*88.2*
No.60	0.0984	0.25	*61.3*
No.100	0.0591	0.15	*14.9*
No.200	0.0295	0.075	*4.3*
% Clay	0.0079	0.02	3.8

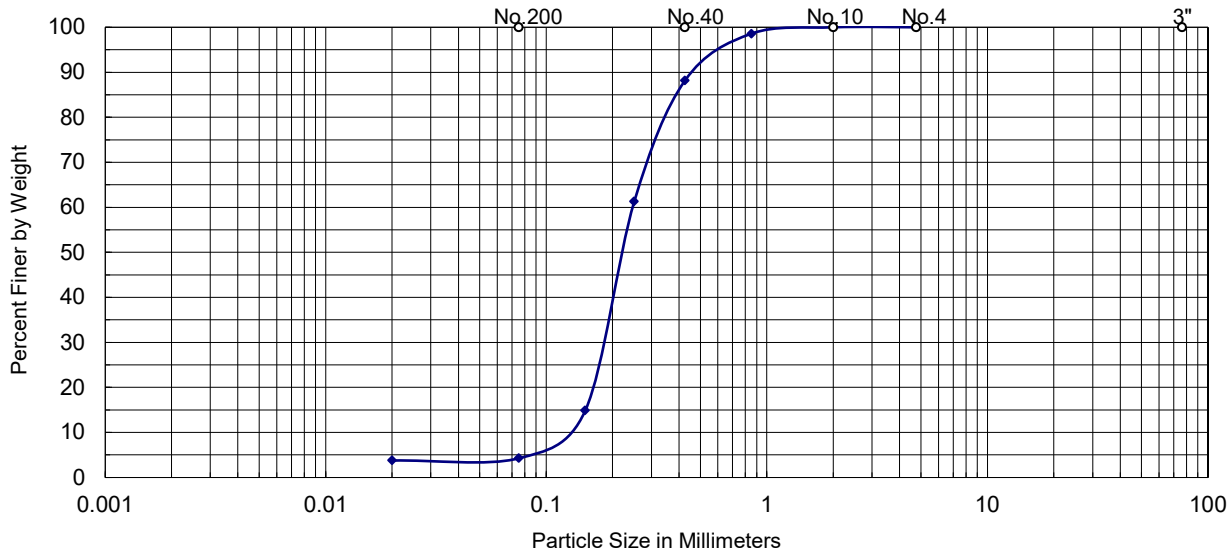
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	

D_{10} (mm) =	
D_{30} (mm) =	
D_{75} (mm) =	
Coefficient of Uniformity, C_u =	
Coefficient of ccurvature, C_c =	

Organic Content, %	
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SP - Poorly graded sand
GDOT	

Appendix F - Seismic site class determination

McGinnis Ferry Road, Wall #23 - PI 0004634, Forsyth Co.

Table 3.10.3.1-1—Site Class Definitions

Site Class	Soil Type and Profile
A	Hard rock with measured shear wave velocity, $\bar{v}_s > 5{,}000$ ft/s
B	Rock with 2,500 ft/sec $< \bar{v}_s < 5{,}000$ ft/s
C	Very dense soil and soil rock with 1,200 ft/sec $< \bar{v}_s < 2{,}500$ ft/s, or with either $\bar{N} > 50$ blows/ft, or $\bar{s}_u > 2.0$ ksf
D	Stiff soil with 600 ft/s $< \bar{v}_s < 1{,}200$ ft/s, or with either $15 < \bar{N} < 50$ blows/ft, or $1.0 < \bar{s}_u < 2.0$ ksf
E	Soil profile with $\bar{v}_s < 600$ ft/s or with either $\bar{N} < 15$ blows/ft or $\bar{s}_u < 1.0$ ksf, or any profile with more than 10.0 ft of soft clay defined as soil with $PI > 20$, $w > 40$ percent and $\bar{s}_u < 0.5$ ksf
F	Soils requiring site-specific evaluations, such as: • Peats or highly organic clays ($H > 10.0$ ft of peat or highly organic clay where H = thickness of soil) • Very high plasticity clays ($H > 25.0$ ft with $PI > 75$) • Very thick soft/medium stiff clays ($H > 120$ ft)

Boring W-21

Sample	di	N	di/N
1	2.5	6	0.4167
2	2.5	6	0.4167
3	2.5	8	0.3125
4	2.5	28	0.0893
5	5	100	0.0500
6	5	100	0.0500
7	5	100	0.0500
8	5	100	0.0500
9	5	100	0.0500
10	5	100	0.0500
11	5	100	0.0500
12	5	100	0.0500
13	5	100	0.0500
14	5	100	0.0500
15	5	100	0.0500
16	5	100	0.0500
17	5	100	0.0500
18	5	100	0.0500
19	5	100	0.0500
20	5	100	0.0500
21	5	100	0.0500
22	5	100	0.0500
∑di=	100	∑di/N=	2.1351

Average N= 46.8

Site Class = D

Boring W-22

Sample	di	N	di/N
1	2.5	5	0.5000
2	2.5	9	0.2778
3	2.5	8	0.3125
4	2.5	1	2.5000
5	5	3	1.6667
6	5	100	0.0500
7	5	100	0.0500
8	5	100	0.0500
9	5	100	0.0500
10	5	100	0.0500
11	5	100	0.0500
12	5	100	0.0500
13	5	100	0.0500
14	5	100	0.0500
15	5	100	0.0500
16	5	100	0.0500
17	5	100	0.0500
18	5	100	0.0500
19	5	100	0.0500
20	5	100	0.0500
21	5	100	0.0500
22	5	100	0.0500
∑di=	100	∑di/N=	6.1069

Average N= 16.4

Site Class = D

Appendix G - Wall foundation design data

DESIGNER: ATLAS
DATE: March 15, 2021
PI NUMBER: 0004634
PROJECT: CR 3717 Mcginnis Ferry Road
FROM: Jaime Mandujano, EIT, Bridge Engineer, Atlas Technical Consultants, LLC
TO: Yong Shao, Ph.D. PE Atlas Technical Consultants, LLC

SUBJECT: **WALL FOUNDATION DESIGN DATA (LRFD)**

The following design information has been calculated for the below listed structures. Please use the provided values to complete the Wall Foundation Investigation report for this project.

Structural Data For Foundation Design								
Wall #	Design Height (ft)	Location	Description	Strap Length (ft)	Strength		Service	
					Bearing Pressure (ksf)	B'=L-2e (ft)	Bearing Pressure (ksf)	B'=L-2e (ft)
23	10	STA 128+85.00 to 129+56.50	Along Roadway	10	2.16	8.26	1.82	8.78
23	12	STA 129+56.50 to STA 129+65.20	Along Roadway	10	2.72	7.58	2.25	8.32
23	14	STA 129+65.20 to STA 129+74.00 STA 131+41.16 to STA 131+70.91	Along Roadway	10	3.43	6.79	2.75	7.79
23	16	STA 129+74.00 to STA 129+83.40	Along Roadway	12	3.64	8.57	3.00	9.65
23	18	STA 129+83.40 to STA 129+95.00 STA 130+25.00 to STA 130+67.00	Along Roadway	13	4.11	9.07	3.38	10.31
23	20.17	STA 129+95.00 to STA 130+25.00 STA 130+67.00 to STA 131+41.16	Along Roadway	15	4.39	10.79	3.67	12.13
Surcharge Load = 0.25 ksf								

If you have any questions please contact Jaime Mandujano of Atlas Technical Consultants at 770-263-5945 or Jaime.Mandujano@oneatlas.com

Appendix H - Bearing resistance calculations

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-21	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 1

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	72	← data entry if known
Footing Width B (ft) =	8.26	← data entry if known
Current Case - L/B =	9	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

0.6	← data entry
0.8	← data entry
0.9	← data entry
1	← data entry
1.5	← data entry
2	← data entry
2.5	← data entry

Total Number of Readings	4
Number of Clay Readings	2
% Clay Readings	50

Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (

CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	8	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

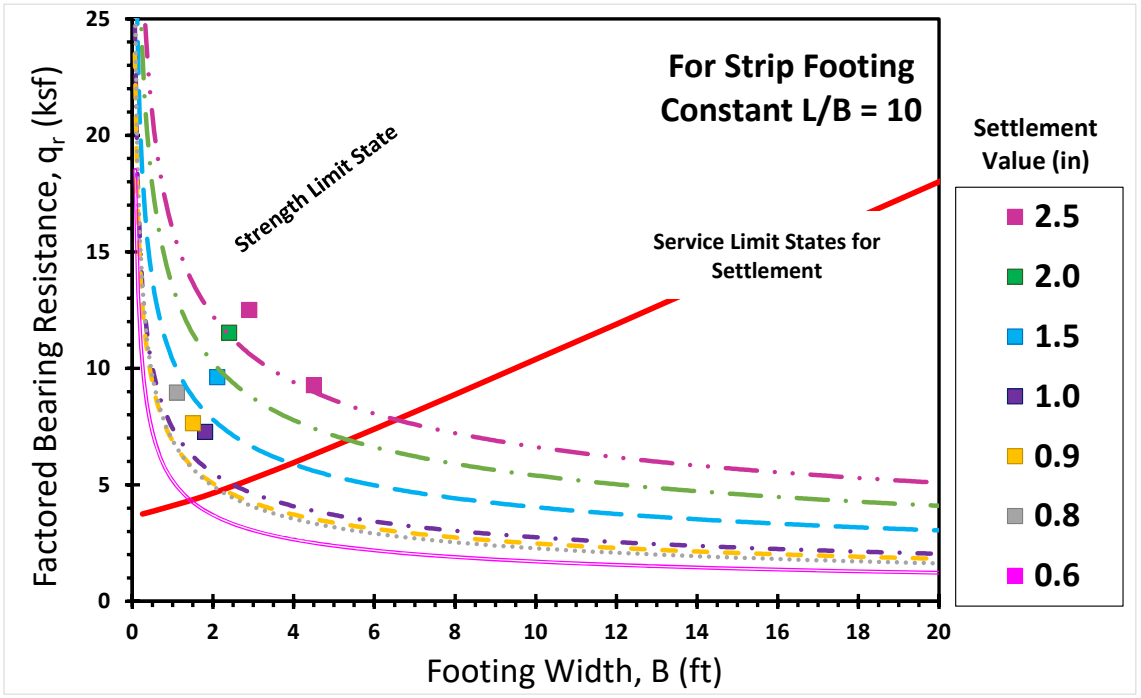
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	2	2	2	4
data entry →	2	2	2	4
data entry →	2	2	3	5
data entry →	3	5	13	18

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		ML
data entry →	7.50		SC
data entry →	10.00		SM

Strip Footing Solution for L/B = 10

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	32.67
Rectangular Distortion Ratio (L/B) =	10.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	8.00
Average Bulk UW, γ_{bulk} (kcf) =	0.12
Layer Thickness, h (ft) =	16.00
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	292.28
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
32.67	37.551	33.439	25.076	0.4



0.9														
Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
0.9	0.07	1.50	15.00	5.35	16	2.153	4000	292.28	0.00	0.00000	1.003	2	0.9219	7.65
0.9	0.07	3.00	30.00	10.70	16	1.816	4000	292.28	0.00	0.00000	1.003	2	0.9520	4.39
0.9	0.07	5.00	50.00	17.84	16	1.502	4000	292.28	0.00	0.00000	1.003	2	0.9683	3.13
0.9	0.07	7.00	70.00	24.98	16	1.281	4000	292.28	0.00	0.00000	1.003	2	0.9763	2.60
0.9	0.07	9.00	90.00	32.11	16	1.116	4000	292.28	0.00	0.00000	1.003	2	0.9811	2.31
0.9	0.07	12.00	120.00	42.82	16	0.936	4000	292.28	0.00	0.00000	1.003	2	0.9855	2.06
0.9	0.07	14.00	140.00	49.96	16	0.845	4000	292.28	0.00	0.00000	1.003	2	0.9874	1.95
0.9	0.07	16.00	160.00	57.09	16	0.770	4000	292.28	0.00	0.00000	1.003	2	0.9889	1.87
0.9	0.07	18.00	180.00	64.23	16	0.708	4000	292.28	0.00	0.00000	1.003	2	0.9901	1.81
0.9	0.07	20.00	200.00	71.36	16	0.654	4000	292.28	0.00	0.00000	1.003	2	0.9910	1.76
0.9	0.07	22.00	220.00	78.50	16	0.609	4000	292.28	0.00	0.00000	1.003	2	0.9918	1.71
0.9	0.07	24.00	240.00	85.64	16	0.569	4000	292.28	0.00	0.00000	1.003	2	0.9925	1.68
0.9	0.07	26.00	260.00	92.77	16	0.534	4000	292.28	0.00	0.00000	1.003	2	0.9930	1.65
0.9	0.07	28.00	280.00	99.91	16	0.503	4000	292.28	0.00	0.00000	1.003	2	0.9935	1.63
0.9	0.07	30.00	300.00	107.05	16	0.476	4000	292.28	0.00	0.00000	1.003	2	0.9939	1.61
0.9	0.07	32.00	320.00	114.18	16	0.451	4000	292.28	0.00	0.00000	1.003	2	0.9943	1.59
0.9	0.07	34.00	340.00	121.32	16	0.429	4000	292.28	0.00	0.00000	1.003	2	0.9946	1.57
0.9	0.07	38.00	380.00	135.59	16	0.391	4000	292.28	0.00	0.00000	1.003	2	0.9952	1.54
0.9	0.07	42.00	420.00	149.87	16	0.358	4000	292.28	0.00	0.00000	1.003	2	0.9956	1.52
0.9	0.07	8.26	82.60	29.47	16	1.172	4000	292.28	0.00	0.00000	1.003	2	0.9796	2.40

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-21	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 2

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	8.7	← data entry if known
Footing Width B (ft) =	7.58	← data entry if known
Current Case - L/B =	1	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

0.6	← data entry
0.7	← data entry
0.8	← data entry
1	← data entry
1.5	← data entry
2	← data entry
2.5	← data entry

Total Number of Readings	4	
Number of Clay Readings	2	Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (
% Clay Readings	50	CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	8	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

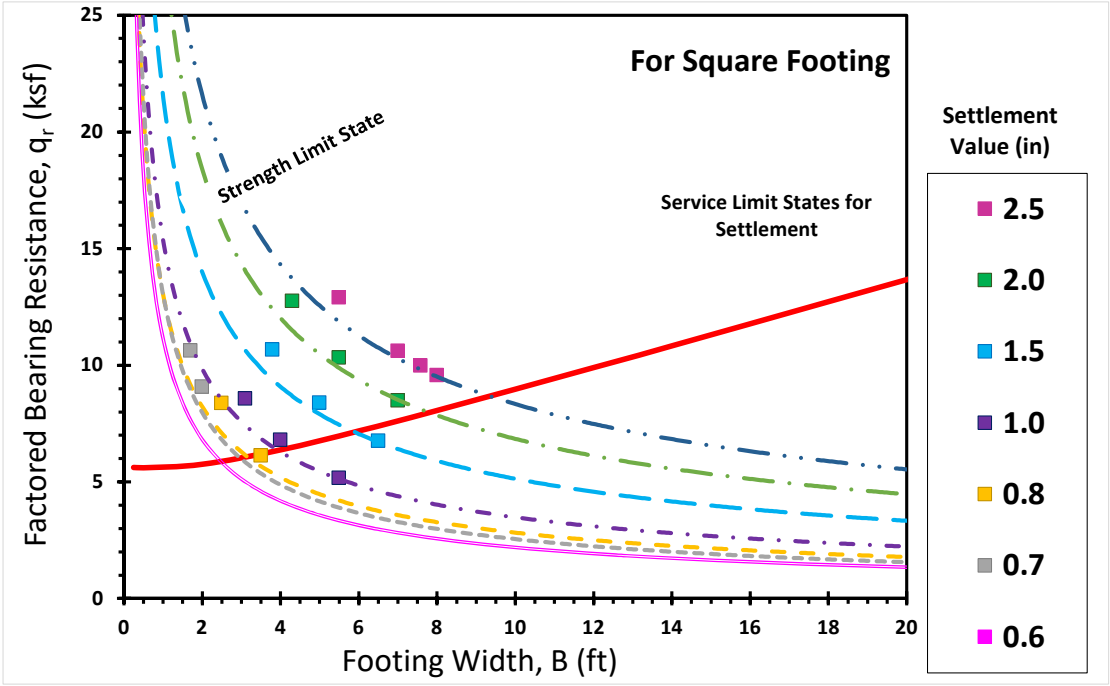
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	2	2	2	4
data entry →	2	2	2	4
data entry →	2	2	3	5
data entry →	3	5	13	18

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		ML
data entry →	7.50		SC
data entry →	10.00		SM

Square Footing Solution for L/B = 1

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	32.67
Rectangular Distortion Ratio (L/B) =	1.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	8.00
Average Bulk UW, γ_{bulk} (kcf) =	0.12
Layer Thickness, h (ft) =	16.00
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	292.28
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
32.67	37.551	33.439	25.076	0.4



0.7														
Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
0.7	0.06	1.70	1.70	1.92	16	1.128	4000	292.28	0.00	0.000	1.003	2	0.8695	10.62
0.7	0.06	2.00	2.00	2.26	16	1.112	4000	292.28	0.00	0.000	1.003	2	0.8776	9.07
0.7	0.06	3.00	3.00	3.39	16	1.064	4000	292.28	0.00	0.000	1.003	2	0.8986	6.18
0.7	0.06	5.00	5.00	5.64	16	0.979	4000	292.28	0.00	0.000	1.003	2	0.9245	3.91
0.7	0.06	7.00	7.00	7.90	16	0.906	4000	292.28	0.00	0.000	1.003	2	0.9398	2.97
0.7	0.06	9.00	9.00	10.16	16	0.844	4000	292.28	0.00	0.000	1.003	2	0.9500	2.45
0.7	0.06	12.00	12.00	13.54	16	0.765	4000	292.28	0.00	0.000	1.003	2	0.9601	2.01
0.7	0.06	14.00	14.00	15.80	16	0.720	4000	292.28	0.00	0.000	1.003	2	0.9648	1.82
0.7	0.06	16.00	16.00	18.05	16	0.680	4000	292.28	0.00	0.000	1.003	2	0.9686	1.68
0.7	0.06	18.00	18.00	20.31	16	0.644	4000	292.28	0.00	0.000	1.003	2	0.9716	1.57
0.7	0.06	20.00	20.00	22.57	16	0.612	4000	292.28	0.00	0.000	1.003	2	0.9741	1.49
0.7	0.06	22.00	22.00	24.82	16	0.583	4000	292.28	0.00	0.000	1.003	2	0.9762	1.41
0.7	0.06	24.00	24.00	27.08	16	0.557	4000	292.28	0.00	0.000	1.003	2	0.9779	1.36
0.7	0.06	26.00	26.00	29.34	16	0.532	4000	292.28	0.00	0.000	1.003	2	0.9795	1.31
0.7	0.06	28.00	28.00	31.59	16	0.510	4000	292.28	0.00	0.000	1.003	2	0.9808	1.26
0.7	0.06	30.00	30.00	33.85	16	0.490	4000	292.28	0.00	0.000	1.003	2	0.9820	1.23
0.7	0.06	32.00	32.00	36.11	16	0.471	4000	292.28	0.00	0.000	1.003	2	0.9830	1.20
0.7	0.06	34.00	34.00	38.36	16	0.454	4000	292.28	0.00	0.000	1.003	2	0.9839	1.17
0.7	0.06	36.00	36.00	40.62	16	0.438	4000	292.28	0.00	0.000	1.003	2	0.9848	1.14
0.7	0.06	42.00	42.00	47.39	16	0.395	4000	292.28	0.00	0.000	1.003	2	0.9868	1.08
0.7	0.06	7.58	7.58	8.55	16	0.887	4000	292.28	0.00	0.000	1.003	2	0.9432	2.79

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-21	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 3

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	8.8	← data entry if known
Footing Width B (ft) =	6.79	← data entry if known
Current Case - L/B =	1	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

0.7	← data entry
0.8	← data entry
0.9	← data entry
1	← data entry
1.5	← data entry
2	← data entry
2.5	← data entry

Total Number of Readings	4
Number of Clay Readings	2
% Clay Readings	50

Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (

CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	8	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

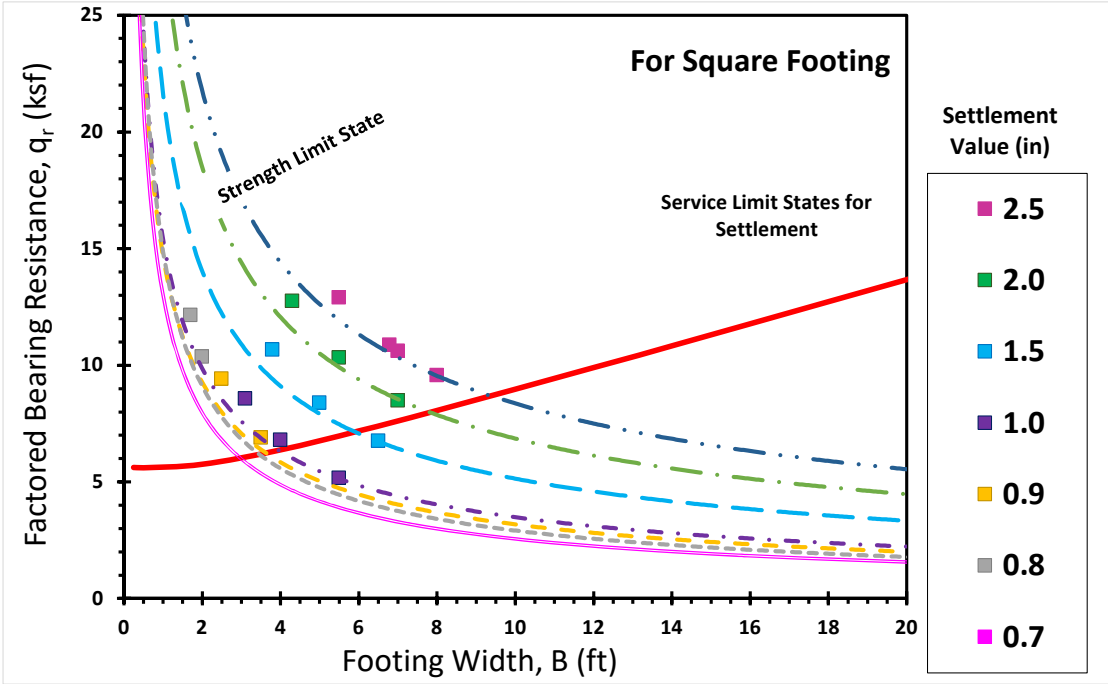
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	2	2	2	4
data entry →	2	2	2	4

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		ML

Square Footing Solution for L/B = 1

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	32.67
Rectangular Distortion Ratio (L/B) =	1.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	8.00
Average Bulk UW, γ_{bulk} (kcf) =	0.12
Layer Thickness, h (ft) =	16.00
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	292.28
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
32.67	37.551	33.439	25.076	0.4



0.8														
Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
0.8	0.07	1.70	1.70	1.92	16	1.128	4000	292.28	0.00	0.000	1.003	2	0.8695	12.14
0.8	0.07	2.00	2.00	2.26	16	1.112	4000	292.28	0.00	0.000	1.003	2	0.8776	10.37
0.8	0.07	3.00	3.00	3.39	16	1.064	4000	292.28	0.00	0.000	1.003	2	0.8986	7.06
0.8	0.07	5.00	5.00	5.64	16	0.979	4000	292.28	0.00	0.000	1.003	2	0.9245	4.47
0.8	0.07	7.00	7.00	7.90	16	0.906	4000	292.28	0.00	0.000	1.003	2	0.9398	3.39
0.8	0.07	9.00	9.00	10.16	16	0.844	4000	292.28	0.00	0.000	1.003	2	0.9500	2.81
0.8	0.07	12.00	12.00	13.54	16	0.765	4000	292.28	0.00	0.000	1.003	2	0.9601	2.30
0.8	0.07	14.00	14.00	15.80	16	0.720	4000	292.28	0.00	0.000	1.003	2	0.9648	2.08
0.8	0.07	16.00	16.00	18.05	16	0.680	4000	292.28	0.00	0.000	1.003	2	0.9686	1.92
0.8	0.07	18.00	18.00	20.31	16	0.644	4000	292.28	0.00	0.000	1.003	2	0.9716	1.80
0.8	0.07	20.00	20.00	22.57	16	0.612	4000	292.28	0.00	0.000	1.003	2	0.9741	1.70
0.8	0.07	22.00	22.00	24.82	16	0.583	4000	292.28	0.00	0.000	1.003	2	0.9762	1.62
0.8	0.07	24.00	24.00	27.08	16	0.557	4000	292.28	0.00	0.000	1.003	2	0.9779	1.55
0.8	0.07	26.00	26.00	29.34	16	0.532	4000	292.28	0.00	0.000	1.003	2	0.9795	1.49
0.8	0.07	28.00	28.00	31.59	16	0.510	4000	292.28	0.00	0.000	1.003	2	0.9808	1.44
0.8	0.07	30.00	30.00	33.85	16	0.490	4000	292.28	0.00	0.000	1.003	2	0.9820	1.40
0.8	0.07	32.00	32.00	36.11	16	0.471	4000	292.28	0.00	0.000	1.003	2	0.9830	1.37
0.8	0.07	34.00	34.00	38.36	16	0.454	4000	292.28	0.00	0.000	1.003	2	0.9839	1.33
0.8	0.07	36.00	36.00	40.62	16	0.438	4000	292.28	0.00	0.000	1.003	2	0.9848	1.30
0.8	0.07	42.00	42.00	47.39	16	0.395	4000	292.28	0.00	0.000	1.003	2	0.9868	1.24
0.8	0.07	6.79	6.79	7.66	16	0.913	4000	292.28	0.00	0.000	1.003	2	0.9385	3.48

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-21	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 4

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	9.4	← data entry if known
Footing Width B (ft) =	8.57	← data entry if known
Current Case - L/B =	1	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

0.7	← data entry
0.8	← data entry
0.9	← data entry
1	← data entry
1.5	← data entry
2	← data entry
2.5	← data entry

Total Number of Readings	4	
Number of Clay Readings	2	Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (
% Clay Readings	50	CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	8	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

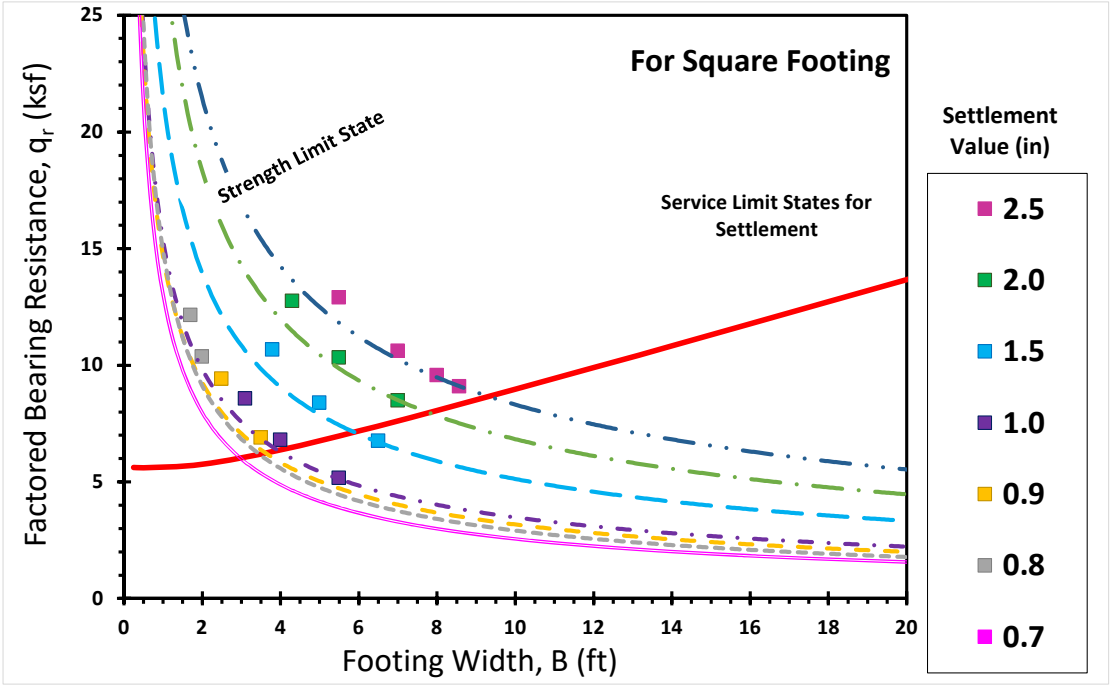
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	2	2	2	4
data entry →	2	2	2	4
data entry →	2	2	3	5
data entry →	3	5	13	18

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		ML
data entry →	7.50		SC
data entry →	10.00		SM

Square Footing Solution for L/B = 1

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	32.67
Rectangular Distortion Ratio (L/B) =	1.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	8.00
Average Bulk UW, γ_{bulk} (kcf) =	0.12
Layer Thickness, h (ft) =	16.00
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	292.28
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
32.67	37.551	33.439	25.076	0.4



1.0														
Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
1	0.08	3.10	3.10	3.50	16	1.059	4000	292.28	0.00	0.000	1.003	2	0.9003	8.56
1	0.08	4.00	4.00	4.51	16	1.020	4000	292.28	0.00	0.000	1.003	2	0.9134	6.79
1	0.08	5.50	5.50	6.21	16	0.960	4000	292.28	0.00	0.000	1.003	2	0.9290	5.16
1	0.08	7.00	7.00	7.90	16	0.906	4000	292.28	0.00	0.000	1.003	2	0.9398	4.24
1	0.08	9.00	9.00	10.16	16	0.844	4000	292.28	0.00	0.000	1.003	2	0.9500	3.51
1	0.08	12.00	12.00	13.54	16	0.765	4000	292.28	0.00	0.000	1.003	2	0.9601	2.87
1	0.08	14.00	14.00	15.80	16	0.720	4000	292.28	0.00	0.000	1.003	2	0.9648	2.60
1	0.08	16.00	16.00	18.05	16	0.680	4000	292.28	0.00	0.000	1.003	2	0.9686	2.40
1	0.08	18.00	18.00	20.31	16	0.644	4000	292.28	0.00	0.000	1.003	2	0.9716	2.25
1	0.08	20.00	20.00	22.57	16	0.612	4000	292.28	0.00	0.000	1.003	2	0.9741	2.12
1	0.08	22.00	22.00	24.82	16	0.583	4000	292.28	0.00	0.000	1.003	2	0.9762	2.02
1	0.08	24.00	24.00	27.08	16	0.557	4000	292.28	0.00	0.000	1.003	2	0.9779	1.94
1	0.08	26.00	26.00	29.34	16	0.532	4000	292.28	0.00	0.000	1.003	2	0.9795	1.87
1	0.08	28.00	28.00	31.59	16	0.510	4000	292.28	0.00	0.000	1.003	2	0.9808	1.81
1	0.08	30.00	30.00	33.85	16	0.490	4000	292.28	0.00	0.000	1.003	2	0.9820	1.75
1	0.08	32.00	32.00	36.11	16	0.471	4000	292.28	0.00	0.000	1.003	2	0.9830	1.71
1	0.08	34.00	34.00	38.36	16	0.454	4000	292.28	0.00	0.000	1.003	2	0.9839	1.67
1	0.08	38.00	38.00	42.88	16	0.423	4000	292.28	0.00	0.000	1.003	2	0.9855	1.60
1	0.08	42.00	42.00	47.39	16	0.395	4000	292.28	0.00	0.000	1.003	2	0.9868	1.54
1	0.08	8.57	8.57	9.67	16	0.857	4000	292.28	0.00	0.000	1.003	2	0.9481	3.64

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-21	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 5

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	11.6	← data entry if known
Footing Width B (ft) =	9.07	← data entry if known
Current Case - L/B =	1	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

0.5	← data entry
1	← data entry
1.1	← data entry
1.2	← data entry
1.3	← data entry
1.5	← data entry
2	← data entry

Total Number of Readings	4	
Number of Clay Readings	2	Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (
% Clay Readings	50	CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	8	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

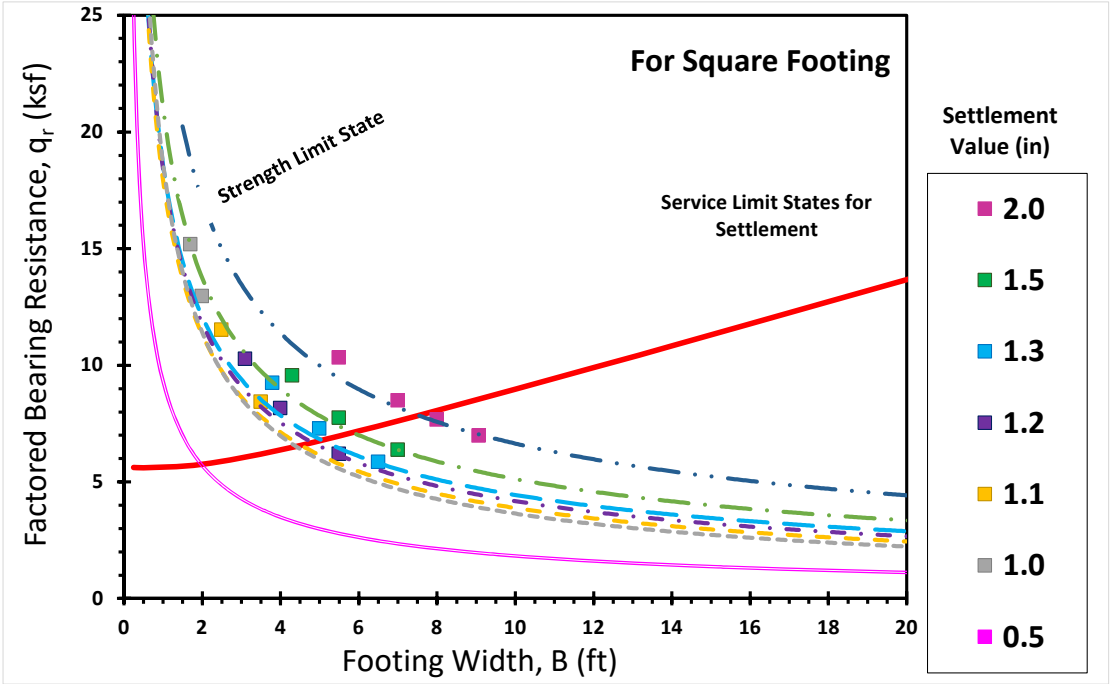
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	2	2	2	4
data entry →	2	2	2	4
data entry →	2	2	3	5
data entry →	3	5	13	18

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		ML
data entry →	7.50		SC
data entry →	10.00		SM

Square Footing Solution for L/B = 1

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	32.67
Rectangular Distortion Ratio (L/B) =	1.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	8.00
Average Bulk UW, γ_{bulk} (kcf) =	0.12
Layer Thickness, h (ft) =	16.00
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	292.28
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
32.67	37.551	33.439	25.076	0.4



1.2

Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
1.2	0.10	3.10	3.10	3.50	16	1.059	4000	292.28	0.00	0.000	1.003	2	0.9003	10.27
1.2	0.10	4.00	4.00	4.51	16	1.020	4000	292.28	0.00	0.000	1.003	2	0.9134	8.15
1.2	0.10	5.50	5.50	6.21	16	0.960	4000	292.28	0.00	0.000	1.003	2	0.9290	6.19
1.2	0.10	7.00	7.00	7.90	16	0.906	4000	292.28	0.00	0.000	1.003	2	0.9398	5.09
1.2	0.10	9.00	9.00	10.16	16	0.844	4000	292.28	0.00	0.000	1.003	2	0.9500	4.21
1.2	0.10	12.00	12.00	13.54	16	0.765	4000	292.28	0.00	0.000	1.003	2	0.9601	3.45
1.2	0.10	14.00	14.00	15.80	16	0.720	4000	292.28	0.00	0.000	1.003	2	0.9648	3.12
1.2	0.10	16.00	16.00	18.05	16	0.680	4000	292.28	0.00	0.000	1.003	2	0.9686	2.88
1.2	0.10	18.00	18.00	20.31	16	0.644	4000	292.28	0.00	0.000	1.003	2	0.9716	2.69
1.2	0.10	20.00	20.00	22.57	16	0.612	4000	292.28	0.00	0.000	1.003	2	0.9741	2.55
1.2	0.10	22.00	22.00	24.82	16	0.583	4000	292.28	0.00	0.000	1.003	2	0.9762	2.43
1.2	0.10	24.00	24.00	27.08	16	0.557	4000	292.28	0.00	0.000	1.003	2	0.9779	2.32
1.2	0.10	26.00	26.00	29.34	16	0.532	4000	292.28	0.00	0.000	1.003	2	0.9795	2.24
1.2	0.10	28.00	28.00	31.59	16	0.510	4000	292.28	0.00	0.000	1.003	2	0.9808	2.17
1.2	0.10	30.00	30.00	33.85	16	0.490	4000	292.28	0.00	0.000	1.003	2	0.9820	2.10
1.2	0.10	32.00	32.00	36.11	16	0.471	4000	292.28	0.00	0.000	1.003	2	0.9830	2.05
1.2	0.10	34.00	34.00	38.36	16	0.454	4000	292.28	0.00	0.000	1.003	2	0.9839	2.00
1.2	0.10	38.00	38.00	42.88	16	0.423	4000	292.28	0.00	0.000	1.003	2	0.9855	1.92
1.2	0.10	42.00	42.00	47.39	16	0.395	4000	292.28	0.00	0.000	1.003	2	0.9868	1.85
1.2	0.10	9.07	9.07	10.23	16	0.842	4000	292.28	0.00	0.000	1.003	2	0.9503	4.18

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-21	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 6

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	30	← data entry if known
Footing Width B (ft) =	10.79	← data entry if known
Current Case - L/B =	3	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

1	← data entry
1.5	← data entry
1.8	← data entry
1.9	← data entry
2	← data entry
2.5	← data entry
3	← data entry

Total Number of Readings	4	
Number of Clay Readings	2	Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (
% Clay Readings	50	CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	8	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

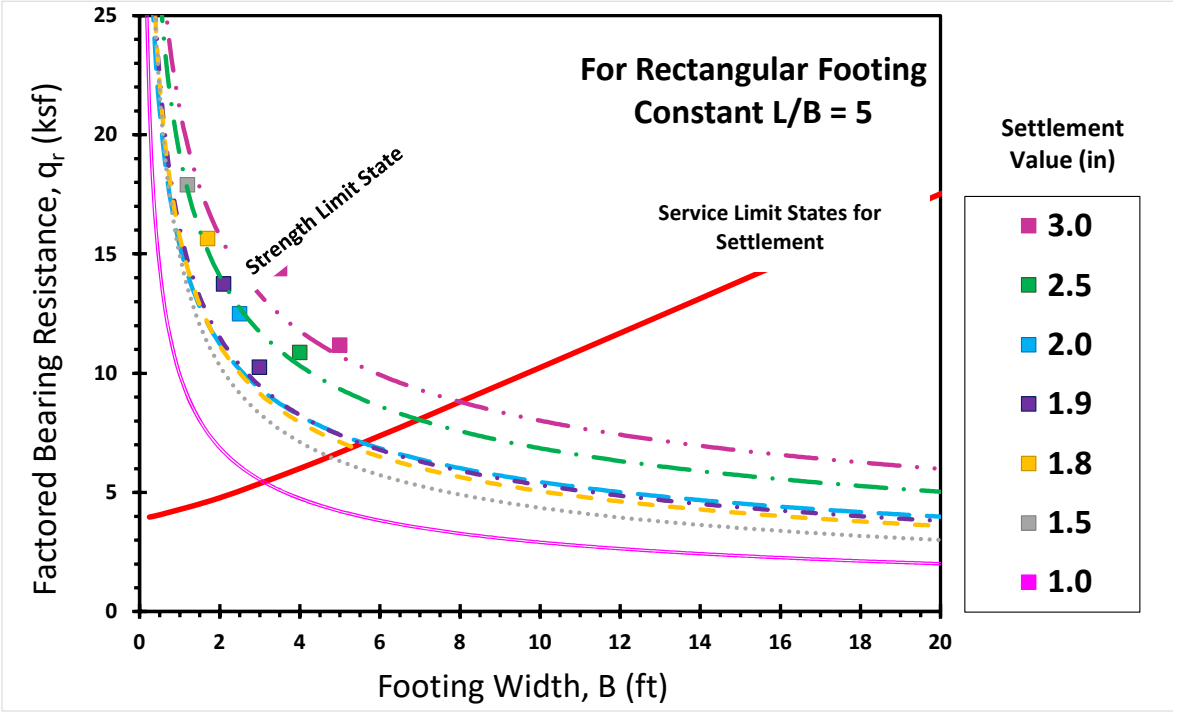
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	2	2	2	4
data entry →	2	2	2	4
data entry →	2	2	3	5
data entry →	3	5	13	18

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		CL
data entry →	7.50		SC
data entry →	10.00		SM

Rectangular Footing Solution for L/B = 5

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	32.67
Rectangular Distortion Ratio (L/B) =	5.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	8.00
Average Bulk UW, γ_{bulk} (kcf) =	0.12
Layer Thickness, h (ft) =	16.00
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	292.28
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
32.67	37.551	33.439	25.076	0.4



1.9

Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
1.9	0.16	2.10	10.50	5.30	16	1.809	4000	292.28	0.00	0.00000	1.003	2	0.9214	13.73
1.9	0.16	3.00	15.00	7.57	16	1.667	4000	292.28	0.00	0.00000	1.003	2	0.9380	10.25
1.9	0.16	5.50	27.50	13.88	16	1.367	4000	292.28	0.00	0.00000	1.003	2	0.9609	6.65
1.9	0.16	8.00	40.00	20.19	16	1.159	4000	292.28	0.00	0.00000	1.003	2	0.9714	5.34
1.9	0.16	12.00	60.00	30.28	16	0.932	4000	292.28	0.00	0.00000	1.003	2	0.9800	4.38
1.9	0.16	14.00	70.00	35.32	16	0.849	4000	292.28	0.00	0.00000	1.003	2	0.9827	4.11
1.9	0.16	16.00	80.00	40.37	16	0.780	4000	292.28	0.00	0.00000	1.003	2	0.9847	3.91
1.9	0.16	18.00	90.00	45.42	16	0.721	4000	292.28	0.00	0.00000	1.003	2	0.9863	3.76
1.9	0.16	20.00	100.00	50.46	16	0.670	4000	292.28	0.00	0.00000	1.003	2	0.9876	3.63
1.9	0.16	22.00	110.00	55.51	16	0.626	4000	292.28	0.00	0.00000	1.003	2	0.9886	3.53
1.9	0.16	24.00	120.00	60.56	16	0.588	4000	292.28	0.00	0.00000	1.003	2	0.9895	3.44
1.9	0.16	26.00	130.00	65.60	16	0.554	4000	292.28	0.00	0.00000	1.003	2	0.9903	3.37
1.9	0.16	28.00	140.00	70.65	16	0.523	4000	292.28	0.00	0.00000	1.003	2	0.9910	3.31
1.9	0.16	30.00	150.00	75.69	16	0.496	4000	292.28	0.00	0.00000	1.003	2	0.9915	3.26
1.9	0.16	32.00	160.00	80.74	16	0.472	4000	292.28	0.00	0.00000	1.003	2	0.9920	3.21
1.9	0.16	34.00	170.00	85.79	16	0.449	4000	292.28	0.00	0.00000	1.003	2	0.9925	3.17
1.9	0.16	38.00	190.00	95.88	16	0.411	4000	292.28	0.00	0.00000	1.003	2	0.9933	3.10
1.9	0.16	42.00	210.00	105.97	16	0.378	4000	292.28	0.00	0.00000	1.003	2	0.9939	3.04
1.9	0.16	10.79	53.95	27.22	16	0.991	4000	292.28	0.00	0.00000	1.003	2	0.9780	4.60

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-21	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 7

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	42	← data entry if known
Footing Width B (ft) =	9.07	← data entry if known
Current Case - L/B =	5	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

1	← data entry
1.5	← data entry
1.6	← data entry
1.7	← data entry
1.8	← data entry
2	← data entry
2.5	← data entry

Total Number of Readings	4	
Number of Clay Readings	2	Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (
% Clay Readings	50	CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	8	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

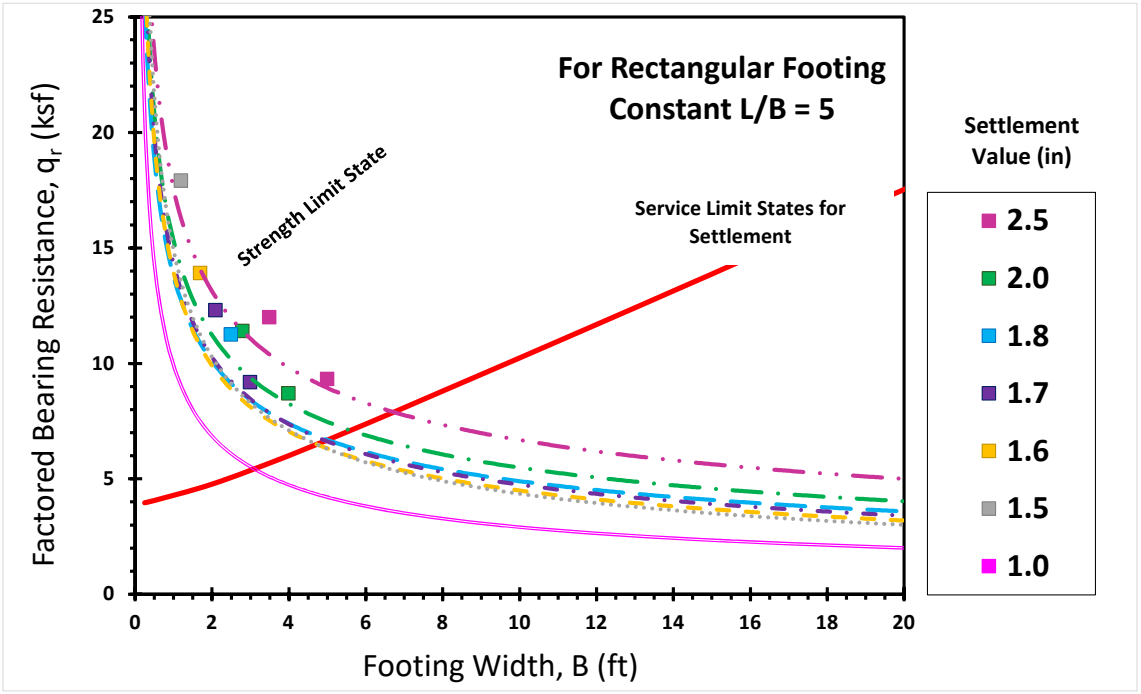
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	2	2	2	4
data entry →	2	2	2	4
data entry →	2	2	3	5
data entry →	3	5	13	18

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		ML
data entry →	7.50		SC
data entry →	10.00		SM

Rectangular Footing Solution for L/B = 5

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	32.67
Rectangular Distortion Ratio (L/B) =	5.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	8.00
Average Bulk UW, γ_{bulk} (kcf) =	0.12
Layer Thickness, h (ft) =	16.00
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	292.28
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
32.67	37.551	33.439	25.076	0.4



1.6

Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
1.6	0.13	1.70	8.50	4.29	16	1.881	4000	292.28	0.00	0.00000	1.003	2	0.9108	13.90
1.6	0.13	3.00	15.00	7.57	16	1.667	4000	292.28	0.00	0.00000	1.003	2	0.9380	8.63
1.6	0.13	5.00	25.00	12.62	16	1.418	4000	292.28	0.00	0.00000	1.003	2	0.9578	5.96
1.6	0.13	7.00	35.00	17.66	16	1.235	4000	292.28	0.00	0.00000	1.003	2	0.9680	4.84
1.6	0.13	9.00	45.00	22.71	16	1.093	4000	292.28	0.00	0.00000	1.003	2	0.9742	4.22
1.6	0.13	12.00	60.00	30.28	16	0.932	4000	292.28	0.00	0.00000	1.003	2	0.9800	3.69
1.6	0.13	14.00	70.00	35.32	16	0.849	4000	292.28	0.00	0.00000	1.003	2	0.9827	3.46
1.6	0.13	16.00	80.00	40.37	16	0.780	4000	292.28	0.00	0.00000	1.003	2	0.9847	3.29
1.6	0.13	18.00	90.00	45.42	16	0.721	4000	292.28	0.00	0.00000	1.003	2	0.9863	3.16
1.6	0.13	20.00	100.00	50.46	16	0.670	4000	292.28	0.00	0.00000	1.003	2	0.9876	3.06
1.6	0.13	22.00	110.00	55.51	16	0.626	4000	292.28	0.00	0.00000	1.003	2	0.9886	2.97
1.6	0.13	24.00	120.00	60.56	16	0.588	4000	292.28	0.00	0.00000	1.003	2	0.9895	2.90
1.6	0.13	26.00	130.00	65.60	16	0.554	4000	292.28	0.00	0.00000	1.003	2	0.9903	2.84
1.6	0.13	28.00	140.00	70.65	16	0.523	4000	292.28	0.00	0.00000	1.003	2	0.9910	2.79
1.6	0.13	30.00	150.00	75.69	16	0.496	4000	292.28	0.00	0.00000	1.003	2	0.9915	2.74
1.6	0.13	32.00	160.00	80.74	16	0.472	4000	292.28	0.00	0.00000	1.003	2	0.9920	2.70
1.6	0.13	34.00	170.00	85.79	16	0.449	4000	292.28	0.00	0.00000	1.003	2	0.9925	2.67
1.6	0.13	38.00	190.00	95.88	16	0.411	4000	292.28	0.00	0.00000	1.003	2	0.9933	2.61
1.6	0.13	42.00	210.00	105.97	16	0.378	4000	292.28	0.00	0.00000	1.003	2	0.9939	2.56
1.6	0.13	9.07	45.35	22.88	16	1.089	4000	292.28	0.00	0.00000	1.003	2	0.9744	4.21

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-22	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 8

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	74.16	← data entry if known
Footing Width B (ft) =	10.79	← data entry if known
Current Case - L/B =	7	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

Total Number of Readings	5
Number of Clay Readings	1
% Clay Readings	20

Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (

CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

SPECIFIC SETTLEMENT VALUE (

2	← data entry
3	← data entry
3.2	← data entry
3.3	← data entry
3.4	← data entry
3.5	← data entry
4	← data entry

Ground Water Table	10	feet ← data entry
Energy Rating	94	% ← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

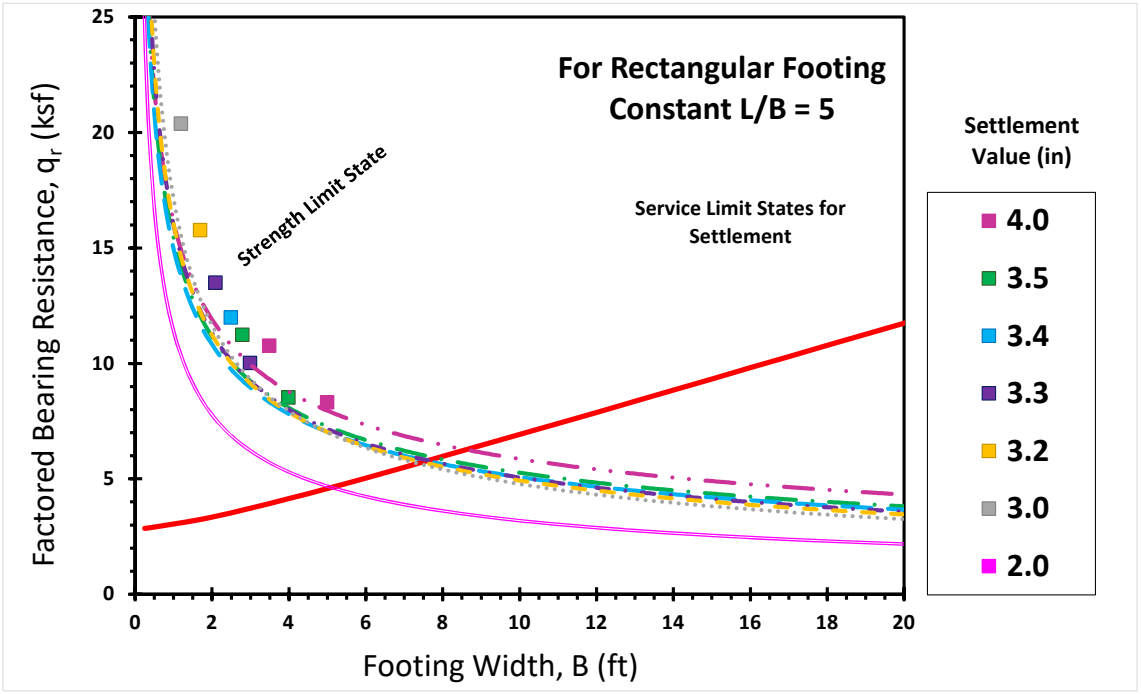
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	1	2	2	4
data entry →	3	3	3	6
data entry →	2	2	2	4
data entry →	0	1	0	
data entry →	0	1	2	3

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		SM
data entry →	7.50		SP
data entry →	10.00		SP
data entry →	15.00		SP

Rectangular Footing Solution for L/B = 5

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	30.27
Rectangular Distortion Ratio (L/B) =	5.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	10.00
Average Bulk UW, γ_{bulk} (kcf) =	0.11
Layer Thickness, h (ft) =	17.50
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	168.07
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
30.27	30.786	23.302	18.965	0.4



3.4

Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
3.4	0.28	2.50	12.50	6.31	17.5	1.778	4000	168.07	0.00	0.00000	1.003	2	0.9298	11.97
3.4	0.28	4.00	20.00	10.09	17.5	1.576	4000	168.07	0.00	0.00000	1.003	2	0.9498	8.26
3.4	0.28	6.00	30.00	15.14	17.5	1.369	4000	168.07	0.00	0.00000	1.003	2	0.9636	6.25
3.4	0.28	7.50	37.50	18.92	17.5	1.246	4000	168.07	0.00	0.00000	1.003	2	0.9698	5.46
3.4	0.28	9.00	45.00	22.71	17.5	1.143	4000	168.07	0.00	0.00000	1.003	2	0.9742	4.93
3.4	0.28	12.00	60.00	30.28	17.5	0.982	4000	168.07	0.00	0.00000	1.003	2	0.9800	4.28
3.4	0.28	14.00	70.00	35.32	17.5	0.897	4000	168.07	0.00	0.00000	1.003	2	0.9827	4.01
3.4	0.28	16.00	80.00	40.37	17.5	0.826	4000	168.07	0.00	0.00000	1.003	2	0.9847	3.80
3.4	0.28	18.00	90.00	45.42	17.5	0.766	4000	168.07	0.00	0.00000	1.003	2	0.9863	3.64
3.4	0.28	20.00	100.00	50.46	17.5	0.713	4000	168.07	0.00	0.00000	1.003	2	0.9876	3.51
3.4	0.28	22.00	110.00	55.51	17.5	0.668	4000	168.07	0.00	0.00000	1.003	2	0.9886	3.41
3.4	0.28	24.00	120.00	60.56	17.5	0.627	4000	168.07	0.00	0.00000	1.003	2	0.9895	3.32
3.4	0.28	26.00	130.00	65.60	17.5	0.592	4000	168.07	0.00	0.00000	1.003	2	0.9903	3.25
3.4	0.28	28.00	140.00	70.65	17.5	0.560	4000	168.07	0.00	0.00000	1.003	2	0.9910	3.18
3.4	0.28	30.00	150.00	75.69	17.5	0.532	4000	168.07	0.00	0.00000	1.003	2	0.9915	3.13
3.4	0.28	32.00	160.00	80.74	17.5	0.506	4000	168.07	0.00	0.00000	1.003	2	0.9920	3.08
3.4	0.28	34.00	170.00	85.79	17.5	0.482	4000	168.07	0.00	0.00000	1.003	2	0.9925	3.04
3.4	0.28	38.00	190.00	95.88	17.5	0.442	4000	168.07	0.00	0.00000	1.003	2	0.9933	2.97
3.4	0.28	42.00	210.00	105.97	17.5	0.407	4000	168.07	0.00	0.00000	1.003	2	0.9939	2.91
3.4	0.28	10.79	53.95	27.22	17.5	1.041	4000	168.07	0.00	0.00000	1.003	2	0.9780	4.50

Standard Penetration Test Data		
GDOT Project ID:	0004634	← data entry
Project Name:	McGinnis Ferry Rd	← data entry
Location:	Wall 23	← data entry
Boring Number:	W-22	← data entry
Date:	19-Dec	← data entry

SPT procedures per ASTM D 1586

Additional Notes:

Design Section 9

FOUNDATION SHAPES and GEOMETRY

Footing Length L (ft) =	29.75	← data entry if known
Footing Width B (ft) =	6.79	← data entry if known
Current Case - L/B =	4	
Square - L/B =	1	
Rectangular - L/B =	5	
Strip - L/B =	10	

SPECIFIC SETTLEMENT VALUE (

1	← data entry
2	← data entry
2.1	← data entry
2.2	← data entry
2.3	← data entry
2.5	← data entry
3	← data entry

Total Number of Readings	5	
Number of Clay Readings	1	Note: "CLAY" means any of the following: CL, CH, ML, MH, CL-ML, (
% Clay Readings	20	CONTACT GEOTECH ENGINEER - CONSIDER CLAY %

Ground Water Table	10	feet	← data entry
Energy Rating	94	%	← data entry

SPT DATA INPUT: PLEASE ENTER EITHER
(a) Raw Field Blows in Columns B, C, & D or put (b) Measured N-value (bpf) in column I

Advisory Note: If the bottom of wall footing/leveling pad/spread footing elevation is more than5 feet below the ground elevation in your boring log, begin inputting boring log data from the elevation that corresponds to5 feet above the bottom of wall footing/leveling pad/spread footing elevation.

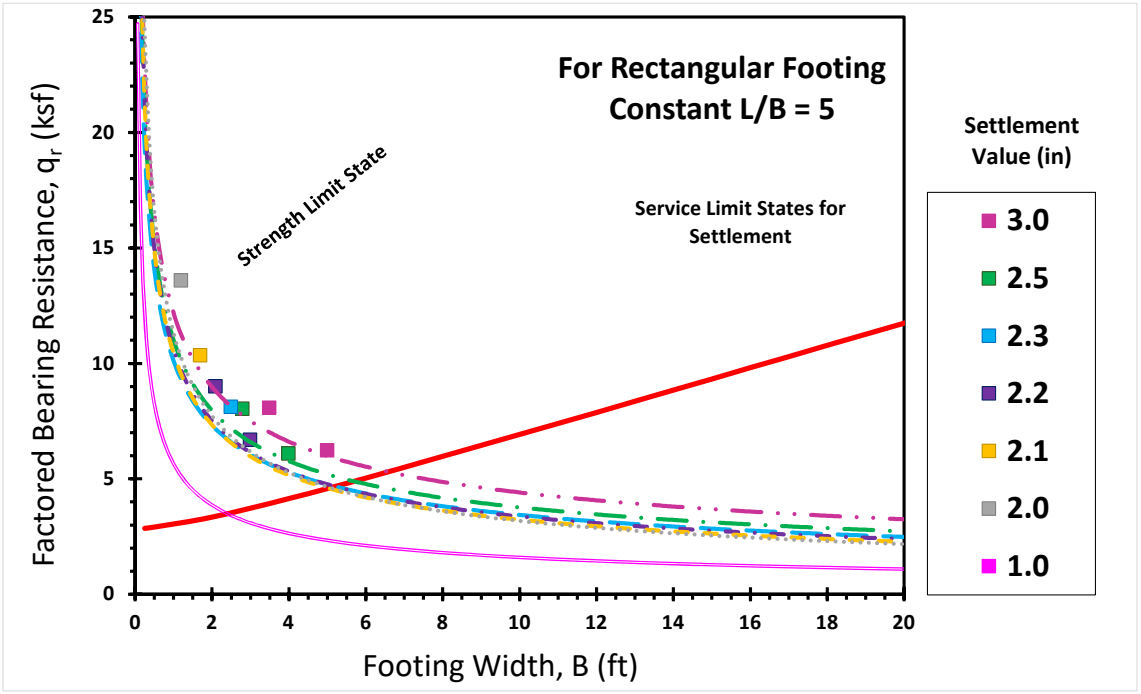
	Raw SPT Blows Per 6 inches			
	#1	#2	#3	N-value (bpf)
data entry →	1	2	2	4
data entry →	3	3	3	6
data entry →	2	2	2	4
data entry →	0	1	0	
data entry →	0	1	2	3

	Depth	SPT Reading	USCS
	(feet)	N-value (bpf)	Soil Type
	0.00		
data entry →	2.50		ML
data entry →	5.00		SM
data entry →	7.50		SP
data entry →	10.00		SP
data entry →	15.00		SP

Rectangular Footing Solution for L/B = 5

Effective Cohesion Intercept , c' (ksf) =	0
Effective Friction Angle, ϕ' (deg) =	30.27
Rectangular Distortion Ratio (L/B) =	5.00
Embedment Depth, D_f (ft) =	2.00
Ground Water Table, D_w (ft) =	10.00
Average Bulk UW, γ_{bulk} (kcf) =	0.11
Layer Thickness, h (ft) =	17.50
Modulus of Foundation, E_{FDTN} (ksf) =	4000
Poisson's Ratio of Soil=	0.20
Poisson's Ratio of Foundation=	0.20
Soil Modulus of Elasticity, E' (ksf) =	168.07
Footing Thickness, t (ft) =	0.00

Friction Angle, ϕ_f	Cohesion BC Term, N_c	Unit Weight BC Term, N_γ	Surcharge BC Term, N_q	Resistance Factor, ϕ_b
30.27	30.786	23.302	18.965	0.4



2.1

Settlement, s (in)	Settlement, s (ft)	Footing Width, B (ft)	Footing Length, L (ft)	Equivalent Diameter, d_e (ft)	Layer Thickness, h (ft)	Shape Disp. factor, I_H	Efdtn (ksf)	Esoil (ksf)	Foundation Thickness, t (ft)	Fdtn Flexibility factor, K_F	Fdtn Flexibility Factor, I_F	z_E (ft)	Embedment factor, I_E	q (ksf)
2.1	0.17	1.70	8.50	4.29	17.5	1.908	4000	168.07	0.00	0.00000	1.003	2	0.9108	10.34
2.1	0.17	3.00	15.00	7.57	17.5	1.705	4000	168.07	0.00	0.00000	1.003	2	0.9380	6.37
2.1	0.17	5.00	25.00	12.62	17.5	1.465	4000	168.07	0.00	0.00000	1.003	2	0.9578	4.35
2.1	0.17	7.00	35.00	17.66	17.5	1.284	4000	168.07	0.00	0.00000	1.003	2	0.9680	3.51
2.1	0.17	9.00	45.00	22.71	17.5	1.143	4000	168.07	0.00	0.00000	1.003	2	0.9742	3.05
2.1	0.17	12.00	60.00	30.28	17.5	0.982	4000	168.07	0.00	0.00000	1.003	2	0.9800	2.65
2.1	0.17	14.00	70.00	35.32	17.5	0.897	4000	168.07	0.00	0.00000	1.003	2	0.9827	2.47
2.1	0.17	16.00	80.00	40.37	17.5	0.826	4000	168.07	0.00	0.00000	1.003	2	0.9847	2.35
2.1	0.17	18.00	90.00	45.42	17.5	0.766	4000	168.07	0.00	0.00000	1.003	2	0.9863	2.25
2.1	0.17	20.00	100.00	50.46	17.5	0.713	4000	168.07	0.00	0.00000	1.003	2	0.9876	2.17
2.1	0.17	22.00	110.00	55.51	17.5	0.668	4000	168.07	0.00	0.00000	1.003	2	0.9886	2.10
2.1	0.17	24.00	120.00	60.56	17.5	0.627	4000	168.07	0.00	0.00000	1.003	2	0.9895	2.05
2.1	0.17	26.00	130.00	65.60	17.5	0.592	4000	168.07	0.00	0.00000	1.003	2	0.9903	2.00
2.1	0.17	28.00	140.00	70.65	17.5	0.560	4000	168.07	0.00	0.00000	1.003	2	0.9910	1.97
2.1	0.17	30.00	150.00	75.69	17.5	0.532	4000	168.07	0.00	0.00000	1.003	2	0.9915	1.93
2.1	0.17	32.00	160.00	80.74	17.5	0.506	4000	168.07	0.00	0.00000	1.003	2	0.9920	1.90
2.1	0.17	34.00	170.00	85.79	17.5	0.482	4000	168.07	0.00	0.00000	1.003	2	0.9925	1.88
2.1	0.17	38.00	190.00	95.88	17.5	0.442	4000	168.07	0.00	0.00000	1.003	2	0.9933	1.83
2.1	0.17	42.00	210.00	105.97	17.5	0.407	4000	168.07	0.00	0.00000	1.003	2	0.9939	1.80
2.1	0.17	6.79	33.95	17.13	17.5	1.301	4000	168.07	0.00	0.00000	1.003	2	0.9672	3.58

Appendix I - Limiting differential settlement check

Differential Settlement Check

McGinnis Ferry Road over Big Creek - Wall No. 23
PI No. 0004634

AASHTO Table C11.10.4.1-1 Guide for Limiting Distortion for Precast Concrete Facings of MSE Walls

Joint Width (in)		Limiting Differential Settlement	
		Area ≤ 30 ft^2	30 ft^2 ≤ Area ≤ 75 ft^2
0.75		1/100	1/200
0.50		1/200	1/300
0.25		1/300	1/600

AASHTO Table C11.6.2.2 Rigid Retaining Walls

Limiting Differential Settlement
1/1000

Section Height (ft)	Wall Section			Centroid	Settlement (in)	Rise (ft)	Run (ft)	Slope
10	128+85.00	to	129+56.50	129+20.75	0.90			
12	129+56.50	to	129+65.20	129+60.85	0.70	-0.0167	40	-0.00041563
14	129+65.20	to	129+74.00	129+69.60	0.80	0.0083	9	0.00095238
16	129+74.00	to	129+83.40	129+78.70	1.00	0.0167	9	0.00183150
18	129+83.40	to	129+95.00	129+89.20	1.20	0.0167	11	0.00158730
20.17	129+95.00	to	130+25.00	130+10.00	1.90	0.0583	21	0.00280449
18	130+25.00	to	130+67.00	130+46.00	1.60	-0.0250	36	-0.00069444
20.17	130+67.00	to	131+41.16	131+04.08	3.40	0.1500	58	0.00258264
14	131+41.16	to	131+70.91	131+56.04	2.10	-0.1083	52	-0.00208514

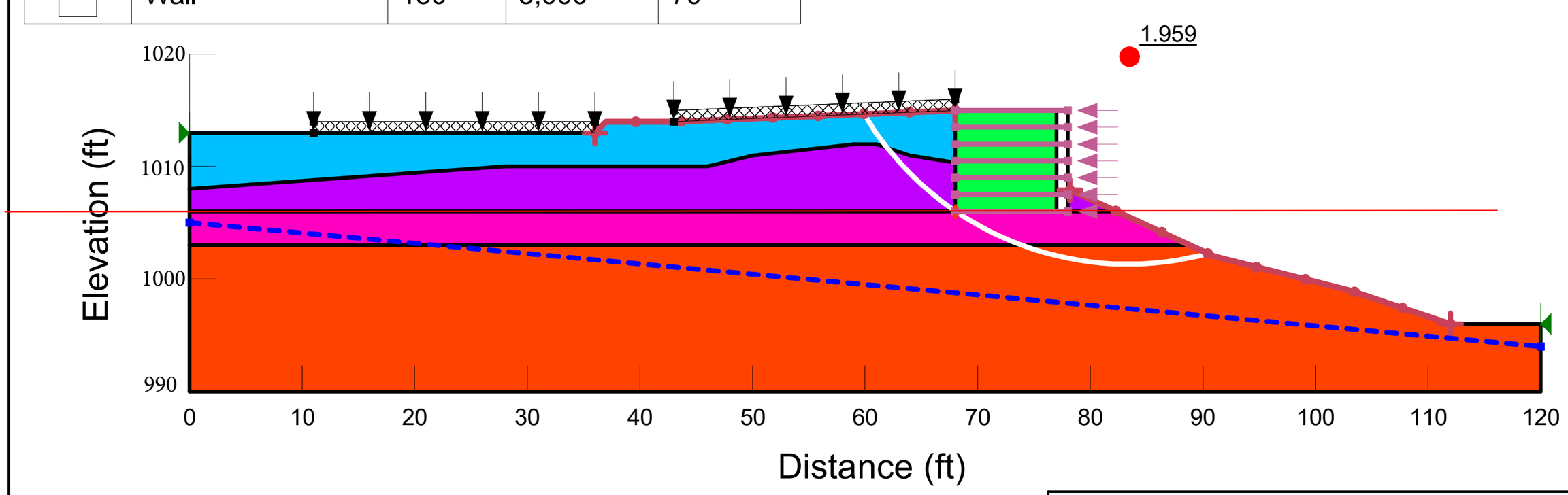
Assuming MSE panels less than 75 square feet with joint width of 0.75 inches, differential settlements along the wall satisfy the limiting distortion values.

Appendix J - Global stability analysis graphical outputs

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	33
	Foundation Soils 3	125	0	43
	Reinforced Zone	120	0	34
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 10 ft

Note: Groundwater represented by dotted piezometric line.

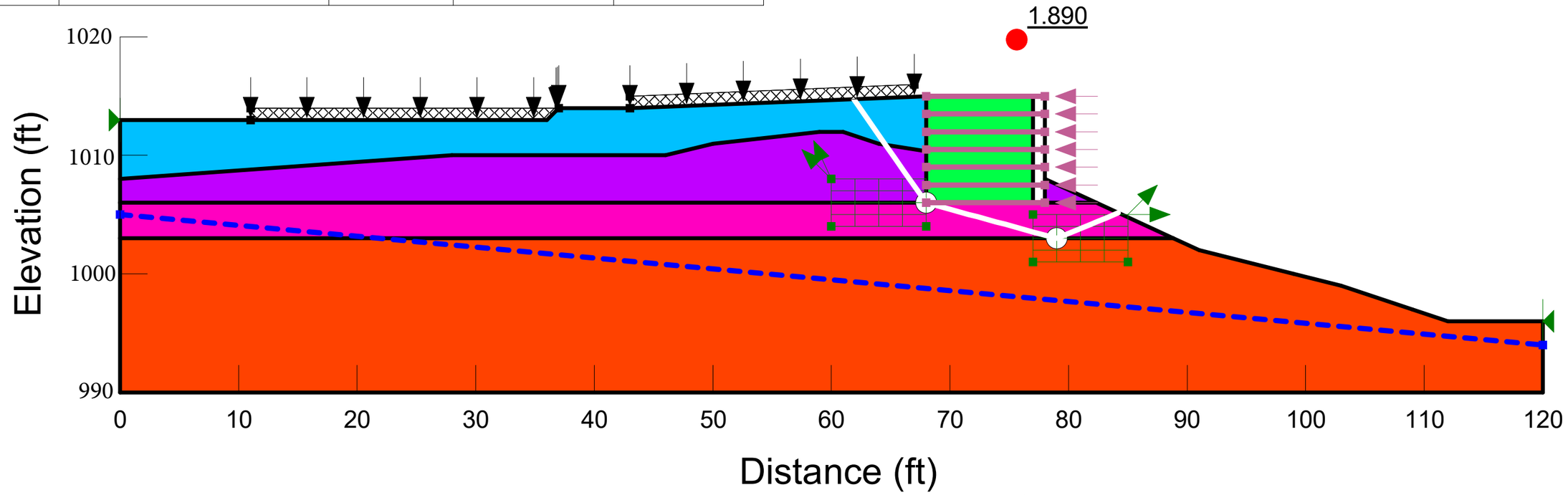


Bishop Non Rigorous Analysis - Circular
McGinnis Ferry Road - FOR095-PH2 - Wall 23 - STA 129+50.gsz
01/26/2022 1:113

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	33
	Foundation Soils 3	125	0	43
	Reinforced Zone	120	0	34
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 10 ft

Note: Groundwater represented by dotted piezometric line.

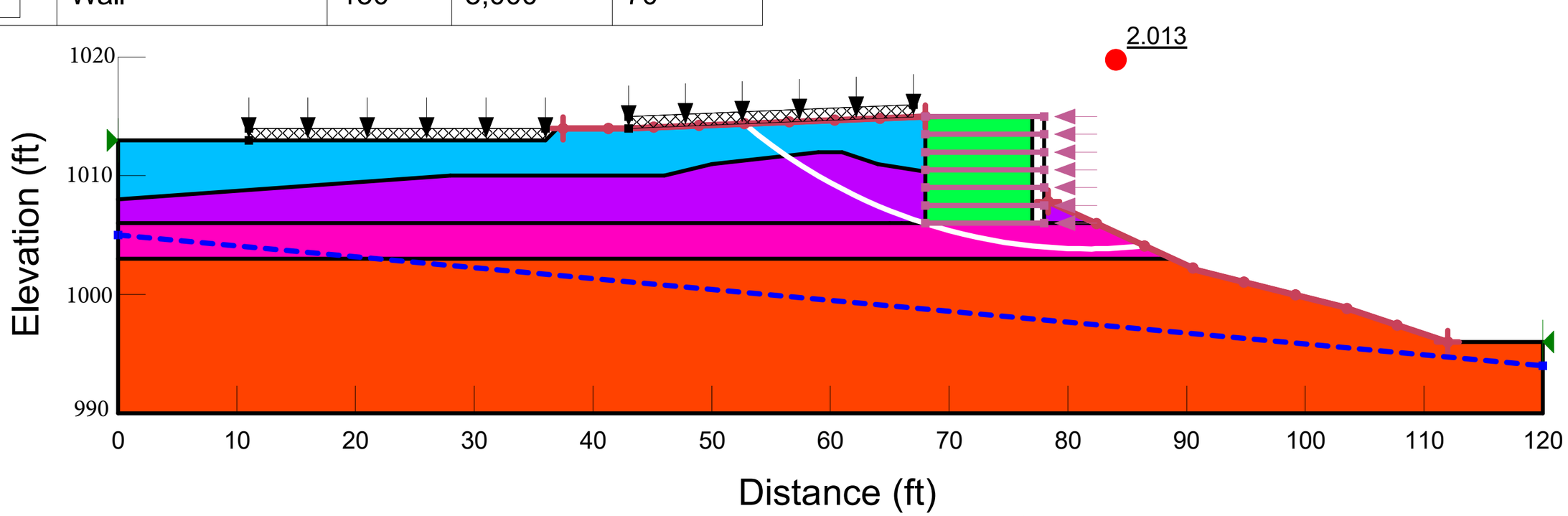


Bishop Non Rigorous Analysis - Non Circular
McGinnis Ferry Road - FOR095-PH2 - Wall 23 - STA 129+50.gsz
01/26/2022 1:113

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	33
	Foundation Soils 3	125	0	43
	Reinforced Zone	120	0	34
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 10 ft

Note: Groundwater represented by dotted piezometric line.

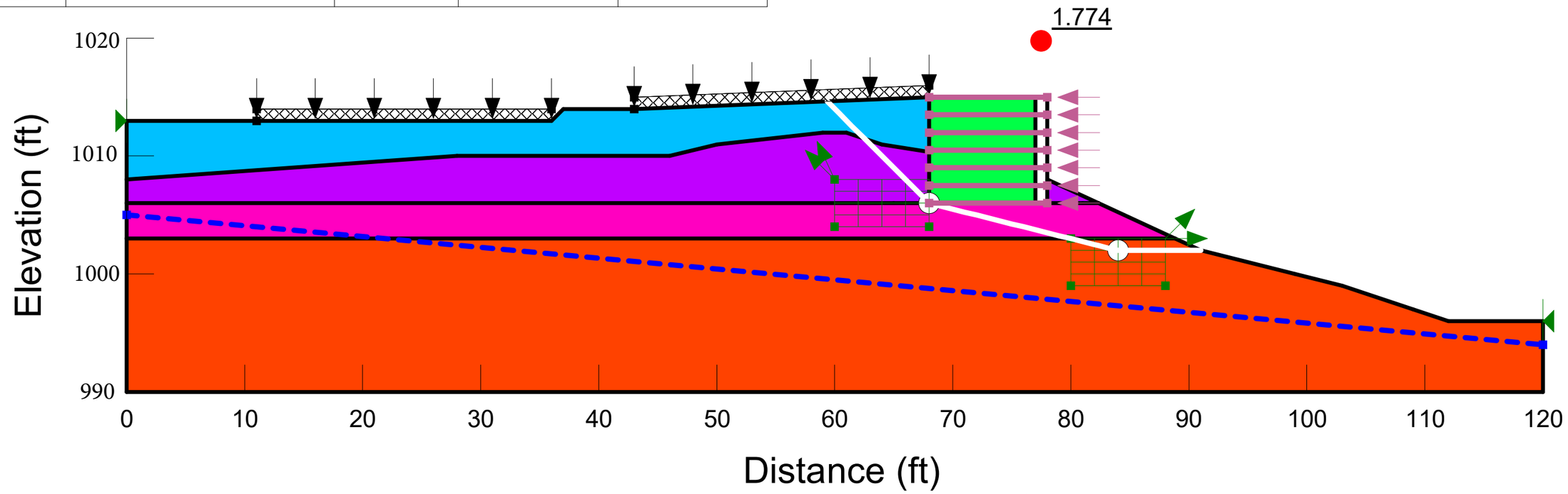


Morgenstern Price Rigorous Analysis - Circular
McGinnis Ferry Road - FOR095-PH2 - Wall 23 - STA 129+50.gsz
01/26/2022 1:113

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	33
	Foundation Soils 3	125	0	43
	Reinforced Zone	120	0	34
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 10 ft

Note: Groundwater represented by dotted piezometric line.

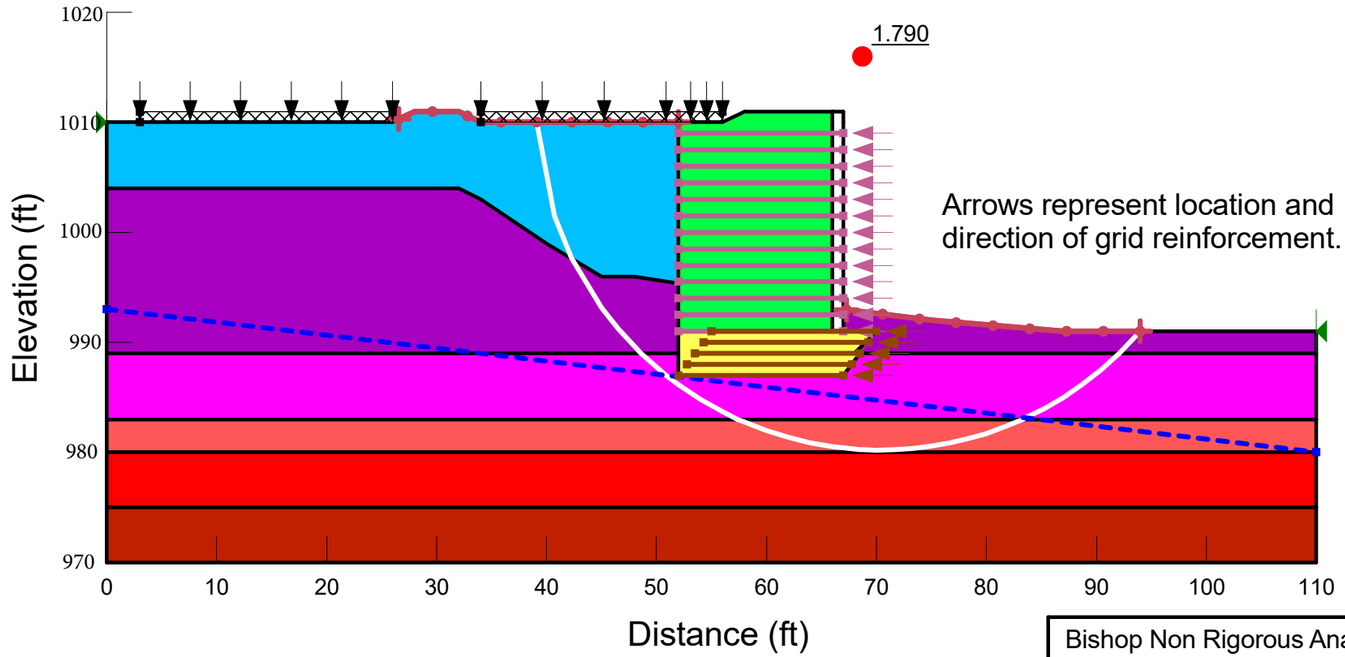


Morgenstern Price Rigorous Analysis - Non Circular
McGinnis Ferry Road - FOR095-PH2 - Wall 23 - STA 129+50.gsz
01/26/2022 1:113

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	32
	Foundation Soils 3	105	0	25
	Foundation Soils 4	110	0	29
	Foundation Soils 5	125	0	43
	Reinforced Zone	120	0	34
	Remediated Foundation Soils	130	0	38
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 15 ft
Remediated Foundation Soils Depth = 4ft
Remediated Foundation Grid Reinforcement Spacing = 1ft

Note: Groundwater represented by dotted piezometric line.



Bishop Non Rigorous Analysis - Circular

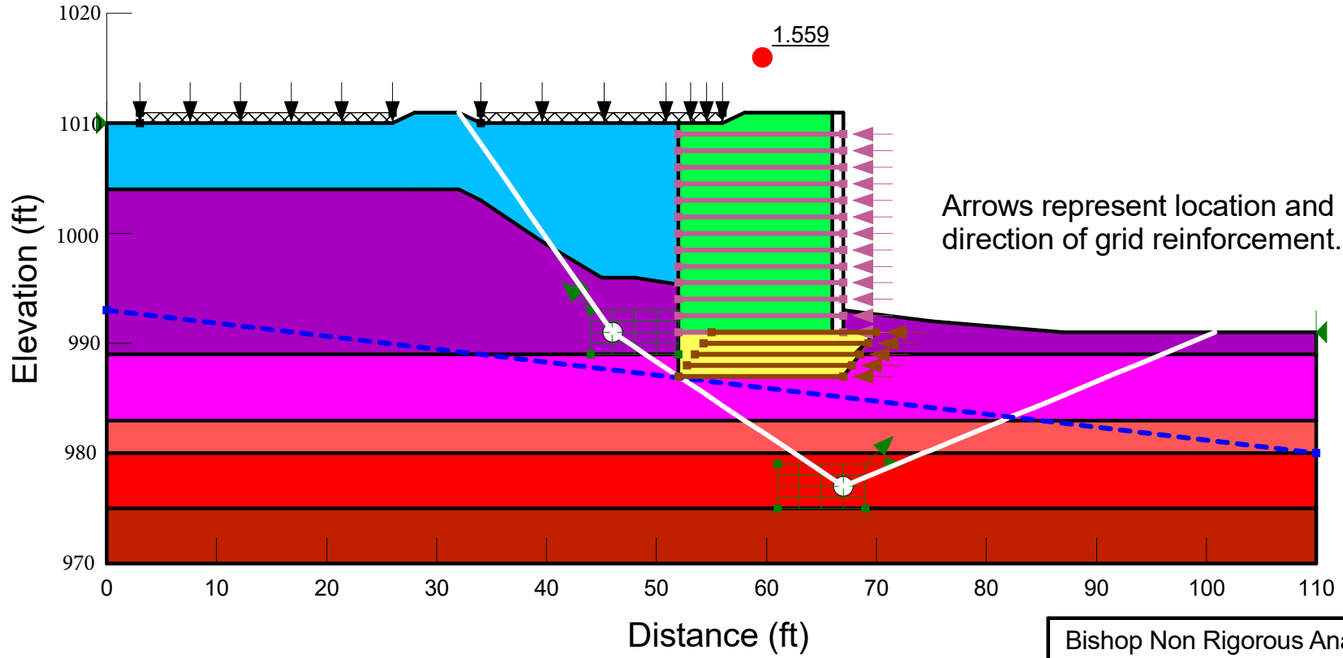
McGinnis Ferry Road - FOR095-PH2 - Wall 23 - STA 131+00.gsz

01/27/2022 1:170

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	32
	Foundation Soils 3	105	0	25
	Foundation Soils 4	110	0	29
	Foundation Soils 5	125	0	43
	Reinforced Zone	120	0	34
	Remediated Foundation Soils	130	0	38
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 15 ft
Remediated Foundation Soils Depth = 4ft
Remediated Foundation Grid Reinforcement Spacing = 1ft

Note: Groundwater represented by dotted piezometric line.

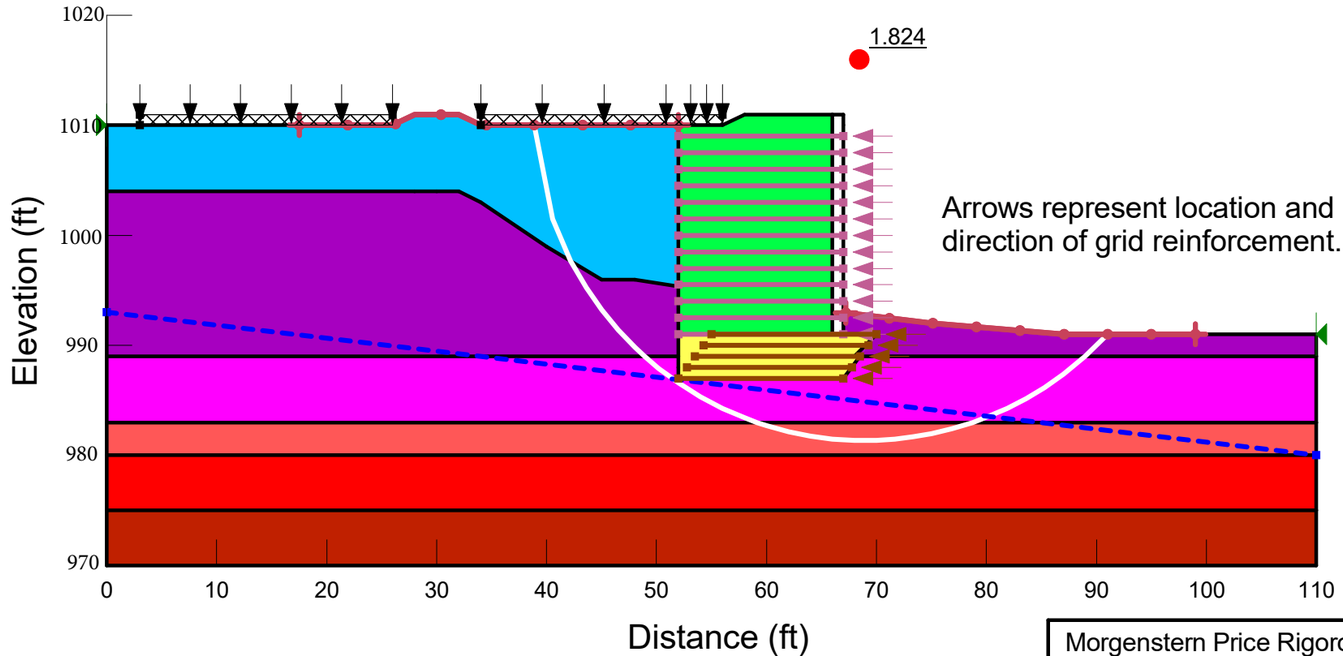


Bishop Non Rigorous Analysis - Non Circular
McGinnis Ferry Road - FOR095-PH2 - Wall 23 - STA 131+00.gsz
01/27/2022 1:170

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	32
	Foundation Soils 3	105	0	25
	Foundation Soils 4	110	0	29
	Foundation Soils 5	125	0	43
	Reinforced Zone	120	0	34
	Remediated Foundation Soils	130	0	38
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 15 ft
Remediated Foundation Soils Depth = 4ft
Remediated Foundation Grid Reinforcement Spacing = 1ft

Note: Groundwater represented by dotted piezometric line.

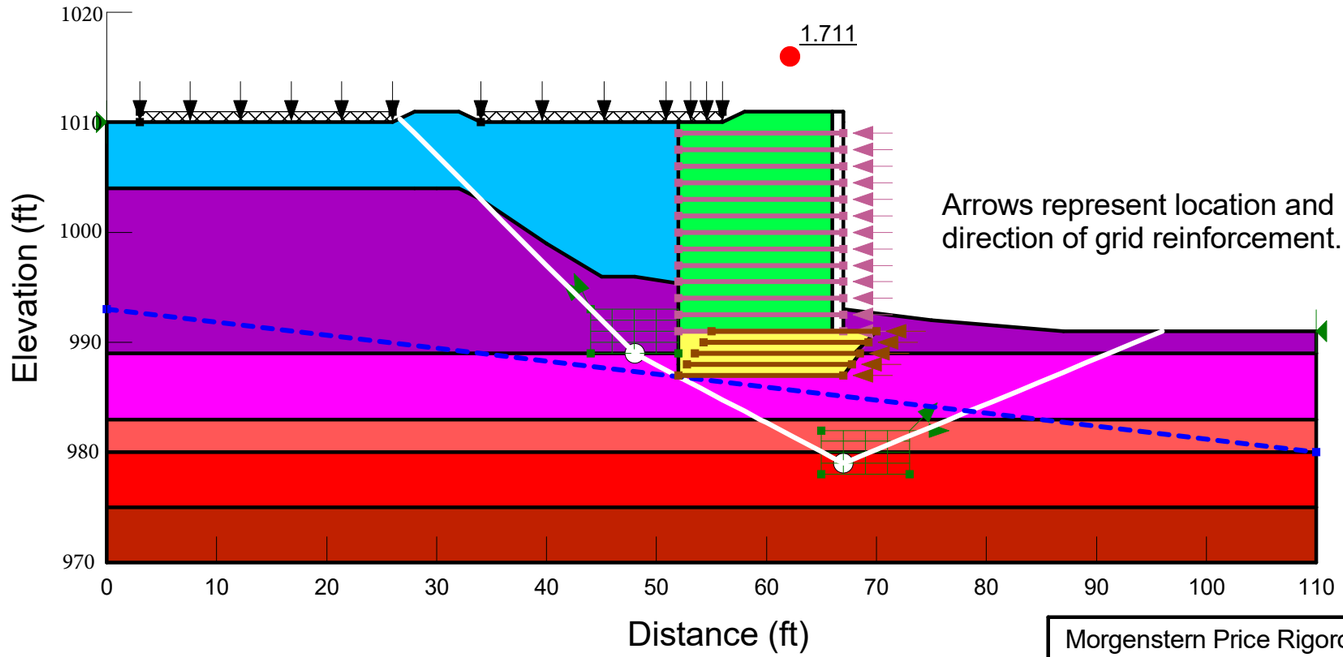


Morgenstern Price Rigorous Analysis - Circular	
McGinnis Ferry Road - FOR095-PH2 - Wall 23 - STA 131+00.gsz	
01/27/2022	1:170

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Foundation Soils 1	115	0	28
	Foundation Soils 2	120	0	32
	Foundation Soils 3	105	0	25
	Foundation Soils 4	110	0	29
	Foundation Soils 5	125	0	43
	Reinforced Zone	120	0	34
	Remediated Foundation Soils	130	0	38
	Retained Soils	115	0	32
	Wall	150	5,000	70

Surcharge Load = 250 psf
Required Strap Length = 15 ft
Remediated Foundation Soils Depth = 4ft
Remediated Foundation Grid Reinforcement Spacing = 1ft

Note: Groundwater represented by dotted piezometric line.



Morgenstern Price Rigorous Analysis - Non Circular	
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01/27/2022	1:170